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FROM A MOMENTARY EXPERIENCE TO A LASTING ONE

THE CONCEPT OF AND RESEARCH ON EXPANDED USER EXPERIENCE OF MOBILE DEVICES
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The concept of and research on expanded user experience of mobile devices

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Abstract

In order to respond to the challenges posed by technological development, new interdisciplinary concepts and methods in the fields of research and design of information and communication technology are required. The researchers in these fields have been trying to solve design problems by, for example, concentrating on designing for the user experience (UX). Nevertheless, the concept of UX has been widely disseminated and rapidly adapted in many areas of design without it being clearly defined or deeply understood.

Not only theoretical study of the phenomenon is needed but also analytical tools to more comprehensively analyse and understand UX. Such an important tool would be a concept that can be used to study practical phenomena in a comprehensive manner.

The theoretical objective of this thesis was to formulate a new, “expanded” concept of UX that can be used to describe human experience with technology so that both short-term and longer-term aspects of this experience can be taken into account. Based on the review of the literature, it seemed that Dewey’s concept of aesthetic experience could provide a theoretical frame of reference for an approach aiming at understanding UX in a more comprehensive manner. A broad theoretical concept, such as Dewey’s concept of aesthetic experience, is not directly applicable to empirical research, however. The practical objective of the thesis was to outline a method or a set of methods how the concept can be operationalised. A comprehensive and operational concept of UX is generated based on Dewey’s concept of aesthetic experience that is divided into two levels utilising Leontjev’s activity theory.

As a result of the research, the concept of expanded user experience (eUX) and the reflective research method for studying it has been created. This research has shown that by studying longer-term UX in addition to temporal UX and by focusing on analysing the user’s activity it is possible to see a larger and more meaningful view on UX. The reflective research method is particularly beneficial as a long-term research method focusing on the everyday environments of users.

Keywords: experience with technology, motivated activity, technology as experience, user experience
Luojus, Satu, Hetkellisyydestä kokemukseen – mobiililaitteen laajennetun käyttäjäkokemuksen käsitteestä ja tutkimisesta
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Tiivistelmä
Teknologian kehityksen asettamiin haasteisiin vastaaminen edellyttää uusia tieteen rajat ylittäviä käsitteitä ja menettelytapoja informaatio- ja kommunikaatioteknologian alan tutkimuksessa ja suunnittelussa. Alan tutkijat ovat alkaneneet etsiä ratkaisuja suunnittelun ongelmien mm. keskitymällä käyttäjäkokemuksen suunnittelun. Käyttäjäkokemus käsitteen käyttö on yleistynyt ja se on omaksuttu nopeasti monilla suunnittelun alueilla huolimatta siitä, että käsitettä ei ole selkeästi määritelty tai syvällisesti ymmärretty.

Käyttäjäkokemuksen tutkimuksessa tarvitaan paitsi tutkittavan ilmiön teoreettista tarkastelua, myös analyysittäviä välineitä käyttäjäkokemusta kokonaisvaltaisesti analysoimiseen ja ymmärtämiseen. Keskeinen väline on käyttäjäkokemuksen kokonaisvaltaisuus, moniulotteista ja reflektiivistä luonnetta kuvaava käsite, jonka avulla käytännön ilmiöitä voidaan tarkastella kokonaisvaltaisesti.

Tämän tutkimuksen teoreettinen tavoite oli kehitettää uusi "laajennettu" käyttäjäkokemuksen käsite, jolla voidaan kuvata käyttäjäkokemusta ottamalla huomioon inhimillisen kokemuksen muodostumiseen vaikuttavia lyhyt- ja pitkäkestoisia aspekteja. Kirjallisuuskatsauksen perusteella vaikutti siltä, että Dewey'n estetettä kokemuksen käsite voisi ratkaista useita aikaisemman käyttäjäkokemuksen tutkimuksessa ilmenneitä puutteita tarjoamalla teoreettisen viitekehynksen lähestymistavalle, jonka tavoitteena on ymmärätä käyttäjäkokemusta aikaisemmassa kokonaisvaltaisemmin. Laaja teoreettinen käsite, kuten Dewey'n esteettisen kokemuksen käsite, ei kuitenkaan ole suoraan sovellettavissa empiriseen tutkimukseen. Näin ollen tutkimuksen käytännöllinen tavoite oli hahmotella menetelmä tai joukko menetelmöitä, joiden avulla Dewey'n esteettisen kokemuksen käsite voidaan operationalisoida. Tutkimuksessa kehitettiin, aikaisemmassa kokonaisvaltaisempia ja operaatioalainen käyttäjäkokemuksen käsite perustuu Dewey'n esteettisen kokemuksen käsitteen avulla. Tutkimuksen tuloksena syntyi laajennettu käyttäjäkokemuksen käsite (the expanded user experience), ja sen tutkimiseen tarkoitetun reflektiivisen käyttäjätutkimusmenetelmän (the reflective research method).

Asiasanat: käyttäjäkokemus, teknologia kokemuksena
Acknowledgements

This dissertation is the result of my long and winding journey along the road of research. I took an exciting and compelling path. At times, it turned out to be fairly rough and almost impassable. As the destination finally begins to loom in the distance, I am starting to perceive the meaning of my journey.

Along the way, I have received support from a number of people and, in addition to those stated here, I would like to thank all with whom I have had exciting discussions over themes touched upon by my research topic.

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1 Introduction

The fact that technology is deeply embedded in the ordinary everyday life of people has generated a need to understand the interaction between people and technology. Aspects of relationships between people and interactive technologies have been addressed by research and practice in areas such as Human-Computer Interaction (hereinafter “HCI”) and Computer-Supported Cooperative Work (CSCW).

An important objective of this thesis is contributing new ideas for the current lively conceptual discussion on user experience research and its bases by studying the concept of user experience. Another objective is studying long-term user experience in order to understand not only the final outcome of the phenomenon being studied but also the dynamics behind the creation of experience. If user experience is more comprehensively understood, it will be possible to address the underlying challenges in the design of interactive high-tech products and environments. The generated concept of expanded user experience is an analytical tool that can be used to analyse and understand user experiences, but it can also be considered to be a starting point for a research method that deeply studies user experience.

The roots of HCI extend at least to WWII, but in its current form, it started at the turn of the 1970s and 1980s when the use of computers became more common and the general public became aware of problems in understanding the interaction between humans and computers. When personal computers became more common, this field of research suddenly gained both social and financial significance, and HCI research quickly expanded both in companies and in universities. The information-processing paradigm of computer science was adopted as the model for human cognition in the field of HCI in the early 1980s. (Kaptelinin & Nardi 2006). Concepts – such as memory, processing and communication channel – were generated based on the paradigm using hypothetical variable models that studied the way the human mind works when a person is using a computer. The models were tested in compliance with the best experimental laboratory research principles. It was possible to analyse and deal with relatively simple routine operations using such models, however, and it was observed that development of information-processing models that enable analysis of how users understand and interpret user interfaces is a much more difficult step, and this was precisely the problem for which practical design work sorely required assistance. The gap between theory and practice started to expand. Even though the status of research orientation was observed, the main attention in HCI was not on new theoretical
models in the 1980s. Instead, the focus lay in studying practical methods. In thelate 1980s, corporate research laboratories created a field of study called usability engineering. It was a continuously developing selection of practical methods that aimed at assessing and improving the quality of software. This field used few theories or conceptualisations, however. (Kuutti 2009).

Challenges for the dominance of the cognitive paradigm and observations about the limitations of the traditional information-processing paradigm began to appear as early as in the mid-1980s (e.g. Winograd & Flores 1986, Suchman 1987). The limitations of cognitivist thinking and the need for a broader focus in HCI research and development were acknowledged by the mainstream HCI community (e.g. Grudin 1990, Bannon 1991, Kuutti 1996) by the early 1990s.

When information technology or communication technology devices became more common and expanded into consumer products in the 1990s, new challenges for design emerged. “Post-cognitivist” approaches have been created in HCI research to understand the problems of living with technology. The term post-cognitivist refers to an approach based on the idea that it is difficult or impossible to address these issues by utilising cognitivist information-processing psychology, and thus researchers have strived to introduce new elements into the original theoretical basis of HCI. Theories have been developed in order to study (1) the human element when using computers from viewpoints other than cognition and (2) the human-computer use case in a broader sense than the immediate interaction. (Kuutti 2009). After the turn of the millennium, HCI researchers started to search a solution for design problems by focusing on designing user experience (cf. ACM series of Designing User Experience (DUX) conferences). This approach focuses on the role and activities of users not only as rational but also emotional beings and consumers seeking pleasure and status (cf. Pine & Gilmore 1998).

User experience (hereinafter “UX”) in itself is a new important concept that aims at describing the comprehensive relationship between a user and a product, as well as the service provided by the product (Jääskö et al. 2003). There is no generally accepted definition or a homogeneous theoretical basis for the concept. Nevertheless, the concept of UX has been widely disseminated and rapidly adapted in many areas of design without it being clearly defined or deeply understood (Law et al. 2008, 2009).

The lack of a shared definition of user experience undermines the effectiveness of researching, managing and teaching user experience. Law et al. (2008) recognise several critical uses of a UX definition: (1) it facilitates scientific dis-
courses, especially when scholars from multiple disciplines are involved; otherwise, communication breakdowns are bound to occur; (2) it enables managing practical applications of UX, which need to be operationalised and evaluated against measurements; and (3) it helps with the teaching of the term with the fundamental understanding about its nature and scope. (Law et al. 2008).

During the last years UX has become a focus of attention in HCI research. For example, within a relatively small community of Finnish HCI research seven PhD thesis on topic have already been completed. Kankainen (2002) generated in her dissertation, “Thinking model and tools for understanding user experience related to information appliance product concepts”, a conceptual model of user experience to be used as a product conceptualisation tool and a tool to facilitate the understanding of user experience, whereas Battarbee’s (2004) dissertation, “Co-experience”, focuses on the social aspect of user experience, i.e., on studying the user experience created through social interaction. Roto (2006) identified in her study, “Web Browsing on Mobile Phones – Characteristics of User Experience”, six factors and sub factors influencing Web browsing with a mobile device and Mattelmäki (2006) studied in her thesis, “Design probes”, an innovative and empathetic user-centred design method and so-called design probes. In her dissertation, “Design implications for mobile user interfaces of internet services”, Vartiainen (2009) provided recommendations for the design of mobile Web service user interfaces. In her thesis, “Internet on Mobiles: Evolution of Usability and User Experience”, Kaikkonen (2009) studied the usage of the terms “usability” and “user experience” by analysing the evolution of Web services used with mobile devices. Arhippainen’s (2009) thesis, “Studying user experience: issues and problems of mobile services – Case ADAMOS: User experience (im)possible to catch?”, provides practical information for conducting user experience studies and evaluating experiences. This Finnish sample is quite representative with respect to the field in general; as a summary, one can state that the primary objective of user experience research characteristic of the design field has been to collect research material by qualitative means to inspire design.

Table 1 summarises the different stages of HCI research, from cognitive information-processing psychology and studies of the user as rational data processor to user experience design and understanding technology as an experience.
Table 1. From cognitive information-processing psychology to user experience design.

<table>
<thead>
<tr>
<th>Decade</th>
<th>Until mid-1980s</th>
<th>Late 1980s</th>
<th>1990s</th>
<th>21st century</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trend</td>
<td>Cognitive</td>
<td>Criticism towards artificial intelligence</td>
<td>Post-cognitivistic approaches</td>
<td>User experience design</td>
</tr>
<tr>
<td>Reason behind the trend</td>
<td>Production of PC software for the consumer market</td>
<td>Need for practical solutions and to analyse how users understand and interpret a user interface</td>
<td>Need to study the problematics of use cases from a broader perspective than cognition and the individual viewpoint (Chapter 2)</td>
<td>Need to study the emotions of users in addition to cognitive and functional aspects (Chapter 2)</td>
</tr>
<tr>
<td>Methods</td>
<td>Fitts' law, GOMS model, etc.</td>
<td>Pragmatic methods, such as usability testing and heuristics</td>
<td>Different kinds of behavioural and social scientific methods in observation and analysis of actual use cases</td>
<td>Mostly applied qualitative behavioural and social scientific methods (such as interviews, probes, participatory design workshops)</td>
</tr>
<tr>
<td>Notable researchers</td>
<td>Fitts, Card, Moran, Newell</td>
<td>Norman, Nielsen, Shneiderman, Winograd, Flores, Suchman</td>
<td>Carroll, Bannon, Badker, Nardi, Kaptealin, Dourish</td>
<td>Garret, Jordan, Hassenzahl, Forlizzi, Ford, McCarthy, Wright</td>
</tr>
</tbody>
</table>

1.2 Motivation of research

There is a great deal of concern with UX in HCI and related fields, but it is often unclear what is meant by the term. Often the idea of user experience used in product development is based more on practically developed skills instead of any existing user experience studies or definitions. Each designer interprets the concept of user experience in his or her own manner (cf. Buchanan 1996). The most limited interpretations consider user experience to be the same as the user’s personal experience of a user interface. Hyyppä’s (2008) description of user experience is an example of a more comprehensive interpretation. According to Hyyppä, the focus of user experience design lies in the activities of the user instead of the
user interface. A good tool is transparent and as imperceptible as possible (in the interaction between the subject and object). (Hyyppä 2008).

The development of conceptual tools have been considered important by, for example, Wright et al. (2003), who argue that “without conceptual development, there is a danger that user experience and related concepts [...] will not be fully realized in studies of people and technology” (Wright et al. 2003: 43) and Davis (2003), who states that “without careful analysis of the objects and methods, terminology, and conceptual frameworks of experiential systems design, misconceptions about what experiences are and how they can be computationally addressed can allow research to proceed in less fruitful directions”. (Davis 2003: 45). Both research and industry applying research results have a clear need for a definition of the concept of user experience that could describe the dynamic and complex nature of user experience in a more comprehensive manner (Forlizzi & Ford 2000, McCarthy & Wright 2004, Wright et al. 2008, Karapanos et al. 2009, cf. Law et al. 2008, 2009). Since HCI is still a young and multi-disciplinary field of study, several of its basic concepts are still fairly superficially defined. Basing the definition of the concept of user experience on already existing behavioural and social scientific studies is not only useful but also necessary. (Buchanan 1996, Davis 2003, McCarthy & Wright 2004, Kaptelinin & Nardi 2006).

According to Siekkinen (2008), design research requires “a deep understanding of what the users want and what they value instead of quantitative measuring results”. In addition to information about the users’ needs, wishes and dreams, practical design work also requires an understanding of the product’s actual physical, social and technical usage context, as well as the user’s motivation for using the product (Siekkinen 2008). Especially interesting is “how the users live with the products” (Hyyppä 2008). In other words, practical product development requires information particularly on how products blend in with the everyday life and everyday activities of people. In order to study how products adapt to everyday life, data must be collected for clearly a longer time than before and the users’ activities must be comprehensively studied. Understanding the importance of the temporal dimension of UX has become more and more actual, as emphasised in a recent paper by Karapanos et al.

“An aspect largely overlooked is that of temporality, i.e. how users’ experiences develop over time. As users’ familiarity with a product increases, one would expect them to experience less frustrating but also less exciting episodes. As a result, the perceived quality of a product is likely to change. Fur-
thermore, the relative importance of different qualities can also change over time. While learnability and novelty may be crucial initially, other aspects such as the product’s usefulness and social capital might motivate prolonged use. While the importance of temporality has been repeatedly highlighted in user experience research, it has rarely been systematically addressed. (...) We argue that temporality is becoming increasingly important.” (Karapanos et al. 2009: 729).

This is exactly the issue this thesis attempts to address. The thesis formulates a concept of user experience that can be used to describe the complex and dynamic nature of user experience in a more comprehensive manner, and also one that can be operationally used in data collection and analysis methods required to study user experiences. The research is related to the discussion on user experience in the fields of HCI and design research, with the aim to participate in the ongoing discussion on the basic concepts of user experience research.

In addition to the relevance for the academic community, the results of this thesis might be relevant for practice as well. There have been voices criticizing the existing concepts of user experience that they are insufficient to respond to the needs of the design of interactive high-tech products (cf. Hyyppä 2008, Siekkinen 2008).

This insufficiency for practical purposes was also the initial starting point for this research. My department at Laurea University of Applied Sciences got 2006 a contract from the product development unit of a high-technology company (Polar Electro) to study what happens in the long-term use of their products in everyday life, and I was assigned as the principal investigator of the project (called Kinos, and explained later in more details). From the beginning I had a plan to use the project as the empirical ground for my PhD thesis, and initially the focus of the planned thesis was in the development of a new method for following a long-term use of a product. Although it was assumed that some conceptual work would be needed for analysis, it was not seen at that time as a major effort. Thus the data gathering and initial analysis methods presented in this thesis were developed first, during the Kinos project. When data started to accumulate and analysis started it appeared, however, that the existing user experience concepts were indeed insufficient for describing what was happening, and that a more serious conceptual effort was needed to connect the findings with user experience discussion in HCI research. Thus the struggle with concepts and theories to construct a conceptual framework coherent enough started already during the Kinos-project and contin-
ued eventually until 2009. Because the construction of a framework was only in the beginning when Kinos-project ended in 2007, an intermediate persona-based representation (which does not lean explicitly to any user experience concept) was developed to explain the results to the customer. Only after the framework solidified, it was possible to refine the data analysis methods and to return back to the original data to see, if any validation can be found for the framework. Thus the way how the research and its results are presented in the thesis does not follow the actual process how the work was conducted in practice, but the presentation is made more straightforward for the sake of clarity. The initial push for this research came from practical design problems in industry, and I hope, that the concepts and the tools created in this research can be utilised not only in research discussions but also to alleviate some of these problems.

### 1.3 Research question and structure of the study

The theoretical objective of this thesis is to formulate a new, “expanded” concept of UX that can be used to describe human experience with technology so that both short-term and longer-term aspects of this experience can be taken into account. The practical objective of the thesis is to outline a method or a set of methods how the concept can be operationalised – how the issues can be studied and analysed in practice, and to do an initial validation for the method. The main research questions of this thesis are thus:

1. *How can the concept of “expanded” user experience be defined and by what means can it be studied in the activities of a user?*

These questions will be addressed in the thesis in the following way (Fig.1).
The introduction offers a basis for the significance of the research project and builds a background for the objectives. The latter part of the introduction chapter includes the objectives, positioning and structure of the thesis. In order to find out how HCI and related research currently understand UX, the theoretical approaches, levels of analysis and conceptualisation and operationalisation issues are reviewed in Chapter 2. Assessment of the state of prior research is necessary in order to study the research gap and specify the necessary steps of the conceptualisation process.

In order to reach the objectives, the studied phenomenon of comprehensive user experience (Chapter 3) and the research method required to study the user experience (Chapter 4) are comprehensively constructed based on literature. The theoretical frame of reference for the research is generated in two parts: Chapter 3, *Towards a more comprehensive understanding of the concept of UX*, focuses on creating the frame of reference required for defining the concept based on previous research. At the end of the chapter, the comprehensive concept of user experience created based on the theoretical frame of reference is studied. In order to answer the research question, it is also necessary to empirically study the concept...
created. For this purpose, data collection and analysis methods which can study the expanded user experience based on the activity of users are required. Chapter 4, *Method for more comprehensive study of user experience*, expands the theoretical frame of reference in the manner required by method development. The created research method is presented at the end of this chapter.

The empirical data has been collected utilising the above-mentioned method in a user study called Kinos. Chapter 5, *eUX in everyday life*, studies the objectives of the empirical part of the research and analyses the research data. There is a summary of the results of the empirical section at the end of this chapter.

The most important results of the research project are presented in Chapter 6, *Results and discussion*. The chapter starts with a brief summary of the research results. The results are studied by comparing them with the results of previous user experience studies and the theoretical background. Utility of the results and further research subjects are studied at the end of the chapter.
2 Current status of user experience research

The concept of user experience (UX) aims at studying the comprehensive interaction between humans and technology. UX has proven a comprehensive and ambiguous phenomenon, and researchers have utilised various means in trying to understand and analyse it. In order to understand how HCI currently views experience, we will study the most important approaches and definitions of UX available in literature. At the end of this chapter, results of previous studies and possible needs to expand the approach to UX are analysed.

2.1 Defining the concept of UX

There are many perspectives one can use to approach UX, and researchers have utilised various means in trying to understand and analyse it (e.g. Swallow et al. 2005, Law et al. 2008). Law et al. (2008) list a few other reasons why reaching a common definition of UX is so challenging: (1) “UX is associated with a broad range of fuzzy and dynamic concepts, including emotional, affective, experiential, hedonic, and aesthetic variables”; (2) “The unit of analysis for UX is too malleable, ranging from a single aspect of an individual end-user’s interaction with a standalone application to all aspects of multiple end-users’ interactions with the company and the merging of the services of multiple disciplines”; (3) “The landscape of UX research is fragmented and complicated by diverse theoretical models with different foci such as emotion, affect, experience, value, pleasure, beauty, etc.” (Law et al. 2008: 2396). The phenomenon is challenging to study also because experience is ever present and thus people tend to believe that they already know what experience is. Many researchers share the opinion that experience is always a very personal and unique phenomenon and nobody can understand in detail what experience means to somebody else (Dewey 1934/2005, Pine & Gilmore 1998, Forlizzi & Ford 2000, Buchenau & Fulton Suri 2000, Battarbee 2004).

However, defining UX is not the first step in trying to make sense of experience or use experience to make sense of something like people’s interaction with technology (McCarthy & Wright 2004). UX can be considered to be a specific subsector of a complex and multidimensional phenomenon, experience. (cf. Roto 2006). The concept of “experience” has been already long studied in philosophy as well as in behavioural and social sciences. Several definitions of it have been created in several fields of science by several different schools. In particular phi-
losophers, psychologists and anthropologists who describe their work as pragmatist or phenomenological have been active in this respect.

There are different classifications of UX research approaches. Battarbee (2004) divides UX descriptions into three categories based on her frame of reference: (1) user-centred, (2) product-centred and (3) interaction-centred descriptions. Hassenzahl and Tractinsky (2006) categorize the research approaches in a different way: (1) beyond the instrumental (the non-instrumental, hedonic needs of users); (2) emotion and affect (the emotion and affect mainly before and after product use); and (3) experiential (the components that have an effect on experiences). (Hassenzahl & Tractinsky 2006). According to Swallow et al. (2005), a number of these perspectives have approached the concept by drawing heavily upon cognitive science and others have adopted a more holistic, phenomenological approach. In this thesis, the UX descriptions are studied in compliance with the division used by Swallow et al. (2005). This cognitive/holistic distinction has been taken in this thesis as the starting point in the review of the literature.

2.1.1 Approaching the concept of UX from the perspective of cognitive science

A coupling of cognitive psychology and computer science brought forth the field of HCI, which adopted the information-processing paradigm of computer science as the model for human cognition in the early 1980s (Kaptelinin & Nardi 2006, Carroll 2003). Characteristics of a cognitive science perspective are (1) separation of the inner world of a thinking subject and the outer world of the object; (2) priority of plan-directed human action that uses internally represented knowledge in plan execution; and (3) empirical studies that treat complex behaviour as reducible to (measurable) variables. According to Swallow et al. (2005), a number of researchers, including Jordan (2000), Norman (2004), and Hassenzahl (2003), have approached the concept of UX by drawing heavily upon cognitive science.

Based on studies of anthropologist Tiger (1992), Jordan (2000) divides the pleasure obtained from products into four types: (1) physio pleasure, or the pleasure brought on by physical feelings; (2) socio pleasure, or the pleasure brought on by communication and social experiences; (3) psycho pleasure, or the pleasure brought on by achievements and challenges; and (4) ideo pleasure, or the pleasure brought on by aesthetic products and the values therein. (Jordan 2000). In order to offer an end user a positive experience, a product must (according to Jordan) be not only pleasurable to use but also emotionally appealing.
Norman (2004) connects UX with the generation of feelings. According to
Norman, feelings are a result of the three levels based on the biological origin of
the brain (Norman et al. 2003). Norman has created a draft of three levels of brain
activity. Each of the levels influences the activity of people in a different way.
Each level deals with different types of stimuli, and this should also be taken into
account in design research. The visceral level is automated and quick; it makes
quick deductions on whether or not food is good and whether or not it is safe, etc.,
by sending purposeful signals to the motoric system, thus alerting other parts of
the brain. This signals affective processing that can be prevented or increased by
signals from an upper level. Most human behaviour takes place at the behavioural
level. The reflective level can reinforce or prevent behavioural level activities and
can also regulate the functions of the lower visceral level. The uppermost level is
reflective thinking. Consciousness and higher level feelings, emotions and cogni-
tion are present only at the reflective level. This is where thinking and feelings
meet — and where they can be experienced. The lower levels (visceral and behav-
ioral) exhibit affections but no interpretation or consciousness. Interpretation,
understanding, and reasoning takes place only at the reflective level. (Norman
2004).

According to Hassenzahl (2003), people have two modes for product interac-
tion: hedonistic and pragmatic. Pragmatic attributes relate to actions that are prac-
tical and work-oriented, whereas the hedonic level is related to fun and entertain-
ment. Thus, Hassenzahl suggests that enjoyment has more to do with the human
mindset than with the product at hand. Hassenzahl’s model assists in clarifying
why one object can sometimes be experienced as irritating and stressful but at
other times as exciting, challenging and fun. (Hassenzahl 2003).

In order to study what constitutes a compelling consumer experience, Hull
and Reid (2003) trialled three studies in which they aimed at developing systems
that evoke engaging experiences in their users. They explained the positive re-
sponses of users to the resulting systems through the model of consumer experi-
ence. It attempts to unpack the nature of engaging experiences by identifying
three key dimensions that are likely to play a role in those experiences: (1) chal-
lenge, achievement and self-expression; (2) social interaction, including bonding,
sharing and competing with others; and (3) drama and sensation, including stimu-
lating sights, smells and sounds, and other cues that trigger the imagination. They
argued that experiences that contain a combination of these dimensions will be
engaging. (Hull & Reid 2003).
Jordan (2000), Norman (2004) and Hassenzahl (2003) are more involved in describing approaches for the study of UX than in striving to define the concept itself. Hull and Reid (2003) focus on analysing the nature of engaging experiences, whereas Jordan’s (2000) description is an analysis of the pleasure obtained from products. Norman’s (2004) approach to UX starts from the biological structure of the brain and feelings. Hassenzahl’s (2003) description focuses on interaction, and it is a more comprehensive approach that also strives to explain the situational nature of experiences. The model does not account for how or why the modes change or what other aspects may influence experience (Battarbee 2004). In cooperation with Tractinsky, Hassenzahl (2006) gives a more detailed definition of UX, stating that UX is a consequence of a user’s internal state (predispositions, needs, expectations, mood, motivation, etc.), the characteristics of the designed system (e.g. complexity, functionality, purpose, usability, etc.) and the context (or the environment) within which the interaction occurs (e.g. organisational or social setting, meaningfulness of the activity, voluntariness of use, etc.).” (Hassenzahl & Tractinsky 2006).

A common strategy in cognitive science is the reduction of experience into a number of factors, layers or elements. “A pure engineering approach suggests that one can understand user experience by building formal models of it” (Sengers 2004: 25). In addition to the descriptions above, researchers approaching user experience from the viewpoint of cognitive science include, for example, Garrett (2002), Roto (2006) and Kankainen (2002), who have defined the concept of UX. Garrett (2002) has a technology-driven vision of UX in which it can be designed and controlled (Garrett 2002: 21):

“The user experience development process is all about ensuring that no aspect of the user’s experience with your site happens without your conscious, explicit intent. This means taking into account every possibility of every action the user is likely to take and understanding the user’s expectations at every step of the way through that process.” He suggests that “by breaking the job of crafting user experience down into its component elements, we can better understand the problem as a whole”. (Garrett 2002: 21)

Garrett (2002) offers a model for designing web sites that provide a positive user experience. He introduces five layers of UX: (1) The surface plane which brings everything together visually. “What will the finished product look like?” (2) The skeleton plane that makes structure concrete. “What components will enable people to use the site?” (3) The structure plane that gives shape to scope. “How will the pieces of the site fit together and behave?” (4) The scope plane that trans-
forms strategy into requirements. “What features will the site need to include?” (5)
The strategy plane that is where it all begins. “What do we want to get out of the site? What do our users want?” (Garrett 2002: 21–23).

In order to understand “the user experience building blocks in the case of mobile browsing”, Roto (2006) carried out several usability studies with mobile web browsers in both a laboratory and a mobile context, and conducted contextual inquiry interviews. Roto has identified six factors influencing the Web browsing experience of a user with a mobile phone: (1) the user’s state; (2) context; (3) mobile device; (4) browser application; (5) network infrastructure; and (6) web sites. (Roto 2006).

Kankainen (2002) presents in her dissertation a conceptual model of UX. According to that model, a user’s experience is a result of a motivated action in a certain context. The model depicts that the user’s previous experiences and expectations influence the present experience, and the present experience leads to more experiences and modified expectations. (Mäkelä & Fulton Suri 2001, Kankainen 2002). Kankainen focuses on studying the interaction between a human and a product, striving to take into account feelings, needs and motivation in the model. Their mutual relation and their relation to experience are not studied in more detail, however.

The cognitive science perspective discussed above has been criticized of being too limited approach for HCI (e.g. Winograd & Flores 1986, Suchman 1987, Grudin 1990, Bannon 1991, Dourish 2001, McCarthy & Wright 2004, Kaptelinin & Nardi 2006) to human experience with technology. When approaching the concept of UX from the perspective of cognitive science, many researchers strive to understand the human experience by identifying phenomena observed in a human experience situation, thus overlooking the problematics of concepts and the construction of a theoretical frame of reference for concepts. A common strategy is the reduction of experience into a number of factors. UX is defined by loosely connecting into different factors of the UX separate product characteristics belonging to the “external world”, factors relating to the context of use and “the user’s internal state”.

According to Swallow et al. (2005), such approaches “may be useful for experimental analysis but they can miss some of the insights available in accounts that resist such reduction (e.g. Davis 2003, McCarthy & Wright 2004)”. (Swallow et al. 2005: 91). Swallow et al. refer to more comprehensive approaches as the “phenomenological approach”.
2.1.2 Phenomenological approach to UX

According to Swallow et al. (2005), researchers, including Forlizzi and Ford (2000), Davis (2003), and McCarthy and Wright (2004), have adopted a more holistic, phenomenological approach in studying UX. Davis (2003) describes the phenomenological approach as an attempt to reconcile opposing models of experience into a unified framework grounded in our lived experience of the world. “The attempt to reestablish the philosophical project on the basis of our lived experience is known as phenomenology”. (Davis 2003: 46).

Forlizzi and Ford (2000) identify three ways to approach UX: (1) as an experience, i.e., a continuous flow of consciousness; this definition is based on the experienced cognition theory of cognitionist Carlson; (2) as an experience (Dewey) with a beginning and an end, and which causes changes in the user and the experience environment as a result of the experience; and (3) as part of storytelling based on the ideas of Schank. According to the definition by Forlizzi and Ford, UX can be divided into four components: sub-consciousness, cognition, narrative, and storytelling. The subconscious component refers to routine ways of acting. Cognitive experience requires thinking and an ability to resolve problems. A narrative experience is conscious and one that can be verbally described. A storytelling experience is personal and unique, and it is influenced by previous experiences, emotion, and context. A narrative experience is conscious and one that can be verbally described. When an experience becomes significant, a person’s activities become narrative, i.e., the person sums up the changes in the product and in himself. (Forlizzi & Ford 2000). Forlizzi and Ford (2004) propose meaning to be an essential part of the UX. The model also describes how experiences change, and are re-interpreted in a social context. This description stresses the changing nature of experiences. Forlizzi and Battarbee have later improved the initial model by presenting three types of user-product interaction: fluent, cognitive and expressive. (Forlizzi & Battarbee 2004).

Davis’ (2003) thesis “Theoretical Foundations for Experimental System Design” is “an attempt to begin this radically interdisciplinary project so as to place experiential systems design on a more theoretically-grounded foundation”. (Davis 2003: 45). Davis aims at understanding experience with technology from humanistically informed theoretical models of experience, communication and mediated experience. He shows that (1) experience is not an object (or even a collection of objects), but a process; (2) experience is an intangible process of interaction among humans and the world that has its existence in human minds; (3) experi-
ence is not something that can be archived or transmitted; (4) we can only archive or transmit the materials (data) which occasion experiences in human minds; and (5) every new interaction with these materials is itself a new experience (Davis 2003).

Neither Davis (2003) nor McCarthy and Wright (2004) present a definition of UX, but they suggest an approach to viewing living with technology as experience. McCarthy and Wright state that “in order to do justice to the wide range of influences of technology in people's everyday lives, technology should be understood in terms of lived and felt experience”. (McCarthy & Wright 2004: 12) Their thoughts of technology as experience are based on Dewey’s concept of “an aesthetic experience”. They outline a theoretical frame of reference for characterization of experience that enables interpretation of the influence of technology in everyday life (McCarthy & Wright 2004). McCarthy and Wright’s account of aesthetic experience for use in understanding people’s interactions and relations with technology can be characterised by three themes: (1) a holistic approach to experience wherein the intellectual, sensual, and emotional stand as equal partners in experience; (2) continuous engagement and sense-making wherein the self is always already engaged in experience and brings to each situation a history of personal and cultural meanings and anticipated futures that complete the experience through acts of sense-making; and (3) a relational or dialogical approach wherein self, object, and setting are actively constructed as multiple centres of value with multiple perspectives and voices and where an action, utterance, or thing is designed and produced but can never be finalized since the experience of it is always completed in dialog with those other centres of value. (McCarthy & Wright 2004, Wright et al. 2008).

Despite the fact that Forlizzi and Ford identify approaches based on previous behavioural and social scientifical research, their four components of UX are not studied in these theoretical frames of reference. Like Forlizzi and Ford (2000), Davis (2003) notes that the nature of experience is linked with temporality. For Davis, time and experience are perspectival and constructed. “Experiences come into our consciousness and are shaped by the constructive activities of embodied, situated perception at the intersection of the intentional trajectories of anticipation and retrospection.” (Davis 2003: 46). In Davis’ opinion, experience is an internal process of humans that does not take into account the contextual and situational nature of the experience.

McCarthy and Wright’s (2004) starting point for viewing technology as experience is the pragmatism of philosophers of experience, who are “used to bring
the emotional, sensual, and volitional aspects of experience to the fore in ways that do not require a rejection of the intellectual.” (McCarthy & Wright 2004: 190). They base their approach to viewing technology as experience on Dewey’s characterization of an experience and internal dynamics of experience. McCarthy and Wright’s major contribution to the discussion of UX is “the aesthetic turn” that points toward “an aesthetic experience as paradigmatic of what human experience with technology might become”. (McCarthy & Wright 2004: preface). Their approach is studied in more detail in the next chapter.

2.2 The need for expanding the approach to UX

Kankainen (2002) and Roto (2006) notwithstanding approaches discussed above are not really any grounded definitions of the concept of UX, but more lists of various issues related to UX, or descriptions of research approaches. Unlike in the cognition science approach, a characteristic of the phenomenological approaches is the fact that they do not strive to define the concept of UX but seem to aim at constructing a theoretical frame of reference based on previous experiences in order to more deeply understand the UX. A common trait of such descriptions is that they are non-operational and thus not directly applicable for studying the phenomenon.

Academic UX research should be ready for a more deep and systematic study of phenomena and for constructing a theoretical base. As noted in the introduction, academic UX research and the industry utilising its results seem to require UX research that approaches the studied phenomenon in a more comprehensive manner and that aims at understanding not only the final result of the phenomenon but also the dynamics and structure involved in its creation. UX research requires not only theoretical study of the phenomenon but also analytical tools to more comprehensively analyse and understand UX. Such an important tool would be a concept describing the holistic, multidimensional and reflective nature of UX that can be used to study practical phenomena in a comprehensive manner.

Although the various approaches presented in the beginning of this chapter can be acknowledged as a useful contribution to understanding people’s relations with technology by shifting the empirical focus from laboratory to the everyday life with technology, heightening the sensibility to the social, and drawing attention to the reflective, they seem to lack the kind of sensibilities to the feelings and personal issues that are associated with experience. According to McCarthy and Wright (2004), Dewey’s concept of “an aesthetic experience” provides a frame of
reference for a clearer analysis of technology as experience. They suggest viewing technology as experience that is open to the sensual, emotional, volitional, and dialogically imaginative aspects of felt experience. (McCarthy & Wright 2004, Wright et al. 2008).

2.2.1 The aesthetic turn

McCarthy and Wright (2004) describe their position by listing their six propositions: (1) “in order to do justice to the wide range of influences that technology has in our lives, we should try to interpret the relationship between people and technology in terms of the felt life and the felt or emotional quality of action and interaction”; (2) “social-practice accounts of interactive technologies at work, at home, in education, and in leisure understate the felt life in their accounts of experiences”; (3) “it is difficult to develop an account of felt experience with technology”; (4) “pragmatist philosophy of experience is particularly clarifying with respect to experience, and that the models of action and meaning making they encompass express something of felt life and the emotional and sensual character of action and interaction”; (5) “the importance given to the emotional-volitional and creative aspects of experience in pragmatism prioritises the aesthetic in understanding our lived experience of technology”; and (6) “the revisionary theorizing of pragmatism is particularly valuable for understanding technology and design”. (McCarthy & Wright 2004: 12–21).

McCarthy and Wright, together with Wallace (Wright et al., 2008), describe their account of aesthetic experience for use in understanding people’s interactions and relations with technology by the three themes that were already mentioned above: (1) A holistic approach to experience, wherein the intellectual, sensual, and emotional stand as equal partners in experience; (2) Continuous engagement and sense-making, wherein the self is always already engaged in experience and brings to each situation a history of personal and cultural meanings and anticipated futures that complete the experience through acts of sense-making. (3) A relational or dialogical approach, wherein self, object, and setting are actively constructed as multiple centres of value with multiple perspectives and voices and where an action, utterance, or thing is designed and produced but can never be finalized, because the experience of it is always completed in dialog with those other centres of value. (Wright et al. 2008). In order to understand the thoughts of McCarthy and Wright, these themes must be studied in more detail.
Searching for a holistic approach

Many approaches recognise the need to consider not only the cognitive, intellectual or rational, but also the emotional and sensual as important aspects of UX. McCarthy and Wright have attempted to capture Dewey’s holism by conceptualising experience as a braid made up of four intertwining threads: (1) the sensual thread; (2) the emotional thread; (3) the compositional thread; and (4) the spatio-temporal thread. They emphasise the idea that the threads are not fundamental elements of experience but ideas that assist in clearer ideas of technology as experience. (McCarthy & Wright 2004, Wright et al. 2008).

The sensual thread of experience is connected with sensory, bodily engagement with a situation. According to Wright et al. (2008), “attention to the sensual thread reminds us that we are embodied in the world through our senses. Aesthetic experience emerges out of the engagement of the whole embodied person in a situation.” (Wright et al. 2008: 4).

McCarthy and Wright suggest that “the emotional aspect is concerned with the sense or meaning ascribed to an object or person because of the values, goals, and desires we have.” (McCarthy & Wright 2004: 87). The emotional thread also refers to the empathetic aspect of experience. (Wright et al. 2008). The emotional thread refers to the fact that for Dewey, emotions are qualities of particular experiences.

The compositional thread refers to the relationship between the parts and the whole of an experience (cf. “unifying emotion”, Jackson 1998). McCarthy & Wright disagree in that “some activities or events are intrinsically satisfying and others no; rather the aesthetic quality of the event reflects the way in which person and event relate to each other” (McCarthy & Wright 2004: 88). McCarthy and Wright argue that when people are immersed in experience, the elements of experience interpenetrate each other to such an extent that they lose their sense of the separation of self, objects and events. “There is no gap to be bridged between person and object. In this context, aesthetic experience is used to shine a light on experience that falls short of the richest experience we can imagine and, in the process, to provide a model for design and evaluation.” (McCarthy & Wright 2004: 91). They explain the role of the compositional thread as follows:

“In an aesthetic experience the compositional thread has a particular sense of unity in which the parts come together to give a sense of cumulation in which one part shapes and is shaped by the meanings of other parts, tensions
emerge and are resolved, and there is a sense of culmination or consumma-
tion that gives unity to the whole.” (Wright et al. 2008: 5).

According to McCarthy and Wright, all experiences also have a spatio-temporal
component. Thus, context and time can be seen as inseparable parts of experience.
They emphasise the idea that the interpretation of the relationship between people
and technologies should be done in terms of “the felt life” and the “felt or emo-
tional quality of action and interaction”. Thus, the idea of “technology as expe-
rience” is not limited to present or momentary experience, but highlights temporal
aspects of experience. “The spatio-temporal thread reminds us that experiences
are particular. They relate to a particular person in a particular situation at a
particular time. No two experiences are identical.” (Wright et al. 2008: 5). (cf.

Continuous engagement and sense making

Wright et al. (2008) argue that “experience is constituted by continuous engage-
ment with the world through acts of sense-making at many levels.” Wright et al.
(2008) state that “meaning is constructed out of dynamic interplay between the
compositional, sensual, emotional, and spatio-temporal threads. It is constituted
by experiences with particular qualities, be they satisfying, enchanting, disap-
pointing, or frustrating. We have found it helpful to think of sense-making in terms
of six processes.” (Wright et al. 2008: 6). Those six processes are (1) anticipating;
(2) connecting; (3) interpreting; (4) reflecting; (5) recounting; and (6) appropriat-
ing. (Wright et al. 2008).

Meaning making process has a central role in Dewey’s thinking. Instead of
the six processes listed above, it could be more useful to study Dewey’s ideas
about the meaning making. This will be discussed in more detail in the chapter
3.1.5.

A relational or dialogical approach

“A relational or dialogical approach” seems to refer to a relationship of the indi-
vidual and the social aspect in an aesthetic experience. Wright et al. (2008) con-
sider meaning making in social interaction a significant part of an aesthetic ex-
perience:
“the dialogical character of aesthetic experience, in which self and others, technology and setting, are creatively constructed as multiple centers of value, emotions, and feelings and the experience is completed simultaneously by self and others, not determined solely by one or the other. Consequently, a dialogical relation involves at least two centers of meaning or two consciousnesses. In a dialogical account, the meaning of an action, utterance, expression, or artifact is open because its interaction with the other makes its meaning contingent.” (Wright et al. 2008: 8)

Despite the primacy of the perspective of an individual, Dewey always considers experience a shared experience in the sense that meanings are meanings of the society. This will be studied in the chapter 3.1.5.

2.2.2 Expanding the theoretical frame of reference

McCarthy and Wright’s (2004) striving to understand the interactions and relations of humans and technology is a major step towards a more comprehensive way of studying UX that exceeds the previous reductionist approaches. It raises essential questions about human experience that are not studied in many other UX studies. Furthermore, McCarthy and Wright start their search for answers to their questions from a solid theoretical foundation, i.e. Dewey’s concept of aesthetic experience.

It seems that Dewey’s concept of aesthetic experience could resolve several defects observed in previous UX studies by providing a theoretical frame of reference for an approach aiming at understanding UX in a more comprehensive manner (Buchanan 1996, Forlizzi & Ford 2000, Petersen et al. 2004, McCarthy & Wright 2004, Wright et al. 2008). Furthermore, the limitation of focusing separately on the subject and the object of experience is overcome by Dewey’s definition of experience. It is also compatible with previous ideas of the author (Luojus 2008). Is Dewey’s concept of aesthetic experience suitable for the theoretical frame of reference to be used in the definition of the comprehensive concept of UX that is the objective of this thesis? Does it provide the necessary tools for studying UX?

As such, Dewey’s concept of experience is not applicable in studying UX. A theoretical concept, such as Dewey’s concept of aesthetic experience, cannot be studied as such. It needs to be operationalised. In order to operationalise a theoretical concept, the phenomenon being studied must be divided into unambiguous
dimensions that constitute the phenomenon. How can Dewey’s concept of the aesthetic experience be operationalised in order to be utilised when studying UX?

Furthermore, construction of the tools required to study Dewey’s concept of aesthetic experience requires expansion of the frame of reference. McCarthy and Wright, for example, emphasise the meaningfulness of experience as a precondition for aesthetic experience and as an account for the variety of experiences between individuals. Dewey’s concept of aesthetic experience does not provide the necessary tools to study the meaningfulness of experience and the variety of experiences between individuals. McCarthy and Wright expand their theoretical frame of reference with the semiotics of another pragmatist, Bakhtin. However, Bakhtin’s semiotics does not provide much assistance in studying the variety of experiences between individuals, because it does not consider factors that would explain differences between individual experiences, such as activity and motive of an actor.

For Dewey, experience is first and foremost a result of activity. Thus, studying the goals of activity and the motives of the user seems to be a useful approach when trying to explain the meaningfulness of experience and the variety of experiences between individuals. Furthermore, it seems that in order to reach an understanding of the dynamics of experience, one must also have a deeper understanding of human activity. Even though activity has a central role in Dewey’s philosophy, it does not provide the concepts and tools needed to analyse human activity. Dewey’s concept of aesthetic experience alone does not provide the tools required to study the determination of user activities and goal-orientation, or to explain the variety of experiences.

Studying UX from the viewpoint of interaction between user and product and also from the viewpoint of the product’s mediated role and user’s motivation may provide tools for theoretical analysis and understanding of the concept of UX. It is not possible to directly observe motivation, thus the characteristics of motivation and motives must be studied indirectly. In order to do this, the concept of theoretical motivation must be used. This requires an expansion of the theoretical frame of reference.

The theoretical starting point for this study is Dewey’s concept of aesthetic experience. In this study, a comprehensive definition of UX is obtained by focusing on (1) studying the dimension of long-term user experience in connection with the temporal dimension, and (2) analysing the activities of the user at the activity level.
The existence of long-term experience has been recognised, but it has not been seriously studied or developed (Forlizzi & Ford 2000, Davis 2003, McCarthy & Wright 2004, Kiljander 2004, Wright et al. 2008, Karapanos et al. 2009). Existing frameworks approach temporality through “a micro-perspective” but one could also raise a number of “macro-temporal” issues. Karapanos et al. (2009) have shown time to be a significant factor altering the way individuals experience and evaluate products. They also raise a question of the dynamic nature of UX: “Does the distribution between unconscious and cognitive experiences remain stable over time or do cognitive experiences reduce as users’ familiarity increases?” They have also asked the following questions: “what motivates the process of lifting up experiences and communicating them in social contexts?” and “do these underlying motivations change over time, e.g. as users’ initial excitement fades out?” (Karapanos et al. 2009: 730). Forlizzi and Ford (2000) have noted that the nature of experience is volatile, ever-changing and cumulative: “We know that a singular experience is made up of an infinite amount of smaller experiences, relating to contexts, people, and products”. (Forlizzi & Ford 2000: 240). It seems that a comprehensive understanding of UX requires a study of the dynamic and reflective nature of experience by analysing the temporal dimensions.

McCarthy and Wright emphasise the fact that “we must be aware of how stories from the past and the future, from particular people and from culture, interpenetrate in experience” (McCarthy & Wright 2004: 122). They suggest that “in attempting to turn consideration of technology toward experience” the emphasis should be “on the felt, emotional quality of experience” (McCarthy & Wright 2004: 183–184). Even though understanding of felt experience as something that has been lived through seems to require a study of the dynamic nature of experience, McCarthy and Wright do not analyse the temporal issues connected with experience to any great extent.

Karapanos et al. (2009) have observed that the focus should be expanded to “the study of prolonged experiences, understanding how a product becomes meaningful in a person’s life”. They point out that product qualities that make initial experiences satisfying do not necessarily motivate prolonged use, and thus time is a significant factor altering the way individuals experience and evaluate products. Based on their findings, they promote three interesting avenues for further research: design for meaningful mediation, design for daily rituals, and design for yourself. (Karapanos et al. 2009: 737). Without “a macro-temporal” ap-
approach, there will not be the necessary preconditions for studying the dynamics of
how UX is formed.

(2) McCarthy and Wright (2004) express their concern: “the cultural analysis
being developed in HCI and CSCW in the name of practice theory, activity theory,
or user experience can be used in a meaningless manner, separate from people
fearing, hoping, imaging, revolting, and consoling”. (McCarthy & Wright 2004:
183). Their response to this danger is that analysis of relations between people
and technology “must engage some sort of felt life” (McCarthy & Wright 2004:
183). McCarthy and Wright suggest that “in attempting to turn consideration of
technology toward experience” the emphasis should be “on the felt, emotional
quality of experience” (McCarthy & Wright 2004: 183–184). Furthermore, they
note that “some social-theoretical approaches may also be of value in framing
HCI” (McCarthy & Wright 2004: 189). The classical Leontjev’s activity theory
(1977) represents the “strong version of activity theory” demanded by McCarthy
and Wright, but alone it does not provide the tools to study experience in the
manner to which McCarthy and Wright refer. Analysing the activities of a user
and perceiving the goals of the user’s activity may provide new information on
UX by deepening the level of analysis.

Nardi (1996) argues that “activity cannot be understood without understand-
ing the role of artifacts in everyday existence; especially the way artifacts are
integrated into social practice” (Nardi 1996: 14). On the other hand, one could
also think that the role of artefacts in everyday existence cannot be understood
without understanding the activity in which those artefacts are involved. Kape-
linin and Nardi (2006) describe Leontjev’s activity theory as “an approach in
psychology and other social sciences that aims to understand individual human
beings, as well as the social entities they compose, in their natural everyday life
circumstances, through an analysis of the genesis, structure, and processes of
their activities.” (Kaptelinin et al. 2006: 31). Could Leontjev’s activity theory be
the kind of frame of reference that could assist in expanding the concept of UX?

Constructing the multidimensional and reflective nature of the comprehensive
UX concept based on Dewey’s concept of aesthetic experience seems to require
(1) operationalisation of the concept of aesthetic experience and (2) expanding the
theoretical frame of reference in such a manner that it will provide tools for study-
ing the goal-oriented nature of user’s activity and for analysing the variety of
experiences.

Activity theory seems to complement the theoretical frame of reference by
providing a multi-disciplined frame of reference for studying human activity both
at the individual level and from the social perspective. In activity theory, the basic unit is human activity that is studied through the actor, object, motivation, tools and social rules. Analysing the activity of a user at the activity level assists in understanding the motives behind the user’s activity as well as the significance of activity from the perspective of the individual and the community. As a conceptual framework, activity theory provides a means to connect the concept of motivation with the concept of activity as well as concepts and tools needed when studying them. Activity as a unit of analysis provides a way to analyse a larger whole than a subject or an object of activity at the same time. In the sense in which Dewey considers it, experience has not been studied to any great extent in activity theory:

“That which we call internal experiences is the essence of the phenomenon, taking place on the surface of the system of consciousness, and it is in this form that consciousness appears directly for the subject. For this reason, the experiences, interests, boredom, inclinations, or remorse do not disclose their nature to the subject; although they seem to be internal forces moving through his activity, their real function is only leading the subject to their real source in that they signal the personal sense of events taking place in his life, they make him seem to stop the flow of his activity for an instant to contemplate the life values he has constructed in order to find himself in them, or perhaps to review them.” (Leontjev 1978: 99).

In the next chapter, Dewey’s concept of aesthetic experience is operationalised by dividing it into two levels based on activity theory. This expansion of the theoretical frame of reference requires a study of the compatibility of the basic claims of Leontjev’s activity theory and the basic ideas of Dewey as well as a study of Leontjev’s activity theory whereas it is necessary in order to operationalise it. A comprehensive and operational concept of UX is generated based on Dewey’s concept of aesthetic experience that is divided into two levels utilising activity theory.
3 Towards a more comprehensive understanding of the concept of UX

This study defines a concept for depicting the comprehensive, multi-dimensional and reflective nature of UX. Another objective is to understand not only the final outcome of the phenomenon being studied but also the dynamics behind the creation of experiences – the comprehensive experience process of a user. Dewey’s functional and holistic concept of experience is one of the most extensive definitions of the concept of experience in the history of philosophy. It is beneficial when constructing a concept of UX that is more comprehensive than in previous research (Buchanan 1996, Forlizzi & Ford 2000, McCarthy & Wright 2004.) Furthermore, Dewey does not consider the content of experience primarily psychological; instead, it is a characteristic of a system consisting of the individual and the environment. It includes the properties of artefacts. (Miettinen 2008). Thus, it is suggested to be a good starting point for the comprehensive definition of the concept of UX.

As a theoretical concept, Dewey’s concept of aesthetic experience cannot be studied as such, however: it must be operationalised. On the other hand, Dewey’s concept of aesthetic experience alone does not provide the necessary concepts and tools to study UX and the activity which UX requires.

This study aims at a comprehensive understanding of UX by focusing on the study of temporal experience and on the experiences generated in long-term everyday use of a product and the activity and goals of end users. Studying UX from the viewpoint of interaction between user and product and also from the viewpoint of the product’s mediated role and user’s motivation may provide tools for theoretical analysis and understanding of the concept of UX. As a conceptual framework, Leontjev’s activity theory provides a means to connect the concept of motivation with the concept of activity as well as concepts and tools needed when studying them. Activity as a unit of analysis provides a way to analyse a larger whole than a subject or an object of activity at the same time.

Neither Dewey’s concept of aesthetic experience nor activity theory alone provides a sufficiently extensive theoretical frame of reference for studying the expanded UX. Instead, the construction of the concept is based on a frame of reference created by the basic ideas provided by Dewey’s concept of aesthetic experience (Chapter 3.1) and Leontjev’s activity theory (Chapter 3.2) combined. That is, the new concept of UX is generated by operationalising Dewey’s concept of aesthetic experience by dividing it into two levels based on activity theory.
The operationalisation and expansion of the theoretical frame of reference require a deep understanding of Dewey’s concept of aesthetic experience as well as a study of the compatibility of the basic claims of Leontjev’s activity theory and Dewey’s basic ideas. In the beginning of this chapter, we will study Dewey’s ideas of experience and the key ideas of Leontjev’s activity theory. From there, we will advance to the most important ideas of Dewey and Leontjev pertaining to the construction of the expanded concept of UX. These ideas refer to activity, motivation, the social nature of meaning and consciousness as well as internalised culture. The developed UX concept is presented at the end of this chapter.

Fig. 2. Construction of the theoretical frame of reference for the UX concept definition at hand.

3.1 Dewey’s philosophy – naturalistic pragmatism

This study considers pragmatism to be a philosophical theory about information, experience and reality, i.e., a theory that can be considered the core of Dewey’s
(1859–1952) later period naturalistic pragmatism. Dewey’s philosophy, based on a Hegelian dynamic, anti-dualist, and naturalist ontology where experience creates a developing and comprehensive unity, has a central role in this study. (Ni-inluuto 2002).

3.1.1 Dewey’s holistic view of experience

According to Dewey “experience occurs continuously, because the interaction of live creature and environing conditions is involved in the very process of living.” In this participation, “the varied wonder and splendour of this world are made actual for him in the qualities he experiences”. (Dewey 1934/2005: 36). Dewey’s holistic view of experience exceeds the barriers of discrete disciplines and thus also avoids the related reductionism in studying experience.

For Dewey, the senses are organs through which the living creature participates directly in the events of the world around him or her. What Dewey means by the concept of sense is a wide range of ideas: “the sensory, the sensational, the sensitive, the sensible, and the sentimental, along with the sensuous”. Sense includes “almost everything from bare physical and emotional shock to sense itself”. Dewey states that “each term refers to some real phase and aspect of life of an organic creature as life occurs through sense organs”. (Dewey 1934/2005: 22). Dewey’s experience links together the environment, thoughts of the user, consciousness, emotions, interests, memory, plans and reactions to prevailing conditions. Experience is more comprehensive than knowing. (cf. cognitive science).

For Dewey, emotions are qualities of particular experiences. The emotional quality of experience is understanding or a sense-making process. Dewey proposes that “experience is emotional but there are no separate things called emotions in it”. (Dewey 1934/2005: 43). He states that emotions are the qualities that round up an experience into completeness. In other words, Dewey considers any experience an emotional experience.

Experience is all about experiencing the consequences of your actions as wanted or unwanted. Sometimes the consequences are fully as expected, in which case they are not consciously experienced. The emotional nature of such an experience is not apparent but one can think that the emotion lies in the unexpectedness of the experience. Even though such qualities are not dramatically experienced as emotional, their significance that guides a person’s actions is precisely the same as that of all other emotions. Thus, there is no reason to talk about emo-
tional or non-emotional experiences. Instead, one should refer to emotional experiences of different types. (Dewey 1934/2005, Kivinen & Ristelä 2001).

3.1.2 Dewey’s concept of “an aesthetic experience”

Dewey’s concept of “an aesthetic experience” is based on his holistic and functional idea of experience. In his aesthetics, Dewey stresses the comprehensive nature of human experience, unwilling to separate aesthetic experience from other fields of life. Instead, he places it in the centre of the practical life and calls all experiences aesthetic with certain limitations. Aesthetic is not strictly limited as an area separate from other fields of experience; instead, its conditions are basically conditions for any experience and any experience can become aesthetic if certain preconditions are met. Thus, Dewey considers an aesthetic experience an ideal form of experience towards which everyday experiences are striving. (Dewey 1934/2005).

According to Dewey, the term “aesthetic” refers to experience as appreciative, perceiving, and enjoying. (Dewey 1934/2005: 49). Thus, the term aesthetic describes the fulfilling nature of activity, a comprehensive and known quality that ideally channels the process of meaning making into an original and fulfilling experience (“an experience”). Dewey makes a distinction between ordinary experience and “an experience” as follows (Dewey 1934/2005: 36–37):

“We have an experience when the material experienced runs its course to fulfillment. Then and then only is it integrated within and demarcated in the general stream of experience from other experiences. A piece of work is finished in a way that is satisfactory; a problem receives its solution; a game is played through; a situation, whether that of eating a meal, playing a game of chess, carrying on a conversation, writing a book, or taking part in a political campaign, is so rounded out that its close is a consummation and not a cessation. Such an experience is whole and carries with it its own individualizing quality and self-sufficiency. It is an experience.”

According to Dewey, an aesthetic experience is uniform and integrated, fulfilled, self-sufficient, an experience that provides satisfaction. Jackson (1998) separates three general characteristics of Dewey’s aesthetic experience: (1) completeness; (2) uniqueness; and (3) unifying emotion. Completeness refers to an aesthetically constructed experience going through the different phases of meaning making in a manner that provides internal continuity. In such an experience, “every successive
part flows freely, [...] into what ensues” (Dewey 1934/2005: 37). Uniqueness refers to a “quality that pervades the entire experience” and converts it into “an experience”. (Dewey 1934/2005: 38). Unifying emotion seems to refer to two issues: on one hand to the emotional tone of the experience, its known background that in an aesthetic experience “are lifted high above the threshold of perception and are made manifest for their own sake” (Dewey 1934/2005: 59), and on the other to an emotional “filter through which observations are selected” (translation by the author). (Jackson 1998, reference by Väkevä).

An aesthetic experience cannot be simplified to a mere feeling of pleasure or happiness. In itself, an aesthetic experience may also be disappointing, exciting, upsetting or sad. According to Dewey, aesthetics is a characteristic natural to activities generating human significance, and it sets people apart from the rest of known nature. (Dewey 1934/2005).

3.1.3 Democratisation of the concept of aesthetics

For Dewey, “aesthetics” is only a common name for specific qualities that are highly valued. Qualities that are valued depend on the historical and cultural context. (Dewey 2005/1934). Dewey considers the connection of an aesthetic experience with everyday life especially important. He stresses the fact that the art found in museums (fine art) does not hold any exclusive right for aesthetic experiences. After all, experiences are as versatile as life itself, and also historically changing and bound to culture. According to Dewey, aesthetic values may also be found in movies, comic books or articles about everyday events in newspapers. (Dewey 1934/2005.) Dewey states that aesthetic experiences are closely connected to the practical life of people (Dewey 2005/1934: 5):

“Domestic utensils, furnishings of tent and house, rugs, mats, jars, pots, [...] were wrought with such delighted care that today we hunt them out and give them places of honour in our art museums. Yet in their own time and place, such things were enhancements of processes of everyday life. Instead of being elevated to a niche apart, they belonged to display of prowess, the manifestation of group and clan membership, [...] and all the rhythmic crises that punctuate the stream of living.”

Furthermore, the word “aesthetic” denotes the point of view of the user rather than that of the manufacturer. Completeness of an action cannot be measured or defined by means of performance; instead, those who understand the product
being manufactured and for whom it provides enjoyment must assess it. As an example of this, Dewey refers to a cook making dinner: he prepares the dinner for the consumer, and the value of the final result will only be found out once the dinner has been consumed. (Dewey 1934/2005: 49).

Dewey states that aesthetic pleasure must be understood as a function of instrumental activity; it does not have an area of its own separate from the producing interests. (Dewey 1934/2005, Väkevä 2004). Dewey demands a recognition of the fact that aesthetic issues can be connected to any experience generating meaning. (Dewey 2005/1934).

3.1.4 “Habit” – a way of life

Habit is one of the most important concepts of Dewey’s approach, and Dewey uses the term in an extremely broad and original sense. According to Dewey, the environment in which an individual lives makes the individual see and feel one issue instead of another; it generates plans for the individual, and the individual can use these plans to successfully interact with others. It reinforces some beliefs and weakens others, depending on what is required to obtain the approval of others. Thus, it little by little creates in the person a certain manner of behaviour, a habit. (Dewey MW 9, Kivinen & Ristelä 2001).

According to Dewey, the term “habit” may refer to one of two issues: (1) “habituation”, i.e., an ability to adapt to one’s environment and use the prevailing conditions as a means to reach a goal, or (2) “inclination”, i.e., favouring conditions and selections related to active activities. In the latter form, a habit is more of an intellectual disposition than a result of becoming accustomed to something. Unlike habituation, inclination is continuously open to accommodate different alternative meanings of situations and it expresses the active side of experience, an intentional striving to operatively control issues, a willingness to understand. In Dewey’s approach, habit always includes a moral-social reference. (Dewey MW 9, reference by Väkevä 2004).

Individuals make individual solutions and create their unique identity and way of life based on the material provided by the solutions. According to Dewey, a “good life” requires as full a utilisation as possible of the “art of experience” and the related intellectual reflection in as many areas of human life as possible. The object of an aesthetic experience increases the meaningfulness of immediate life. (Dewey 1934/2005). When studying the meanings of everyday objects, Csikszentmihalyi and Rochberg-Halton (1981) also proved that “an ecology of sym-
bols” can be found in each home. It is a network of objects referring to meanings that make the life of the people living in the home understandable. The objects the residents have purchased are concrete symbols that communicate meaning. (Csikszentmihalyi & Rochberg-Halton 1981).

The more democratic concept of aesthetic experience pursued by Dewey can be seen as a general striving to promote the “good life” that extends to the everyday life of everybody. Dewey’s concept of habit can be considered an important starting point for the creation of the expanded concept of UX. It describes a way of life to which a user identifies and which the user considers means for reaching a “good life”. When selecting products and services, users express their identity and way of life, their habit, and communicate information about it.

3.1.5 Meaning making

Personal and cultural meanings have a central role in the experience thinking of Dewey. In order to study Dewey’s ideas about the meaning making, we must also study the concepts of mind and consciousness. Dewey separated from each other the concepts of “mind” and “consciousness”. For Dewey, mind is the permanent but continuously evolving background for consciousness that should not be separated from the environment and practice. Meanings are there as established modes of action and social practices. The mind can be considered a network of shared meanings from which the consciousness of an individual takes the tools needed in its interpretations. The mind is not an individualistically understood issue because neither are meanings. Consciousness related to the individual viewpoint can also be studied based on this social background that is objective from the individual viewpoint.

Observations obtained during interaction or qualities are interpreted by the mind. Each person has a personal system of concepts and no means of interpreting the events of the world independent from his or her own views. The mind organises meaning for observations from previous interaction. (Dewey 1934/1980). Meaning is use and understanding meaning is an ability to act in a specific manner. For example, understanding linguistic and cultural meaning is an ability to utilise objective marking tools as well as public tools and objects for observation and action. (Dewey 1934/2005, Määttänen 2002). In his work Democracy and Education, Dewey demonstrates the meaning making at the conceptual and the operational level with an example of the meaning making for a hat. A child learns what the meaning of a hat is by using a hat when it is cold. In the
same way, the child learns what the word “hat” means by using the word. (Dewey 1916: 18). As methods of social activity, meanings are objective and public. Learning cultural meanings is social activity, and thinking about these meanings is anticipating social activity. From this viewpoint, the human is a non-restricted social being. (Määttänen 2002).

According to Dewey, an experience has pattern and structure, because it is not just doing and undergoing in alternation, but consists of them in relationship. Thus, an experience includes both an active and a passive element. Dewey emphasises the fact that all results of an action are not regarded as experiences: “to put one’s hand in the fire that consumes it is not necessarily to have an experience”. On the contrary, “the action and its consequence must be joined in perception”. According to Dewey, “this relationship is what gives meaning; to grasp it is the objective of all intelligence. The scope and content of the relations measure the significant content of an experience”. (Dewey 1934/2005: 46). Dewey notes that a child’s experience may be “intense, but because of lack of background from past experience, relations between undergoing and doing are slightly grasped, and the experience does not have great depth or breadth”. Dewey also points out that no one ever arrives at such maturity that she or he could perceive all the connections that are involved. (Dewey 1934/2005: 46).

3.2 The origins of activity theory

Cultural-historical activity theory is based on a new kind of psychology development started by Vygotsky in the Soviet Union in the 1920s and 1930s. Vygotsky created the idea of mediation which was crystallised in the famous triangular model of “a complex, mediated act” that is commonly expressed as the triad of subject, object and mediating artefact. Vygotsky’s work was continued by Leontiev and Luria who developed his ideas further. In the 1970s, Leontiev summarized ideas and principles of his research program into a framework comprising the foundations of activity theory. (Kaptelinin et al. 2006).

Vygotsky’s studies focused on the activities of an individual, but Vygotsky’s colleague Leontiev (1978) suggested that individual actions can only be understood as part of joint, collective activity. (Miettinen 2006a, 2008.) In this study, experience and activities that are required for experience to be created are primarily studied from the viewpoint of an individual, but the social nature of human experience is also taken into account. “Social habits” exist in the habits of individual people, but the habits of an individual people cannot be understood when
taken out of the context of social activity. The environment in which a human acts, experiences and creates his or her habits is not only a natural environment but also a social environment. (Dewey MW 14, Kivinen & Ristelä 2001). As a theoretical frame of reference, Leontjev’s activity theory provides tools for studying the activities of an individual while taking into account the social environment.

3.2.1 Key ideas of activity theory

The two main underlying ideas of activity theory are identified by Kaptelinin et al.: (1) the unity of consciousness and activity, and (2) the social nature of the human mind (Leontjev 1981, Kaptelinin et al. 2006). A set of basic principles that jointly constitute the general conceptual activity system theory is identified by Wertsh (1981): (1) the hierarchical structure of activity; (2) object-orientation; (3) mediation; (4) internalization – externalization; (5) mental processes vs. external behaviour; (6) interpsychological vs. intrapsychological; and (6) development. (Wertsh 1981, reference by Kaptelinin et al. 2006).

This study deals only with the principles important for expanding the theoretical frame of reference: (1) the hierarchical structure of activity which connects the concept of motivation and the concept of activity; (2) object-orientation which enables the linking together of the notions of activity and emotions; and (3) mediation which assists in understanding the role of a high-tech product in the activity of a user.

Hierarchical structure of human activity

Human activities are typically not directed straight toward their motives. Kaptelinin et al. (2006) point out that socially distributed activities are characterised by dissociation between their motivating and directing objects. Living in society and especially participation in social activities make it necessary for individual subjects to reproduce within the structure of their individual activities the complex, mediated dissociation between (a) objects that attract them, and (b) objects at which their activities are directed. (Kaptelinin et al. 2006.) The conceptual model of the hierarchical structure of human activity, where an activity can be seen as composed of a sequence of steps, each of which is not immediately related to the motive even though the sequence as a whole may eventually result in attaining the motive, helps in reaching a deeper understanding of human activity and its underlying motives.
Human activity can be represented as a hierarchical structure (activity – actions – operations), which is equivalent to a hierarchical structure of motivation (motive – goals – conditions). (Fig. 3). The top layer in the hierarchy is the activity itself, and the motive obeys it. The motive is the object that stimulates and excites the subject. The basic “components” of separate human activities are the actions that realise them. Action is regarded by Leontjev as the process that corresponds to the notion of the result that must be achieved, i.e., the process that obeys a conscious goal. Just as the concept of motive is correlative with the concept of activity, so the concept of goal is correlative with that of action. Each activity is implemented by operations that have different kinds of conditions. Levels of activity can transform into each other (e.g. “automatisation” and “deautomatisation”). (Leontjev 1977).

The separation of goal-oriented actions as components of human activity naturally brings up the question of their internal relations. Leontjev (1977) has explained the relations between actions and activity:

“ [...] activity is not an additive process. Hence actions are not separate things that are included in activity. Human activity exists as action or a chain of actions. [...] When we consider the unfolding of a specific process – external or internal – from the angle of the motive, it appears as human activity, but when considered as a goal-oriented process, it appears as an action or a system, a chain of actions.” (Leontjev 1977: 8)

The same action may realise various activities, may pass from one activity to another, thus revealing its relative independence. The given action may also have quite different motives, i.e., it may realise completely different activities. On the
other hand, the same motive may generate various goals and hence various ac-
tions. (Leontjev 1977).

Operations are considered as spontaneous routine processes oriented toward
the conditions under which the subject is trying to attain a goal (Leontjev 1977).
Goals are usually considered to be conscious, whereas according to Leontjev,
motives “are revealed to consciousness only objectively by means of analysis of
activity and its dynamics. Subjectively, they appear only in their oblique expres-
sion, in the form of experiencing wishes, desires, or striving toward a goal” (Leot-
jev 1978: 132). Making motives conscious requires a special effort of making
sense of “indirect evidence” (Kaptelinin 2006).

Object-orientation

Activity theory maintains that all human activities are directed toward their ob-
jects. Leontjev (1977) has stated that “in fact, the very concept of activity (doing,
Tätigkeit) implies the concept of the object of activity. The expression ‘objectless
activity’ has no meaning at all”. (Leontjev 1977: 4). Leontjev (1981) differenti-
ates between the concepts of activity and action by stressing the importance of
object-orientation in human activity. By activity, he means “processes that are
psychologically characterised by what the process as a whole is directed to (its
object) always coinciding with the objective that stimulates the subject to this
activity, i.e. the motive.” On the other hand, an action is “a process whose motive
does not coincide with its object (i.e. with what it is directed to), but lies in the

Human senses (sensations, feelings, images of perception, representations)
can be seen as directed toward something in the world, “sense is always sense of
something”. There are no “pure” senses. (Leontjev 1981: 229). Thus, an analysis
of objects is a necessary requirement for understanding human beings, acting
either individually or collectively. Kaptelinin et al. (2006) summarise that objects
of activities are “prospective outcomes that motivate and direct activities, around
which activities are coordinated, and in which activities are crystallized in a final
form when the activities are complete” (Kaptelinin et al. 2006: 66).

An analysis of activity and the objects provides a foundation for understand-
ing the relationship between human beings and technology. The idea of linking
together the notions of activity and emotions by means of the concept of object-
oriented activity, proposed by Kaptelinin et al. (2006), reflects Dewey’s thoughts
of the forming of an experience.
Mediation

Activity theory emphasises social factors and the interaction between people and their environments in studying human activity. According to Kaptelinin et al. (2006), “the approach integrates the functional and the developmental aspects of mediation, placing artifacts in the context of purposeful interaction between the subject and the world, and, at the same time, in the context of the creation and transmission of social experience within a culture”. (Kaptelinin et al. 2006). The key components of mediation are the subject, object and mediational artefact (Vygotsky 1982, Vygotsky 1978).

The use of tools is related to mediated activity. The mediating characteristics of an object or an idea meant as a tool will only be observed in use when the tool interacts with the object. Thus, the usage characteristics of a tool are not solely based on the structure of the tool itself, but also on the characteristics of the object. A tool has a slightly different task every time it is used because the objects of an action and the goals differ. An object or a concept can be used as a tool in many different ways. In regular language, the term “tool” refers only to objects that have been manufactured to be used when working on something. Tools are usually clearly separated from the skills and knowledge of a person. In practical activity, the difference between external tools and internal tools (patterns of thinking, skills and knowledge) is very flexible. When you use a tool, you adopt information and patterns of thinking that are important when using the tool, and these become your internal thought tools. On the other hand, you can transfer the results of your thinking into an external object and later use them as tools of your activity. (Virkkunen 1995).

High-tech products usually have an instrumental role in the activity of a user. Activities are directed to an object, and the goal is to reach a final result or achievement by shaping the object. The activity is guided and maintained by the intention that can at least partially be concretely seen in the object of the activity. However, this object-orientation is mediated, i.e., the object is shaped in a mediated manner. The mediating tool is the high-tech product. When a high-tech product is taken as part of the activity, it influences the way how the intention becomes concrete in the object of the activity and the functional environment; changes of activities often cause changes in the physical environment. (Hyysalo 2006).
3.2.2 The concept of activity

The theoretical approach to activity aims at understanding humans both at the individual and at the social level through an analysis of the genesis, structure and process of their activity. Activity as a unit of analysis provides a way to properly understand both “poles”, the subject and the object of the activity (Leontjev 1978), and such a holistic analysis cannot be achieved by focusing on the subject or the object alone (Leontjev 1978, Kaptelinin et al. 2006).

Activity theory refers to a specific level of activity, the level at which the object has the status of a motive (Kaptelinin et al. 2006). Thus, the concept of activity is necessarily bound up with the concept of motive. Leontjev (1977) describes that relationship in the following way:

“There is no such thing as activity without a motive; ‘unmotivated’ activity is not activity that has no motive, but activity with a subjectively and objectively hidden motive.” (Leontjev 1977: 7).

Leontjev (1978) emphasises the social nature of human activity:

“[…] whatever kind of conditions and forms human activity takes place, whatever kind of structure it assumes, it must not be considered as isolated from social relations, from the life of society. In all of its distinctness, the activity of the human individual represents a system included in the system of relationships of society. Outside these relationships human activity simply does not exist.” (Leontjev 1978: 47).

According to Leontjev’s (1978) view, activity is “a system that has structure, its own internal transitions and transformations, its own development”. (Leontjev 1978: 46). In the theoretical approach to activity, the structure of activity is described as components in human activity: (1) an active subject who directs his or her activity towards (2) an object in the world, mediated by (3) a tool. (Leontjev 1978). The activity is motivated by transforming the object into an (4) outcome (Kuutti 1994).
Fig. 4. Structure of an individual, mediated action (based on Engeström 1987).

The constituent feature of activity is that it has an object, an object that both motivates and directs the activity. Each activity is specific and activities are distinguished from each other according to the differences between their objects (Leontjev 1977). The object of activity can be a material object, but it can also be less tangible or totally intangible, as long as it can be shared for manipulation and transformation by the participants of the activity (Kuutti 1994). Thus, according to Leontjev’s idea, objects have not only physical, biological and chemical properties, but also socially and culturally defined properties (Leontjev 1978).

3.2.3 An individual activity system as a unit of analysis

In order to study a phenomenon, you must find an applicable, relatively independent and limited entity to study (Virkkunen 1995). An activity system is a relatively independent and limited entity where all the essential features and relations of activity can be seen (Engeström 1987). In activity theory, the activity system of an individual is dealt with as an internally communicated and contextual system. Humans are studied with their activity objects, tools, etc. This enables a versatile approach to studying the activity of an individual. When the concept of activity is used as a unit of analysis for reality, concrete activities must be distinguished and analysed. The activity types can be separated from each other only if the needs and motives of each activity are proven (Leontjev 1977).

Engeström expanded Vygotsky’s original triangular model of a complex, mediated act into a model of a collective activity system (Engeström 1987). Engeström’s activity system model (Fig 5.) builds on Leontjev’s approach but describes collective rather than individual activities (Kaptelinin 2006). According to Engeström (1995), the structural parts of an activity system are an actor, a community, an object, tools, rules and a division of labour. The actor is an individual or a group that works on the object of activity and from whose viewpoint
the activity is studied. The community is made up of all the participants of the activity system who participate in producing the same object, product or service. The term “object” refers to the object being worked on, raw material and the result of the activity. “Tools” refers both to material and immaterial tools that are used to interpret or modify the object. “Division of labour” refers to the division of tasks, authority and benefits among the members of the community. All the components of the activity system interact with each other (Engeström 1987, Engeström 1995).

An important characteristic of an activity system is its cultural mediation. The relationship between the actor and the object and the actor and other members of the community is mediated by the tools used by the actor, the rules of the community and the division of labour among the members of the community. Activity creates a system whose parts are interdependent, change each other and mediate the relations of the other components (Virkkunen 1995). Through these subprocesses, the activity system arranges, moulds and reforms itself (Engeström 1995).

Fig. 5. Basic structure of an activity. (Engeström 1987).
3.3 On the relation between Dewey’s pragmatism and the starting points of activity theory

Expansion of the theoretical frame of reference requires a study of the compatibility of Dewey’s basic ideas and the basic claims of Leontjev’s activity theory. In order to study the compatibility, the philosophical starting points and shared basic ideas of these two approaches must be studied. This thesis utilizes largely the research done by Miettinen (2000, 2006a, 2006b, 2008) who has extensively studied the compatibility of Dewey’s ideas with activity theory.

Dewey started to develop his theory of activity against the psychological theories that dominated philosophy in the 1890s. A mature philosophical foundation for the pragmatist concept of activity was presented in the 1920s (Experience and Nature 1925, Quest for Certainty 1929). Vygotsky developed the foundation of activity theory in the 1920s (Thought and Language was published in English in 1962). Activity theory was adopted in the 1970s and 1980s in Europe and the United States as an alternative approach, especially in the study of learning, thinking and education (e.g. Wertch 1985a, 1985b; Moll 1990) and recently also of work (e.g., Engeström et al., 1999) and the uses of technologies (e.g. Bødker 1987, 1989, 1991, 1993; Kuutti 1991, 1992; Kaptelinin 1992). Pragmatists and activity theorists were formulating their respective theories of activity simultaneously and independently, but they still came to many similar conclusions (Miettinen 2006a, 2008).

The most important philosophical basis of activity theory was Marx’s materialism. Many authors have pointed out the similarities between the ideas of Marx and Dewey on practical activity (e.g. Russel 1951, Bernstein 1971, Joas 1991). By referring to Gavin (1988), Miettinen points out two important connections between Marx and Dewey: “the dismissal of the idea of subject and object as independent forms of being as well as the social, historical and relational origins of self and individual consciousness”. (Miettinen 2006a: 390). Several authors have sought an explanation for this from the shared philosophical root of the two theories:

“The Hegelian background provides a commitment to an ontology of change as well as to an anthropology of becoming. Both Marx and Dewey naturalized Hegel in their own ways (e.g. Garrison 1995, Shook 2000).” (Miettinen 2006a: 391).
According to Tolman and Piekkola (1989), a shared characteristic for the thinking of Dewey and Leontjev was “the materialist epistemological requirement for an objective description of the reality in question” (Tolman & Piekkola 1989: 46). In his paper, “Epistemology of Material Transformative Activity: John Dewey’s Pragmatism and Cultural-Historical Activity Theory”, Miettinen (2006a) compares Dewey’s pragmatism and cultural-historical activity theory as epistemologies and theories of transformative material activity. He finds four shared characteristics of the two approaches: (1) the constitutive philosophical significance of the concept of activity. Dewey characterised activity by using the concept of instrumentalism and Vygotsky in terms of mediation; (2) their concepts of language and meaning; (3) the idea about the significance of resistance for the objectivity of knowledge; and (4) the experimental and interventionist research strategy based on their transformative ontology. (Miettinen 2006a).

### 3.3.1 Activity as a constitutive philosophical category of the two theories

Miettinen (2006a) argues that both activity theory and Deweyan pragmatism can be regarded as theories of activity. Both theories regard the concept of transformative practical activity as a theoretical category that makes it possible to solve philosophical dilemmas that emerged from Cartesian dualism (body-mind and subject-object). According to Miettinen (2006a):

“*The two theories share the idea that subjects and objects co-emerge and become interactively transformed in the reality-transforming practical activity. The concept of practice or activity is used by both traditions as a seminal means of solving the problems of ontology and epistemology, such as the nature of objects, the subject-object relationship, meaning and objectivity*."

(Miettinen 2006a: 394).

Dewey developed his concept of activity against the dominant psychological theories, according to which mental life originated from sensations that are passively received and which are formed, through the laws of retention and association, into images and conceptions. (Miettinen 2006a). On the contrary, Dewey saw a need for psychology based on the development of biology, on the idea of organic, adaptive life activity:
“Wherever there is life, there is behavior, activity. In order that life may persist, this activity must be both continuous and adapted to the environment. (...) In the interests of the maintenance of life there is transformation of some elements in the surrounding medium. The higher the form of life, the more important is the active reconstruction of the medium.” (Dewey 1920/1988: 128, reference by Miettinen).

Miettinen summarises that the concept of activity is constitutive of Dewey’s ontology, epistemology and his conception of self and consciousness which are functions of life activity and special forms of action themselves.

The tradition of materialistic dialectics and activity theory also regards activity as a fundamental category (Miettinen 2006a). Leontjev (1979) criticised the dominant “stimulus-response” formula in psychology:

"The unsatisfactory nature of this scheme consists of the fact that it excludes the process that active subjects use to form real connection with the world of objects. It excludes their objective activity." (Leontjev 1979: 42).

He concludes that in order to find a real solution to this problem “we must replace the two-part scheme of analysis with a fundamentally different one...” (Leontjev 1979: 45). A new unit of life, of actual existence in the world, was needed. This new unit was suggested by Marx – activity. According to Leontjev’s view, activity is not a reaction or a combination of several reactions; instead, it is a system with its own structure, changes and development. He has proven that a characteristic of activity is object-orientation; and thus all forms of development can be considered as the history of the development of the object of the activity. (Leontjev 1979, Tolman & Piekkola 1989). What is fundamental to activity theory is a reconceptualisation of the subject-object relationship as activity (Tolman & Piekkola 1989).

Miettinen argues that in activity theory, cognition in all its forms is formed in the subject’s practical activity that involves material objects. In his opinion, the concept of activity adopted the idea of objectification or reification of activity into objects from Hegel. Miettinen regards the internalisation and further development of these mediating objects as constitutive of human activity and consciousness:

“The production and use of such mediating objects (Lektrosky 1980, 154) ‘assumes a breaking away from organism’s natural relation to the environment and use of standards that have socio-cultural (and in this sense artificial) character.’ These systems of cultural artifacts embody mankind’s socio-historical experience.” (Miettinen 2006a: 395).
In 1931, Dewey defined pragmatism as “the doctrine that reality possesses practical character”. (Dewey 1931: 31, reference by Miettinen). In Dewey’s opinion, man gains knowledge of reality by being involved in practical interaction with it:

“In the first place, the interaction of organism and environment, resulting in some adaptation that secures utilization of the latter, is the primary fact, the basic category. Knowledge is relegated to a derived position, secondary in origin, even if its importance, when once it is established, is overshadowing. Knowledge is not something separate and self-sufficing but is involved in the process by which life is sustained and evolved.” (Dewey 1931: 31, reference by Miettinen).

In Miettinen’s interpretation, “things of reality become known when they enter the sphere of human, reality-transforming activity (or human-environment interaction)”. (Miettinen 2006a: 395). In developing this conclusion, Dewey uses the example of a carpenter who observes articles not as articles in themselves but in reference to what he wants to do to them and with them. Only by these processes of active manipulation of articles in order to realise his purpose can the carpenter discover what the properties of the articles are. (Miettinen 2006a, 2008).

On the other hand, for Dewey, a tool is more than a particular artefact: it is an artefact “in which a connection, a sequential bond of nature is embodied.” (Dewey 1925/1988: 101, reference by Miettinen) According to Miettinen’s (2006a) interpretation, a tool’s primary relationship is toward other external artefacts, and it can therefore be regarded as a “controlling principle” that regulates and orders the “connection of things”. Miettinen marks that Leontjev characterised the epistemological implications of work in a similar manner:

“Work is the instrument that places man not only ahead of material objects but also ahead of their interaction, which he himself controls and reproduces.” (Leontjev 1978: 23, reference by Miettinen).

Leontjev’s theory of consciousness regarded human thought as a product of socio-historical development and a special “theoretical” form of human activity. Even with this degree of development, when thought becomes relatively independent, practice remains its basis and the criterion for its objectivity. (Leontjev 1978, Miettinen 2006a, 2008).

“As a function of the human brain, thought represents a natural process, but not outside of society, outside accumulated human knowledge and the meth-
ods of thought activity worked out by the human race” (Leontjev 1978, reference by Miettinen).

In Miettinen’s interpretation, the world and the beings and artefacts in it exist for humans as objects and tools of human activities and transformation, and the artefacts in the environment are primarily objects of desire, use and enjoyment. Awareness of these characteristics is connected with the achievement of human goals. The characteristics and impact of the artefacts in our environment can be seen in practice when a human strives to reach specific goals that are important for his or her activity. (Miettinen 2006a, 2008). Dewey outlines his view: “It signifies nothing less than that the world or any part of it as it presents itself at a given time is accepted or acquiesced in only as material for change” (Dewey 1957: 114, reference by Miettinen). Such a view on nature and consciousness is characterised by “participation in an unfinished universe and not a spectator of a completed cosmos” (Garrison 1995: 111, reference by Miettinen).

Instrumentalism and mediation

Both activity theory and Deweyan pragmatism suggest that interaction between human and her or his environment, mediated by tools and language, constitute the foundation for understanding the nature of knowledge and reality. Dewey characterised activity by using the concept of instrumentalism and Vygotsky in terms of mediation. (Miettinen 2006a).


Vygotsky developed the concept of mediation as an anti-dualist solution to the crisis of psychology in the beginning of 19th century. When referring to a crisis, Vygotsky meant the fact that the discipline was dominated by two unsatisfactory approaches. Vygotsky formulated an alternative conception to these two opposing but equally unsatisfactory explanations: the concept of mediated action (Vygotsky 1978). The relation between the subject and the object is mediated by cultural means (tools and signs). The use of signs as ‘psychological tools’ constitutes the foundation of higher psychological functions and during socialisation an
individual internalises the means of culture as well as norms and modes of acting. Consciousness does not exist situated inside the head of the individual but in the interaction between the individual and the objective forms of culture. Although Vygotsky’s theoretical work was inspired by Marx (the genetic method), he heavily criticised the attempts to develop a “Marxist psychology”. Vygotsky argued that these attempts applied the concepts and categories of Marxist dialectics externally, not taking into account the special nature of the phenomenon being studied (Miettinen 2006a). According to Miettinen (2006a), Vygotsky also critically used and further developed the ingredients of developmental psychology, Gestalt theory, sociology and anthropology (Miettinen 2006a, 2008).

Vygotsky focused on the activity of the individual (Miettinen 2008). Vygotsky’s colleague Leontjev (1978) suggested that individual actions can only be understood as a part of joint, collective activity. Activity is defined by its target and motive as well as the social usefulness of the final result. The activity and goals of individuals are interconnected through activity as part of the whole Leontjev calls an activity system. (Miettinen 2006a, 2008).

Engeström has developed the concept of activity system into a theoretical frame of reference to be used when studying the changes in the activity of work communities and learning (Engeström 1987, Engeström 1995). When studied in this way, activity research ceases to focus on the psychology of an individual and instead focuses on the interaction between an individual, systems of artefacts, and other individuals in historically developing institutional settings (Miettinen 2006a, 2008).

According to Miettinen Dewey’s instrumentalism and Vygotky’s mediation have “a family relationship”:

“Both of them regard thought and its material means (tools and language) as a vehicle of both the orientation of an individual body to its environment and coordination of the actions of individuals in shared undertakings. Language is a special means, a tool of tools, that makes ‘thought, reflection, foresight and recollection possible’ (Dewey 1925/1988, 134). In characterizing the functions of thought in activity, Dewey used both the concept of ‘reconstruction’ and the concept of ‘mediation’ (Dewey 1925/1988b, 14). These two have an affinity with the two key dimensions of Vygotsky’s mediation, the external transformation of objects using tools and the use of signs as ‘internal tools’ or cognitive artifacts for affecting and controlling one’s behavior (Vygotsky 1978, 54-55).” (Miettinen 2006a: 394)
3.3.2 Concepts of language and meaning in Dewey’s pragmatism and cultural-historical activity theory

In Dewey’s epistemology, meanings made possible by language are not about artefacts that are somewhere out there. According to Dewey’s idea, meanings are rather about the ways of doing something and the regularities of interactions of artefacts in shared action, and about the properties of artefacts as they are expressed in the activity (Miettinen 2006a).

“Meaning is not indeed a psychic existence; it is primarily a property of behavior, and secondarily a property of things. (...) Primarily meaning is intent and intent is not a personal in a private and exclusive sense. (...) Secondarily, meaning is the acquisition of meaning of things in their status of making possible and fulfilling shared cooperation. (...) Meanings are rules for using and interpreting things (...) Meanings are objective because they are modes of natural interaction; such an interaction, although primarily between organic beings, as includes things and energies external to living creatures.” (Dewey 1925/1998: 141–142, 149, reference by Miettinen).

Ilyenkov, the main Russian philosopher associated to Activity Theory, is according to Miettinen (2006a) to a large extent sharing this position. Miettinen describes Ilyenkov’s thoughts as follows:

“...meaning is not primarily a property of either activity or things, but rather of the endless mutual transformation of the two to each other (Ilyenkov 1977a, 99). [...] functional human capability and actions follow the 'form' of things. On the other hand, man transforms things. An idea expressed in words turns into action, and action into a thing. Ideality, the concept [...] for meaning, only exists in the constant reciprocative transformation from the form of activity into the form of things, and from the form of a thing into a form of activity. In this process of transformation, things ‘show’ their objectivity”. (Miettinen 2006a: 396).

Miettinen (2006a) also pays attention to the fact that both activity theory and Dewey’s pragmatism regard language use and meaning making ultimately as means of coordinating and making sense of shared human activities and concerns. Dewey believes in an intrinsic connection between language and “a community of action”. Leontjev (1977) also has similar ideas:
"... meanings are the linguistically transmuted and materialised ideal form of the existence of the objective world, its properties, connections and relations revealed by aggregate social practice. So meanings in themselves, that is to say, in abstraction from their functioning in individual consciousness, are just as ‘psychological’ as the socially cognised reality that lies beyond them.” (Leontjev 1977: 17).

Leontjev distinguishes between socio-historically evolved meanings and personal meanings. Socio-historically evolved meanings comprise the results of action, means and conditions, independent of the individual’s subjective motives. They are adopted in activity and they become the characteristics of individual consciousness. The content of meaning can be developed into concepts, information, generalisations, forms, social norms, values, etc. Personal meanings refer to the vital significance of generalised modes of action, social norms, etc., to single individuals. The relation of a subject to reality holds behind it the meaningfulness of the information of the world obtained by the individual. Meaningfulness reflects the content of the individual’s real relations to reality and defines the bias of consciousness. Leontjev describes the double life of meanings as follows:

“When the products of socio-historical practice, idealised in meanings, become part of the mental reflection of the world by the individual subject, they acquire new systemic qualities. [...] In this second life of theirs meanings are individualised and ‘subjectivised’ only in the sense that their movement in the system of social relations is not directly contained in them; they enter into another system of relationships, another movement. But the remarkable thing is that, in doing so, they do not lose their socio-historical nature, their objectivity.” (Leontjev 1977: 19–20).

By distinguishing socio-historically evolved meanings and personal meanings, Leontjev creates the precondition needed when analysing activity and the motives guiding activity, both at the individual and at the social level.

The fundamental insight of Dewey’s pragmatism is the primacy of the perspective of an individual. Despite its individual nature, Dewey always considers experience a shared experience in the sense that meanings are meanings of the society. Thus, experiences are shared whereas and to the extent the meanings used to interpret and analyse them are shared. Meanings generate the habits of activity through which we interact with the surrounding world. “Through habits [...] we inhabit the world”, in Dewey’s words. (Dewey 1934/2005, reference by Määtt-
tänen). Dewey’s concept of habit points out that the concept of an aesthetic experience also involves a social aspect.

### 3.3.3 Resistance and objectivity of knowledge

Miettinen (2006a) raises a question as to how the activity-based theories view the objectiveness of information and how can it be characterised when studied from the perspective of philosophy. He seeks an answer from an approach he calls pragmatist realism. It has been characterised as follows:

“Crucial to the pragmatist project is the notion that nature is not a simple project of ideas; nor is nature determined by society. Nature is plastic but not infinitely malleable. It resists, and in doing so actively participates in forming our purposes”. (Lenoir 1992: 162, reference by Miettinen).

In both activity theory and Deweyan pragmatism, the concepts of objectivity and resistance are interrelated. Dewey defined an object as “that which objects, that to which frustration is due” (Dewey 1925/1988: 184, reference by Miettinen). Leontjev defines an object in a similar way:

“The concept of object is normally used in a dual sense: in the broadest one as a thing standing in some kind of relation to other things, i.e. ‘a thing having existence’; and in a narrower sense – as something withstanding (German Gegenstand) resistant (Latin Objectum), that to which an act is directed, i.e. as something precisely a living creature relates itself as the object of its activity”. (Leontjev 1981: 36, reference by Miettinen).

In Leontjev’s definition, according to Miettinen, objects of the environment definition are ideal and subjective (as objects of desire and intentions) and objective, capable of resisting these desires and intentions. The significance of resistance of material entities for the objectivity of knowledge has been an important theme in the sociology of knowledge. Miettinen regards resistance as constitutive for a basic experience of experimental natural science and engineering work. (Miettinen 2006a).

“What the sociologists of knowledge say about the experimental activity of natural sciences holds for all practical activity involving interaction between men and objects”, Miettinen observes, adding: “Not only are the unanticipated and unexpected properties of material entities faced but also other purely understood and surprising conditions of social reality” (Miettinen 2006a: 399). As examples,
he mentions that people resist, tools do not conform to new uses, rules are inappropriate and disturbances occur in automatic production systems. “This resistance faced constantly in practice forces us to change our preconceptions, hypotheses and plans” (Miettinen 2006a: 399). Thus the existence of resistance is a guarantee that we are not moulding the world into some predetermined categories that we are in a touch with objective reality existing independent of us, something that can be learnt to know better.

In this research user experience is seen from the perspective of user’s activity and the mediating role of a technology product in it. The adaptation into the everyday life of an user, and the features of the product uncovered in the interactional relation are in the focus. Thus studying resistance is constitutive also for UX research and pragmatic product design work.

3.3.4 Experimental and interventionist research strategy

Both activity theory and Chicago pragmatism regard practical experimentation and intervention as an essential part of studying human practices. According to Miettinen (2006a), the reasons are both epistemological and moral. In both traditions, the commitment to the problems and wellbeing of the people and activities studied is also a constitutive feature of research (Miettinen 2006a):

“The chief function of philosophy is not to find out what difference ready-made formulas make, if true, but to arrive at and to clarify their meaning as programs of behavior for modifying the existent world. From this standpoint, the meaning of a world-formula is practical and moral not merely in the consequences which flow from accepting a certain conceptual content as true, but as regards that content itself.” (Dewey 1916: 312, reference by Miettinen)

Miettinen (2006a) comprises this statement with Marx’s 11th thesis on Feuerbach (1984: 127), according to which: “The philosophers have only interpreted world, in various ways; the point is to change it.” Miettinen (2006a) summarises:

“From the points of view of pragmatism and activity theory, lasting ontological (the inevitable change in the world), epistemological (understanding the conditions of social change and transformative human agency) and ethical reasons (contributing to the solving of vital social problems) underlie the significance of intervention and experimentation as a research strategy. This does not contradict the study of such phenomena and aspects of practices as
power relations, marginality, dialogue and multiple interests and points of views. These phenomena, as a matter of fact, offer a challenge for the interventionist approach.” (Miettinen 2006a: 402)

According to Miettinen (2006a), both of these approaches (activity theory in particular) have developed an interventionist research approach with relevant concepts (a working hypothesis, remediation, developmental contradiction, the zone of proximal development) based on the dialogue between the researchers and the people whom they are studying. In user-centered design the aim is to provide a dialog between an user and a designer to bring user experiences (UX) to bear in design. The assumption is that this new knowledge will inspire a designer and help him or her to transcend his or her own experiences.

3.3.5 Dewey’s basic ideas and the basic claims of Leontjev’s activity theory as a theoretical basis for the concept of eUX

Both pragmatism and activity theory have focused on studying the problem of change and development in human activity. Miettinen (2006a) summarises the similarities of activity theory and Deweyan pragmatism:

“Both of them regard practical, material activity in forms of bodily actions and habits as the starting point for studying human conduct. Both of them, in addition, study the relationship between thought, imagination, objects and the transformation of the world. Both Dewyan instrumentalism and Vygotskyan mediation suggest that thought and reflection serve the reorientation and coordination of shared activities. In addition, they both suggest that special ‘secondary objects’, cognitive instruments, typically concepts or models, are needed to understand the conditions of activity, give new meanings to its elements, and to develop new ends-in-view and alternative forms of activity. The collaborative creation of such shared mediating artifacts is therefore essential for (organizational) learning and for the creation of new joint activities.” (Miettinen 2006a: 403).

According to the comparison presented above there seems to be a common ground and compatibility between Leontjev’s activity theory and Dewey’s pragmatism. Moreover, both theories hold a rather similar view on central concepts for expanded user experience, such as activity, mediation, reflection, meaning mak-
ing, and habit. Both theories strive to transcend the dualism between individual and social.

Dewey is using the concept “habit” to transcend the dualism between thinking and acting, and that between reason and emotion, but also to resolve the problem between individual and societal. “Societal customs” exist as individual habits, but on the other hand these cannot be understood without connecting them to societal practices. The environment where a human acts, experiences and forms his or her habits, is besides a natural also a particular social environment (Kivinen & Ristelä 2001). Also Leontjev recognizes emotional experiences and habits. Substructures of personality as, for example, temperament, needs and inclinations, emotional experiences and interests, aims, habits and customs, moral traits, etc., which are “the result of the self-movement of his activity in the system of social relations”. (Leonjev 1978: 115).

Moreover, both Dewey and Leontjev see for consciousness a role that transcends the cognitive interpretation. Leontjev makes a distinction between (1) “mind” which is personal and which is organising the personal meaning of observations related to earlier interactions, and (2) societal “consciousness” related to individual point of view. He emphasises that meanings are socially formed, and independent of subjective motives, results of actions, means, and conditions. (Leontjev 1977, 1978; Hakkarainen 1991).

For Dewey, consciousness is not independent of environment, individual property, but because of the societal nature of meanings also consciousness must be societal. And because actions are impossible without a material body, conscious can be seen as bodily as well. Thus consciousness is not a property of a body but a property of the interaction between a body and its environment. This emphasises the societal nature of experiences, because the environment of a human is essentially social and cultural (Leontjev 1980, Kivinen & Ristelä 2001, Määttäinen 2002).

Besides certain compatibility between Leontjev’s activity theory and Dewey’s pragmatism their ideas related to the topic of this research seem to complement each other: Dewey’s concept of aesthetic experience gives a holistic view on humans, while Leontjev’s activity theory delivers the connection between motivation and activity, and concept of actions needed to operationalise and study them. Thus by combining Dewey’s and Leontjev’s ideas we seem to reach a plausible starting point for a conceptual framework for the purposes of this research.
3.4 The concept of expanded UX

An experience is always personal. Furthermore, the components of each single experience are dependent not only on the subject and object of the experience but also on the comprehensive interaction between these two. UX can only be studied if the user and the product, as well as the user’s activity, are analysed. This requires the user to reflect on his or her own activity. A precondition for a deep understanding of UX is internalisation of the dynamics of the creation of UX. In this study, the dynamics of the creation of experience is studied based on the above-mentioned complementing ideas of Dewey and Leontjev.

3.4.1 On dynamics of the creation of expanded UX

The study of the creation of the expanded UX is based on the idea that a high-tech product usually has the role of a tool in the activity of its user, i.e., it is used as a tool in order to reach a final result or achievement. The user’s activity – the use of the product – is activity guided by motivation. UX can only be understood if the user’s activity and the underlying motivation are identified and analysed.

Since experience is all about the connection between activity and its consequences, activity is a necessary precondition for experience. Emotions that arise when the consequences of activity are experienced reveal whether or not the result of the activity is the desired result, i.e., whether the result complies with the motives of the subject of the experience or whether it contradicts the motives. When analysing the control and maintenance of activity, one must pay special attention to how humans live and work, in which way they are active. This defines the individual’s habit.

The user’s habit describes the way of life to which the user identifies and which the user considers means for reaching a “good life”. A habit is created when the user interacts with the social, material and cultural environment. It is based on individual and personal meanings that come from the culture in which the individual has grown up and into which the individual has been raised. A user can be considered an actor in the social world who strives to reinforce those characteristics that are the most valued in the current field of action. The striving for a “good life” provides the user motivation that guides and maintains the activity. In addition to needs, the user’s motive is influenced by the user’s personal meanings. In this activity, a high-tech product acts as a tool, i.e., it is used as a tool to achieve a final outcome or achievement.
In compliance with Dewey’s basic idea of experience, the object of experience cannot be isolated from everyday life. Furthermore, Dewey is of the opinion that each experience is based on a powerful desire (“impulsion”). This requires a subject for the UX or an actual user of the product being designed who genuinely “wants” to use the product, and that the product or the user’s activity is no longer isolated from the authentic context of use when studying UX. When the user experiences the consequences of his or her actions, UX is created. Emotions that arise when the consequences of activity are experienced reveal whether or not the result of the activity is the desired result, i.e., whether the result complies with the motives of the user or whether it contradicts the motives.

Expanded UX is formed when (1) an authentic user (2) when using the product in its natural and true context and environment (3) experiences the consequences of the activity that has been concluded and that provides the user satisfaction, and (4) the user identifies the emotional tone of the experience. Identifying the emotional tone of the experience due to intellectual reflection is a starting point for the subjective explication of the user’s personal experience.

Comprehensive understanding of UX requires the analysis of the factors that influence the personal experience of a single user, such as the user’s activity and the underlying motivation, “habit”. This, on the other hand, requires an analysis of the user’s activity and an analysis of the user’s social, material and cultural environment. Comprehensive nature of UX refers to comprehensive and versatile identification of not only the cognitive but particularly the emotional, cultural and social factors that influence the user’s personal experience, and an analysis of these in the actual usage context of the object. This approach is different from most of the previous definitions of UX which aim at perceiving UX using predefined static factors and deal with UX as a momentary phenomenon at the level of activity.

3.4.2 The definition of the concept of expanded UX (eUX)

The motivation of activity is created by the influence of the habit that has been created in interaction of the individual’s social and cultural environment. The activity of the user that is the precondition for eUX is guided by the user’s personal motives. The concept of “motive” can be used to identify and explain the different factors influencing the UX generated by a product in different types of users. In order to perceive motives, an analysis of the activity level of product use is necessary. Therefore, the analysis unit of expanded UX is the user’s activity.
One can also assume that expanded UX has different dimensions that are the consequences of the multi-level activity (act-action-activity). The concept of expanded UX crosses the level between subject and object, and inseparably links these two.

The motivation guiding the user’s activity objectively explains how the UX is formed. In order to perceive motivation, an analysis of the activity level of product use is necessary. Therefore, the analysis unit of expanded UX is the user’s activity. Thus, the concept of expanded UX crosses the level between subject and object, and inseparably links these two.

When the activity of a user is analysed at different levels of activity – combined actions and the activity level – it is possible to differentiate two dimensions of expanded UX: (1) temporal UX that describes how the user experiences the consequences of an action (level of combined actions) and (2) long-term UX that describes how the user experiences his or her activity (activity level). When combined, these two dimensions create the “expanded user experience”, or eUX.

A temporary UX is created when a user experiences the consequences of an action he or she has completed. A temporary UX is dynamic and connected to the specific moment. An action can be a single time of physical exercising, for example. In such a case, the emotional quality of the temporary UX is created by whether or not the result of the action promotes the user’s exercising objectives, i.e., whether or not the sports performance that is optimal for the user’s exercising goal is achieved. A long-term UX is created cumulatively over time when the user experiences the consequences of his or her activity. It can be considered the stable background of the temporary experience that is moulded over time by temporary UXs. Both of these dimensions must be studied to fully understand UX. Thus, a study of the expanded UX must be longer than the studies presented in previous user research methods. The figure below elucidates the structure of the expanded UX:
3.5 Characteristics of the concept of eUX

The objective of this study has been to define a concept that can reflect the comprehensive, hierarchical and reflective nature of UX. Next, as a first step of validation of the concept we will study whether or not the developed eUX has the desired characteristics. To give a reference point and perspective the characteristics are studied in comparison with definitions of UX made by Kankainen (2002) and Roto (2006), which were in chapter 2 found to be the clearest ones.

3.5.1 Comprehensiveness of eUX

In his aesthetics, Dewey stresses the holistic nature of human experience, unwilling to separate aesthetic experience from other fields of life. Instead, he places it in the centre of the practical life and calls all experiences aesthetic with certain limitations. For Dewey, the content of experience is not primarily psychological; instead, it is a characteristic of a system created by the individual and the envi-
ronment that also contains the characteristic of artefacts (Miettinen, 2008). Thus, it is a good starting point for the definition of the concept of expanded user experience (eUX).

One can see the characteristics of Dewey’s aesthetic experience in eUX: (1) completeness; (2) uniqueness; and (3) unifying emotion. (Dewey 1980, Jackson 1998, Väkevä 2004). Next, we will study eUX based on these characteristics.


“A piece of work is finished in a way that is satisfactory; a problem receives its solution; a game is played through; a situation, whether that of eating a meal, playing a game of chess, carrying on a conversation, writing a book, or taking part in a political campaign, is so rounded out that its close is a consummation and not a cessation. Such an experience is whole and carries with it its own individualizing quality and self-sufficiency. It is an experience.”

Thus, an action that is the precondition for experience must be (1) completed and (2) finalised in a manner that provides satisfaction. In order to complete the activity that is a precondition for eUX, the situation in which the user acts must be unhurried and natural so that the users will have the opportunity to complete the activity that is the starting point for experience and allow themselves to be immersed in the experience. An eUX cannot be achieved by temporary activity in a predefined place at a predefined time. Instead, it will not be formed until (1) the product has been taken home, (2) the product has been taken into use and (3) the product is being used in the end user’s own usage context. The activity that is a precondition for experience must be finalised in a manner that provides satisfaction. Finalising an activity so that it will provide satisfaction is only possible if the activity that is a precondition for the eUX is meaningful and purposeful for the user.

*Uniqueness* of an experience can be considered to refer to qualities pervading the entire experience. According to Dewey, emotions are qualities of complex and changing experience, and this makes them meaningful (Dewey 1934/2005, Väkevä 2004). Dewey illustrates this idea by providing an example of emotions as qualities of drama and the manner in which they change when the drama develops. The unique nature of emotion will be revealed when a person sees a play.
or reads a book. Emotion participates in the development of the plot, and the plot requires a stage and a space in which it can develop and start to open. Thus, an experience is emotional but it does not consist of separate issues called feelings. Experience creates a unit whose existence is defined by the single quality that pervades the entire experience, regardless of the variations in its different components (Dewey 1934/2005).

The uniqueness of experience can also refer to the fact that experiences are as versatile as life itself, and also historically changing and bound to culture. In practice, this means that an experience cannot be modelled using any predefined and generalised description of the experience and its components. UX cannot be defined as a combination of static components independent of the product at hand or even as a combination of product-specific static components. The relation between the goal of the activity and the final result defines the quality of the experience, and thus identifying these aspects is a precondition for understanding the experience. Therefore, understanding motivation based on an analysis of the users' activity level is a precondition for understanding the dynamics when an experience is created and the unique nature of UX.

*Unifying emotion* seems to refer to two issues: (1) the emotional tone of the experience that arises during the experience and (2) an emotional “filter through which observations are selected”.

According to Dewey, all experiences are emotional; it is all about experiencing the consequences of your actions as wanted or unwanted. Experiencing the consequences as wanted or unwanted refers to the goal-oriented nature of activity. Activity causes positive emotions only when it supports the user’s goals. Even if a product is functionally perfect, it will not provide satisfaction if it fails to support the user’s objectives. This causes a need to address the goals and objectives that cause a user to use a product, i.e., the user’s motivation. Leontjev’s activity theory (Leontjev 1977) and the human activity system based on it (Engeström 1987) provide the necessary tools to analyse the activity of users and their motivation.

In her thesis, Roto (2006) focuses on Web browsing with a mobile phone. She aims at understanding the building blocks of UX in the case of mobile browsing. She differentiates between the concepts of “experience” and “user experience”, justifying this approach by stating that “otherwise the variety of different types of experiencing cases is too big to get hold on. Making this difference would help us to understand what is meant by experience or user experience, to identify the factors affecting user experience, and also to evaluate (user) experience in a systematic way” (Roto 2006: 32). Her separation of user experience from human
experience in order to simplify identifying the factors affecting UX seems an unnecessary and unhelpful approach that will lead to a cognitivistic reduction of experience. When UX is separated from human experience, the definition loses the kind of sensibilities to the uniqueness, the emotional and the personal that are associated with experience. On the other hand, an approach to UX that differentiates between user, context and system, “the three main factors affecting user experience”, (Roto 2006: 31), does not allow for a comprehensive approach to analysis of the phenomenon that would exceed the limits between experience subject and object. This approach may be useful in user studies implemented in connection with practical product development, but when studied from the viewpoint of scientific information, one can state that it may miss some of the insights available in accounts that resist such reduction.

Kankainen (2002) aims at developing models of thinking and tools that would assist in understanding UX related to information appliance product concepts. She focuses on studying the interaction between a human and a product, striving to a more holistic understanding of UX. Kankainen’s view of UX is situational and connected to the concept of activity. In Kankainen’s definition, one basic element of experience is the user’s motivation. Perhaps this is the reason why Kankainen seeks a theoretical frame of reference from activity theory; however, in the development work, she expands the frame of reference without providing any justification for the expansion.

By motivation, Kankainen refers to a need that makes a person use a product; feelings may guide this need. As a result of this, the motivating-level needs are connected with identity, roles and values, etc. On the other hand, the activity-level needs are connected with the tasks at hand and usability. According to Kankainen, a user has different needs when using a product, but not all of these lead to activity. A need becomes motivating when its intensity reaches a sufficiently high level in a specific context. When the need is satisfied, the tension experienced by the user lessens. In addition to needs on the motivating level, people have activity-level needs. The activity-level needs are cognitive to a higher extent than the motivating-level needs because they are connected to the mental model on performing the activity that the user has created. Kankainen bases her description on the creation of motive on the existence of needs. Kankainen’s definition of motive is a need that makes a person use a product. On the other hand, she considers feelings as motivators of activity. (Kankainen 2002).

Kankainen’s definition of motivation is a need that makes a person use a product. On the other hand, Kankainen considers feelings as motivators of activity.
Roto’s (2006) definition of the user’s state also includes motivation as well as mental and physical resources: “user’s current emotional state, knowledge, attitudes and expectations affect the perceived user experience as well.” (Roto 2006: 31). What is common to these definitions is that even though they aim at taking into account the factors affecting UX in a versatile manner, the definitions are not uniform and comprehensive because the impact of the several multi-faceted concepts on the creation of UX and their mutual relation remain unclear. The reason for this may be the lack of a consistent theoretical background.

### 3.5.2 Hierarchical nature of eUX

In this thesis, the term “dimensions of UX” refers particularly to taking into account temporal dimensions in the UX definition. In the frame of reference for this study, they are considered a consequence of the hierarchical structure of activity.

The hierarchical structure of activity which is equivalent to the hierarchical structure of motivation system developed by Leontjev provides a frame of reference for analysing the activity of users and the underlying motives. Leontjev’s hierarchical system of individuals’ activities is an appropriate tool for studying the multi-dimensional nature of UX. Construction of the concept of eUX is based on operationalisation of Dewey’s concept of aesthetic experience that has been divided into two parts utilising Leontjev’s “strong version of activity theory”. The developed concept of eUX can be used to describe the user experience that is created as a result of the user’s mediated and goal-oriented activity with an interactive high-tech product as well as the different dimensions that are caused by the hierarchical nature of human activity and the motivational structure.

Kankainen (2006) divides her conceptual model of temporary experience into three basic elements: context, motivation and activity. Furthermore, the definition states that previous experience influences motivated activity. Activity occurring in its context leads to an experience, and the experience influences future expectations. According to Kankainen, attention must be paid to the previous experiences of a person, his or her motivation, what he or she is doing, the context and the person’s expectations relating to future experiences when studying UX (Kankainen 2002)

Roto also studies mainly temporary UX, “user experience in use case”. According to Roto “to be able to talk about user experience, we demand at least one use case with the system.” The definition also takes into account a longer-term UX dimension, which Roto calls “overall user experience”. “The user experi-
ences from use cases do not form the overall user experience alone, but together with attitudes and emotional relations not tied to the use cases”. (Roto 2006: 30–31). Roto describes the impact of experience on future experiences as follows: “the resulted user experience typically affects user’s state, which in turn influences the forthcoming user experiences”. (Roto 2006: 31). On the other hand, Roto includes a temporary element in the concept of “context” which “refers not only to the physical surroundings but also to the social and temporal context, as well as the task context that is related to the current motivation for interaction” (Roto 2006: 31). The mutual relation of the temporal dimensions included in the definition and their relation to other identified elements of UX are not dealt with, however.

**3.5.3 Reflective nature of eUX**

As stated above, when studying experience, one assumes that the phenomena being studied are present in the living world but in a form that is not directly applicable for conceptualisation and understanding (Tuomi & Sarajärvi 2002, Anttila 2005). Polanyi (1966) divides information into two main categories: tacit knowledge and explicit knowledge. Tacit knowledge refers to information that has been obtained through experience, and which is often impossible to describe in words. (Polanyi 1966). Experience-based information can only be explicated by means of reflection. Creation of longer-term UX, in particular, is based on the mental reflection of the individual subject. The reflective nature of UX is also connected to the temporal dimensions of the phenomenon as well as the study of the phenomenon’s dynamic nature.

When defining UX, Roto mentions the impact of reflection in the creation of UX. She interprets the thoughts of Wright et al. (2004) on reflection as follows: “user experience may change after the actual use case and this phenomenon is called reflecting”. Roto illustrates her view on reflection as follows: “If the user has obtained new perceptions or information concerning the system after the use case, these may change the overall user experience”. (Roto 2006: 31). This view is clearly different from what reflection is considered to be in this thesis. Kankainen’s (2002) definition does not mention reflection.

Based on the discussion above it can be claimed that he developed concept of eUX seems to be able to deal with the comprehensive, hierarchical and reflective nature of UX. Also it can be seen that the concept of eUX is in several ways more extensive than some best previous approaches and more capable to grasp the es-
sence of UX in a more comprehensive way. This gives the concept some valida-
tion. But the real proof of the pudding is in the eating, and next we will turn to the
actual use of the concept in user experience research.
4 A method for a more comprehensive study of user experience

This chapter aims at developing data collection and analysis methods that can study the expanded user experience based on the activity of users. In the beginning of the chapter, we study the methodical challenges due to the special characteristics of the studied phenomenon. The starting point for the development of a new method is a s.c change laboratory, based on cultural-historical activity theory. The background, motivation, and composition of the change laboratory method is first discussed. As such change laboratory is not suitable for our purposes, because it has been developed for a different purpose. Next some central ideas of the change laboratory are used in constructing a method or a set of methods to study user experience and to ground the study on everyday life of participants. The created research methods are presented at the end of this chapter.

4.1 On studying tacit information

When studying experience, one assumes that the phenomena being studied are present in the living world but in a form that is not directly applicable for conceptualisation and understanding (Tuomi & Sarajärvi 2002, Anttila 2005). According to Schön (1983), human knowledge is usually tacit knowledge, i.e., information indirectly contained in activity and the obtained impression of the object of activity.

According to the Ba theory of Nonaka and Konno, tacit knowledge is created in an environment where feelings, experiences and images can be shared with others. Tacit knowledge can be communicated better than written or spoken instructions through joint activity, being together and living in the same environment (Nonaka & Konno 1998).

The Japanese use the concept of “Ba” when referring to tacit knowledge. Ba can be understood as a shared space that offers the basis for creating information and building connections. Ba provides a platform for developing individual or community level information capital. (Nonaka & Konno 1998) In interactive Ba, individuals share images with each other but also reflect and analyse their own images. The mental models and thoughts of the participants are changed into shared concepts. Tacit knowledge changes into clear information that can be expressed and is externalised. Dialogue is the key. Susceptibility in understanding
what others mean and their meanings as well as willingness to bring tacit knowledge visible are required. (Nonaka & Konno 1998, Anttila 2005)

One of the major challenges in studying UX is making tacit knowledge visible. Such studies require methods which can be used to study phenomena that cannot be grasped by means of direct observation and understanding. When tacit knowledge is being made visible, the most important issues are finding an applicable research method, cooperation and working methods.

4.2 On studying eUX

User studies in the field of HCI favour qualitative methods because research data compiled by these methods provide stimuli that allow ideas and insights to be created and opportunities to share them (Mattelmäki 2006). Qualitative research of temporal UX has been studying and understanding the emotions, pleasure and usage context of users. The previous research has, however, left some questions still unanswered, such as: (1) why is the high-tech product used?; (2) why do the experiences of different users when using the same product differ from each other?; (3) why is it that the same UX of an individual may change over time?; and (4) which factors influence the creation of UX? A comprehensive view on UX needs answers to questions like these, and hence there is a need for data collection and analysis methods capable to deal with such issues.

The existing research methods are content with studying the use of a product at the level of single actions instead of requiring an understanding of the activity of the product user and the motives behind this activity. On the other hand, a temporal (interview, observation, case study) UX study that sometimes has been removed from its context (usability testing, participatory design workshops) cannot grasp the comprehensive, multi-dimensional and reflective nature of UX. Particularly when developing high-tech products, it is important to note that products usually have an instrumental role in the activity of a user. The use of the product, the activity, is controlled and maintained by a goal or an objective, and the product is used in order to reach this goal (Hyysalo 2006). Deeper understanding of UX requires a focus on studying the user’s activity level.

Recently there has been a lot of interest in emotions, but collecting data on emotions has been found to be difficult. Based on work by Desmet et al. (2001) Arhippainen and Tähti (2003) have developed a method to collect emotional data using nine “emotional icons” (emoticons). Emoticons developed and tested with users depict feelings. Emoticons have been found to be useful in recording mo-
mentary feelings but they cannot be used to grasp any motives or longer-term aspects of user experience. Research on emotion has also the problem that although it is possible to record some emotions, the relation between emotions and experience has not been elaborated.

The phenomenon studied can only be properly studied by utilising methods and tools that provide sufficient resources for the end users participating in the study to reflect on their personal emotions, experience or tacit knowledge and for them to make it visible. The selected starting point for method development is a working method utilising the change laboratory setting because it seems to offer not only tools for reflective long-term work but also a forum for the researcher, the technology users and the designers to meet. Furthermore, analytical methods and tools are required to more deeply understand the collected research data. This requires development of analysis methods that strive for a comprehensive understanding of the UX and the dynamics in the creation of the UX. This objective can be reached by utilising the methods and tools provided by activity theory (Vygotsky 1978, Leontiev 1981, Engeström 1987, Cole & Engeström 1993).

4.3 Analyzing activity

According to Leontiev (1977), activity is not an additive process and actions are not separate things that are included in activity. On the contrary, “human activity exists as action or a chain of actions” (Leontiev 1977: 8). Thus, an activity can be analysed at different levels: activity – actions – operations. These “units” of human activity form its macrostructure. The analysis by which they are identified is not a process of dividing activity into separate elements but of revealing the relations which characterise that activity (Leontiev 1977). More advanced activity requires the achievement of several concrete goals and often the achievement of some of this in a particular order. In other words, activity usually consists of a chain of actions dependent on specific milestones. Therefore, a characteristic of higher development stages is a conscious motive as the final objective. Because it is conscious, it becomes the motive objective of the activity (Leontiev 1977, Hakkarainen 1991).

Defining the difference between the activity of an individual and the behaviour of an individual is challenging. When the concept of activity is used as a unit of analysis, focus lies in a different place than the concept of behaviour; it requires that concrete activities are distinguished and analysed. The activity types can be separated from each other only if the needs and motives of each activity
are proven. If the basis of need and motives of processes that seem different are the same, it is a question of the same activity despite the fact that they are seemingly different. The analysis of observed behaviour becomes an analysis of activity when one starts to study the relation of the observed actions to motivation and needs. According to Leontjev, the level of activity can be found through needs and motives (Leontjev 1980, Hakkarainen 1991). Leontjev provides guidelines for analysing human activity (1977):

“So, in the general flow of activity which forms human life in its highest manifestations (those that are mediated by mental reflection), analysis first identifies separate activities, according to the criterion of the difference in their motives. Then the action processes obeying conscious goals are identified, and finally, the operations that immediately depend on the conditions for the attainment of a specific goal”. (Leontjev 1977: 8).

Leontjev stresses the goal-oriented nature of activity as a factor bringing activity together, but this does not necessarily mean any concrete nature that can be observed with your senses. The activity level can only be construed using theoretical tools. A study of a user at activity level and identification of his or her motives is essential in the understanding of expanded user experience. Activity theory is offering conceptual tools to analyse user’s activity and motives.

4.4 Change laboratory

A change laboratory is a method of participatory development that a community can use to change its operations culture and improve its activities. The concept of change laboratory was developed in the University of Helsinki Center for Activity Theory and Developmental Work Research (Virkkunen, Engeström, Helle, Pihlaja & Poikela 1997). It is based on the cultural-historical activity theory (Vygotsky 1978, Leontjev 1981, Engeström 1987, Cole & Engeström 1993) and developmental work research (Engeström 1995).

4.4.1 Structure of developmental work research

Traditionally, developmental work research simultaneously develops activity and studies it. A change is considered to be dependent on the input of employees. The researcher provides means for the change to be used as an incentive and tools but the researcher does not provide any ready-made objectives or solutions. Since the
researcher supports the change, the researcher’s relationship with the people being studied is cooperative and interactive. In order to understand the activity from within, the researcher cannot remain in the traditional researcher role – i.e., as a distant collector of data and publisher of results. Instead, the researcher must understand the everyday operations environment of the people being studied. (Engeström et al. 1992).

According to Engeström (1995), in the design of developmental work research, the people being studied are active participants in the research. Developmental work research is participatory; it involves cooperation between the employees and the researcher. Developmental work research has a reflective research approach. The problems and tensions experienced by the employees in their work are concretely illustrated to them like a “mirror”. The data of the mirror is analysed utilising applicable secondary analysis tools, such as categories, classifications, dimensions and models which allow an analysis of the mirror data on its own terms. In other words, the mirror is a tool for reflection. Simultaneously, a hypothetical model of the work development stages and conflicts is created by means of historical analysis. With this model, the data of the mirror is theoretically studied, and the hypothesis of the model is tested and specified. The mirror allows the employees to experience the analysis subjectively. The model assists them in distancing themselves from their personal reactions and see the data as an expression of conflicts in the entire activity system. The motions between the model and the mirror implement the “double stimulation method”. (Vygotski 1982, Engeström 1995). The results are interpreted by comparing them to the conflicts of the activity system. The reflective approach means that the researchers obtain feedback on their own solutions in the developed work research and they can analyse their own work (Engeström 1995).

4.4.2 Change laboratory setting

In a change laboratory setting, the analysis of a task in compliance with the double stimulation method of Vygotsky (1978) is done using a new tool. In a change laboratory, the test arrangement task is handled by “the mirror” which describes the problems and disturbances in activity. The original internalised tools are the models of thinking and conceptions of the participants. In a change laboratory, the tool provided in connection with the task is replaced by the activity system model. In a change laboratory setting, the participants voice their thoughts and experiences to be processed together. The mirror includes observational data on the
way activity is currently implemented and the related disturbances, communication breaks and new solutions. This data is generated by means of interviews, different types of diaries and by observing authentic work. Samples that highlight the strengths and weaknesses of the current practices are selected as the mirror data. Working with the model enables intellectual specification and reflection of observations. The interaction between the members of the group supports the detailed review of issues. At the same time, the members of the group support each other. Ideas and intermediate-level tools assist the participants in distancing themselves from problems experienced in their work. The model is used to create an overall picture of the essential characteristics and conflicts in current practices as well as a vision of the future operations model. (Virkkunen et al. 1997).

In discussions conducted in a change laboratory, different views of the participants as well as different interpretations of the members of the community and the outside researcher meet. Issues are studied by changing viewpoints (Virkkunen et al. 1997). When problems are being worked on in a change laboratory, questions and ideas arise. These are tested in everyday activities. The fact that problems and possible solutions are transferred from one frame of reference to another promotes the discovery of reasons and solutions. These transfers can be called “border crossings”. (Engeström et al. 1995).

4.5 A method utilising the change laboratory ideas in user research

The change laboratory is a method for participatory workplace development, and as such is not directly applicable for studying user experiences. It has, however, a proven record in making tacit knowledge visible, which is needed here as well. Thus the idea has been to use the ideas of a change laboratory but to adapt them in another setting. This has been made easier by the fact that just finding issues of life is considerable easier than changing a workplace. A method utilising the change laboratory ideas is appropriate when the objective is a dialogue and a cooperative meaning making with the users participating in the research.

The employees as active developers of their work are at the core of developmental work research, but in the user research method being developed here, users are considered as inspirers of product development and partners in design work. The users actively participate in the interpretation of the research data that has been created in their own everyday life, the analysis of their own experiences, reflection and innovation. Joint workshops are used in order to provide a social
context for the explication of tacit knowledge and also a development platform where technology developers and users can meet.

Research data is collected from the everyday life of the users. The research data is collected utilising a probe method (Mattelmäki 2006) and also an applied form of the so-called experience sampling method. The research users document their activities and their everyday environment by means of self-documentation, such as by keeping activating diaries and by responding to questions posed by the researcher as SMSs, multimedia messages or e-mail messages. In addition to verbal expression, they are encouraged to provide visual data.

The work in the joint reflection workshops utilises the change laboratory setting. The research data for public handling that has been created in the everyday life of the users is collected in the mirror. The mirror is used as a reflection tool. Samples that highlight different aspects of the current practices and the users’ experience are selected as the mirror data. Data and records generated in meetings make up a central part of the research data. The users participating in the research participate in cooperative interpretation of the observation data. Unlike the change laboratory this research setting does not aim for the development of new activities, and thus the “model” component of the method is unnecessary during interactions with users. It is used, however, in researcher’s analysis. All thoughts and ideas that arise during this interpretation are brought back to the real life development laboratory to be tested. The cooperative meetings and border crossings to the everyday life of the users occur in turns.

Traditionally, the data generated in a user research is interpreted by the researcher or group of researchers. In this study, the dialogue with the people being studied has a central role. The goal with the cooperative interpretation of the research data is to construct an image of the user, the UX and the factors influencing the UX together with the users. The mutual interaction of the users also supports the explication of tacit knowledge. By observing the situation in which users jointly analyse and reflect their experiences and provide meaning for them, it is possible to obtain profound information on UX. This research design also enables a study of the product usage process.

A known drawback of group discussions is that people tend to explain their activities in a group situation in a manner that does not comply with their behaviour in real life. The reliability of the study is improved by utilising triangulation.
4.6 Studying eUX

In the frame of reference of this study: (1) the user is a subject of both activity and experience; (2) the user’s activity is object-oriented, purposeful and mediated by a technical product; (3) the product’s mediating characteristics can only be observed in use when the tool interacts with the object of activity; and (4) the unit of analysis is the user’s activity.

The starting point in the development of a set of methods is Dewey’s idea that experience is all about experiencing the consequences of your actions as wanted or unwanted. When an activity is completed, an unique experience emerges. When the user reflects upon the results of an activity to his or her motives, an unifying emotion is formed that defines the quality of a user experience. By combining user’s knowledge over his or her emotions with the understanding of motives that has been gained by analysing his or her activity, it is possible to grasp the expanded user experience and outline the dynamics of its emergence.

The developed theoretical framework offers concepts and tools to study emotions, activity and motives of an activity, and thus also to answer the questions presented above. Table 2 connects the questions, suitable data collection methods, and analysing methods based on selected concepts.

<table>
<thead>
<tr>
<th>Required information</th>
<th>Data collection method</th>
<th>Analysis method</th>
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</thead>
<tbody>
<tr>
<td>Where is the high-tech product used?</td>
<td>Design probes, experience sampling</td>
<td>Content analysis, affinity diagram as the principle of analysis</td>
</tr>
<tr>
<td>How is the high-tech product used?</td>
<td>Design probes, experience sampling, reflection workshop utilising the change laboratory setting</td>
<td>Content analysis, affinity diagram as the principle of analysis</td>
</tr>
<tr>
<td>What kind of emotions does the high-tech product create?</td>
<td>Emoticons, Design probes, experience sampling</td>
<td>Identifying emotions, Dewey ([1934/2005] (1) completeness; (2) uniqueness; and (3) unifying emotion) Identifying motives guiding activity by analysing activity</td>
</tr>
<tr>
<td>Required information</td>
<td>Data collection method</td>
<td>Analysis method</td>
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<tr>
<td>Why is the high-tech product used?</td>
<td>Design probes, experience sampling, reflection workshop utilising the change laboratory setting, free interview</td>
<td>Identifying motives guiding activity by analysing activity (Engeström's [1987] activity system structure model and Leontjev's [1977] hierarchical description of motivation structure)</td>
</tr>
<tr>
<td>Why do the experiences of different users when using the same product differ from each other?</td>
<td>Design probes, experience sampling, reflection workshop utilising the change laboratory setting, free interview</td>
<td>Identifying motives guiding activity by analysing activity (Engeström's [1987] activity system structure model and Leontjev's [1977] hierarchical description of motivation structure)</td>
</tr>
<tr>
<td>Why is it that the UX of an individual may change over time?</td>
<td>Design probes, experience sampling, reflection workshop utilising the change laboratory setting, free interview</td>
<td>Activity level analysis (Leontjev's [1977] hierarchical description of motivation structure), Identifying user’s habit (Dewey [1934/2005])</td>
</tr>
<tr>
<td>Development of process of use</td>
<td>Design probes, experience sampling</td>
<td>Simplifying and combining the research data</td>
</tr>
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</table>

The purpose of the method development is to create situations, where a user can reflect upon his or her experiences. The research setting utilises a method based on the change laboratory setting. Characteristics of a reflective user research method include (1) a multi-method approach; (2) utilisation of a multiperspective approach; (3) cooperative interpretation and reflection on meanings and experiences; (4) iterative progress of the research; and (5) generation of information in the environment in which the high-tech product is actually used.
4.6.1 Multi-method approach

Indirect study of phenomena that cannot be studied by means of multidimensional and immediate observation requires collection of versatile and rich research data. This can be achieved by utilising several parallel information retrieval methods and approaching the phenomenon being studied from several directions, i.e., utilising a multi-method approach. In this way, it is possible to obtain specific and comprehensive information about the multi-dimensional phenomenon being studied. (Anttila 2005).

A multi-method approach seems to be a useful approach for studying the versatile and multi-dimensional phenomenon at hand. The study aims at finding answers also to questions pertaining to the creation and the dynamic nature of experiences. In order to do this, several data collections must take place, i.e., one must utilise a multidata method.

4.6.2 Multiperspective and multi-actor nature of the research group

Innovations are created as a result of a dialogue between technology designers and users. The end user of a high-tech product is the best expert when it comes to his or her own activity, experiences and motives. A challenge in the development work is finding methods and ways of working that can make the user’s tacit knowledge visible: the users’ experiences, needs and motives. The research design aims at creating a forum for the meeting of users and designers as well as providing tools for making the empirical tacit knowledge visible. In other words, the objective is developing the research process into a dialogical process involving the developers of the high-tech product, the researchers and the users.

The fact that the technology developers participate in the research group expands not only the group’s pool of competence but also improves the interpretation of the research data by allowing the research group to approach it from their own substance competence viewpoint. On the other hand, close participation in the research group allows them the opportunity to study the research data in detail and utilise the preliminary results of the user study immediately after the preliminary analysis.

The users participating in the study have a central role. Firstly, the user study data mostly consists of observational data based on the users’ authentic use contexts and situations, their themed diaries and different kinds of descriptions provided by the users. Secondly, the users participate in the cooperative interpreta-
tion of the user study data and providing of meaning in reflection workshops. All working situations are captured on camera and the records constitute a central part of the research data.

4.6.3 Cooperative interpretation and reflection of meanings and experiences

The experiences of a person being studied can never be fully understood. Any text or image generated by a human being already contains meanings in itself, i.e., it contains the conceptions, experiences, beliefs, desires, ideals and values of the person. These can only be interpreted if the preconditions for the generation of the data being studied are compared with the cultural context, the time and place in which the data was generated and the time and place in which it is being studied and interpreted (Vilkka 2005). Thus, interventions and the dialogue with the people being studied are important for the research method; the basic principle is allowing the people being studied to participate in the cooperative interpretation of the research data and in the process of assigning meanings. The objective is to make reflection workshops a forum in which tacit knowledge can be made visible in order to reach a shared understanding between the user, the researcher and the technology developer. Special attention is paid to the techniques and tools that can support the achievement of a shared view between the user, the researcher and the designer.

The mirror is a tool for reflection. Research data provided by the users is collected in the mirror for the research group and the users to jointly interpret. The users’ interpretation and reflection of the research data they have provided will connect the samples to their context, thus creating a story. Without the reflection of the users, the provided research data will not be connected to anything, and they will depend on the interpretation of the researcher. By involving the technology user and developer in joint interpretation of the user research data and by encouraging the users to reflect on their experiences based on the research data provided by them and other members of the group, it is possible to reach a deeper analysis of the research data than the researcher could reach by analysing the data alone.

The joint interpretation of the images provided by the research users provides all members of the group an opportunity to voice any meanings, experiences and interpretations awoken by an image generated by another group member. Furthermore, observation data generated in earlier workshops are provided to support
the joint interpretation and promote dialogue. Data whose significance is unclear to the researchers or which the researchers want to study in more detail is selected for joint handling. The research data supporting product development is also interpreted by utilising the different ways of data analysis and different ways of providing meaning to the research data used by the multi-disciplinary research group. The correctness of these preliminary conclusions by the research group is tested by the users.

4.6.4 Iterativeness of research

When users reflect on their experiences and provide them meanings, they require time. If they also study the appropriateness and meaning of their experiences during the research project, they require even more time. Mere adaptation of products in normal use may take months or even years (Muller et al. 2003,巴塔尔比 2004). Thus, any ideas of studying only the temporal experience of users must be abandoned, and the focus must lie in a longer-term study of the comprehensive experience.

The longer-term study progresses as iterative cycles during which the different aspects of UX are studied in an empathetic manner, projecting oneself to the world of the people being studied. The observation of the users’ everyday life must be divided into themes in such a manner that the self-documentation cycle preceding each reflection workshop focuses on collecting user data on a particular theme.

The reflection workshops focus on jointly interpreting the themed observation data and providing meanings. Correctness of preliminary analysis results may be tested by the end users at the same time. The cyclic progress of the research process and the fact that data collection and data processing focuses on themes that complete each other provides an opportunity to analyse the research data by simultaneously specifying and complementing it as well as to deepen the researchers’ understanding of the research object.

One can think of this cycle of iteration as a concrete manifestation of a metaphor, a hermeneutic cycle. The hermeneutic cycle can be used to describe how the shared understanding of the researcher/multi-disciplinary research group is created. Understanding always starts with a starting point set by the researcher, and during the course of the research, the researcher continuously returns to the starting points as the researcher’s understanding becomes more complete. The goal is for the researcher to gradually separate him/herself from all characteristics and
thoughts that focus on him/herself in favour of characteristics and thoughts focusing on the research object. The analysis of the research data overlaps with data collection. As the content of the research data is analysed, the research data also becomes richer, and the data collection is guided by preliminary conclusions made based on the research data. Final conclusions are formed when a level formed by the initial assumptions, the research events and the continuous understanding of the previous level is exceeded. The goal is reaching an interpretation that describes the object being studied as accurately as possible (Varto 1992, Vilkka 2005).

Thoughts created during the joint interpretation of the research data and the joint generation of meanings are introduced back into the everyday life of the users to be tested in the environment in which the product is used. This means that the samples of the phenomenon being studied are mainly collected from the everyday life and world of experiences of the research users, avoiding any non-natural research designs. Individual interviews at the end of the research project focus on specifying questions arisen during the research that are significant for the research at hand, surveying background variables and testing the correctness of the researcher’s preliminary conclusions on the users.

### 4.6.5 Generating information in the actual environment in which a high-tech product is used

The key idea behind method development is that innovations are not always created by the product development units of companies. In many fields of business, users more often than the manufacturers are the people who produce a hit product (Von Hippel 1988). The innovativeness of everyday environments is based on the fact that different types of actors meet in everyday environments.

Most common technology company product development partners are so-called leading experts. Cooperation with the sector’s most valued experts provides the product being developed more credibility. Experts often also provide an idea of what is top-notch in the sector; they can also provide an extensive general view of their specialty. Von Hippel considers so-called leading users to be a useful group of users from the viewpoint of product development because they may be able to anticipate the needs of most users, and they often possess the motivation, experience and views required to develop their tools (Von Hippel 1988). When stressing the utilisation of innovative users in product design, von Hippel sees two ways of addressing such users: (1) by encouraging them to present their best ideas
to the manufacturer, or (2) by analysing the way the users use the already existing products (user analysis strategy). (Von Hippel 1988).

According to Hyysalo (2006), however, the needs and preferences of leading experts and innovative users are not the same as those of the majority of users. Cooperation is most fruitful with users who are actual or potential users of the product. (Hyysalo 2006). Kulkki (2007) expands the idea of lead users introduced by von Hippel and Thomke (2002) by stressing the significance of regular users and different kinds of contexts of use as a strength of research supporting product development. The importance of studying the experiences of authentic users is also supported by Dewey’s idea that the starting point of a complete experience is a powerful desire (“impulsion”). It originates from a need that can only be fulfilled by means of instigating specifically defined relations (relations of activity, interactions) with the environment. One can interpret this in such a manner that a sufficiently reliable research design may not be reached by studying selected potential users because they do not necessarily have the “impulsion” required by eUX to use the product, and thus their experience cannot be “complete”. Users participating in the study of eUX represent a heterogeneous group of actual end users.

As a summary of the previous reviews can be presented that studying authentic end users of a high-tech product in the actual environment of use is an appropriate approach for a user study because (1) the meaning of the tool will not be created until it is in use (mediation, p. 48); (2) the user’s activity is based on a genuine need (impulsion, p. 85); (3) a user using a product in the actual environment of use already has experiences in the use of the product; and (4) such a design also provides an opportunity to study the development of the product’s process of use (development, p.45).

4.7 Progress of reflective user study

At the preliminary preparation stage of a reflective user study, the multidisciplinary research group (1) studies the use culture of the high-tech product on which the study focuses. The framework of the actual research process consists of the following stages: (2) documenting the use experience and situation; the users document the use of the product and their experiences with themed diaries, SMSs, multimedia messages and e-mails; (3) handling of the documentation data; the research group selects illustrative samples from the pre-processed self-documentation data; (4) interpreting the representations together with representa-
tives of the user group; and (5) analysing the research data; the multi-disciplinary research group analyses the interpreted data in cooperation with the users. Stages two through five create a cycle of iteration during which understanding of the phenomenon being studied becomes deeper. Each cycle may focus on a theme that has been observed important for the study. Finally, the enriched and saturated data is (6) analysed and a reported. The progress of the research project is illustrated in Figure 7.

Fig. 7. Progress of a reflective user study.
5 eUX in everyday life

The concept of expanded user experience was defined in Chapter 3 of this thesis, *Towards a more comprehensive understanding of the concept of UX*. Chapter 4 constructed the method for studying the phenomenon. This chapter describes an empirical case study – the Kinos project – where the method is put in the practice. The Kinos project had both practical and research aims. It was conducted for an industrial customer company, Polar Electro, which is the major producer of fitness heart rate monitors. The product development department of the company was genuinely interested in what happens when people use their products in longer term, and the purpose of the project was find out this, and also find ways to condense and illustrate the finding for product development. At the same time the project served also as a way to collect information for validation of both the theoretical and methodological hypothesis made in chapters 3 and 4. In the chapter 5, both the process of the Kinos project as well as the data collection and analysis methods will be explained, and a summary of the empirical results will be given. In the end of the chapter, the importance of results to research is shortly reflected before the deeper analysis in chapter 6.

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**Fig. 8. Progress of the empirical part of the research.**
5.1 Research setting

Researchwise, the empirical study aims at finding out the following: Is it possible, using the methods selected, to identify short- and long-term components in UX? If so, what is their mutual relationship? The practical objective of the Kinos user study was to provide on how, where and why authentic users of the F11 fitness heart rate monitor “live” with the product. The empirical data of this research consists of research data collected during 2006 in the Kinos user study. The data was collected by studying the end users of the product in their actual everyday environments. The data collection methods used included design probes, experience sampling, reflection workshops utilising the change laboratory setting and free interviews. In addition, the research data was complemented by data collected from interviews of a peer group.

5.2 Selecting research users

The most important principle applied when selecting the users to participate in the user study was that the users had to be actual users of the product. Actual end users, i.e., people who have purchased a F11 heart rate monitor or received one as a gift, were selected as participants in the study. For practical reasons, only users living in the Helsinki Metropolitan region in Finland were selected. The client who ordered the study provided contact information of their customers who met these conditions, who had registered with the client and who had given their consent for the client to contact them. When participants were being selected, a total of fifty customers meeting the conditions were included in the register of the client. A letter including a brief description of the study and four preliminary exercises was sent to these customers. Among the customers who replied to the letter (24 in total), a group of ten research users that was as heterogeneous as possible was selected. The group included people at least 18 years of age who regularly exercise, both men and women. The research users selected already had experience in using their heart rate monitors: they had purchased their current monitor three to nine months prior to the beginning of the study period, and some of them had also used another type of heart rate monitor prior to that. When the research started, the F11 heart rate monitor had been on the market for approximately ten months.

The thirteen users who were not selected in the research user group were sent an e-mail requesting a telephone interview. The five users who replied to the e-
mail enquiry and a F11 heart rate monitor user who was a personal acquaintance of the researcher created the control group for the end users of the heart rate monitor product. The heterogeneity of the control group was not stressed to the same extent as that of the actual research group because the control group was mainly used when studying the applicability of the research results in a broader context and in assessing the reliability of the research method. Tables 2 and 3 show a summary of the users selected for the research group and the control group, respectively.

Table 3. Summary of the users selected in the study.

<table>
<thead>
<tr>
<th>ID</th>
<th>Primary use</th>
<th>Age</th>
<th>Marital status</th>
<th>Previously used a heart rate monitor</th>
<th>Types of sport</th>
</tr>
</thead>
<tbody>
<tr>
<td>N1</td>
<td>Getting and keeping fit</td>
<td>35–44</td>
<td>Married</td>
<td>No</td>
<td>Gym, walking, aerobics</td>
</tr>
<tr>
<td>N2</td>
<td>Getting and keeping fit</td>
<td>25–34</td>
<td>Married</td>
<td>No</td>
<td>Jogging, aerobics, dancing</td>
</tr>
<tr>
<td>N3</td>
<td>Active fitness sports</td>
<td>25–34</td>
<td>Unmarried</td>
<td>Yes</td>
<td>Gym, football, floorball</td>
</tr>
<tr>
<td>N4</td>
<td>Active fitness sports</td>
<td>25–34</td>
<td>Unmarried</td>
<td>No</td>
<td>Cycling, swimming, aerobics</td>
</tr>
<tr>
<td>N5</td>
<td>Active fitness sports</td>
<td>55–64</td>
<td>Married</td>
<td>Yes</td>
<td>Swimming, aerobics, gym and strength training</td>
</tr>
<tr>
<td>M1</td>
<td>Active fitness sports</td>
<td>25–34</td>
<td>Unmarried</td>
<td>No</td>
<td>Swimming, gym, football</td>
</tr>
<tr>
<td>M2</td>
<td>Weight management</td>
<td></td>
<td>Unmarried</td>
<td>No</td>
<td>Gym, cycling, swimming</td>
</tr>
<tr>
<td>M3</td>
<td>Active fitness sports</td>
<td>45–54</td>
<td>Married</td>
<td>Yes</td>
<td>Jogging, swimming, tennis</td>
</tr>
<tr>
<td>M4</td>
<td>Getting and keeping fit</td>
<td>&lt; 25</td>
<td>Unmarried</td>
<td>No</td>
<td>Jogging, cycling, gym</td>
</tr>
<tr>
<td>M5</td>
<td>Getting and keeping fit</td>
<td>55–64</td>
<td>Married</td>
<td>Yes</td>
<td>Walking, skiing, golf</td>
</tr>
</tbody>
</table>

Table 4. Summary of the users selected in the control group.

<table>
<thead>
<tr>
<th>ID</th>
<th>Primary use</th>
<th>Age</th>
<th>Marital status</th>
<th>Previously used a heart rate monitor</th>
<th>Types of sport</th>
</tr>
</thead>
<tbody>
<tr>
<td>V1</td>
<td>Getting and keeping fit</td>
<td>25–34</td>
<td>Unmarried</td>
<td>No</td>
<td>Walking, aerobics, martial arts</td>
</tr>
<tr>
<td>V2</td>
<td>Getting and keeping fit</td>
<td>55–64</td>
<td>Unmarried</td>
<td>No</td>
<td>Cycling, walking, winter sports</td>
</tr>
<tr>
<td>V3</td>
<td>Weight management</td>
<td>35–44</td>
<td>Married</td>
<td>Yes</td>
<td>Walking, gym, aerobics</td>
</tr>
<tr>
<td>V4</td>
<td>Getting and keeping fit</td>
<td>55–64</td>
<td>Unmarried</td>
<td>No</td>
<td>Cycling, walking, winter sports</td>
</tr>
<tr>
<td>V5</td>
<td>Getting and keeping fit, weight management</td>
<td>35–44</td>
<td>Married</td>
<td>Yes</td>
<td>Golf, jogging</td>
</tr>
<tr>
<td>V6</td>
<td>Active fitness sports</td>
<td>25–34</td>
<td>Unmarried</td>
<td>No</td>
<td>Jogging, cycling, mountain biking</td>
</tr>
</tbody>
</table>
5.3 Progress of the study

The progress of the Kinos user study was an iterative process where the following stages were repeated for each theme: (1) generation of user study data in the users’ everyday life; (2) interpretation of the collected user study data in cooperation with the users in reflection workshops; (3) preliminary analysis of the enriched research data by the user study group and selecting samples considered interesting as the mirror data for the next reflection workshop. The analysis and reporting stage consisted of an analysis and synthesis done by the researcher, verification of the final results with the end users and providing a report of the research results to the client. The progress of the Kinos user study is described in more detail in Fig. 9.
Fig. 9. Progress of the user study Kinos.
5.3.1 Research data

The research data was collected over a period of five months utilising complementary research methods. In this study, the fact that the data was collected over a period of several months offered the researcher an opportunity to study the dynamics of the creation of UX and the development of a use process. For the users, the long period offered sufficient time to reflect on their activity.

The research data consisted of data provided by the end users: themed diaries, SMSs, multimedia messages and e-mails as well as the above-mentioned joint interpretation and observation of the research data. The diaries provided for the users for self-documentation included emoticons that the users could use to express their experiences and the reflecting feelings of these experiences. The users were also requested to assess their feelings in words. The users commented on the use of the heart rate monitor and their feelings for each day in the diary both in a section named “Today, I exercised...” and in a section named “My feelings”. Furthermore, the users were asked to assess their satisfaction in the heart rate monitor as a school grade in their weekly summaries and the questions sent to them by SMS.

![Fig. 10. A page of the themed diary.](image)
“A Story on the use of the heart rate monitor” was drawn up for each user included in the research group. The story included all the research data regarding the user in question: all the multimedia messages (about 10 / user), SMSs (about 25 / user), e-mails (about 4 / user) and images made by the user (about 4 / user), transcribed diaries (2 x 2 weeks / user), descriptions created during the meetings and observations recorded (about 10 hours) in the user meetings. Furthermore, the empirical data also included the data generated in the individual interviews of the research group members and the control group members. This process created a 254-page document that provides specific information on the world of the users and the context in which the product is used. The document includes ten authentic stories on how end users use the product in their everyday lives. Because of the ethical research questions, the document cannot be included as an appendix to this thesis.

The reflection workshops were managed by a director accredited for change laboratory work who, in cooperation with the researcher, designed the reflection workshop agenda. The experienced and competent teamwork manager improved reliability of the study. The research users’ own interpretations on photos sent by them and their meaning improved the reliability of the research group’s preliminary interpretations and conclusions. Video records and notes by several members of the research group offered an opportunity to study the original situation when analysing. Furthermore, the empirical data also included the data generated in the individual interviews of the research group members and the control group members. In these personal free interviews, the research users openly expressed their thoughts and interpretations, and this also improved the reliability of the research data.

Most of the questions posed during the study allowed for very free answers so that the users were able to answer them based on their own starting points. Naturally, the researcher started with the assumption that the information provided was true. The researcher aimed at identifying intentions related to different types of activities and messages of the users. The multi-method approach of the study supported this objective of the researcher.

Every time one interviews a person, even a person who has already been interviewed before, new information is obtained because the experience and generation of meaning of each person are ever-changing (Vilkka 2005). In order to define the saturation point, the researcher must be aware of what is being sought from the research data, i.e., the research problem must be clearly defined (Eskola & Suoranta 2000). The study was implemented in compliance with the research
plan. Plenty of research data was collected because the objective was responding to the information needs of both product development and academic research. Thus, all the collected data, such as physiological measuring results of sports, was not analysed for this study. The data was documented, however, and it provided additional viewpoints for the interpretation of the actual research data.

The research problem was more specifically limited as the iterative study progressed in connection with the preliminary analysis of the enriched and specified research data. However, in the last reflection workshop, it seemed that the basic logic of the research data started to repeat itself, and it was observed that no additional data would provide any new information or new viewpoints for the research problem.

A large quantity of research data was obtained. Managing the data and presenting it for handling and analysis proved to be a challenging task. In order to facilitate data processing, all data was digitised and organised in a database categorised on the basis of the users and the exercises/questions. The collected data was versatile and profound; it provided a window to the everyday life of the users – it was a piece of the world being studied (Alasuutari 1994). Thus, the data offered an opportunity to conduct a versatile analysis.

5.3.2 Analysing the data

Reflective reading and preliminary analysis of the research data started already when the research data was being collected and digitised. Because of the cyclic research method and the fact that the research data was continuously being enriched, the research data was analysed while new data was being collected. While the research data became more enriched, preliminary interpretations of the data were conducted. The preliminary interpretations of the research data guided the data collection process. The following reflection workshops were designed based on the analyses and the questions sent to the research users as SMSs were specified in order to focus on phenomena interesting for the research. From the enriched and analysed data, the researcher selected samples interesting for the study to be used as the mirror data in the next reflection workshop.

Alasuutari (1994) states that a qualitative analysis consists of two stages: simplification of observations and solving a mystery. According to Grönlund (1985), data analysis is a combination of analysis and synthesis. The collected data is deconstructed into its conceptual elements in an analysis, and the components thus created are recollected into scientific conclusions in a synthesis (Grönlund-
In this study, observations were simplified by categorising the research data and by generating uniting descriptions (synthesis). When using a reflective research method, one can consider the identification of the existence of eUX and its different dimensions as well as the identification of the interdependencies between the dimensions as solving the mystery.

With the help of content analysis, it was reasonably easy to find answers to the questions of where and how the heart rate monitor is being used from the research data. Furthermore, it was possible to survey the users’ emotions and the meanings given to the monitor in the users’ everyday life. The analysis results remained detached, however, and it was not possible to use them to explain, for example, the meaningfulness of experience, or use them as an account for the variety of experiences between individuals. The observed differences in the individual experiences also remained unexplained.

The researcher aimed at understanding the dynamics in creation of UX and the factors that influence it. A deeper analysis required different kinds of concepts and tools. Activity theory provided human activity as the unit of analysis. It also provided the concept of motivation and the activity system model for the analysis of activity.

In order to reach a deeper understanding of the activity of the users and the underlying motives, the researcher analysed the use of the heart rate monitor as mediated and contextual activity. The high-tech product was studied as part of the human activity system. The classification tool used by the researcher was the model describing the structure of the activity system by Engeström (1987) that was presented above (see Figure 5). The researcher implemented the deeper analysis of the research data in two stages: (1) first, the researcher surveyed the underlying motivation of the end users for using the heart rate monitor by analysing the activity of the users and the tool roles of the monitor. (2) Next, the researcher analysed the users’ feelings related to the use of the monitor and the underlying reasons by quantifying the diary entries of the users with the questions surveying their satisfaction in the use of the monitor and then comparing these with the users’ identified motivation.

(1) The deconstructed and simplified research data was studied based on the human activity system model: the use of the heart rate monitor was considered to be the user’s internally communicated and contextual activity. This enabled a versatile approach to studying the activity of an individual. The researcher used this approach to illustrate the motive of each user for using the heart rate monitor.
based on the analysis data that had been deconstructed into the units of analysis. The researcher constructed the activity system of each research user by placing the heart rate monitor in the model as the tool of activity. The object and target of the activity as well as the underlying motive was studied based on the deconstructed research data of each user.

Based on the results of this analysis, the researcher classified the motives of the users for using the heart rate monitor into different categories. The activity models of the heart rate monitor users continuously changed as research data was collected, complemented and specified. At first, six categories were found, but after a more specific activity analysis, the researcher combined two of these categories because the motives for different activities of the users proved to be similar. When data collection had ended, the researcher reconciled the structural models of the activity systems of all the heart rate monitor users who participated in the study. The researcher simultaneously searched for any controversy in the constructions created. The researcher used as a support for the categorisation Leontjev’s hierarchical description of motivation structure in order to perceive the activity levels and levels of motivation structure guiding the activity as well as their compatibility with the constructed structural activity system model.

(2) Most of the users described their feelings in a comprehensive manner in their diaries. The answers highlighted differences in the users’ personalities and their method of self-expression: some where more detailed and provided more detailed descriptions than others. Sometimes, the users selected several emoticons to describe their feelings and experiences. Furthermore, some research users classified their experiences based on whether they were related to their general feelings that day or whether they were related to sports or the use of the heart rate monitor. The users also provided additional explanations in addition to the emoticons to explain which single issue the experience in question referred to.

In order to better perceive the factors influencing the creation of UX, the researcher combined the emoticons selected by each user in the diary and the explanations connected to them for each person. When analysing the feelings of the users when using the product and any factors influencing these feelings, the researcher quantified the emoticons included in the diaries and the data on their explanations. In the table, the feelings reflecting the user’s experiences (the emoticons) as well as the factors explaining these feelings classified by the user were listed. Next, the researcher combined the emoticon selected by the user in the diary with the explanation category for this emoticon for each diary day in the table. The feelings entered in the diaries explained the functionality and character-
istics of the heart rate monitor (7) more related to the weather conditions or other conditions, work-related hurry or otherwise a busy day (42), physical condition or tiredness (29), previous monitoring of exercising (28), success/failure of the physical exercise (25) and comments on other sports gear (3). The table below (Table 4) includes a summary of the emoticons selected by the research users and the factors explaining them.

Table 5. Factors explaining the experiences and the reflecting feelings in the diaries.

<table>
<thead>
<tr>
<th>Explanation</th>
<th>Very happy</th>
<th>Happy</th>
<th>Satisfied</th>
<th>Dissatisfied</th>
<th>Extremely dissatisfied</th>
<th>Tired</th>
<th>Angry</th>
<th>Confused</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chores</td>
<td>15</td>
<td>10</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Busy at work</td>
<td>8</td>
<td>15</td>
<td>15</td>
<td>11</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Weather/conditions</td>
<td>24</td>
<td>22</td>
<td>22</td>
<td>8</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Company/friends</td>
<td>10</td>
<td>12</td>
<td>12</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Tiredness/illness</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>6</td>
<td>5</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Sports</td>
<td>16</td>
<td>6</td>
<td>6</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Heart rate monitor</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Other gear</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

The long-term reflected experiences of the users were studied by posing the following question: “How well has the heart rate monitor achieved its intended task? Please grade the monitor and provide brief argumentation for the grade.” The irritation and negative feelings seen in the diaries did not seem to decrease the grade when the users assessed how well the heart rate monitor had fulfilled its intended task in the long term. The longer-term grades given were good/excellent on average. The users who most clearly expressed irritation in the diary did not give poorer grades than the other users for the monitor in their long-term evaluations. On the other hand, some of the users who most often selected a happy smile as their diary emoticon gave a grade that was poorer than the average in their long-term evaluations. The longer-term reflected experiences remained unchanged or changed very little over time. The long-term reflected experiences of the users were studied by posing the following question: “How well has the heart rate monitor achieved its intended task? Please grade the monitor and provide brief argumentation for the grade.” In the following some characteristic expressions of emotions reflecting both short- and longer-term experiences are presented. The translations from Finnish to English are by the author.
N1 - Diary entries:

“...I studied the manual yesterday because the monitor stopped working when I was exercising. I was able to repair it but I was irritated because I didn’t get any results for the day.”

“I have to lace the belt and I wasn’t able to use the lock.”

Longer-term assessments:

Excellent (29 March 2006)

Excellent: “I don’t know what I would do without it; it is my best partner when exercising.”

Excellent: “I would no longer know how to do sports without it. And it encourages me to move if I don’t have the motivation.”

N3 - Diary entries:

“The results of my fitness test has dropped to good from ‘very excellent’.”

“I was irritated when watching the ‘ringlets’.”

“I’m irritated if the monitor stops working when I am exercising: the whole workout was to no avail!”

Longer-term assessments:

Excellent (29 March 2006)

Excellent: “An excellent inspirer to moving.”

Good: “... The monitor saves all the sports I do, and I especially like the fact that I can use the fitness test to monitor how fit I am.”

N4 - Diary entries:

“I’m angry now – the data transmitted from the wrist unit to the computer is somehow all mixed up. GRRR! The figures do not match and I don’t know why!”

“SCORCHING HOT! A crazy weekend, and the hot weather won’t let up... Cycling is more pleasurable than ever! I also feel like swimming but maybe next time. A black cloud: THE MONITOR WENT CRAZY, not even pressing
the four buttons at the same time did the trick. If finally came back to life in the evening.”

Longer-term assessments:

Excellent (29 March 2006)

Excellent: “The monitor has functioned just fine but one of the features that is essential for its use, the online diary, has its problems.”

Excellent: “The monitor has been excellent. It works nicely and usability is ok. I am slightly irritated because it is so big and because of the Web problems. A nice gadget!”

M1 - Diary entries:

“This irritated me because I would have wanted to know whether or not snorkelling is effective exercising, whether or not it burns calories and whether or not my heart rate increases.”

Longer-term assessments:

Excellent (29 March 2006)

Excellent: “Delivers what it promises.”

Good: “…The monitor has been working well during sports. The only major drawback are the problems with the Web service.”

M2 - Diary entries:

“I was irritated to see zeros instead of results.”

“I would have wanted to see my records on the monitor.”

Longer-term assessments:

Excellent: “Worked just fine all week long. Sometimes it didn’t show my heart rate but these problems quickly resolved themselves.”
Good: “...All the features I need have been working, except for some problems: the monitor getting stuck and the clock resetting itself. I suppose I have to get it fixed.”

5.4 Results of the Kinos user study

This chapter includes a brief summary of the practical objectives of the study.

5.4.1 Why is the F11 heart rate monitor used?

When the heart rate monitor was studied as a tool and when the activity level of the product was studied, it was observed that different kinds of motives guiding the use of the heart rate monitor were found in the research data. The users could be categorised based on their motives for using the product. After an activity analysis, five categories were found from the research data. The five motives guiding the use of the heart rate monitor are: (1) achieving social acceptance; (2) shaping one’s body; (3) improving as an exerciser; (4) balancing the different areas of one’s life; and (5) confirming one’s own conceptions. Thus, the users of the F11 heart rate monitor can be divided into five categories based on the motives for using the product. The categories were named using quotes from the descriptions given by the users participating the study: (1) “When doing sports, you look like you know what you are doing”; (2) “I pay a lot of attention to shaping my body”; (3) “Active sports”; (4) “Balance”; and (5) “Monitor or no monitor, I regularly exercise”.

The user types have here been condensed and illustrated using a variant of “user persona”- technique common in interaction design (Pruitt & Grudin 2003, Chang et al. 2008). “Personas” were visualized by image collages describing the “habit” of corresponding user groups. A product rarely has a single target group; instead, users can be extremely different people. Thus, the collage of images should describe the issues and values that are common to all the users in the group. The image collages represent personal and social values shared by the users, their lifestyle and their consumption habits. In these images, the life of the user is usually represented in a positive light because the users were expected to identify with some of the lifestyles or the related issues illustrated in the collage. The image collage includes issues describing the user group’s work, leisure or style of dressing, for example. The images may include interior decoration, environments and objects describing the status of the target group. A visual descrip-
tion of a user group may also illustrate a feeling appealing to the group in question. Although using user personalities as a support for design is not a new idea (Cooper 1999), basing a classification into personalities on motives guiding the activity is not an established practice. The “persona” descriptions were used not only to illustrate the results but also as tools in discussions with users.

User person I – “When doing sports, you look like you know what you are doing”

These users described their use of the heart rate monitor and their attitude towards exercising as follows:

“...I can eat sweets with less of a guilty conscience.” N1

“I am interested in how many calories I burn.” N2

“...When doing sports, you look like you know what you are doing when you have the monitor, etc...” N2

“It is interesting to compare the figures with others.” N2

“...I always have a guilty conscience if I don’t have the time to exercise as I have planned...” N1

“...my heavy workload stressed me and causes anxiety.” N2

“I rushed from the parent’s evening at school to the aerobics class...” N2

“I walked home from the office in 36 minutes, burning 222 calories with my heart rate between 153 and 135.” N1

“I took a nice evening run. The running was smooth and the summer night was perfect for exercising. I had a little headache but it was gone once I got back home.” N2

“...The monitor still has some features I don’t use and that are unclear to me.” N2

The user group “When doing sports, you look like you know what you are doing” was illustrated using visual “user person descriptions” that describe the “habit” of the user group:
For this user group, the motive for using the heart rate monitor seems to be a striving to achieve social acceptance and positive feedback. Positive feedback provided by the monitor, in a way getting a trophy, may represent social acceptance. On the other hand, by using a heart rate monitor, a person can let others know that he or she is an athletic person who takes care of him/herself and who is “committed to the cause”. The brand of the product is important for this group.

The representatives of this group are living the busiest time of their lives. Many sectors of their life compete for their leisure: they have a family, children, work and hobbies. The heart rate monitor reminds them how important it is to take care of themselves and exercise regularly. These users exercise in order to have the stamina to do more in their lives and promote their health. Very important objectives for this group are toning the body and weight management, i.e., losing a couple of kilograms.

These users learn the basic use of the heart rate monitor fairly easily and they do not have any difficulties in utilising the monitor when exercising. They thoroughly study the manual before starting and also read it later on, if necessary. However, the type of language used in the manual may seem difficult for them, depending on how fluent they are in languages other than Finnish. On the other
hand, these users feel that their heart rate monitor has many “fine features” they would like to learn to use but that are still unclear to them. Improvement of the physiological and technological know-how of these users could assist them in better utilising the features of their monitor. These users feel that they would have required more support in using the product, such as personal guidance or a more user-friendly manual.

These users are satisfied with the functionalities of the heart rate monitor because all the features they use are functional. Their school grade for the heart rate monitor is excellent. They have purchased the monitor to control or teach/guide them.

*User person II – “I pay a lot of attention to shaping my body”*

The second group described their use of the heart rate monitor and their attitude towards exercising as follows:

*I have tried to increase my weight/muscle mass for four years. M1 (notes 29 March 2006)*

*I no longer have a coach of my own; the monitor is my coach and teacher. N3 (notes 29 March 2006)*

“...my own programme and objectives motivate me to exercise because I have set my goals and it is good that there is someone ‘on the outside’ to monitor whether or not I achieve the goals. A personal trainer would be ideal but the monitor is much cheaper, although more limited.” M1

“...I’m comprehensively shaping my body and my results become better when I train regularly.” N3

“It allows me to see whether or not I’m exercising properly and not too lightly.” N3

“I have achieved my goals and have far exceeded them. I started to do a new routine in the gym, and it feels good. I also cycled pretty much last week. I didn’t swim at all, though.” M1

“After work, to the gym for strength training and a 40-minute aerobic exercise. Fitness boxing in the evening.” N3

“...I was able to lift a lot of iron, and I’m fit. ...” M1
“What caused me more trouble, and is still causing it, is that I would like to use the information as effectively as possible to reach my goals.” M1 (notes on how well he is able to utilise the heart rate monitor)

“I have read the manual a little, and as weeks went by, there were sometimes things I had to check from the manual.” N3 (notes on how much effort it took to learn how to use the heart rate monitor)

“If I were to use the heart rate monitor when walking to work or doing similar exercising, I would feel like I’m cheating. I only use it when I’m doing actual sports.” N3

The user group “I pay a lot of attention to shaping my body” was illustrated using visual “user person descriptions” that describe the “habit” of the user group:

Fig. 12. Image collage illustrating user person II.

For this group, the exercising motive and the motive for using the heart rate monitor is shaping one’s body; striving towards their ideal body type. The term “shaping one’s body” refers to clearly increasing the amount of muscle mass and/or losing weight, toning and burning fat. The exercising of this user group is clearly goal-oriented, and they have clearly increased the amount of exercise they get in the past few years. In order to reach their objectives, these users have also
changed their lifestyle in a more comprehensive manner, such as changing their diet, the way they use their time or the way they exercise (such as types of sport, regularity, pace of their exercises).

They consider the heart rate monitor to be a trainer/personal trainer/inspirer/controller to teach them how to exercise correctly in order to reach their goal. These users may have studied the manual, perhaps only glanced at it, and immediately taken the monitor into active use. In their own opinion, they are very adept in using all the features of the monitor that are useful to them, and they felt that taking the monitor into use and utilising it while exercising was easy/fast (took one week). On the other hand, they thought that taking the monitor into use took more time and effort than they had expected. They have also found some hidden features once they started actively using the monitor (reminder and alarm features). These users would like to have some additional features in the monitor (more memory capacity, body fat measuring, continuous saving of heart rate and a representation of it in graphical format, better PC compatibility, GPS, colour display, a bicycle stand). For these users, it is important that they are able to document their performance, monitor how their level of fitness improves and see how they advance towards their goal.

These users are young adults with good readiness for using high-tech products. In order to use the heart rate monitor more effectively, these users would require information on nutrition, physiology, customisability of the monitor and how to utilise it when exercising. The users would like to have a telephone hotline or helpdesk to assist them in using the product.

The users are satisfied with the heart rate monitor, but using it also irritates them from time to time. These users graded the monitor as “good” because it serves them well in the task they purchased it for.

**User person III – “Active sports”**

The third group described their use of the heart rate monitor and their attitude towards exercising as follows:

“I think the heart rate monitor could be used by anyone. For an active exerciser (which is my goal), it is good in monitoring fitness and as a diary.” N4

“...Before I purchased the heart rate monitor, I planned my own exercises [...] I did not have any specific information on exercising at different levels of en-
durance, and my exercises were based on the suggestive training I mentioned earlier and listening to my own body.” M2

“...The heart rate monitor is especially well-suited for people who want to get more out of their exercising and who want to monitor their heart rate and thus the improvement of their fitness...” M2

“...particularly my running has become more versatile. With the separate fitness programme of the Polar F11 heart rate monitor, I draw up a month-long ‘running exercise programme’ for myself. I have been easily able to see how effective my exercising is, and based on this information, I have increased/decreased the intensity of my exercises...” M2

“I often used (and still use) the heart rate monitor when cleaning the house. It is interesting to see how effective exercise airing your carpets or mattress, vacuuming, etc., ‘actually’ is.” N4

“Last week, I clearly reached and even exceeded my exercising objective. The swimming stadium was open and since I was on holiday, I had time to go swimming, no matter what the weather. ☺Wonderful!” N4

“A resting day. I just stretched my muscles a bit.” ... “A nice and intensive training week is over. I think that next week I’ll do the same again!” M2

“The monitor is (a positive) slave-driver: it makes me exercise. And it also motivates me in reaching my objectives and punishes me if I’m lagging behind: ‘no reward for you!’” N4

“Yes. When I studied the features of the heart rate monitor, I first checked the manual to see what it said. Then I just tried myself.” M2 (notes on studying the manual)

“...My motivation is, after all, the health impact of sports and a healthy lifestyle. Exercise is good for you!” M2

“I don’t follow any particular fitness programme. The programme the heart rate monitor offers is always ‘too little’. I make my own plans, and sometimes change them as well...” N4

“I exercise according to my own programme that includes exercise four to five times per week, usually the gym two to three times plus swimming and
two runs and a ball game. I have also entered this programme in the heart rate monitor but I don’t follow it to the letter.” M2

“...If you have studied your own heart rate enough, you will be able to adjust the effectiveness/strain of each exercise.” M2

The user group “Active sports” was illustrated using visual “user person descriptions” that describe the “habit” of the user group:

![Image collage illustrating user person III.](image)

Fig. 13. Image collage illustrating user person III.

User group III consists of users who want to develop themselves, “becoming better”, either in their own type of sports or as an exerciser in general. These active exercisers use the quantitative information (“figures”) provided by the heart rate monitor to improve their fitness plan. These users like to use gears and monitors. They value a healthy lifestyle in all their choices.

These users have carefully studied the manual. They have immediately taken the heart rate monitor into active use and immediately made it a natural part of their exercising. In their own opinion, they are very adept in using all the features of the monitor that are useful to them, and they felt that taking the monitor into use and utilising it while exercising was easy/fast (took one week). They have also found some new features once they started actively using the monitor (own-
zone, online feature). These users would like to have some additional features in the monitor (continuous saving of heart rate and a representation of it in a graphical format, an interval training mode, better EPOC monitoring features, more security in underwater use). These users are young adults with good readiness for using high-tech products and at least a basic level of knowledge about physiology. They naturally resolve technological challenges on their own. The manual suffices as support for the use of the monitor; by browsing the menu structure of the wrist unit, they are able to perceive the features available and start using them.

These users are interested in physiology, and in order to improve their use of the heart rate monitor, they mainly require information on more advanced use of the device. It is very important for these users to monitor how their fitness improves and thus they want to document their exercising as extensively as possible. The users are satisfied with the product and assessed that the product was excellent in the task for which it was intended.

**User person IV – “Balance”**

These users described their use of the heart rate monitor and their attitude towards exercising as follows:

“Sports has always been part of my hobbies in some form but I have taken ‘sabbaticals’ and exercised less during those periods of time...” M3

“I have not started exercising now by no means. However, after I purchased the monitor, I have exercised more and I also have better motivation for exercising. Now I have fewer excuses for not exercising because the ‘meter is running’ all the time.” M4

“...I use the fitness diary on the Polar website and I have to get some evidence of exercising to put into the diary. As a nice reward, I get the weekly summary, and if I have exercised enough, I get a trophy. It’s a small thing but still something you remember every time you look at the watch.” M3

“No pressures, although I did purchase the monitor to motivate myself. That is, I purchased it to force myself into exercising.” M4

“Balancing between exercise and nutrition – I’m aiming at a balance between these two.” M3 (notes on 7 June 2007)
“To summarise it in one word: balance.” M4 (notes on what a good life is all about)

“Balance in life” M4 (notes on 7 June 2007)

“...Exercising the way I do now improves the quality of my life now and particularly in the future.” ... “Motto: what is important is living, not just being alive.” M4

“Yes, I did study it. The device has so many features that I had to. The manual could be clearer and the booklet could be larger in size. I would like to have quick instructions in a small booklet.” M3

“Yes, I exceptionally did because it is a technical device. (I usually only use the manual if I’m not able to use a device without it.) However, this one has so many features that I changed my policy.” M4

“I learned the basics in a couple of days. More specific use took about a week to learn, and I didn’t get online until a couple of weeks after purchasing the device. There are still some areas that are not familiar enough to me.” M3

“In a couple of weeks. There may still be some features I could better utilise.” M3

“At first, I learned the necessary features and then I have ‘lazily’ studied any other features there might be.” M3

“Gym – crosstrainer 30 minutes, swimming 500 metres.” M3

“Cycled to work 17 km, and back 17 km. Played tennis for about an hour. Watched football on TV.” M3

“A regular tennis session! I played doubles for a change and even with a player who is better than me. It’s been long since I have had to hit so hard and move so much when playing tennis.” M4

“Measurements and my own programme the same night, and then out to try it the next day.” M4

“Still jogging. Listening to the radio, keeping up good pace. Next I will add more speed even though my heart rate is pretty good now.” M4

“Cleaning the upstairs of the summer house. Walking (5 km) / jogging (5 km), then the sauna.” M3
The user group “Balance” was illustrated using visual “user person descriptions” that describe the “habit” of the user group:

![Image collage illustrating user person IV.](image)

This group of users use the heart rate monitor because they are interested in and/or concerned about their health and the balance in their lives. They require some motivation to keep fit, balance their lifestyle and possibly manage their weight because they like to indulge in the small pleasures of life and they have a busy lifestyle. They have wanted to exercise more regularly for a longer time. The heart rate monitor motivates/attracts/forces them to exercise regularly and teaches them how to exercise “right”. The heart rate monitor is primarily a controller of their exercising. On the other hand, they may also view the heart rate monitor as a verification tool: it is important for them to be able to document all the exercise they get (how much calories they burn) and/or obtain reassurance that their exercising is effective.

These users have carefully studied the manual. They have quickly taken the heart rate monitor into active use and quickly made it a natural part of their exercising. In their opinion, they are fluent in using most of the features that are useful for them but they feel that they could utilise the monitor even better when exercising. They have not found new features after having taken the monitor into use but
they have not actively tried to find any. The users would like to see some additional features in their heart rate monitor (GPS, odometer).

**User person V – “Monitor or no monitor, I regularly exercise”**

The last group described their use of the heart rate monitor and their attitude towards exercising as follows:

“...I have regularly exercised all my adult life.” N5

“It is a part of my life.” M5 (thoughts on exercising)

“The heart rate monitor was an impulse purchase to some extent.” M5 (notes on 29 March 2007)

“Finally exercising with the dog (50 min). EVERGREEN aerobics in the evening.” N5

“Brisk exercising with the dogs for approximately 70 minutes.” M5

“A nice jog of 54 minutes.” M5

“Walking the dogs for one hour. A round of golf at Pickala.” M5

“A walk in the summer evening for one hour. It’s so WONDERFUL to be at the summer house! I have gone swimming at least ten times.” N5

“A good servant.” M5

“...it is mainly a tool to monitor my heart rate and a tool to assist me in moving at the correct pace.” M5

“I immediately took care of the basic settings but it took me approximately three months before I studied the other features.” N5

“The fancy features always cause me problems. The basic idea of monitoring my heart rate at the time is okay.” M5

“Not to this day.” N5 (An answer to the question: “How fast after having purchased the heart rate monitor did you feel that you had learned to use the features that are necessary for you?”)

“Not yet in any case.” M5 (Answer to the question: “How fast after having purchased the heart rate monitor did you feel that you had learned to use the features that are necessary for you?”)
“Yes, but I do get more out of it when I’ve done everything.” N5 (An answer to the question: “Did it take a lot of time and effort to start using the heart rate monitor?”)

“Yes, I think that the instructions are meant for younger people.” M5 (An answer to the question: “Did it take a lot of time and effort to start using the heart rate monitor?”)

“...the monitor is a tool, not an end to itself.” M5

“...monitor or no monitor, I regularly exercise...” N5

“I don’t follow any programme, I just exercise for fun.” N5

“...Maybe the idea that the monitor will be useful when I expect my heart rate to increase to more than a hundred, maybe I use it more easier then.” M5

“...I achieved my exercising goal, or actually even double or triple the goal.” N5

The user group “Monitor or no monitor, I regularly exercise” was illustrated using visual “user person descriptions” that describe the “habit” of the user group:
User group V consists of users who consider sports a way of life. Their motive for using the heart rate monitor comes from their willingness to verify their own ideas and conceptions about their exercising habits and the way their body works. They clearly consider the heart rate monitor to be a tool used in verifying their own bodily functions. These users do not need the heart rate monitor to motivate them or to teach them how to exercise right because they already exercise a great deal even without the monitor. Regardless of this, the users consider the monitor an encourager.

These users have not studied the manual very carefully. They have slowly taken the monitor into use (in a period of two to three months) and they do not consider themselves adept in all the features useful to them as of yet. They have not yet incorporated the monitor as a natural part of their exercise. They feel that it was difficult to learn how to use the heart rate monitor.

They are very knowledgeable about their body and they have good physiological competence. These users stated that it is easy to utilise the monitor when exercising but they still feel that their heart rate monitor has many “fine features” they would like to learn to use but that are still unclear to them. These users did...
not wish for any additional features in the heart rate monitor. Instead, they wished for clearer instructions and preferably less features.

Improvement of the technological know-how of these users could assist them in better utilising the features of their monitor. These users feel that they would have required more support in using the product, such as personal guidance or a more user-friendly manual. These users are not as satisfied with their heart rate monitors as the users in the other personality groups: they assessed that the product has fulfilled its task in a satisfactory manner. All of the users in this user group own a dog.

**User motivation as starting point for development of process of use**

The user personalities based on the users' motives also explain how the process of use of the different user groups has developed. The user’s own activeness in taking the high-tech product into use and in using it clearly influenced how fast the product became a natural part of the user’s activity system and how comprehensively the user started to utilise the features of the product. Users who were active when taking the product into use were able to grasp its use in approximately one week. They used the product more often and also used the features of the product in a more comprehensive manner than users who did not immediately take the product into use. The users who had an active role in taking the product into use were generally more satisfied with the product than users who were less active in learning how to use the product. The activeness of the users was influenced by their motive for using the product. The support needs, the quality of the support needed and the comprehensiveness of the use complied with the motive-based user classification.

**5.5 Results of the empirical study**

The empirical study showed that short-term and long-term components can be identified from eUX. Furthermore, the mutual relations of these UX “dimensions” can be explained using the theoretical frame of reference specified. Studying eUX is based on analysing the user’s activity level and identifying the motives guiding the user’s activity. The UX dimensions arise from the hierarchical nature of the activity. Next, we will study the results in more detail.
5.5.1 Dimensions of eUX

The empirical study verified the idea that there are two dimensions to eUX: (1) the temporal user experience, which is influenced by the immediate factors appearing in actions that define whether or not the final result of the activity complies with the user’s objectives. For example, if the user's objective is a successful exercise, the achievement of this objective depends on how the heart rate monitor functions as well as the weather and other conditions, whether or not the user is currently busy with other activities, the user's health, who accompanies the user when exercising, or how fluent the exercise is. When the longer-term activity of the user is studied, one can see the user’s (2) longer-term user experience, which is created when the user has used the product for a longer time. The creation of this experience is particularly influenced by whether or not the user’s activity supports the objectives that are the basis for the user’s motives. For example, the user experience of a user who aims at shaping his or her body is influenced by all factors influencing weight loss or increase of muscle mass. When the user reflects on the experiences created by the product, the user compares the final results of the activity with how well or poorly the user has been able to reach the objective. Thus, the different motives guiding the use of the product cause the user experience of different types of users to consist of different factors.

The research users were more satisfied in their heart rate monitors than the average user despite problems experienced when using the product and momentary negative emotions experienced. The momentary or temporal experiences are connected to experiencing the results of single actions, whereas the longer term reflective experiences are connected to the activity guided by the user’s motives. Thus, the hierarchical structure of human activity coined by Leontjev seems to explain the existence of different dimensions of UX. The concept of eUX is a model that connects these dimensions to each other and enables their simultaneous handling.

5.5.2 Studying eUX

Traditional user study analysis methods (such as application of interpretation models, interpretation with the material’s terms, summary and combination as well as direct interpretation) can be used to relatively easily find answers to the questions as to where and how the heart rate monitor is used from the research data. Furthermore, it is possible to survey the users’ emotions and the meanings
given to the heart rate monitor in the users’ everyday life. The results are often detached, however, and their relationship with experience is unclear. Furthermore, it is not possible to use them to explain, for example, the meaningfulness of experience, or use them as an account for the variety of experiences between individuals. The dynamic nature of the experience of (a single) individual often remains unexplained as well.

The concept of eUX provides a frame of reference not only for studying the different dimensions of UX, but also for studying the creation of UX, the factors influencing UX, and their mutual relations. New kinds of methods were required to collect data and analyse it in more detail. For this purpose, the reflective user research method was developed.

The level of analysis was improved by using the user’s activity as the unit of analysis and by aiming at identifying motives guiding the user’s activity. Activity theory provided human activity as the unit of analysis. It also provided the concept of motivation and the activity system model for the analysis of activity. In order to understand the users’ motives for using the heart rate monitor, the use of the monitor was studied as mediated and contextual activity. When the motives were made visible, it was easier to understand the dynamics of the creation of UX, identify the factors influencing UX, and perceive their mutual relations. The motives can also be used to explain the differences in the experiences of different individuals when using the same product. Most importantly, the developed method can be used to identify the activity levels explaining the different dimensions of UX. Table 2 summarises the methods used when collecting and analysing the empirical data as well as the data needs to which the data can respond. Together, they form a reflective user research method.
6 Results and discussion

This chapter includes a summary of the research results. As the conclusions, the developed concept of eUX is compared with Dewey’s ideas on aesthetic experience and Leontjev’s basic ideas on activity theory. At the end of the chapter, thoughts on the usefulness of the research results and further research are given.

6.1 Summary of the results

The starting point of this research was an industrial need to study what happens when people use a high-tech product a longer period. An initial data collection method was developed for that purpose based on the ideas of activity theory and change laboratory method. The developed method utilised ideas of change laboratory where the essential issues are interventions and dialogue with the people being studied. This research design aimed particularly at making visible the tacit knowledge of authentic users. The empirical data was collected by means of a Kinos user study. A test setting was constructed for the empirical study: it was assumed that an authentic comprehensive UX is an actual phenomenon. The empirical study aimed at finding out what happens when a technology product is used a longer period, and what can be learnt from that for product development purposes. The research data was analysed by using the developed reflective user research methods that strived at better understanding UX by analysing the activity of users. This initial analysis provided results that satisfied the needs of the customer.

During the initial customer project, a literature study on user experience research was started to find out what to look for in the data collected. In the literature review it was found that there is no generally accepted definition of UX that comprehensively describes the nature of the phenomenon. When data accumulated and was analysed, UX seemed too rich and fluid a phenomenon to be modelled using the general and stable models or lists of predefined factors. On the other hand, it was found that although the existence of long-term experiences is recognised, the focus of the overwhelming majority of research is short-term only, and there have been no attempts to combine these two levels or dimensions. The initial analysis of collected empirical data showed that there indeed exist long-term experiences, and that they are different than the short-term ones.

This led to the definition of the theoretical research questions of this study: where and how do the long-term experiences emerge, what is their connection
with the short-term ones, and ultimately how can long-term and short-term experiences meaningfully combined into an “expanded user experience”? And correspondingly, how can this new more complex phenomenon be studied in practice?

In a reflective literature review of prior research it was found on one hand that the cognition science perspective has been already long criticized as too limited an approach (e.g. Winograd & Flores 1986, Suchman 1987, Grudin 1990, Bannon 1991, Dourish 2001, McCarthy & Wright 2004, Kaptelinin & Nardi 2006). On the other hand, it was found that a characteristic of many of the so-called phenomenological approaches is that they do not define the concept of UX but aim at constructing a theoretical frame of reference based on previous experience in order to better understand UX.

Based on the review of the literature, it seemed that Dewey’s concept of aesthetic experience, that already had gained some following within the research community (Buchanan 1996, Forlizzi & Ford 2000, McCarthy & Wright 2004, Wright et al. 2008), could alleviate several defects observed in previous UX studies and provide a theoretical frame of reference for an approach aiming at understanding UX in a more comprehensive manner. It was also compatible with previous ideas of the author (Luojus 2008). A broad theoretical concept, such as Dewey’s concept of aesthetic experience, is not directly applicable to empirical research, however.

Constructing the multidimensional and reflective nature of the comprehensive UX concept based on Dewey’s concept of aesthetic experience required (1) operationalisation of the concept of aesthetic experience and (2) expanding the theoretical frame of reference to provide tools for studying the goal-oriented nature of user’s activity and for analysing the variety of experiences.

Dewey’s concept of aesthetic experience was operationalised by dividing it into two levels based on activity theory. This operationalisation by combination of the two theoretical frames of reference required a study of the compatibility between them. A comprehensive and operational concept of UX, the concept of expanded user experience (eUX), was then generated based on Dewey’s concept of aesthetic experience that is divided into two levels utilising activity theory.

To validate the defined concept, it was necessary to check if a corresponding phenomenon could be identified also empirically. For this purpose, the data collected in the original customer project was reused. The data analysis methods used in the original project were aimed for finding practical answers for product development, and as such they were too coarse. Therefore, a refined set of data analysis methods was developed to be able to see whether or not it is possible to
identify temporal dimensions of UX and if so, what their mutual relation is. A reflective user research method was developed for collecting and more comprehensively analysing the data. This method assists in identifying the activity levels explaining the different dimensions of UX, for example.

The empirical study verified the idea that there are two dimensions to eUX. The concept of eUX is a model that connects these dimensions to each other and enables their simultaneous handling. It also provides a frame of reference for studying the creation of UX, the factors influencing UX, and their mutual relations.

As a result of the research, a conceptual model of expanded UX and a user research method for studying it has been created. These results are grounded on one hand on a theoretical analysis and on the other hand on the empirical data about the ideas and conceptions of the users about the use of the product, their motives and their experiences, and interpretations created when meaning was assigned to these and these were reflected. This research has shown that by studying longer-term UX in addition to temporal UX and by focusing on analysing the user’s activity it is possible to see a larger and more meaningful view on UX.

6.1.1 Concept of eUX

Chapter 3, Towards a more comprehensive understanding of the concept of UX, presents the concept of expanded user experience (eUX) and the dynamics of its creation. In Chapter 5, the empirical part of this thesis, it was shown that it is possible to identify situations where longer term experiences emerge from short term ones. Thus the existence of the phenomenon is at least at some level validated, and eUX concept developed in the work is again at least at some level capable to describe the phenomenon.

The motivation of activity is created by the influence of the habit from interaction of the individual’s social and cultural environment. The activity of the user that is the precondition for UX is guided by the user’s personal motives. The concept of “motive” can be used to identify and explain the different factors influencing the UX.

The motivation guiding the user’s activity explains how the UX is created. In order to perceive motivation, an analysis of the activity level of product use is necessary. Therefore, the analysis unit of expanded UX is the user’s activity. Thus, the concept of expanded UX transcends between subject and object, and inseparably links these two.
When the activity of a user is analysed at different levels – combined actions and the activity level – it is possible to differentiate two dimensions of expanded UX: (1) temporal UX, which describes how the user experiences the consequences of an action (level of combined actions) and (2) long-term UX, which describes how the user experiences his or her activity (activity level). When combined, these two dimensions create the “expanded user experience” or eUX.

A temporary UX is created when a user experiences the consequences of an action he or she has completed. A temporary UX is dynamic and connected to the specific moment. An action can be a single instance of physical exercising, for example. In such a case, the emotional quality of the temporary UX is created by whether or not the result of the action promotes the user’s exercising objectives, i.e., whether or not the sports performance that is optimal for the user’s exercising goal is achieved. Thus, temporal UX may not be sufficiently reliable to be used as the basis for design solutions.

A long-term UX is created cumulatively over time when the user experiences the consequences of his or her activity. It can be considered the stable background of the temporary experience that is moulded over time by temporary UXs. Both of these dimensions must be studied to fully understand UX. Thus, a study of the expanded UX must be longer than the studies typically used in user experience research this far.

6.1.2 Reflective user research method

By studying the use of a high-tech product as mediated activity, it is possible to identify motives guiding the activity. The motives help in explaining the experiences of a user. Activity theory has provided not only a frame of reference for development of the user research method but also methods, tools and techniques for interpreting and analysing the research data: (1) the hierarchical description of motivation structure (Leontjev 1977) and the description of the human activity system structure based on activity theory (Engeström 1987) have, among others, provide tools for perceiving the activity of a user and structuring it when analysing user research data. (2) A method inspired by the change laboratory setting where users reflect on their experiences, enables a research design that provides a forum for the researcher, the high-tech product users and the developers to meet. Unlike in the developmental work research setting for which the change laboratory has originally been developed, the method developed in this thesis does not aim to change the way the studied user acts. Instead, user research utilises a par-
 anticipatory and analytic approach. The developed method adopts the means of generating data characteristic to change laboratory work where the essential issues are interventions and dialogue with the people being studied.

Characteristics of the reflective user research method include (1) a multi-method approach; (2) utilisation of a multiperspective approach; (3) generation of information in the environment in which the technology product is actually used; (4) cooperative interpretation and reflection on meanings and experiences; and (5) iterative progress of the research.

The constructed reflective user research is better to be seen not as a single research method but more as a “toolkit of methods” for studying eUX, as illustrated in Table 4.

The concept of eUX is an analytical tool for design of interactive high-tech products. The reflective research method enables studying UX more comprehensively than before, because it can look at the two dimensions of eUX: (1) the temporal and dynamic UX as well as (2) the longer-term UX created through reflection. Understanding the second part – how the user experiences the results of his or her activity – is crucial in putting the temporal UX in the context.

6.2 Conclusions and discussion

An approach to UX research that studies the phenomenon in a more comprehensive manner and that aims at understanding not only the end results but also the dynamics and structure involved in their creation, has been needed by both academy and industry. UX research requires not only theoretical study but also practical analytical tools. An important step forward is a concept describing the holistic, multidimensional and reflective nature of UX. The purpose of this thesis has been to provide a first approximation of such concept, and to show how it can be used in practical analysis.

The concept of eUX defined in this thesis is based on Dewey’s concept of aesthetic experience. It alone did not, however, provide operational means required to study the determination of user activities and goal-orientation, or to explain the variety of experiences. That required operationalisation of the concept of aesthetic experience by dividing it into two levels utilising Leontjev’s activity theory and (2) expanding the theoretical frame of reference to provide tools for studying the goal-oriented nature of user’s activity and for analysing the variety of experiences. As explained earlier the characteristics of Dewey’s aesthetic ex-
perience have been maintained in eUX: (1) completeness; (2) uniqueness; and (3) unifying emotion (Dewey 1980, Jackson 1998, Väkevä 2004).

To point out the differences between the eUX approach developed in this work and the previous UX research, it has been in the end of Chapter 3 contrasted against two earlier definitions of UX (Kankainen 2002, Roto 2006). These two were identified to be among the clearest ones within the UX literature. The comparison focused in characteristics essential for a comprehensive approach to UX: comprehensiveness, multi-dimensionality and a reflectivity.

In the comparison it was found that these definitions did not constitute a comprehensive concept of UX. The definitions are not uniform and comprehensive because of the use of several multi-faceted concepts in the creation of UX, whose mutual relation remains unclear. The reason for this may be the lack of a consistent theoretical background.

In this thesis, the term “dimensionality” refers to temporal dimensions of UX. In the eUX concept they are considered a consequence of the hierarchical structure of an activity. Both of the studied earlier definitions address both previous experiences and future experiences, but the mutual relation of these temporal dimensions and their relation to other identified elements of UX remain unclear.

In this thesis the reflective nature of UX, making tacit knowledge visible, is connected to the temporal dimensions of the phenomenon as well as the study of the phenomenon’s dynamic nature. Roto’s interpretation of the ideas of Wright et al. (2004) is clearly different from what reflection is considered to be in this thesis. Kankainen’s (2002) definition does not take into account reflection.

Analysing a user at the activity level assists in understanding the motives behind the user’s activity as well as the significance of activity from the perspective of the individual and the community. As a conceptual framework, activity theory provides means to connect the concept of motivation with the concept of activity. Activity as a unit of analysis provides a way to analyse a larger whole than a subject or an object at the same time.

Aiming at more comprehensive understanding of UX requires a study of the dynamic and reflective nature of experience by analysing the temporal dimensions of experience. This, on the other hand, requires an analysis of the determination of user goal-orientation taking place in user’s activity and in user’s social, material and cultural environment.
6.3 **Assessment of the research**

The aim of this thesis has been to contribute in the ongoing discussion on the basic concepts of user experience research by the following ideas: (1) Introducing the dimension of long-term UX into the discussion. So far, UX research has clearly focused on temporal experience. The existence of long-term experience has been noted, but it has not been studied further or developed in more detail. In this respect, this thesis may be one of the first such attempts in the field of UX (cf. Karapanos *et al.* 2009). (2) Creating a concept of UX that is well-grounded on previous theoretical research on human experience. The combination of baseline theories used in this thesis (Dewey’s pragmatism and the concept of aesthetic experience and the cultural-historical activity theory) has not been previously applied in UX research. (3) Creating a model that connects the temporal and long-term UX to each other and enables their simultaneous. The resulting construct is called *expanded user experience* (*eUX*).

Furthermore, this thesis has (4) developed a method or a set of methods that enables the identification, collection and analysis of data connected to the *eUX* specified in the theoretical section. Results provided by the method seem to have not only theoretical but also some practical significance.

The results of the empirical study show that short- and long-term components can be identified in UX, and their mutual relations can be explained by the hierarchical nature of the user’s activity. This seems also be a novel finding in UX research.

One criterion for assessing the reliability of qualitative research is the analysability and repeatability of the data. The multi-disciplinary approach utilised in this research aimed not only at enriching the research data but also improving the reliability of the research. It was also assumed that the fact that users participated in interpreting the research data improved the reliability of the user study results. For example, the photos taken by the users did not always depict artefacts interesting for the purposes of this research project, and thus some of them contained information considered secondary which the researcher might not have been able to utilise in her interpretation. However, the information that is essential is not depicted in the images themselves but in the explanations of the people about the photos and the situation in which the photo was taken (Carter & Mancoff, 2005; Mattelmäki, 2006). Furthermore, the correctness of the researcher’s preliminary conclusions was tested by the users.
The representatives of the client who participated in the Kinos study estimated that the use of triangulation improved the reliability of the study by providing the preconditions needed for long-term collection of versatile research data.

Neither the conceptual nor the methodological development work presented in this thesis is by no means complete; it is more like the first step. It is, however, author’s hope that it could serve to open up and advance the discussion within the UX field further.

6.4 Utility of the results and further research subjects

Several issues that could be studied in more detail were observed during the course of the research process. Firstly, different types of empirical tests should be arranged to explore and develop the eUX concept further. Secondly, it would be interesting indeed to do a user study simultaneously in several cultures to assess how deeply culturally specific the developed concept is. Such a study could also include a study of the applicability of the reflective user research method in different cultures.

The operational concept of eUX and the reflective user research method developed to study it proved their value as tools in the practice-oriented user study. Feedback from the client of the Kinos user study, Polar Electro Ltd., has been highly encouraging. The research design enabled product designers a direct contact with actual end users of the product they have designed. Representatives of the client have been especially pleased with the fact that participation in the research group enabled them to study authentic users and authentic research data. The Kinos user study found not only answers to the research questions but also new general information about exercising and sports habits that was especially interesting for the client.

The research results have been actively utilised in the R&D activities of Polar Electro Ltd., and they have been influential in the design solutions implemented in a new generation of products.

In the form presented in this thesis the reflective user research method may be too heavy and time-consuming for collecting user data for a single company or the design of a single product. The method seems to be applicable in university research, however. In order to allow more extensive and financially more profitable utilisation of the reflective user research method, it should be systematised. Techniques utilising communication technology in a more effective manner could be used when collecting the research data, for example. Development of wireless
high-tech solutions applicable for collecting, managing and to some extent interpretation of extensive bodies of qualitative research data would probably promote expansion of user studies by reducing the amount of routine work required in the study, thus decreasing the costs arising from the study. (cf. SPV E200 Smartphone, Swallow, Blythe & Wright 2005, Mobile probes, Hulkko, Mattelmäki, Virtanen & Keinonen 2004).

The results of the Kinos study indicate that data generated by means of a reflective user study is not limited to one product and the related UX only. The research method seems to offer an opportunity to study issues that are more extensive than a single product. Thus, the reflective user research method and the concept of eUX seem to be applicable also for innovation activity in compliance with the Living Lab approach where research results are utilised by an ecosystem instead of one party. The reflective user research method and the concept of eUX could be especially applicable for the following research challenges occurring in Living Lab ecosystems: (1) the Living Lab approach aims at a more permanent innovation ecosystem than those enabled by one-time interview or observation studies; (2) innovativeness of the Living Lab ecosystem can be considered to be based on the meeting of different actors acting in the open innovation environment; and (3) in a Living Lab ecosystem, the openness of information generation and the multi-actor approach cause the research to focus on entities larger than single products, such as the design of living and operations environments.
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THE CONCEPT OF AND RESEARCH ON EXPANDED USER EXPERIENCE OF MOBILE DEVICES