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User Experience Management in High Tech Start-up Company

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ABSTRACT OF THE
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A modern organization bases its product development and design on the knowledge about the users. The better the organization understands the users, the better solutions it can develop systematically, being able to obtain competitive advantages. According to the current view of the HCI, all aspects of interaction between the user, the product and the organization, are encompassed in the user experience.

Researching the user experience, it is possible to understand what does the particular product mean to the user and how the features and properties are evaluated. Connecting the evaluations to organizational operations, it is possible to form a link between market understanding and the product development.

The purpose of this thesis is to discuss the importance of the user experience in terms of PowerKiss. The latest definitions of user experience are also presented. Different research methods, especially questionnaires, are then discussed as means to collect data about the user experience from the point of view of PowerKiss. Finally, a proprietary questionnaire for collecting user experience data is designed. The questionnaire was validated and is planned to be taken into PowerKiss' use.

Keywords: user experience (UX), product developmen and design, usability, user experience measurement, questionnaire

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Moderni tuotekehitys perustaa lähtökohtansa tuotteen käyttäjien tuntemiselle. Mitä paremmin tuotteen käyttäjät tunnetaan, sitä parempia ratkaisuja heille voidaan tehdä systemaattisesti, joka taas johtaa kilpailukykyisen organisaation syntymiseen.
Nykyisen käsityksen mukaan ensisijaisesti ihmisen ja tuotteen välistä vuorovaikutusta voidaan kuvata käyttäjäkokemuksen kautta, joka sisältää vuorovaikutuksen kaikki aspektit niin tuotteen, käyttäjän kuin organisaation kannalta.

Käyttäjäkokemusta tutkimalla voidaan ymmärtää mitä tuote merkitsee käyttäjälle ja miten käyttäjä arvioi tuotteen eri osa-alueita. Yhdistämällä näiden osa-alueiden arviointi organisaation omaan toimintaan, saadaan suora linkki tuotekehityksen ja markkinaymmärryksen välille.

Tämän työn tarkoituksena on perehtyä käyttäjäkokemuksen hyödyntämiseen PowerKiss-yrityksen näkökulmasta. Aluksi esitellään uusimmat määritelmät käyttäjäkokemukselle ja sen merkityksestä PowerKissille. Tämän jälkeen esitellään erilaisia metodeja käyttäjäkokemuksen kartoittamiseen, perehtyen erityisesti kyselyihin. Lopulta suunnitellaan PowerKissin käyttöön oma kysely, joka myös testattiin ja on tarkoitus ottaa yrityksen käyttöön laajemmin.

Avainsanat: käyttökokemus, tuotekehitys, käytettävyys, käyttökokemuksen mittaaminen, kysely

Preface

In hindsight, it seems that all my education, from the high school to this date, has been embodied cogently into one entity that I am now expressing in this thesis. The work that I have been doing at PoweKiss has given me the opportunity bundle the theoretical side of the profession into the practical use, giving me access to experiences that would otherwise been unreachable.

I would like to thank Maija for granting me this opportunity to express myself and work with this fascinating topic. She also, despite her own hurries, always reacted fast and was profound about the topic, expressing true interest.

I also want to express my gratitude towards my supervisor, Mikko Sams, who regardless of occasional extremities in schedules, was able to support the completion of this thesis.

Last, but certainly not least, I would like to thank my dear Paula, who gave her support and understanding even at the darkest and most critical moments.

Helsinki, 25 May 2011

Peter Sazonov

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Abbreviations

HCI	Human-Computer Interaction
UX	User Experience
ISO	International Organization for Standardization
UCD	User Centered Design
ROI	Return On Investment
SUS	System Usability Scale
USE	Usefulness, Satisfaction, and Ease of Use
CSUQ	Computer System Usability Questionnaire
QUIS	Questionnaire for User Interface Satisfaction
NN/g	Nielsen Norman Group
UI	User Interface

1 Introduction

1.1 The purpose of the thesis

The purpose of this thesis is to conduct a case research for PowerKiss concerning the user experience that is related to its products. The main aims of the research is to establish means to collect data concerning the user experience via means that are suitable for PowerKiss and suggest means to utilize the collected data inside the organization. Especially, the means are aimed to be a continuous, giving constant feedback for the organization that is utilized in formal decision-making, so that the organization is able to see how its products are perceived in the markets. As a whole, the data is supposed to be used as a serious business tool that is used for decision-making in the organization.

The main aspects can be divided into two distinct parts:

1. To develop formal and systematical methods and means to collect the information about the user experience associated with the particular products

2. To discuss how the developed means could be utilized in the company

1.2 PowerKiss

1.2.1 Description of the company

PowerKiss a Finnish start-up company designing wire-free charging solutions for mobile devices, such as mobile phones. Wire-free charging is referred to a power transaction that is based on electromagnetic fields rather than physical power cables. PowerKiss was founded by its current CEO, Maija Itkonen, and her business partners in 2008 with the vision of releasing people from the inconvenience of using charging cables, and to make charging on the go simple. Today the company provides an easy-to-use wire-free charging solution that can be integrated into a wide-range of environments via furniture and other surfaces. PowerKiss is currently employing approximately 10 people, mostly with backgrounds in technology development. The office is located in Espoo, at the premises of Aalto University's Design Factory.

PowerKiss business is based on selling physical products (Heart and Ring) to the customers. The core customer segment is hospitality industry (airports, hotels and cafes). The most important and biggest customer to the date has been SSP – Food Travel Experts, a company managing cafes and restaurants across the globe for more than 60 years in 400+ locations worldwide. PowerKiss wire-free charging is implemented at the moment through SSP to 60 cafés and restaurants in 30 airports worldwide. Other customers and business partners include Wayne's Coffee, Café Carusel, Robert's Coffee, Hilton and Glo hotels. PowerKiss has also been selling its technology to furniture manufacturers directly, so they can add the wire-free charging as a feature to their products. These manufacturers include for example Martela, Isku and Artek.

1.2.2 The products related to the case research

The main products are used for wire-free charging of handheld devices, such as mobile phones and mp3-players, and in near future the solutions are going to cover also charging of laptops and value adding services. The main artifacts of the PowerKiss' wire-free charging system are Ring and Heart (see figure 1).

Figure 1: PowerKiss' products, wire-free charging transmitter Heart above, below three types of wire-free charging receivers, the Rings

Ring is a small accessory that is attached to the device that being charged, working as a receiver for the inductive power transaction. Heart is a transmitter of the inductive power transaction, creating the electromagnetic field through which the power is transferred. Differing from other companies working on the same industry, PowerKiss has developed its system to be integrated into the environment, such as furniture and other similar surfaces. Most of the competitors, Powermat being maybe most well known, have developed their system to be used with distinct charging pads that are placed on furniture, being a tangible part of the environment.

So, in order to take the system into use, the Heart is integrated into the piece of furniture, for example tabletop. As the Heart is powered, a distinct guided electromagnetic field is formed on the surface of the piece of furniture. As a device with Ring is then placed on the charging area, the device starts to charge through the field. See figure 2 below for schematic diagram.

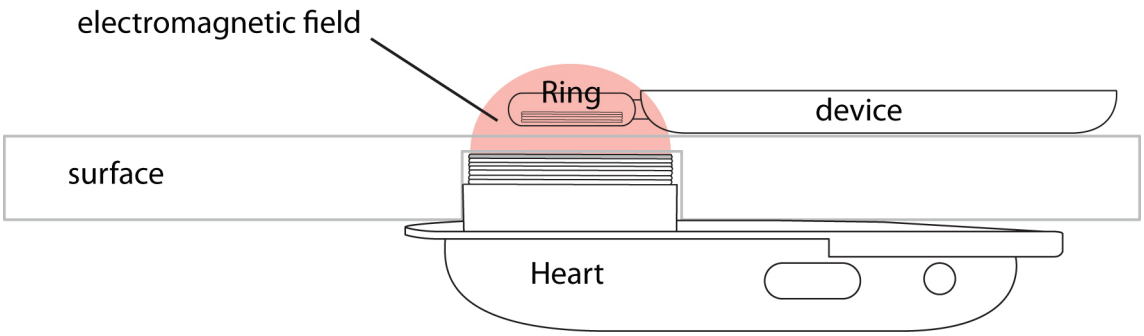


Figure 2: A schematic diagram of PowerKiss' solution for inductive based power transfer

In figure 3 is showed an actual situation of usage of PowerKiss products. Like most of the commercial solutions that use inductive coupling for power transaction, the receiver part must be close to the transmitter in order to effectively transfer power.

Figure 3: Picture of actual usage of PowerKiss products

1.2.3 User experience and PowerKiss

PowerKiss has depicted that understanding its users as well as possible is extremely vital for product development and bringing the product successfully to markets. CEO Maija Itkonen has stated that one of the initial reasons for starting the company and building the business was the idea of enhancing the user experience of mobile device users, through offering easy to use solutions for powering the devices.

The need for having means to easily charge electronic devices in different locations has increased dramatically as usage of different mobile devices has increased during the past years, having ever increasing number of sales worldwide, especially mobile phones

[1]. The companies are also starting to develop other handheld and easy to carry devices, such as tablets and mini laptops, with ever increasing sales [2]. This all leads to situation where, from point of view of user of the end terminals, one of the greatest challenges is to keep the devices charged whenever needed. This leads further to dissatisfaction and user provoked means to deal with the limitations of the usage [4], especially when most of the manufacturers have failed to introduce devices with significant improvements in battery life.

Here is where PowerKiss comes in. The PowerKiss offers means to keep mobile devices charged. The usage of the PowerKiss products are based on already existing paradigm of usage, trying to be as intuitive as possible from the point of view of the user. PowerKiss' own researches have shown that users of mobile phones tend to periodically place their devices on the tabletops as they are in cafes, restaurants and other semi-public places spending time, depending on the context of the visit and the type of the environment. As the devices are already close to the surface of the furniture, it is possible to use the inductive power transfer sufficiently to charge the devices through the furniture surface.

In commercial use, there are some challenges regarding the implementation of wire-free charging. Most of the places offering wire-free charging are semi-public and thus the products need to be managed accordingly. Currently, the regular way of using the PowerKiss' products in cafes and restaurants, is to ask the Ring from the personnel. Having had the Ring, the user then sits to the table capable of wire-free charging, attaches the Ring the device's power connection port and places the devices so that the Ring is on the charging area (see figures 2 and 3). The typical user path of wire-free charging is depicted as a whole in figure 4.

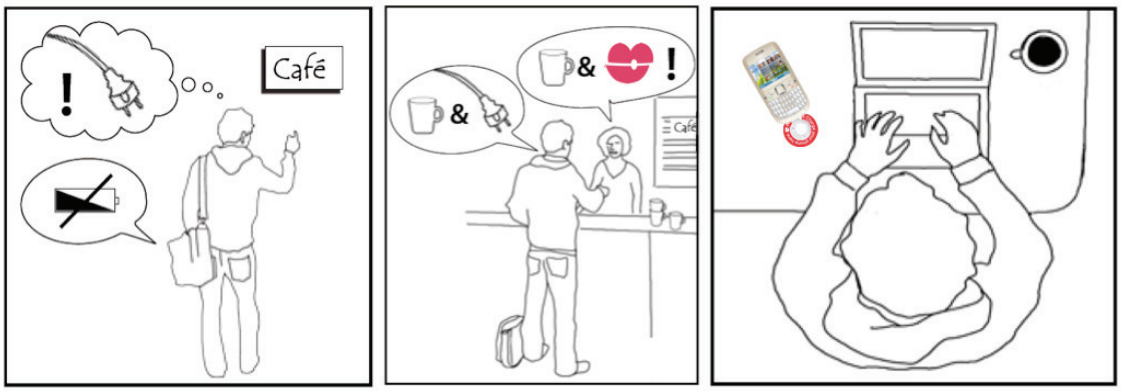


Figure 4: A typical user path in PowerKiss environment

At every step there is a possibility to lose the customer. The harder the usage of the new service is, the more probable it is that the customer does not want to switch to the new way of charging the devices. Even if the customer successfully will get the device charging with the new system, it would require additional value in order to switch to from the regular charging paradigm. Optimizing the UX, it would be possible to realize a system that would gain an acceptance amongst the users of mobile devices and ultimately drive the business goals of PowerKiss. In a whole, the situation can be regarded to be a classical example of introducing disruptive technology [4], PowerKiss' solution having possibility to dethrone the regular chargers from being the main methods for charging the mobile

devices. But in order to do this, the UX of the PowerKiss' offering must be optimized so that the users would feel a need to change the way of charging the devices.

Understanding the above, PowerKiss, has been trying to understand and follow the user experience caused by its system, in order to learn and utilize the information in the company. PowerKiss has used both qualitative and quantitative research methods for mapping the user experience, including usability tests, questionnaires and focus groups. As the company is still in its infancy, the methods have usually been used in ad-hoc terms, without systematic and long-term data collection. The management of the data collection has been also more reactive then proactive, being emphasized during the critical times. This had lead to agile but in long-term, incoherent and incongruent user experience data collection. Recognized as strategic objective to collect user experience data that can be used in as means to evaluate further product and market development, there is need for developing systems that can provide chronologically comparable information.

As PowerKiss is still regarded to be a start-up company with limited resources, the data collection system is needed to be as less resources consuming as possible but still providing rich and ecologically useful data.

1.3 The structure of the thesis

This thesis concentrates on a development and design of UX research tool for PowerKiss. The first chapter focuses on the PowerKiss as a company. The second chapter introduces several definitions of UX and assesses the latest descriptions the concerned field, pointing out the significance of UX in commercial world. Third chapter portrays the basis for designing the UX collection, reflecting it on the means that the industry is currently using. In the fourth chapter the formal UX tool is formulated and introduced. Fifth and final chapter discusses more widely about UX measurement in the organizations and what elements are crucial for a successful product.

2 The value of the user experience

2.1 Introduction to the term user experience

Before there can be developed formal and systematic ways of collecting data about user experience, the term user experience, often referred as UX, should be explained and understood. Also, the business sense of UX is discussed in order to depict the importance of UX for businesses in terms of competitive advantages.

Speaking in academic sense, the expression user experience has had an interesting history; it became widely adopted in the academic world, particularly in sciences regarding human-computer interactions (HCI), before it was actually defined in detail [5]. The first academic recognitions of the importance of the aspect to look at the usage of a particular device or service in a holistic overview, as an experience, can be found at the late 80's depicting that primary is the experience of a person [6]. During the next decades, the non-utilitarian aspects, such as emotional, affective, experiential, hedonic, and aesthetic variables were gaining more and more attention and were constantly one of the topics discussed within the interaction design communities.

Today seems that the HCI researchers and practitioners have become well aware of the limitations of the traditional usability framework, which focuses primarily on user cognition and user performance in human-technology interactions. As Donald Norman [7] pointed out: "..usability and understandability are never goals, they are means toward the goal. Pleasure, enjoyment, fun, however, can be goals."

As the academic communities started to embrace the idea of holistic experience that defines how "good" or "bad" particular artifact of interaction is, they confronted a new challenge: what actually is the dominating user experience, from what is consists of and how would one define it? Several attempts have been made to clear this matter out, but because of the "fuzzy", dynamic and difficult concepts that were associated with the term, a shared view was not developed in instance [5]. One of the notable steps was ISO's (International Organization for Standardization) reviewed standard Human-centred design for interactive systems [8], which defined the term user experience as:

- Person's perceptions and responses resulting from the use and/or anticipated use of a product, system or service.

- User experience includes all the users' emotions, beliefs, preferences, perceptions, physical and psychological responses, behaviours and accomplishments that occur before, during and after use.

- User experience is a consequence of brand image, presentation, functionality, system performance, interactive behaviour and assistive capabilities of the interactive system, the user's internal and physical state resulting from prior experiences, attitudes, skills and personality, and the context of use.

- Usability, when interpreted from the perspective of the users' personal goals, can include the kind of perceptual and emotional aspects typically associated with user experience. Usability criteria can be used to assess aspects of user experience.

As a comparison, the definition of usability according to ISO is: “Extent to which a system, product or service can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use”. Effectiveness is regarded to be “accuracy and completeness with which users achieve specified goals”, efficiency is “resources expended in relation to the accuracy and completeness with which users achieve goals” and satisfaction “freedom from discomfort and positive attitudes towards the use of the product”. [8]

The ISO’s definition of UX seems to enjoy the approval of wider audience although different authors have emphasized different aspects. Marc Hassenzahl [10] has spoken through the terms of technology, defining UX as “experiences created and shaped through technology”. Law and van Schaik [9] brought up the importance of interaction with other users and socio-cognitive aspects.

Nielsen Norman Group (NN/g) states that UX “encompasses all aspects of the end-user’s interaction with the company, its services, and its products“. NN/g also emphasizes the integration the services and disciplines within the organization in order to achieve high user experience. These include engineering, marketing, graphical and industrial design, and interface design. A model of the construction of the UX by NN/g can be seen in figure 5. [11]

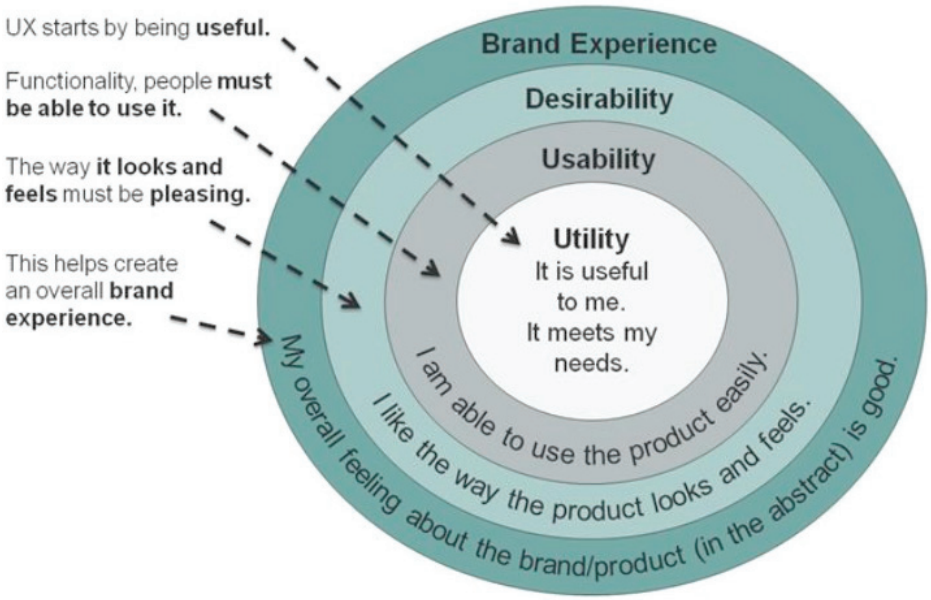


Figure 5: Model for layers of high quality user experience [12]

Hassenzahl [10] has also pointed out that memory plays a major role in the formation of UX. The actual use of a product is often quite short comparing to the time when the product is not used, so the most of the time people are working with memories of the experiences that they have of the actual usage. This means that users are communicating and remembering personal, intrinsic reality of the actual event, not what “actually” happened. This phenomenon or claim is not new to the cognitive psychology studying users; term mental model has been used to describe the cognitive representation of understanding of interaction with system [13]. Mental models include a number of high-level cognitive structures that are used to store information about interaction with devices.

According to Norman [14], mental models are incomplete, unstable, do not have clear boundaries and include "superstitious" behavior.

Theory of mental models implies that users tend to internalize and communicate only parts of the actual reality and fill the gaps between the elements with things that make sense for them, thus conducting their internal, complete representation. In this way users can build comprehension of world. Hassenzahl [10] suggests that the method how users form their internal representation is comparable to constructing "a story", which then becomes the reality for the particular user.

The aspects above emphasize couple of processes in formulation of UX for particular product. First, the interaction with the user before and after the actual usage and second, gaining the understanding of the elements that user will remember or acquire as culmination points. Around these culmination points users will "code" their own explanations and relations so the story will be whole and thus useful. The fact that the users cannot always know and comprehend the reality of product functions and features, means that the features of a product that are not directly related to the achievement of the primary goal of the product can become one of the culmination points of the UX.

2.2 Using user experience as design driver

The trend of emphasizing broader holistic context of human behavior instead of efficiency and usability in HCI started also redefinition of user-centered design (UCD) and human-centered design. UCD and human-centered design are referred to a design process, where the humans are taken into consideration as soon as possible during the design processes and kept as evaluators of the development through out the process. The difference between the two terms is that human-centered design is actually design method standardized by ISO and UCD is a broader definition. The standard is considered to be a modern way of integrating end-user into the designing process, as an "approach to systems design and development that aims to make interactive systems more usable by focusing on the use of the system and applying human factors/ergonomics and usability knowledge and techniques". Also, the standard emphasizes that term human-centered design is used rather than user-centred design in order to emphasize that this also addresses impacts on a number of stakeholders, not just those typically considered as users. A schematic diagram of the process definition is presented in figure 6. [8]

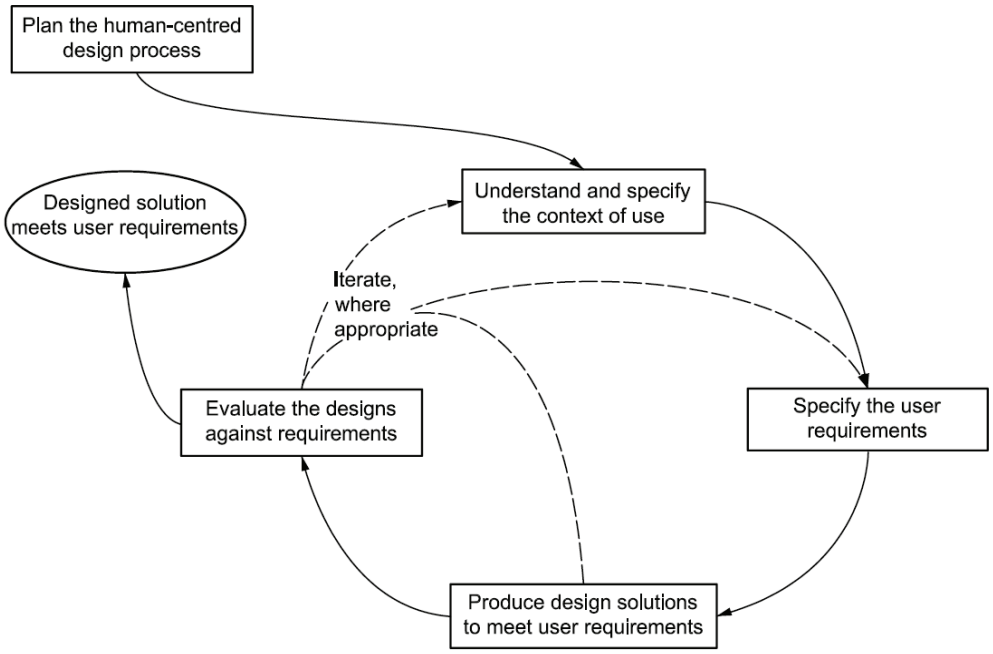


Figure 6: Interdependence of human-centered design activities [8]

Taking into account the nature of user experience, it seems to be hard to truly design something human-centered without a deep understanding of the emotional experiences prevalent in human nature [15]. Norman [16] noted that it is important for designers to speak about the people for whom they design as people, not as customers, consumers or users. Norman states that labeling them more as objects instead of personifying them as rich, complex beings that are using devices for specific goals, motives and agendas will cause degradation, which will ultimately affect the way the designs are designed.

As the idea of holistic design started to get ground in HCI new terms started to emerge, such as experience design, user experience design and experience centered design. Hassenzahl states that UX and experience in general are indistinguishable so designing UX is actually designing experience. Hassenzahl refers to term experience design as being means to "write stories" or meaningful experiences which are being told through the product. Hassenzahl claims that the point of view of story telling through products has "a potential to change the way we think and design". The process of Hassenzahl's experience design starts with clarifying the needs and emotions involved in an activity. Only after that, the functionality that is capable of providing the experience and as last, an appropriate way of putting the functionality to action. Hassenzahl calls these three steps as Why, What and How layers and the experience designing to be an action that aims to merging these with the Why layer setting the tone. According to Hassenzahl, this leads to products that are "sensitive to the particularities of human experience". [10]

Unger has defined user experience design as: "The creation and synchronization of the elements that affect users' experience with a particular company, with the intent of influencing their perceptions and behavior". The process of user experience design has had more instrumental characterizations also; such as importance of understanding the integration of the all inputs that user might have when interacting with the product, including touch, hear and smell. [17] During early discussion of design process that

takes holistic experience into account, Wright and McCarthy [18] pointed out: ".. we cannot design an experience. But with sensitive and skilled way of understanding our users, we can design for experience". Later on Wright and McCarthy [19] outlined more accurately their definition of Experience-centered design to be a process designing for the "richness of human experience with the wide variety of new technologies and media that are available". As opposed to other authors, Wright and McCarthy also underline the humanistic and ethical views of the usage of technologies, stating that the ultimate goal of technology should be improvement of life quality, giving a possibility for people to have a richer life and giving means to accomplish goals that cannot otherwise be reached. [19]

2.3 The advantages of UX in terms of businesses

Garret [20] argues that UX is most significant factor in building customer loyalty to a company, as customers become loyal because of positive experiences they have with the company. A pursuit of loyal customers is seen as a strategic objective, as loyal customers tend to lower costs, increase sales and market stability, promote products and raise barriers for competitors' market entry [21]. A connection between customer loyalty and company's employees' well being has been suggested, as serving loyal customers make some jobs easier and thus more satisfying [22].

The product of a company is usually the embodiment of the business for the customer, as customers are spending most time with this representation of the company and having strongest emotional content towards it [20]. As a result, creation of a product with positive UX is essential for building customer loyalty. Speaking in financial terms, Keefer [23] claims that companies can monetize loyal customers more than twice times more than neutral customers resulting in actual business prospects.

As UX has been understood to be a valuable organizational objective, there have been discussions about adapting financial metrics related to the UX operations, in order to map the optimal amount of resources needed. Also, there has been need for unambiguous metrics to have as discussion tool between management and designers, in order to have information whether a particular design opportunity is worth the investment it requires [25]. In financial terms, return on investment (ROI) has been widely used metric to assess the profitability of an investment and is also known usually through out the organizational levels [24]. Because of this, the ROI of UX has been suggested to be one of the metrics used as described tool because of its simplicity [25].

Since usability is was first areas of UX research that was emphasized in HCI literature, it was also the first ones to undergo discussion about profitability; designers were talking about the significance of it in qualitative means and managers were questioning the profitability of the usability operations that were raised in need for something concrete. Although there are challenges with universal "rule of thumb" in ROI of usability designing activities, there has also been studies that claim the cost benefit ratio of usability design to be 1:2 or even 1:10 in software development [26] and "every dollar invested in ease of use returns $10 to $100" [27]. Karat [26] also depicted several other benefits of usability engineering, presented in figure 7.

Figure 7: Usability Engineering Benefits [26]

In 2006 there was an experiment were was hypothesized that companies that deliver a great UX will see it reflected in their stock price also. To test the hypothesis 50 000$ were invested in 10 companies that were regarded to fulfill the features of delivering a great UX. Investment was held for one year and then compared the share values. In one year, the value of the portfolio was increased 39% to overall value of app. 70 000 $, also outperforming all major U.S. indices (NASDAQ 18.09%, S+P 9.47%, NASDAQ 100 26.81%, NYSE 14.67%). In 2011, the value of the portfolio has exceeded 100 000 $ with more than 100% of value growth. [28]

Keefer suggests that investing in UX during a project's concept phase can decrease significantly products' time-to-market by reducing the development cycles and focusing better on essential features of the product. Keefer also suggests that major issues that cause overrunning a budget of a development project is unforeseen usability issues and these could be avoided by adequate UX planning and testing. As a whole, the intentional use of UX design decreases development costs both internal and customer facing by minimizing the corrections post-launch and during the development. [23]

When assessing the "whole" UX in terms of ROI, a study by Haas School of Business and design company Adaptive Path, suggested that using a simple equation as ROI, cannot be applied to the complexity of UX directly [25]. Instead, they suggest using two different tools for means to assess the design decisions: The User Experience Value Chain and ROI Process Model. The User Experience Value Chain is a process of making "educated guesses", including ex-ante and ex-post revisions of projects. These projects are evaluated by cross-functional team through criteria that are based on connection between user behavior and business value, using financial metrics as possible. These include, for instance, increase of sales, decrease of dissatisfied customers and costs, taking account risks and resource consumptions. The ROI Process Model embodies the extent of integration of design teams in the corporate strategic goals; the study showed that there was a correlation with the success in using user experience to achieve a wide array of corporate goals. In sense, the ROI Process Model is the extent in which the User

Experience Value Chain has been integrated in the organizational functions.

Pine and Gilmore [29] have argued that with increasing experience economy, the actual "power" of the technology has less and the UX more to do with the strategic business advantages that a company may have, emphasizing the totality of understanding the UX that company is offering. Thinking in terms of consumer choices, certain studies have shown that experiential purchases (e.g. concerts, dinners and journeys) make people happier than material purchases (e.g. clothing, jewellery or stereo equipment) of the same value [30], [31]. Hassenzahl [10] argues that this inclination is result of shifting towards post-materialistic culture after superficial and consumerist 80s and 90s. Ronald Inglehart [32] theorized that societies in sustained periods of material wealth become increasingly interested in values such as personal improvement and turn into societies whose members equate happiness with the positive life events. As a summary, there has been significant emphasis on shifting of the strategic business advantages from technology driven to more totality of user experience in order to acquire competitive advantages.

3 Measuring the user experience

3.1 Introduction to user experience measurement and research

The previous discussion about the framework of UX and its all aspects makes it evident that UX is a complex concept and, even though being in the spotlight of the current HCI research, there is no shared understanding of its nature. Regarding this, it seems that the measurement of UX, something that is not even unambiguously defined, would be a challenging topic. Still, there has been strong discussion about the different aspects of the UX and how they are measured. More significantly, can they be measured; the subjective nature and emotional context have added challenges to the measurement discussion. Also, the interdependencies of the different areas of UX are under discussion and, whether all measurements are meaningful, useful and valid.

As UX evaluation stands in the tradition of usability evaluation, major part of the authors have suggested usability measurements to be a starting point for the mapping the experience and even being significant part of the UX. Tullis and Albert have presented in their book Measuring the user experience [33] usability metrics being a way to measure the UX, although they noted that: "Some products strive to create an exceptional user experience. It's simply not enough to be usable. These products need to be engaging, though-provoking, entertaining, and maybe even slightly addictive" [33]. Also, in the ISO definition of UX, it is stated that UX and its aspects can be assessed via "usability criteria" [8].

Although usability is definitely a distinguishable part of the UX, some authors have noted that the traditional HCI and, thus usability, tend to emphasize the pragmatic level of product usage and thus "fail to address the more hedonic level of experience" [35]. Even though there are a lot of different approaches to the definition of the UX, the importance of emotions and hedonic pleasure of the interaction with the product is critically emphasized, so that aspect definitely needs to be also addressed in the measurement of UX. As the UX is by definition subjective, it seems to be difficult to create an objective method for the company to use as a metric for evaluation. However, this explicit challenge has not stopped researchers and practitioners from developing universal methods for examining and mapping the UX.

Hassenzahl [35] has argued that people's experiences can be described and characterized through questionnaires that focus on the experiential evaluation. By experiential evaluation Hassenzahl means an approach where the questions are reflected through subjective rather than objective means, away from product-oriented focus to personal views of the answerer. Hassenzahl states that by using experiential evaluation, there are at least two potential advantages: first of all it, it is easier for people to evaluate the product through subjective means, by telling how they feel towards it, rather than evaluating the product itself. This can avoid the challenge of questioning the competence to judge the product, e.g. does the answerer have the ability and competence to judge the particular product. The challenge often is that the evaluator, if is not a particularly familiar with the product, such as its design and development, does not have adequate understanding about the product and thus bases the evaluation on other than facts. Experiences are personally already meaningful, whereas product perceptions and evaluations require deeper understanding about the product and its features. Second, experiential evaluation might enable comparison between different products due to the universal nature of experiences.

There are also challenges related to the mindset of "one static" measurement of UX. The relationship of user to the product changes over time, thus having significant affect

to the validity and reliability of the UX measurement in temporal sense, adding the time as a variable to UX data. Koskinen et al. [36] studied the UX changes over time and concluded that first impression of a product tends to change during the use of the product. They argue that first impression is mainly dominated in how the object relates to user's self-image, having the material, shape and style as important aspects. But, the experiences accumulate and change during the use, thus changing the initial perception of the products, emphasizing the functionality, durability and quality of product.

3.2 Methods for user experience research at different phases of product development

In order to present or discuss methods that could be valid enough to give comparable measurement data about UX, the current UX research methods should be discussed in general. One approach to the topic is dividing the methods for user experience research by the development phase of the product, e.g. conceptualizing, developing and measuring the outcome of the product design.

Every commercial organization has in it incentives the creation of successful product and to integrate solutions and methods that by default result in optimized UX of the product. For a small start-up company, such as PowerKiss, the initial impact of the first launched product can determine the whole future of the organization, because the investors would probably want proof of the viability of the business and that is encompassed in the first offering. So the pressure in getting an actual, competitive product launched that addresses the need and hopes of the stakeholders (including the investors and end-users) is critical for survival. Also, company that is not rich with assets cannot use its resources for post launch improvements in the same manner that a major company can if the product does not fulfill the adequate needs. For example, Samsung introduced its new tablet, the Galaxy Tab 10.1, in 2011 February but quickly draw it back for re-design [37]. They introduced the same Galaxy Tab only month later [37] with significant changes in its thinness, having cut over 2mm of its thickness [38]. Seemingly the company perceived that the thinness of the tablets is going to be a crucial element in the product success, so they used a lot of resources for re-designing the product and thus, postponing the official launch for the markets. For a small company, this maneuver could have been impossible.

Regarding this, it seems to be even more important for organizations launching their first product to integrate the UCD paradigm (see figure 6) into the product design process. A major company that is rich on assets and has a solid market will not have as significant drawback from unsuccessful product comparing to organization that has no previous products or is low on assets. For a start-up company the UCD paradigm, its features and methodology should be implemented in the product development process from the conception of the organization.

As there is a great amount of different research methods for acquiring UX data into the product development, in order to utilize these effectively, the organization should understand what methods should be used in what stages of the development project. Kuniavsky [39] presents model for the cyclical development, defining different research methods for every stage (figure 8).

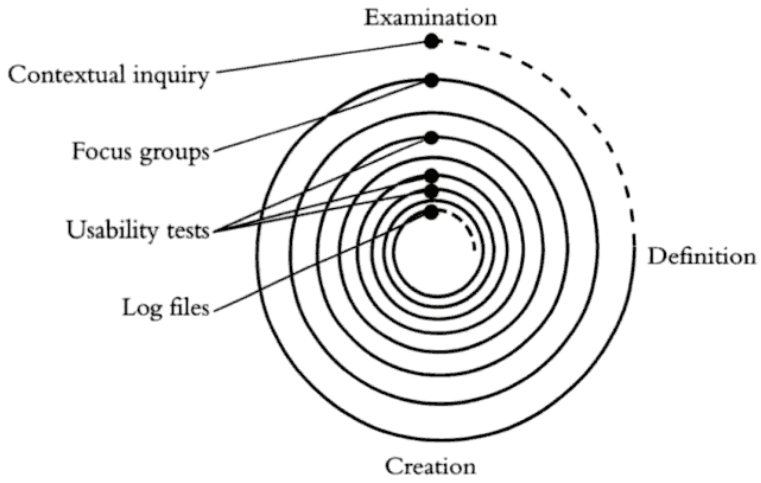


Figure 8: User research program with iterative development spiral [39]

The main point is, that not every method is viable at every stage of the product development. In order to obtain ecologically valid data about the product development and thus the project, a right method should be selected. As seen in the Kuniavsky's spiral model (figure 8), the examination methods are more exploratory at the beginning of the development cycle, and become more precise as the development progresses, giving more definitive data about the product, such as performance in usability tests (as the spiral tightens). Kuniavsky describes the user research in iterative product development as "continual refinement through trial and error", where the researcher, gradually tests the design, being the design as more and more detailed to the end. Kuniavsky's model gives more detailed meaning in for the ISO's standard Human-centred design for interactive systems [8], depicting the different needs at different product development stages.

Rohrer [40] has summed the user research methods that organization should conduct at different phases of the product development (see figure 9). As the organizational approach is taken, Rohrer all product development should come from the strategic and business decisions. As the business opportunity is understood, the product that is required to achieve the business goals is designed in user centric ways. These ways include participatory design, usability test and field studies in incremental and iterative means as expressed in figure 8. As the product is finally launched, the company should collect data about the actual impact on the markets and users, ultimately screening how the strategic and business goals were achieved.

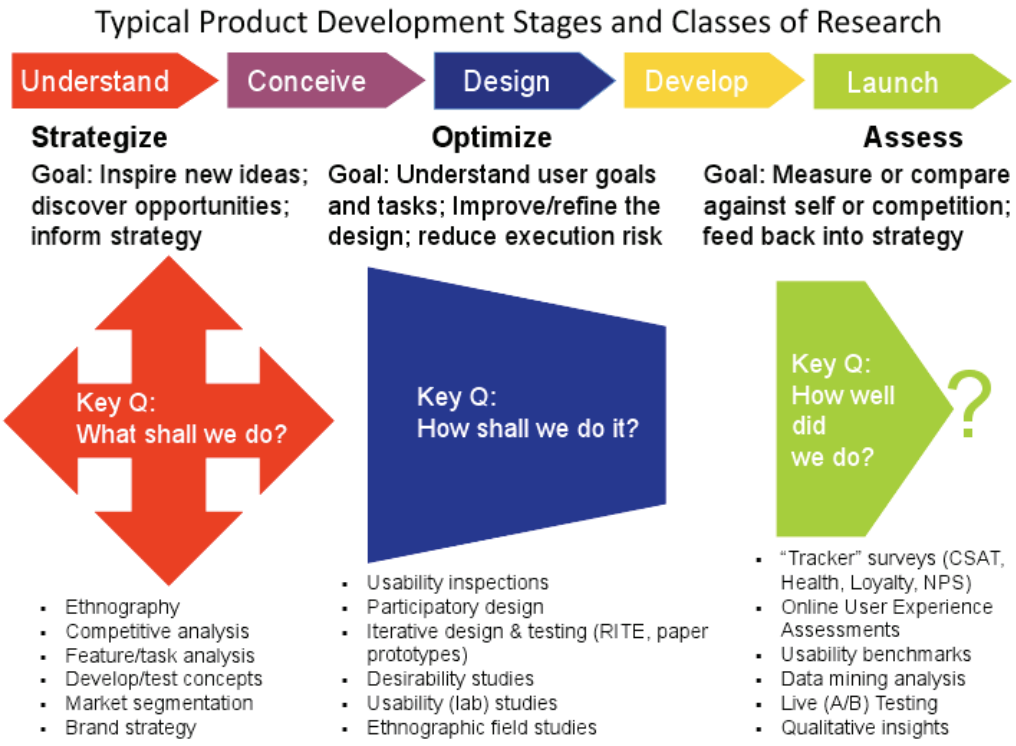


Figure 9: Typical Product Development Stages and Classes of Research [40]

Considering the situation of PowerKiss, this link between Launch and Understand is what needs to be developed. This ties the business goals and UX evaluation together; the better the understanding of the UX of the product is, the better PowerKiss can formulate and communicate the strategic goals for the product. For example, if it is seen that the products effectiveness, one of the UX features, on the target markets is poor and thus acts as an bottleneck for achieving the target business goal, the strategic decision in the future product development could be improving the technology functions of the product. But, if the data collection depicts that the markets see that the product is not attractive, yet another UX feature, the development resources could be allocated in industrial design processes. In order for the company to screen how the decisions of resource allocation have effected on the next generation development (or other organizational operations such as marketing and promoting), there should be adequate means to compare the UX feature that was paid attention to. For example, if the metric of attractiveness on the target markets has gone up, comparing to the previous generation, the company can be regarded to achieve the UX improvement goals. Naturally, the link to financial gains is much more complicated and are not straightly related to UX improvements. If the product will be significantly more costly because of the new design, target market group could become smaller and thus affect on the sales.

3.3 Data collection related requirements for the UX measuring

As noted in the introductory chapters, PowerKiss has been interested in collecting UX data about their products and projects throughout its existence. The product development of the Ring was based on the user research conducted with first promotional version of the wire-free charging receiver and throughout the development of the Ring, there were conducted systematic and incremental evaluation of the design with actual users. Conceptualizing of the Ring started from usability challenges that were noticed during user evaluation with the promotional receiver. The user evaluation was based on usability studies, including also quantitative methods, such as questionnaires.

In general, PowerKiss has used questionnaires as main UX research tools, also independent of the product development. The questionnaires have been usually simple, unobtrusive and implemented in places that had PowerKiss' products. As the main target segments of PowerKiss' products include hospitality providers, such as cafes, restaurants and hotels, these have also been the places of data collection. The questionnaires have been designed as self-reported, post-task assessments, where users fill out themselves the questionnaires after or during the use.

The challenges of the implemented questionnaires have been lack of systematic and comparable metrics, resulting in data that is only valid within the one type of questionnaire. Regarding the UX evaluation research, it would be advantageous for the company if the metrics used in the questionnaire would be comparable in chronological manner, enabling comparison of different product designs and projects. In this way, the management could use the UX metrics collected to evaluate success of projects in wider means and also provide systematical data for product development.

A questionnaire that users themselves fill out provides benefits as a method for UX data collection from the point of view of PowerKiss because, as start-ups and companies in their survival phases, full time resources cannot be allocated in wider and more exploratory research on constant basis. Also, there is need for simple and unobtrusive methods that can be implemented in target environments, regarding the requirements of the service providers, such as cafes and restaurants. Because all of the places where the research would be conducted do have their own business goals, such as serving the customers well, the research must respect the environment and be as unobtrusive as possible. Also, the data should be easily processed, without substantial efforts of interpretation and translation.

The form of the data collection should also represent the brand elements of PowerKiss and act as promotional material. Regarding the user, the data collection should be as effortless as possible, still providing adequate insights into the UX and be based on the experiential evaluation paradigm. If possible, the data collection and interaction should leave an engaging and interest provoking memory, thus acting in positioning PowerKiss in beneficial ways to target customer group.

3.4 Self-reported metrics as UX data collection method

3.4.1 Introduction to self-reported metrics as UX data collection method

Self-reported metrics give most important data about users' perception of the system that they are interacting with because of including the emotions and feelings, thus answering how much users like the system [33]. The more users like the system, the more likely they become loyal customers of the organization, resulting in business advantages as discussed in earlier chapters. Regarding the self-reported metrics, there are many forms of questions, for example rating scales, attribute lists and open-ended questions that can be used in the data collection.

Obviously, the type of data that is being collected must reflect the needs of the organization and thus depicts the pre-planning of the research. For overcoming biases of self-reported questioning and maximizing the ecological validity of collected data, they must be standardized among the answerers. Because in the PowerKiss' situation, where the users are supposed to fill out on their own the questionnaires, the researcher cannot and is not supposed to influence the data collection procedure, the pre-planning of the study is critical.

Albert et al [41] have divided the self-reported metrics into two categories by the nature of the focus: post-task and post-session questionnaires. Post-task questions are concerned with a particular task during the study, concentrating on measuring how did the respondent accomplish the task. Post-session or post-study questions are collected at the end of the study, after all tasks, in order to summarize the overall user experience of the concerned product. By collecting the self-reported data just once at the end of the session, the participant's last impression of the experience is actually measured but from the point of view of the organization, this is the perception participants will leave with that is likely to influence any future decisions they make about the product [33]. Regarding the PowerKiss' situation, the post-session research seems to be more suitable than post-task, because the organization is more concerned in the overall UX, rather than particular tasks completion. Post-session studies have been also found to be most successful in comparing the alternative designs [41].

There are different standard questionnaires for collecting post-session user experiences. The advantage in using existing standard questionnaires is taking advantage of already designed ways of data collection by the experts of the field and, because of wide use, they provide possibly benchmarking data [41]. These methods include System Usability Scale (SUS), Usefulness, Satisfaction, and Ease of Use Questionnaire (USE), Questionnaire for User Interface Satisfaction (QUIS), Computer System Usability Questionnaire (CSUQ), Product Reaction Cards and many others.

3.4.2 Likert scale

Most of the questionnaires use Likert scale as scaling method for the answer mapping. Likert scale is a psychometric scale where the respondents specify their level of agreement to a specific statement. The statement may be positive or negative including different intensities through 5-point scale, from strongly disagree to strongly agree:

1.Strongly disagree
2.Disagree
3.Neither agree nor disagree
4.Agree
5.Strongly agree

One of the main characteristics of the Likert scale, in addition to expressing the level of agreement to a statement, is allowing a neutral response. This is because of using odd number of response options. [43]

There are different versions of the Likert scale with more than 5-points but as in the original version there are anchor terms for each point, it is more difficult to use descriptive terms for each point for more then five points. In designing the statements, the researcher must be careful on how the statements are worded because the amount of linguistic intensity does affect the respondent's choice of answer. The use unmodified versions of adjectives is recommended, e.g. the use of phrase "This website is beautiful" is preferred to "This website is absolutely beautiful". [33]

3.4.3 SUS

System Usability Scale (SUS) is widely used tool for quickly and easily assessing the user's subjective rating of usability of given product or service. Although SUS was developed 15 years ago and there are number of other alternatives, SUS has several advantages that make it a good choice for fast post-session assessment tool. SUS questionnaire consists of ten statements about the system that being evaluated. The statements are rated through Likert scale, having half of the statements as positive and half of them as negative in order to avoid the bias of answering only positive statements. An example of filled SUS questionnaire can be found in Appendix A. [33]

As seen in Appendix A, the SUS instrument consists of 10 statements, half positive and half negative, that are scored with Likert scale according to the agreement. The results of these 10 statements are summed into a single score from 0 to 100 that is supposed to represent the overall usability of the system being evaluated, the higher the score, the higher the perceived usability. Albert and Tullis [33] argue that an average SUS score under 60 is relatively poor, over 80 could be considered pretty good. The alternative uses of positive and negative statements is seen as appropriate way of reducing the bias caused only using positive statements and keep the respondent alert during the answering. [43]

One of the major advantages of the SUS is that it is indifferent to the product or service that it is evaluating, making it possible to use with wide range of different targets. The word system is often replaced with the name of the target product. Secondly, SUS is relatively quick and easy to use both participants and researchers. Thirdly, the single numeric value that the SUS provides as an outcome is seen as easy and universal, making it possible to represent it to high variety of different people in the organization. Finally,

the SUS questionnaire is nonproprietary, making it cost effective tool, although it was developed at Digital Equipment Corp. [44]

3.4.4 CSUQ

The Computer System Usability Questionnaire (CSUQ) was designed to do an overall assessment of the system evaluated at the end of a usability study by IBM at non-laboratory settings. Like the SUS, CSUQ is also nonproprietary system to use, although design for corporation use [44].

CSUQ consists of 19 statements to which the respondent replies by 7-point Likert scale, as depicted in Appendix B. The main categories of the CSUQ are: System Usefulness (statements from 1 to 8), Information Quality (statements from 9 to 15), Interface Quality (statements from 16 to 18) and Overall Satisfaction (statements from 1 to 19). Unlike SUS, CSUQ has also possibility to answer "N/A" and all the statements are positive. CSUQ has also been regarded to be very similar to Post-Study System Usability Questionnaire (PSSUQ), also developed by IBM, with the difference being the context of research; CSUQ is designed for non-laboratory setting in contrary to PSSUQ that is supposed to be conducted as a part of usability study. [45]

3.4.5 QUIS

The Questionnaire for User Interface Satisfaction (QUIS) is proprietary, although licensable, questionnaire that was developed at the University of Maryland. The QUIS was designed to assess users' subjective satisfaction with specific aspects of the human-computer interface and is regarded to be reliable across many types of interfaces (QUIS, 2011). QUIS consists of 27 rating scales divided into five categories: Overall Reaction, Screen, Terminology/System Information, Learning and System Capabilities. Ratings are done through 10-point scale, having statement dependent extremities, as depicted in the Appendix C. [33]

3.4.6 USE

Usefulness, Satisfaction, and Ease of Use (USE) questionnaire was developed by Arnold Lund as a means for understand the competence of interface of a system and to be sure that developed products could have a "usability seal of approval". USE questionnaire consists of 30 rating scales divided into four categories: Usefulness, Satisfaction, Ease of Use and Ease of Learning. Each of theses categories have several statements that are supposed to be rated with positive 7-point Likert scale. The statements are shown in Appendix D. [47]

As all of the statements have been answered, the summarized results can be compared to benchmarking levels for understanding the competitiveness of the particular product or as to understand what UX areas the product successful at and which need improvement.

3.5 Comparing the self-reported metrics as UX data collection method

From the point of view of PowerKiss, the main features of the questionnaire include (among the other requirements that were discussed in chapter 3.3) the length of the survey (how demanding the questionnaire is for the respondent), the availability of the survey and how well it represents the different areas of UX. The questionnaires that were introduced above are represented in a table below (table 1) according to these elements.

Table 1: Introduced Post-session questionnaires according to their features

Survey Name	Abbreviation	Developer	Survey Length	Question Type	Availability	UX representation
System Usability Scale	SUS	DEC	10	5 point Likert	Free	One overall usability score
Computer System Usability Questionnaire	CSUQ	IBM	19	7 point Likert	Free	Usefulness, Information, Interface, Satisfaction
Questionnaire for User Interface Satisfaction	QUIS	University of Maryland	27	10 point Likert	Licensable	Overall, Screen, Information, Learning, Capabilities
Usefulness, Satisfactions and Ease of Use	USE	Lund	30	7 point Likert	Free	Usefulness, Ease of use, Ease of learning, Satisfaction

Comparing the discussed questionnaires, Albert and Tullis [33] have argued that SUS appears to yield more consistent results on relatively small sample sizes compared to QUIS and CSUQ (the USE was not part of the research), and base it on the use of both positive and negative statements, thus keeping the participants more alert. But as basic SUS does only provide one, general value of the system perception, it is not valid for researching the adequacy of subareas of the UX in designing project. For example, from one general value it is impossible to say what elements of the UX have been affected by re-designing or other development if these subareas are not depicted or categorized and this is seen as important information for the organization. As it is previously discussed, a young, asset-sensitive company would rather use publicly free questionnaires, so the use of QUIS is not in the scope of the organization.

As it is seen in the table 1, the surveys do not capture entirely the rich and complex features of UX (the features of UX are discussed in more detail in chapter 2), but rather different parts of it. As the questionnaires are developed mainly during the era where HCI field researchers were concentrated on the usability aspects of the product interaction, it is obvious that this is reflected to the research methods. Although the ISO's definition of UX depicts that the UX can be assessed via "usability criteria" [8], in order to fulfill the needs of PowerKiss, the questionnaire must have broader approach to UX, not only usability.

Also, most of the questionnaires are too long for implementing in the target environments, such as cafes and restaurants. The questionnaire sheet must be so light that anyone could possibly fill it without feeling fatigued or bothered: the more the questionnaire will require from the respondent, the more likely the number of answered questionnaires will be low.

Even the lightest of the questionnaires above, the SUS, is using 10 different statements, which is seen as too many from the point of view of PowerKiss and its partners.

The questionnaire should also address the PowerKiss' brand, as the brand is seen as a highly valuable asset of the company and none of the surveys discussed have taken organizational branding aspects into account. NN/g has pointed out the significance of the brand in UX formulation (see figure 5). Furthermore, resent studies have shown that technology brand products, such as Apple's devices, can evoke the same response in brains as religious imagery does in people of faith [48]. This depicts the importance of understanding how people perceive the current brand of PowerKiss and to reflect it with PowerKiss' intentions, being a major part of the UX.

In addition, the questionnaire should map in simple but creative ways who are the primary users of the wire-free charging at the moment, having more qualitative descriptions of them. The reasoning above depicts the need for designing a proprietary questionnaire for the use of PowerKiss, based on the most essential features and aspects of the introduced surveys. This will be discussed in the next chapter.

4 Designing UX measurement tool for PowerKiss

4.1 Introduction to the UX questionnaire

As noted in the previous chapter, the introduced post-session questionnaires do not address PowerKiss' needs for UX mapping and research. Nevertheless, these questionnaires represent the wide understanding of user research to date, taking into account several critical factors and have been evaluated for years. Regarding the above, it seems to be hard to get access to evaluation methods publicly available that would address the topic better than the ones that were introduced in the previous chapter. The decision on designing a new, proprietary post-session research method that is based on the surveys introduced before seems to be most suitable from the point of view of PowerKiss. In this way, the fit of the questionnaire can be optimized for the individual needs of the company, still using the state-of-the-art knowledge of the user research methods in the world today.

There are pros and cons in designing own, proprietary research method. As discussed above, the main benefit is optimization the data collection to the use of PowerKiss. Other benefits include selecting the best practices of the known methods, thus having possibility to develop a new integrated and enhanced research method that is using the most efficient features of the known methods. Also, there is then possibility to include or exclude selected features, such as adding brand assessment and user description parts that were seen as important aspects.

The aggregation of the research methods does have also challenges. Regarding the research design challenges, such as biases and data validity, the integrated questionnaire will have complex position, because of not following the original patterns and question deployment. In quantitative research, there are several factors affecting the validity of the collected data and in viable questionnaires these have been considered taken into account at the design of the questionnaire form. These include for example causality of variables (in what order should the statement be presented to maximize the validity of data), the type and form of the questionnaire (the instrument of the research affects the data collection) and, as discussed throughout the chapter 3.4, the expression of the statements [49]. Naturally, the emphasis of the research design challenges is even greater when assessing complex phenomena such as UX, when the target is to simplify and compress the reality. Also designing a new, proprietary questionnaire will affect the benchmarking properties of the questionnaire results, making the data incomparable with the data collected via other established methods.

Summarizing the above reasoning, the designed questionnaire should have four different outcomes of the collected data: an overall metric for rating the overall UX of the wire-free charging system, a metric for the different UX subareas that, from the point of view of PowerKiss, do comprise the overall UX, brand assessment metric and a description of the user. The first two ones are going to be dealt through quantitative means and the last two through qualitative means.

4.2 The quantitative part of the questionnaire

4.2.1 Choosing the UX subareas that are dealt through quantitative means

Assessing the complex phenomenon as UX in a single, short questionnaire is definitely a challenge, as there are no viable options that could be implemented. A viable approach to this is through the elements of the reviewed questionnaires. Selecting the elements that are closest to the definitions of the UX and combining them can offer means for understanding what elements should and could be assessed in the questionnaire through quantitative means.

A good starting point for understanding what subareas should be assessed, is through NN/g's UX optimization model that was introduced before (see figure 5). According to this, the UX builds around the utility of the product. As it is shown in the picture, this element can be addressed by questioning is the product useful and does it meet the needs of the user. Second layer is the perceived usability of the product that can be addressed through definitions of the usability: effectiveness, efficiency and satisfaction [8]. The next layer is concerned with the desirability of the product, as does the user like the way the product looks and feels. The final element is the brand experience, the way that the user is feeling towards the brand of the product.

Assessing the aspects of the questionnaires as depicted in the table 1, it is obvious that there are similarities within the subgroups of the questionnaires and the UX definition, particularly the NN/g's model of UX. The QUIS questionnaire will not be addressed further on, because of the licensing restrictions. The UX subareas from the different sources are listed in table 2. Although SUS does not have official subareas (it is rather used for having one universal value), the statements are interpreted here to fall to some subareas.

Table 2: The UX subareas according to their reference

UX subarea	Reference
Attractiveness	NN/g
Brand	NN/g
Complexity	SUS
Confidence	SUS
Consistency	SUS
Cumbersomeness	SUS
Ease of learning	SUS (x2), USE
Ease of use	SUS (x2), USE
Effectiveness	NN/g
Efficiency	NN/g
Information quali	CSUQ
Integration	SUS
Interface quality	CSUQ
Overall scale	CSUQ
Satisfaction	NN/g, SUS, USE
System usefulness	CSUQ
Usefulness	NN/g, USE

At this point, it is beneficial to discuss the usage of PowerKiss' products in typical environment, so the UX subareas can be reflected to the actual case. As discussed in the first chapter, the most significant competitor of wire-free charging is the regular charger and the usage paradigm that people have become accustomed with. Introducing a new and novelty product that does the same thing but differently, more user-friendly, has to pay special attention on the UX optimization because the core values are mostly based on convenience and easy usage.

The core innovativeness of the wire-free charging comes from freeing the users from carrying around bigger regular chargers, removing the need for searching a power socket under the tables and using time for sorting out the power cables and also offering more aesthetic solutions in interior design, as the cable clusters are not regarded as very aesthetic by default. As one could note, these are the elements of life easing products that usually rely their success in their additional value offering, as opposed to the absolute need of it. In this sense, the user adoption of the wire-free charging system becomes critical for the company success. Optimization of UX means also the optimization of user adoption, as the overall strategy for progressive user adoption starts from satisfying the user experience. [50]

In order to understand what are the critical factors and elements from the point of view of UX, the typical user path must be discussed. In figure 4, the user path in a typical environment that is offering the PowerKiss service. As it is seen from the last picture in the figure 4, the actual usage can be regarded to start when the user is at the wire-free charging table. In order to use the service correctly, the user needs to know what kind of Ring is needed for the particular phone, how to attach it correctly and how to place the phone on the table correctly. As explained in the first chapter, the features of commercial use of inductive based power transaction do cause some restrictions of technology deployment. The area of the charging field is relatively small and user needs to place the device quite accurately on the tabletop, although the charging area is approximately 60mm wide.

Because the wire-free charging system cannot directly manage what and how does the device message about the actions, there must be viable response at every step that the user does, so it obvious is something done correctly or incorrectly. One of the elements that affect the final experience of the usage of the products is comparison with the regular charger, as it is the charging paradigm, which is familiar to the user. As everything that the system actually does, from the start of the charging to completion of the charging, are intangible for the user, it is important to indicate the progress and give cues about the system performance systematically. In the end, the performance is perceived through the indicators of the device and actual experiments, e.g. trying to make a phone call or switch on the device. Reflecting the UX subareas in table 2 to the actual use of the PowerKiss products, a new table can be formed, with associations to user path, depicting the importance of these different areas. These are showed in table 3.

Table 3: Table of UX subareas according to their reference and PowerKiss user path

UX subarea	**Representative phenomenon**	**Reference**
Attractiveness	The degree of emotional interest towards the system – particularly important for users that are not in actual need of charging their devices and thus bottleneck for starting the user adoption	NN/g
Brand	Representation of the identity of the company – the degree of interaction that the user wants to have with the company's products	NN/g
Complexity	How complex it is to use the PowerKiss system, the more complex is the system, the more unlikely the user is to reach the goal (getting device charged)	SUS
Confidence	The degree of which the user trusts in the system and its performance	SUS
Consistency	How consistently the system is performing, the more consistent it is, the less stressful and cognitively demanding is the actual usage. For example, every time phone with dead battery is placed on the charging area, the system would give exactly the same response	SUS
Cumbersomeness	The degree of cognitive demand for understanding the system, also intuitive usage and signaling for the user	SUS
Ease of learning	How easy it is to learn to use the system, the easier it is, the more likely the user is to repeat the usage. If the system is highly demanding to learn to use, it will decrease the amount of users reaching the goal of the system and using the system more frequently	SUS (x2), USE
Ease of use	The degree of perceived easiness of usage, how easy it is for the user to achieve the goals with the system. For example, how easy it is for the user to get the phone charging and keep it charging, until it is charged	SUS (x2), USE
Effectiveness	The accuracy and completeness with which the user can get the device charging and charged	NN/g
Efficiency	The extent of how much effort the user has to put into the usage of the system, compared to the outcome. Can also be regarded as a perception of the system performance, for example, how long the user has waited in order to get charge to the device. Particularly important in the comparison between wire-free charging and regular charging	NN/g
Information quality	The degree of perceived adequacy and intuitiveness of the information within the system. E.g. how intuitive are the messages that are given to the user through the system and about the system.	CSUQ
Integration	The degree of integration of different functions in the system. E.g. how well the starting and ending of the charging were integrated as functions	SUS
Interface quality	The degree of interface quality, in this case, the interface is actually composed of the device being charged, the Ring and the charging area	CSUQ
Overall scale	-	CSUQ, SUS
Satisfaction	The freedom of discomfort and positive attitudes towards the use of the product. In this case, the final satisfaction encompasses the possibility of repetition of the usage in the future, being a significant part of the user adoption	NN/g, SUS, USE
Usefulness	User's perception of the degree of usefulness of the wire-free charging. Represents the possibility of acquiring the actual products and taking them into more regular use or even the perception of being more useful than the regular charger	CSUQ, NN/g, USE

According to the requirements of short and easy questionnaire, only few of the subareas are chosen for assessment. In order to get as wide representation of the UX as possible, the only one statement is chosen to represent one subarea. Through assessment of the above and the case specific UX understanding (see table 3), the following subareas are selected to represent the quantitative section of the questionnaire: attractiveness, ease of use, ease of learning, efficiency, satisfaction and usefulness.

4.2.2 Forming the statements for the UX subareas

As the questionnaires assess the evaluation through different statements, the link between UX subarea and statement can be formed. The links between UX subareas and statements with the reference data are represented in table 4.

Table 4: The UX subareas linked to different statements

UX subarea	Statement	Statement reference	Remarks
Attractiveness	I like how this product looks and feels	NN/g	
Ease of use	I thought that the system was easy to use	SUS	
Ease of learning	I would imagine that most people would learn to use this system very quickly	SUS	
Efficiency	I am able to efficiently complete my work using this system	CSUQ	CSUQ used this question originally for System usefulness
Satisfaction	I would recommend it to a friend	USE	
Usefulness	I think I would use this system more frequently	SUS	

Hassenzahl [35] argued that the best way to map UX through questionnaire is to have the assessments are based on subjective, experiential statements and questions. This approach depicts the importance of formulation of the statements, in order to emphasizes the respondent's personal experiences towards the product rather than having absolute statements. For researching the UX of a product, by definition the statement should include the personal and subjective assessment claim, rather than having universal and absolute claims. Comparing the statements in the table 4, it seems that they are actually formulated already in this subjective manner. For example, the statement for attractiveness by NN/g is "I like how this product looks and feels" being much more personal than "This product looks and feels good". However, the statement for efficiency is "I am able to efficiently complete my work using this system" and that should be reformed to address the personal statements better, as "I feel that I am able to complete my work using this system".

The statements should also be formulated better to apply to specially PowerKiss' system, also having in mind that the product system can be regarded as new to the respondent. The novelty brings other challenges to the formulation of the statements, because users can be considered to be almost completely unaware of the system's performance attributes and features. Regarding this, it would be best to address the expected performance to the perceived performance. Considering the above reasoning, the statements in the table 4 can be re-phrased to suit this questionnaire's goals better. These modified statements are shown in table 5.

Table 5: The of modified statements

UX subarea	Original statement	Modified statement
Attractiveness	I like how this product looks and feels	I like how these PowerKiss products look and feel
Ease of use	I thought that the system was easy to use	I think that the wire-free charging was easy to use
Ease of learning	I would imagine that most people would learn to use this system very quickly	I would imagine that most people would learn to use this system easily
Efficiency	I am able to efficiently complete my work using this system	I think the wire-free charging worked as it was supposed to
Satisfaction	I would recommend it to a friend	I would recommend these PowerKiss products to a friend
Usefulness	I think I would use this system more frequently	I would like to use these PowerKiss products more often

As one of the major design drivers for the questionnaire is the easiness and simplicity from the point of view of the respondent, the 5-point Likert scale seems to be appropriate tool for mapping the answers. Using more than 5 anchor points could possibly affect the layout of the questionnaire and provide too difficult descriptive terms for each point, lowering the amount and quality of answers. Using the Likert scale can also cause bias in the answers; avoidance of these challenges is discussed in the next chapter.

4.2.3 Avoiding biases and errors through questionnaire design

Using the Likert scale for response mapping has also potentiality for data distortion. There is number of different types of biases and errors that might affect the data collected, including central tendency error, acquiescence bias and social desirability bias. Central tendency error is caused by the reluctance of respondents in answering the most extreme responses during the evaluation, despite the actual performance of the subjects [51]. This results in biased emphasis of the middle scale. Acquiescence bias is tendency of agreeing with a statement, independent of its content, resulting in high susceptibility of agree/disagree questions, especially when the respondents are less motivated to optimize their answers [52]. Social desirability bias can be defined as “the tendency for people to present themselves favorably according to current cultural norms” [53]. This may cause the respondent to over-report or under-report, depending on the situation [52].

The primary procedural method for controlling acquiescence and central tendency error has been the use of balanced scales in which half of the items are positively worded and the other half are negatively worded [52]. Although this method does not eliminate the possibility of bias, particularly acquiescence, some researches argue that it has had a positive affect on questionnaire data validity. For example, Tullis and Albert [33] argue that the reason why SUS is seen to yield more consistent rating then QUIS and CSUQ, is the use of both positive and negative statements. In marketing sense, the balance between positive and negative statements has to be still assessed carefully, in order to avoid the possibility of negative associations towards the brand for no reason.

Considering the above, the UX subarea statements can be balanced through changing half of them as negative. These balanced statements are presented in table 6. The order of the statements is also revised, for having easier and more logical approach to filling the questionnaire and taking into account the possible negative/positive affect on the brand. For example, the easiest way of starting the questionnaire would be with the ease of use ("I thought that the system was easy to use"), because of its easy approach and not leaving suggestive negative statement as last, such as "I WOULD NOT recommend these PowerKiss products to a friend". It is generally advised that the questions should follow a pattern where the first ones are easy and intriguing, having the middle part cover more difficult areas [13].

Table 6: The balanced statements

UX subarea	Original statement	Modified statement	Balanced statement
Ease of use	I thought that the system was easy to use	I think that the wire-free charging was easy to use	I think that the wire-free charging was easy to use
Efficiency	I am able to efficiently complete my work using this system	I think the wire-free charging worked as it was supposed to	I think the wire-free charging DID NOT work as it was supposed to
Usefulness	I think I would use this system more frequently	I would like to use these PowerKiss products more often	I would like to use these PowerKiss products more often
Satisfaction	I would recommend it to a friend	I would recommend these PowerKiss products to a friend	I WOULD NOT recommend these PowerKiss products to a friend
Attractiveness	I like how this product looks and feels	I like how these PowerKiss products look and feel	I like how these PowerKiss products look and feel
Ease of learning	I would imagine that most people would learn to use this system very quickly	I would imagine that most people would learn to use this system easily	I would imagine that most people WOULD HAVE PROBLEMS using these PowerKiss products

For preventing the bias caused by social desirable responding, the most common method has been assuring the respondents to have anonymity [52]. As it is in PowerKiss' incentives to understand who are the customers, there will be voluntary part for identifying the respondent but it will be located at the end of the questionnaire so the respondent do not have to start from that. Also, possibility to leave contact information would be valuable in terms of sales. Another way for reducing the social desirable bias is having respondents filling the questionnaires without direct presence of the researcher. Researches have shown that distant surveys are generally less influenced by social desirability than face-to-face or telephone interviews [54].

4.2.4 Calculation of the UX values

The quantitative questionnaire concerning the UX will have two different sets of outcomes: an overall metric of the UX and six different metrics that assess the subareas ease of use, efficiency, usefulness, satisfaction, attractiveness and ease of learning. The metrics are going to be evaluated on scale from 0 to 100 in order to follow the scale assessment that is familiar from the SUS questionnaire. Regarding this, the answers from the Likert scale must be converted from the scale 1 to 5 to be equivalent with scale 0-100. Each answer is going to be processed according to the table in the table 7.

Table 7: Table for converting the Likert scale results to scale of 0-100

UX subarea	Balanced statement	Equivalence	
		Likert	0-100
Ease of use	I think that the wire-free charging was easy to use	1	0
		2	25
		3	50
		4	75
		5	100
Efficiency	I think the wire-free charging DID NOT work as it was supposed to	5	0
		4	25
		3	50
		2	75
		1	100
Usefulness	I would like to use these PowerKiss products more often	1	0
		2	25
		3	50
		4	75
		5	100
Satisfaction	I WOULD NOT recommend these PowerKiss products to a friend	5	0
		4	25
		3	50
		2	75
		1	100
Attractiveness	I like how these PowerKiss products look and feel	1	0
		2	25
		3	50
		4	75
		5	100
Ease of learning	I would imagine that most people WOULD HAVE PROBLEMS using these PowerKiss products	5	0
		4	25
		3	50
		2	75
		1	100

The overall metric will be an average of the six values from the subarea assessment. The overall metric will thus be calculated with equation (1):

$$UX_{tot} = \frac{1}{6}\sum_{i=1}^{6} x_i \tag{1}$$

where x_i is the converted value of a UX subarea.

Both the overall UX and the subareas are going to be recorded to a database with according mapping possibilities, so that there is information about the respondents answers on single subarea and calculated overall UX. As the amount of data increases, the means of the

different subareas can be calculated to represent the current knowledge of UX segment assessment with equation (2):

$$UX_{sub} = \frac{1}{n}\sum_{i=1}^{n} x_i \tag{2}$$

where x_i is the converted value of one particular subarea and n is total amount of collected values of that particular subarea.

This mean can then be used for organizational assessment of the particular design and its UX subareas. The subareas are meant for segmental assessment of the design and total UX is for general assessment of the design. In order to evaluate the validity of the calculated metrics, error limits should also be calculated. This can be done with standard deviation, which is calculated with equation:

$$s = \sqrt{\frac{1}{N-1}\sum_{i=1}^{N}(x_i - \bar{x})^2} \tag{3}$$

where x_i is the observed value and $\bar{x}$ is the mean value of these values.

4.3 The qualitative part of the questionnaire

4.3.1 Introduction to the qualitative part

As it was stated before, the questionnaire is actually divided into two distinct parts, the first one assessing the UX subareas through quantitative means and the second one using more exploratory approach in order to obtain wider and richer data. The first part of the questionnaire is regarded to be the more important one from the point of view of the case research. The qualitative part is concentrating on understanding the current users of wire-free charging and how they perceive the PowerKiss as a brand. These two are important for UX comprehension but would require much deeper analysis and data collection that is possible to discuss here and address in the simple questionnaire. The main point of the brand and user assessment is to get initial data and knowledge about the topics, thus being addressed in much more open and unbounded way. It is recommended that this part of the questionnaire would be addressed in deeper and more detailed means later on, in order to gather more ecologically valid data.

4.3.2 Brand assessment

As brand is been recognized to be a strong component of PowerKiss' products, it is clear that the brand assessment should be included in the research. The underlying challenge in the brand assessment is that brands are complex entities and cannot be measured by just one parameter [55].

Researches done by de Chernatony, Drury and Segal-Horn [56] and de Chernatony,

Dall'Olmo Riley and Harris [57] have shown that any assessment of a brand's performance needs to be based on measuring internal and external factors of the organization, making the brand assessment much more complex than just mapping users reviews.

Also, after launching a new brand, the acceptability will become apparent over time as the customers and stakeholders respond to the brand [55], so if the brand is unknown to the customer at the point of evaluation, the responses are based on the marketing material available at the scene of the research. Regarding this, the most suitable way to address the brand of a start-up company is an exploratory, qualitative approach. The brand assessment question is: "What is the first thing that comes into your mind when you think of the PowerKiss logo?"

An interesting approach to brand assessment is by BrandTags, a collective online experiment in brand perception, as they argue that "brands exists entirely in people's heads" and thus a brand is whatever customer says it is [58]. Using this argument, the brand assessment in the questionnaire is going to be an open-ended question regarding the feelings that respondents have towards the PowerKiss logo, using it as a reminder and variable of forming an opinion. The descriptions are going to be analyzed as "word cloud", a weighted, graphical diagram, where the phrases and words that have been more frequently expressed are portrayed as bigger, emphasizing the dominant elements. These images can be created with free online software as Wordle or other graphical designing tools, such as Adobe's InDesing with according expansions. An example of using Wordalizer for generating random word cloud is presented in figure 10.

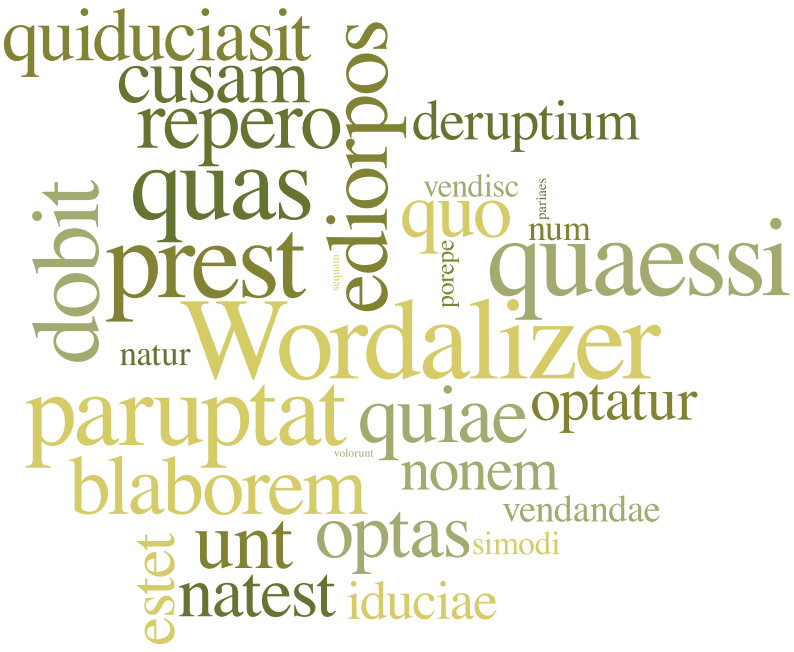


Figure 10: An example of word cloud generated with Adobe InDesign using pseudo language with Wordalizer

4.3.3 User description

PowerKiss has not mapped extensively and systematically how are the actual users of the wire-free charging system at the moment. As this data is critical for organizational operations, for example choosing the right promotional type to assess the particular segment's preferences, choosing features and attributes for further development and building general understanding of use cases, it is seen as important element of this research.

As the elements underpinning the user descriptions are not known in advance, such as clear demographical attributes, a broader, more exploratory approach is preferred. In this way unexpected and possibly advantageous data can be discovered. The open-ended question is guided yet by emphasizing the name and activities that the respondent sees as important to address. In this manner, the validity and future segmentation is ensured better than leaving it completely unguided.

As the data is collected, it will be analyzed further, with possibility of clustering and segmentation of the data, in order to create user profiles. The challenge with creation of user profiles for new technologies is that the new technologies tend to create new categories as the new opportunities are recognized [59]. So in order to have understanding about the possibilities of user types, a broad approach is required first and processed as the data about users is collected. The final open-ended question is: "Tell us something about yourself! What is your name and what do you do?"

4.4 The completed UX questionnaire

4.4.1 The final design of the questionnaire

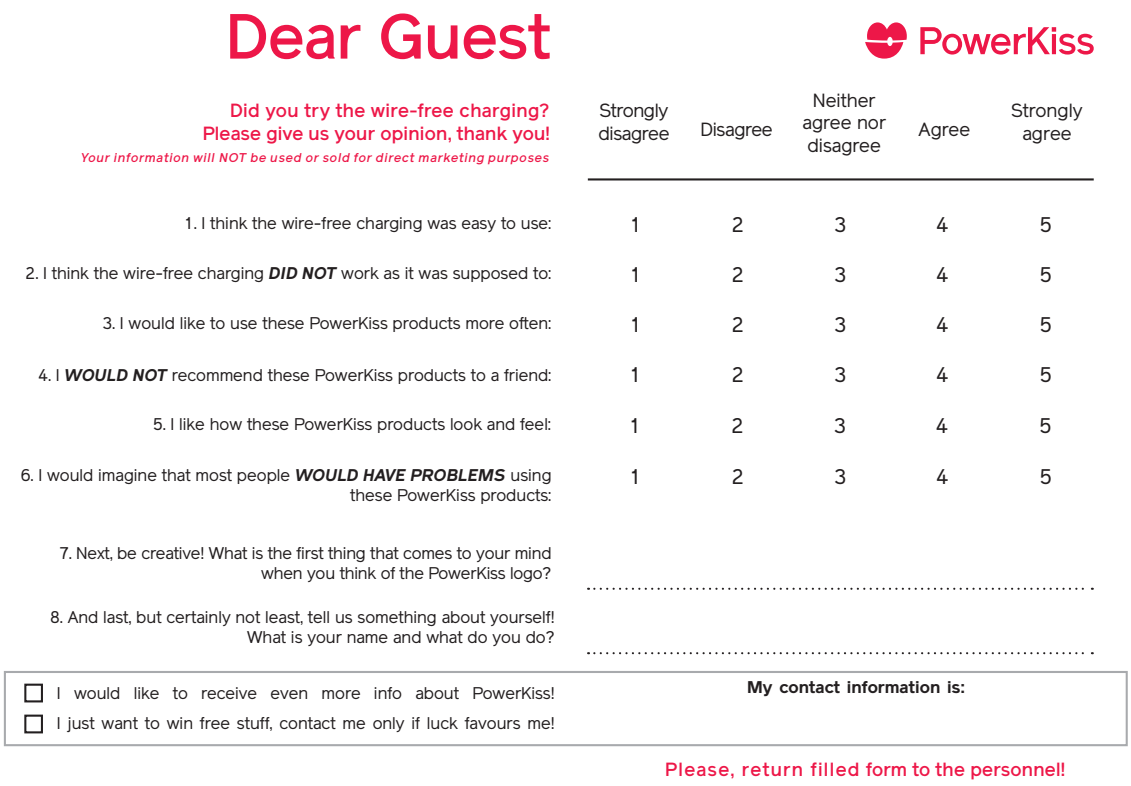
The PowerKiss UX questionnaire designed here is a business tool for understanding the quality and the weight of different elements of the UX. The highly complex entity of UX is broken down into smaller areas that together represent the total UX, offering also means to address the functionality of the organization from the point of view of the user. The ultimate goal of the questionnaire is provide a tool for business decision-making about product design, giving systematical and easily accessible metrics that are based in the real, subjective experience of users, rather than relying only on intrinsic and introspective knowledge.

The questionnaire can be divided into two separate parts, first part addressing the UX in quantitative means and second offering means to map user types and brand experience. The first part is the main tool for UX mapping, second being additional part, and giving mainly supplementary and initial information about the brand and user types. The first part consists of different claims that the user answers according to the level of agreement, giving ultimately score between 0 and 100, the higher score indicating better experience. The UX subareas that the questionnaire addresses are: attractiveness, ease of use, ease of learning, efficiency, satisfaction and usefulness. The answers can be utilized as subareas, highlighting one element of the UX or by one, collective score that is calculated from all subareas.

In the final questionnaire form has to also include corporate brand elements (especially if co-branding is needed), introductory text, instructions and the general layout. The general design should be simple, giving enough room for the answers and having clear sections. The instructions are vital, so they must be simple and clear, especially when

English is the language that is going to be used in the questionnaire (native speakers are probably not representing a significant number of the respondents). The introductory text should explain the purpose of the survey, assure confidentiality and encourage reply. [13]

As a method for encouraging a high response rate, companies have usually used some motivational elements, such as rewarding the respondents. This is also seen to be a method for lowering the questionnaire biases, such as central tendency error and acquiescence bias as respondents might feel that their performance could affect the possibility of receiving the reward. Also, the open-ended definitions of users might be more realistic and adequate if the respondent feel that they can be contacted afterwards. On a downside, this might strengthen the social desirability bias as negative statements could lead to negative impressions about the respondents and thus affecting the relationship of the organization and the respondent. In summary, every element in the sheet aims for lowering the threshold of filling out the questionnaire in appropriate manner. The final design is presented in figure 11.


Dear Guest

PowerKiss

Did you try the wire-free charging?
Please give us your opinion, thank you!

Your information will NOT be used or sold for direct marketing purposes

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
1. I think the wire-free charging was easy to use:	1	2	3	4	5
2. I think the wire-free charging ***DID NOT*** work as it was supposed to:	1	2	3	4	5
3. I would like to use these PowerKiss products more often:	1	2	3	4	5
4. I ***WOULD NOT*** recommend these PowerKiss products to a friend:	1	2	3	4	5
5. I like how these PowerKiss products look and feel:	1	2	3	4	5
6. I would imagine that most people ***WOULD HAVE PROBLEMS*** using these PowerKiss products:	1	2	3	4	5

7. Next, be creative! What is the first thing that comes to your mind when you think of the PowerKiss logo?

.....

8. And last, but certainly not least, tell us something about yourself! What is your name and what do you do?

.....

☐ I would like to receive even more info about PowerKiss!
☐ I just want to win free stuff, contact me only if luck favours me!

My contact information is:

Please, return filled form to the personnel!

Figure 11: The final design for the PowerKiss UX questionnaire

4.4.2 Testing the final design of the questionnaire

The questionnaire was also tested shortly with different product design. The questionnaire was implemented in some environments that offer the service of wire-free charging with PowerKiss products, with three different product designs. From these designs, the first one had a significantly smaller charging area, with less intuitive unification between the receiver and the charging area. The others two were somewhat alike, with the current wire-free charging user interface design. The results from the data collection are shown in the table below. The total amount of the responses was 17.

Table 8: Results from the testing of the questionnaire

Design	Ease of use	Efficiency	Usefulness	Learnibility	Attractiveness	Satisfaction	Total UX	N
1	75	70	66,66666667	79,16666667	62,5	62,5	69,3	7
2	100	100	93,75	87,5	75	93,75	91,675	5
3	90	85	95	80	70	85	84,166	5

Assessing the data, it seems that the questionnaire yielded results that are in line with the organizations own perceptions; the first design was significantly perceived to have smaller UX indicator than the two others, which were quite similar.

4.5 Using the data within the organization

As discussed in the earlier chapters, the primary goal of the questionnaire is to provide easily assessable metrics that help doing business decisions by connecting the user behavior to financial metrics. The better the understanding of the formulated UX is, the better PowerKiss can follow and evaluate its own processes. As UX is considered to be a complex and difficult entity to manage, the questionnaire is providing simplified metrics that assess the different parts of the UX. As these different parts of the UX are operated mainly in different parts of the organization (e.g. R&D is responsible for efficiency of the technology and industrial design for the appearance), this information can help understanding how the organization and its different sections performed in this particular project. Without any metrics, the decisions are based in entities, such as sales figures, that are hard to link directly the organizational actions.

In order to integrate the UX evaluation to the organizational processes, a system of assessing the business decision from the point of view of UX should be introduced. Hirsch et al [25] have presented a cyclical model of addressing the business decisions through UX evaluation, calling it The User Experience Value Chain. This model depicts the integration of the project design development in the business decision-making, where the business decision can be reflected to UX management and development. For example, if the organization has indentified a business opportunity in target markets, it can communicate it through the means of the UX, having the UX description stating what the product should represent. In this ways, the product can be assessed through the UX metrics, for assessing the final result, e.g. were the goals of the product development fulfilled. Using the questionnaire designed for the use of PowerKiss, the initial UX metrics

can be obtained from real-life situations and thus having a comparative value for the project success. The project can be assessed through individual subareas of the UX or by the total value of UX.

The data can be presented in various ways; in the means to represent the data should be decided according to the audience. In general, most authors suggest using graphical means as they are seen as effective and universal for distributing the data. This particularly useful when the data represent multiple dimensions [33], as in this particular situation. The subareas of the UX can be plotted in a radar type chart, so it represents all the data at once, having an overall and sub values. An example of using radar type chart for presenting the data from three different designs is shown in figure 12. The data for this chart was taken from the actual questionnaire test with the organization and its users, discussed above.

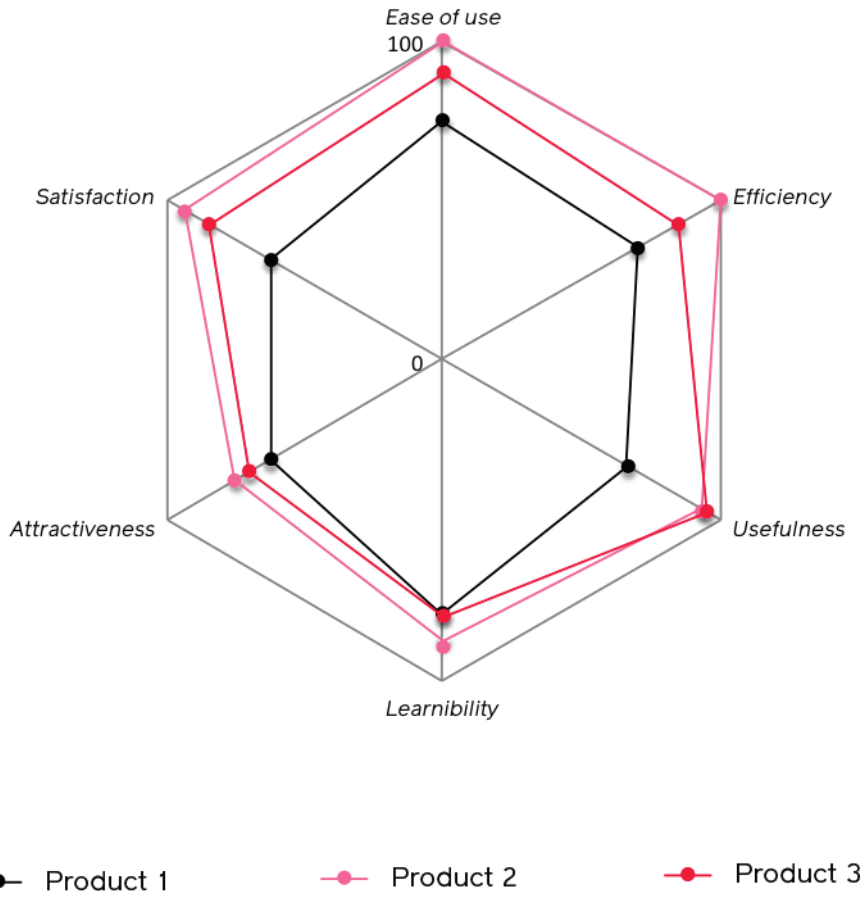


Figure 12: An example of presentation of UX metrics in a radar chart in order to compare different designs

Having the data from one design also provides benchmarking data, to which the next projects can be compared and reflected. Especially this is important in cases where there has been found challenges in some subareas of the UX. For example, if the collected data shows that efficiency of the product is perceived as weak from the point of view of users, an R&D re-design project can be started. As starting the re-design project, the improvement

of UX metrics can be stated as project goals. In this way, the project outcome can be addressed directly through the subarea, thus having ability to allocate resources in agile but systematic ways and still be reflected with the actual users' perceptions of the product. In this way, the users are integrated into the product design systematically, thus providing valuable insights for the organization.

How the UX subareas can be appointed inside the organization depends on the structure of the organization having possibly overlapping tendencies between the different organizational operations. In the case of PowerKiss, there can be depicted at least following functional parts: R&D, design, usability engineering, marketing, customer relations and business logic. Business logic is referred here as a strategic capability of understanding the business opportunities in the markets, customer relations as supporting channel for the users and design as user interface and industrial design. The distribution of the UX subareas according to the structure of the organization is depicted in table 9.

Table 9: UX subarea distribution within the PowerKiss

Ease of use	**Efficiency**	**Usefulness**	**Learnibility**	**Attractiveness**	**Satisfaction**
Usability engineering	R&D	Business logic	Usability engineering	Design	Customer relations
R&D	Usability engineering	Marketing	Marketing	Marketing	R&D
Design		R&D	Design		Design
					Usability engineering

The UX metrics can also provide a tool for communicating simpler the business goals to the rest of the organization, acting as a channel for design requirements, internally and externally. The strategic views can be assimilated better when they are reflected into a real-life based metrics that encompass the actual work employees are doing. For example, the engineers do not always consider themselves personally responsible for the sales figures as they are for the technological aspects, although increasing the revenues should be an incentive for everyone in the company. Transforming these "distant" objectives into product specific metrics, for example improving the efficiency of the product, the organizational goals could be understood better and more personally.

In order to efficiently use that data, there must be appointed a person who manages the data collection, analysis and recording on constant basis. As the data is collected from business partners and service providers (cafes, restaurant and such), not from places that are managed directly by PowerKiss, the implementation cannot be excluded from marketing. The questionnaire physically acts as a promotional material, both for the end-users and the service provider that will have to be taken into account when planning the research. The service providers usually have own requirements for this kind of material, such as placement in the environment and visibility that might affect the final design of the questionnaire. Also, usually the service providers are interested in the data collected in their premises, so a demand for access in the collected data have to be though of. Regarding this, the management of quantitative UX metrics, have to be a partially involved in the interaction with the service providers.

4.6 Conceptual limitations of the designed PowerKiss questionnaire

Although the designed questionnaire attempts to describe as well as possible the UX caused by PowerKiss and its products, it is clear that short and mainly quantitative method cannot address the whole complexity of the UX. As it was proposed earlier, some authors have suggested that the UX is indistinguishable from an experience, giving the UX much broader meaning and definition. As the term human experience is "almost overwhelmingly rich concept, with a long history of debate" [10], it is clear that single questionnaire cannot describe the whole essence of the UX. The questionnaire is mainly meant to be a guideline and a tool for understanding the easily accessible points of the UX, giving the organization possibility to link the product success to business goals through user centered perceptions.

Setting aside the conceptual challenges, there are also direct challenges that affect the validity of the collected data. As the questionnaire is designed to be filled only once by one person, it gives the impression that the experience does not change after the measuring point, having only one, static value for the experience. It is argued that time is actually one variable of the experience and the experiences do change over time, with constant usage [36] or as memories of the usage. As Van Boven [60] states: "one's memory of an experience can be sharpened, leveled and spun so that the experience seems better retrospect than it actually was". As the experience is a dynamic and ever-changing entity, it should be measured accordingly, not only as a single, static value. An on-going measurement with even simple and unobtrusive method as the questionnaire introduced would need systematic management and integration between users and the organization. A system that would capture the UX even more broadly, including also in-depth data collection, must be designed throughout and be a systematic part of the organizations operations, giving it a significant resource allocation and system implementation to utilize the data accordingly. Regarding this, the optimization of UX knowledge of an organization must have different levels and layers.

5 Discussion

5.1 Introduction to experience centered organization

Throughout this thesis there has been discussion about defining, understanding and measuring the UX, particularly from the point of view of PowerKiss' products. The thesis has covered the current definitions of UX and its effects on the businesses, having pointed out the importance of designing the products through optimal UX. The approach has significantly paid attention towards the organizational operations, having systematic methods and channels of providing the evaluation information from the actual users in a spotlight. Strategic goal of this is to have the whole organization, from R&D to marketing, understand the importance of optimizing the UX in order to design better products and ultimately, to achieve competitive advantages and success. The UX centered organization is not, of course, achieved only by having some systematic methods of user evaluation but the idea needs to be integrated in the organizational behavior and culture. However, the first steps towards achieving this state is by implementing easy but effective system of UX evaluation that binds the different organizational levels together, offering universal means to discuss and evaluate the organizational actions. A system for this was introduced in previous chapter, being the initial channels for creating the UX centered organization.

In a sense, organizations are offering and selling experiences, whether they like or not. The interaction of a customer with a company, regardless of what industry it represents, is encompassed in the UX and is ultimately the reason for the interaction. Generating deliberate experience with defined attributes should be the initial and strategic goal for the organization that will define the actions and operations this organization must undergo in order to achieve the creation of the target experiences. Looking this from the point of view of business, the above forms into question: what kind of experience offering would generate revenues in order to have growth oriented organization? As the target experience is formed and understood, the organization should base its operations in achieving this. In a sense, the UX optimization is a guide for creating viable and sustainable business, not just a product design aspect.

The next chapters are going to discuss the human experiences in more broader sense, including emotional, social and cultural aspects. Also, the essence of successful product design is going to be addressed, trying to make sense why there are particularly successful products that seemingly are not useful for their owners.

5.2 Product success

5.2.1 UX models and product success

The model discussed above and Nielsen Norman Group's organizational UX model (see figure 5) are sufficient ways of integrating the UX mindset into organizations, thus having means to achieve to optimal UX designing processes and thus reliable possibilities for collecting revenues. But are these models universal and absolute? When assessing some of the really successful products in the world today, it seems that they break some of the most initial and essential features of these models. By the term successful it is referred here to also other factors than only sales volumes, such as valuation and accreditation from sufficient parties and impact on the industry the product represents. In other words, a truly successful product can be described as somewhat iconic.

One famous example is Philippe Starck's Juicy Salif, a lemon juice squeezer designed for Alessi in 1990 (see figure 13). Juicy Salif is famous of its bold design perspective, having the emphasis on form rather than function. Although the lemon squeezer has some actual innovative features that do assess some of the usability challenges concerning the lemon squeezing, such as streamlined grooves that guide the juice to fall into a glass straightly, the product itself is regarded difficult to use. The usability challenges derive from the squeezer's legs, which are so long and thin that the user is required to hold down the Juicy Salif in order not the spread the juice around on the surface where the squeezer is actually used, as the squeezer starts to wobble during the usage. And, as the user holds down the squeezer from one of its legs, the holding hand interrupts the juice flow. This results in juice dribbling on the hand, tabletop and floor, but not into the glass. In other words, the element that makes the Juicy Salif usable is by its nature not usable during the usage of the product. [62]

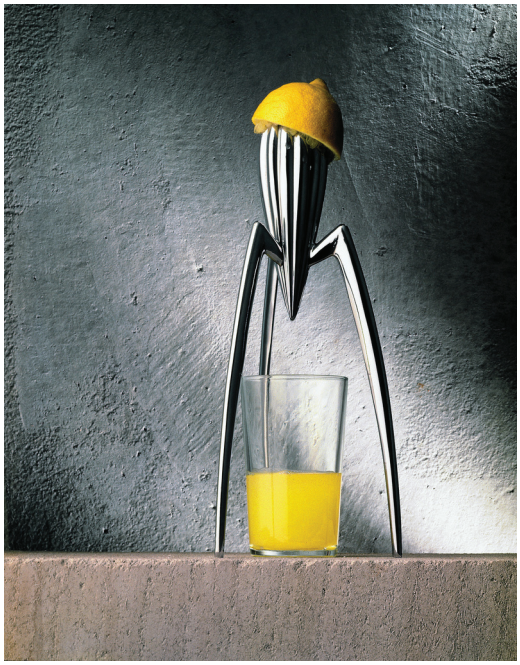


Figure 13. Juicy Salif, a lemon squeezer designed by Philippe Starck

Also, there are versions of the Juicy Salif that are made from other materials, such as gold, than aluminum and some of these even have a label with them that they are not meant for lemon squeezing. The designer, Philipper Starck, is also rumored to have said: "My juicer is not meant to squeeze lemons; it is meant to start conversations." [61]

Another example of not useful, or at least with bad usability products include the AJ cutlery, a set of cutlery that has futuristic and interesting design elements but hard to use for efficient eating and Nathan Horwitt's Museum Watch that does not have any numbers, symbols or lines to mark hours and minutes. In the other end of the iconic products that are actually famous for their usability, are Apple's iPods, the mp3-players that became an icon for a whole generation. The simple, yet effective usage of the UI has made the competitors pay more attention to the design of the mp3-players, forcing them to innovate

over the normal array of buttons. The sales of iPods had reached the 100 million mark within 6 years, having 4,000 related accessories [63]. The same brand has evoked other products that have been praised for their usability, such as Macintosh, and have also been successes. [62]

Although the listing above is relatively small and insufficient for universal comparison, it is obvious that the models of UX optimization discussed before are insufficient in providing universal solutions for designing successful products. In order to understand why products that are actually not usable or useful can be successes, one has to go beyond rational reasoning.

5.2.2 Emotions, brands and product success

In Western world, human emotions have been usually looked as disruptive and harmful, opposed to logical, rational thoughts that are necessary for mastering the irrational emotions. Only recently the fact that emotions serve as functions and actually are necessary for survival has taken more ground. The latest studies show that emotions are adaptations of the environment for the individual experiencing them, offering means to act in the environment accordingly. It is hypothesized that emotions reflect important functional relationships for the individual with the environment, giving means to figure social dilemmas, moral judgments and other decisions, also offering channels for universal communication. Also, emotions enable rapid orientation, having means to interrupt on-going processes so that the individual can direct attention to threats or opportunities in the environment. [64]

Antonio Damasio [65] has researched several patients with brain lesions that affect the emotional response they experience. These lesions were considered to hinder or almost completely block the ability to experience emotions. In these studies, the patients have shown to have intact intelligence (some patients could even be described as highly intelligent) and rational reasoning but still unable to lead their lives properly, especially because doing decisions that can be described as completely unintelligent, both socially and rationally. Damasio shows that defects in experiencing emotions lead to a stage where the patients had significant difficulties making decisions, being unable to choose effectively, choosing badly or not being able to choose at all.

As a result, the emotions are considered to be necessary for individuals as they offer means to plan future and enable decision making over matters that would be otherwise insolvable rationally; rather than examining every possible option for acting in a situation that requires decision making, some options are automatically blocked emotionally and others are more attractive [64].

Looking this from the point of view of product design and business opportunities, the emotional context and attributes of a product do play a major role when designing the optimal UX. As the emotions are the guiding element in decision-making, in order to achieve positioning advantages compared to other products, the product should address this matter by enhancing the emotions that are associated with product adoption. In other words, the product should be capable of elevating emotions. Using this emotional design, the target customer group is more prone to use and acquire the particular product, as it assesses the decision making positively.

Researches have actually shown that emotional reactions are 80% faster than cognitively filtered reactions to brand stimuli. Also, the parts of the brain that are associated with emotional processing are reported to send 10 times the data to areas that are responsible

for higher cognitive actions, such as rational thinking, compared to what it sends back to the areas of emotional processing. (The Economic Times, 2009)

This all depicts that emotions are not just irrational, but rather compulsory part of humans existence. In the examples of not usable products that still are successes, the emotional parts of the experiences are so dominant that they override the rational side of the purchase decisions. And as the company or designer brands are regarded to be one of the sources of the emotional commitment, means to add value to customer's lifestyles, they are close to the emotional product success management [55]. A position where a brand can evoke almost religious emotions, like in Apple's case, the company can be sure to have addressed this well [48].

5.2.3 Social meaning of products

As it was discussed before, the success of a product can sometimes seem irrational and thus, in order to understand what elements make up the ultimate UX, other attributes have to be discussed. Alongside the emotions, social elements are ultimately important. It is claimed that the evolutionary adaptedness of human was not defined by adaptation to surroundings, such as hot or cold, forest or seashore but to social environment. The adaptation to social characteristics such as sexual attachments, care giving, co-operations amongst group members and dynamic hierarchies that affect the allocation of resources were the basis of evolutionary survival. [64]

In other words, there is inherent susceptibility to social environment, proposing that social relations and the artefacts used in these can get cultural dependent meanings, thus representing something that has different value outside the particular culture. In more familiar sense, these phenomena are called trends, fashions and fads that are results of complex interactions and dynamic relations within an environment. The above reasoning thus predicts that humans are bound by their nature to be affected by interactions of others in the society, having belonging to a group and being accepted as a member, a part of natural survival instinct.

The social meaning that products can have is thus important part of understanding the ultimate UX, because sometimes the products do have completely different value outside the particular culture. Without being a close member of such culture, it is hardly imaginable what could the underlying values represent but following the trends and fashion inside the culture, an organization can get a reflection of these values. In global terms, design feature trends are traceable through sales and discourse analysis. For an organization, using the particular trends, fashions or fads in its own operations is usually a strategic dilemma. It is even claimed that in most cases, it is better to follow the fashionable design practice of the moment, even though the designer responsible for the product would had much better way of doing things [67].

Relying only on trends and present broader cultural representations can also be disadvantageous without getting insights of the product itself. In the 1970s, a major film studio gave a science fiction film proposal for a marketing research purposes, to determine would it be success or would it fail. The researcher concluded that the film would fail. He argued that the Watergate scandal had made America less trusting of its institutions, and as a result, realism and authenticity would be preferred over science fiction. Also, the film had a word "war" in its title that would not be attractive because of post-Vietnam trauma. The film in case was called Star Wars. What comes to the researcher, he delivered the information of market, not insight. He failed to understand the script itself, bypassing the

fundamental human story of love, conflict, loss and redemption that drove people into the cinemas then and has an iconic status now. [68]

5.2.4 Other means to understand the users

The reasoning above is not meant for deep and comprehensive analysis of social and emotional attributes of product meaning but rather to depict the complexity of human perceptions towards products. In some situations even optimizing the UX does not provide means for success, if there are social elements that restrict the success of the particular product. In the end, the markets will decide what products are going to be successes and what are not. And the markets are dynamic and mediated through and between multiple channels and parties, having sometimes outcomes that are hard to rationalize or predict. Hindsight is easy, prediction is not.

Using only one estimate for UX measurement is for growth oriented organization suboptimal solution. As depicted, the deeper and more holistic understanding of target users is crucial for product success. There are several good examples of innovative solutions for user research, from usability tests to on-going relationships between users and organizations. It is interesting that close understanding and researching of the users is still not seen as basic operation and essential for success. There are numerous market leading companies are the ones that have been doing this research already for quite some time, one of the rules of thumb being: "learn from small samples, closely observed" [69].

A. G. Lafley, the former CEO of P&G insisted that managers stop worrying about focus groups and spend time in consumers' homes, watching them cook and clean, before launching new products. Intuit, a respected tax-preparation software developer, has used a process called "Follow Me Home" where the company sends employees to watch customers carry out accounting and tax preparation tasks in their homes and offices. Starbucks periodically takes product development teams on "inspiration" trips to meet customers, in order to get a better sense of local cultures, behaviors, and trends. Nokia used the same approach in China, India, and Nepal, to study how people with low incomes would use cellular telephones. Based on the data from the research, the developers created an icon-based that allow semiliterate villagers to use cell phones, having enormous market potential there. [69]

Probes, stories and interviews, they all provide insights into deeper and surprising experiences that could be transformed into business solutions and success products. An innovative organization should be aware of different levels of knowledge and develop means into aggregating the data towards its own success. The better you know your customers, the better solutions you can develop for them.

5.3 Final words

For a young, innovative and agile organization as PowerKiss, it seems to be one of the most important tasks to get the whole organization to understand the meaning of experiences in product design, establish experiential design culture from the beginning of the growth. The whole organization should understand that it is creating experiences; to understand that the product usage is experienced mostly through memories that people compose according to what culmination points are perceived as meaningful. One cannot decide to design an iconic product, something that will have lasting impact in its users, environment

and industry. But taking into account several things, as the experience as holistic entity, the probability increases. Future cannot be predicted but it can be influenced now. Designer is a storywriter who tells the story through products.

The designed UX questionnaire is a good start but the whole organizational culture must be managed accordingly, towards innovative and experience centered lifestyle. Future research on this field is highly suggested and seen valuable. PowerKiss, a company whose core of business is embodied in the innovative capabilities, should embrace new knowledge and state-of-the-art research. There must be established multiple channels of knowledge and information exchange, both internal and external, about the experiences of target users, in micro and macro environments. The essence of having ultimate design drivers for products is not to do what users say but to understand the underlying experiences, interpreting the needs and transforming these into something tangible. As Henry Ford once said: "If I had asked customers what they wanted, they would have said a faster horse" [70]. You need to understand your customer better than they understand themselves. The UX is a portal to users' minds, giving tool for understanding something that is entirely subjective but infinitely meaningful.

References

[1] Gartner. *Gartner Says Worldwide Mobile Phone Sales Grew 35 Percent in Third Quarter 2010; Smartphone Sales Increased 96 Percent.* Press release. November 10, 2010. Referred 06.04.2011. Available: http://www.gartner.com/it/page.jsp?id=1466313

[2] Keizer, Gregg. *iPad lead shrinks as tablet sales grow*. Computerworld news. January 31, 2011. Referred 06.04.2011. Available: http://www.computerworld.com/s/article/9207319/iPad_lead_shrinks_as_tablet_sales_grow

[3] Rahmati A. & Zhong L. Human–battery interaction on mobile phones. Elsevier, Pervasive and Mobile Computing, Article in Press. 2008.

[4] Bower, J. & Christensen, C. *Disruptive Technologies: Catching the Wave.* Harvard Business Review. 1996.

[5] Law, E. L-C., Roto, V., Vermeeren, A.P.O.S., Kort, J. and Hassenzahl, M. SIG on *Towards a shared definition of user experience.* Proceedings of ACM CHI 2008, Florence, Italy, pp. 2395-2398

[6] Whiteside, J. and Wixon, D. *The dialectic of usability engineering.* In INTERACT 87 – 2nd IFIP International Conference on Human – Computer Interaction. September 1 – 4, 1987, Stuttgart, Germany, pp. 17 – 20

[7] Donald A. Norman. *Introduction to this special section on beauty, goodness, and usability.* Hum.-Comput. Interact. 19, 4, December 2008, pp. 311-318

[8] International Organization for Standardization. ISO 9241--210: 2010 - Ergonomics of human-system interaction, Part 210: Human-centred design for interactive systems. 2009.

[9] Law, E. L-C & van Schaik, P. *Modelling user experience - An agenda for research and practice*. Interacting with Computers, Volume 22, Issue 5, Modelling user experience - An agenda for research and practice, September 2010, Pages 313-322

[10] Hassenzahl, Marc. *Encyclopedia entry on User Experience and Experience Design*. Interaction-Design.org. Referred 11.03.2011. Available: http://www.interaction-design.org/encyclopedia/user_experience_and_experience_design.html

[11] Nielsen Norman Group. *User Experience - Our Denition.* 2007. Referred: 12.03.2011. Available: http://www.nngroup.com/about/userexperience.html

[12] Nielsen Norman Group. *Conference: User Experience 2008*. Amsterdam, November 2008

[13] Benyon, D., Turner, P. & Turner, S. Designing Interactive Systems: People, Activities, Contexts, Technologies. England: Pearson Education. 2005

[14] Norman, D. A. *Some observations on mental models*. In D. Gentner & A. Stevens (Eds.), Mental models. Hillsdale, NJ: Erlbaum. 1983

[15] Lim, Y. K., Donaldson, J., Jung, H., Kunz, B., Royer, D., Ramalingam, S., Thirumaran, S., and Stolterman, E. *Emotional Experience and Interaction Design.* In Affect and Emotion in Human-Computer Interaction, Christian Peter and Russell Beale (Eds.). Lecture Notes In Computer Science, Vol. 4868. Springer-Verlag, Berlin, Heidelberg 116-129. 2008

[16] Norman, D. A. *Words matter. talk about people: not customers, not consumers, not users*. Interactions 13(5): 49-63. 2006

[17] Unger, R. & Chandler C. *A Project Guide to UX Design.* New Riders Press; 1 edition, 2009

[18] Wright, P., McCarthy, J., Meekison, L. *Making Sense of Experience*. In Blythe, M., Overbeeke, K., Monk, A.F., Wright, P. (eds), Funology: From Usability to Enjoyment, pp. 43-53. Kluwer Academic Publishers, Netherlands. 2003

[19] Wright, P., McCarthy, J. *Experience-Centered Design: Designers, Users, and Communities in Dialogue*. Synthesis Lectures on Human-Centered Informatics. Morgan & Claypool Publishers, 2009

[20] Garrett, J. *Customer Loyalty and the Elements of User Experience*. Design Management Review 17(1): pp: 35-39. 2006

[21] Buchanan, R. W. T. and C. S. Gillies. *Value managed relationships: The key to customer retention and profitability.* European Management Journal 8(4): pp: 523-526. 1990

[22] Schlesinger, L. and Heskett, J. *Breaking the cycle of failure in service*, Sloan Management Review, spring, 1991, pp. 17-28

[23] Keefer, Rob. *The Secret to Success.* Technology First Magazine, June 2009. Referred: 20.3.2011. Available: http://www.technologyfirst.org/magazine-articles/50-june-2009/376-the-secret-to-success.html

[24] J. Berk & P. DeMarzo. *Corporate Finance*, 2nd edition, global edition, Pearson Addison Wesley 2011

[25] Hirsch, S., Fraser, J. & Beckman, S. *Leveraging Business Value: How ROI Changes User Experience*. Report for Adaptive Path, 2004. Available: www.adaptivepath.com/uploads/documents/apr-005_businessvalue.pdf

[26] Karat, C. *Cost-justifying usability engineering in the software life cycle*. In Helander, M., Landauer, T., and Prabhu, P. (Eds), Handbook of Human-Computer Interaction. Elsevier Science, Amsterdam. 1997

[27] IBM. *User-Centered Design: Cost justifying ease of use*. Referred 29.3.2011. Link: http://www-01.ibm.com/software/ucd/ucd.html#costjustifying

[28] Teehan+Lax. *UX Fund*. Referred 30.03.2011. Available: http://www.teehanlax.com/uxfund/

[29] Pine B.J. & Gilmore J.H. *The experience economy.* Harvard Business School Press, Boston. 1999

[30] Boven, Leaf Van and Gilovich, Thomas. *To Do or to Have? That Is the Question.* In Journal of Personality and Social Psychology, 85 (6) p. 1193–1202. 2003

[31] Carter, Travis J. and Gilovich, Thomas D. *The Relative Relativity of Material and Experiential Purchases.* In Journal of Personality and Social Psychology, 98 pp. 146-159. 2010

[32] Inglehart, Ronald. *Modernization and Postmodernization: Cultural, Economic, and Political Change in 43 Societies*. Princeton University Press. 1997

[33] Tullis, T., & Albert, B. *Measuring the User Experience: Collecting, Analyzing, and Presenting Usability Metrics.* Burlington, MA: Morgan Kaufmann. 2008

[34] Väänänen-Vainio-Mattila, K., Roto, V. & Hassenzahl, M. *Now let's do it in practice: user experience evaluation methods in product development.* In CHI '08 extended abstracts on Human factors in computing systems (CHI EA 2008). ACM, New York, NY, USA, 3961-3964

[35] Hassenzahl, Marc. *Experience Design: Technology for All the Right Reasons*. Morgan and Claypool Publishers. 2010

[36] Koskinen, I., Battarbee, K. & Mattelmäki, T. *Empathic Design. User Experience for Product Design.* Helsinki: IT Press. 2003.

[37] Michaluk, Kevin. *Samsung Galaxy Tab 10.1 (USA) Video First Look!* Android Central, March, 2011. Referred 20.4.2011. Available: http://www.androidcentral.com/samsung-galaxy-tab-101-usa-video-first-look

[38] Kyle. *Galaxy Tab 10.1 Redesign*. Galaxy Tabs, News March, 2011. Referred: 20.4.2011. Link: http://www.galaxytabs.com/2011/03/galaxy-tab-10-1-redesign/

[39] Kuniavsky, Mike. *Observing the User Experience: A Practitioner's Guide to User Research*. Elsevier Science & Technology, 2003

[40] Rohrer, Christian. *User Experience Research Methods in 3D: What to Use When and How to Know You're Right.* Presentation. BayCHI, SF chapter of ACM SIGCHI, January 13, 2009 - Palo, Alto, CA

[41] Albert, W., Tullis, T. & Tedesco, D. *Beyond the Usability Lab: Conducting Large-scale Online User Experience Studies.* Morgan Kaufmann, 2010

[42] Likert, Rensis. *A Technique for the Measurement of Attitudes*. Archives of Psychology 140: 1–55. 1932

[43] Brooke J. *SUS: a 'quick and dirty' usability scale*. In: Jordan PW, Thomas B, Weerdmeester BA, McClelland IL (eds) Usability evaluation in industry. Taylor & Francis, London, pp 189–194. 1996

[44] Bangor, Aaron , Kortum, Philip T. and Miller, James T. *An Empirical Evaluation of the System Usability Scale*, International Journal of Human-Computer Interaction, 24: 6, 574 — 594. 2008

[45] Lewis, J. *IBM Computer Satisfaction Questionnaires: Psychometric evaluation and instructions for use.* International Journal of Human-Computer Interaction, 7(1), 57–78. 1995

[46] University of Maryland. *QUIS*. Referred 25.4.2011. Available: http://lap.umd.edu/quis/

[47] Lund, A. *Measuring usability with the USE Questionnaire*. Usability Interface: The usability SIG newsletter of the Society for Technical Communications, 8(2). 2001. Available: http://www.stcsig.org/usability/newsletter/0110_measuring_with_use.html

[48] Ackerman, Evan. *As far as your brain is concerned, Apple fanaticism is a religion.* Dvice article, May, 2011. Referred: 20.05.2011. Available: http://dvice.com/archives/2011/05/as-far-as-your.php

[49] Saunders M., Thornhill A. & Lewis P. *Research Methods for Business Students*. 4th Edition, Pearson Education, 2007

[50] Hughes, Mike. *Progressive User Adoption.* UX Matters, 2009. Referred: 21.5.2011. Available:http://www.uxmatters.com/mt/archives/2009/03/progressive-user-adoption.php

[51] Watson, W. A. Contrast, Assimilation, and the Effect of Central Tendency. The American Journal of Psychology Vol. 70, No. 4 (Dec., 1957), pp. 560-568, University of Illinois Press Stable. Available: http://www.jstor.org/stable/1419446

[52] Baumgartner, H., & Steenkamp, J.-B. E. M. *Response biases in marketing research.* In R. Grover & M. Vriens (Eds.), Handbook of market research: Do's and don'ts (pp. 204-237). Thousand Oaks, CA: Sage. 2005

[53] Mick, D. G. *Are studies of dark side variables confounded by socially desirable responding?* The case of materialism. Journal of Consumer Research, 23(September) 2006,pp. 106-119

[54] Nederhof, A. J. Methods of coping with social desirability bias: A review. European Journal of Social Psychology, 15, 263-280.1985

[55] de Chernatony. *From Brand Vision to Brand Evaluation - The Strategic Process of Growing and Strengthening*. 3rd edition. Elsevier Science & Technology, 2010

[56] de Chernatony, L., Drury, S., & Segal Horn, S. *Using triangulation to assess and identify successful services brands.* The Service Industries Journal, 25(1), 5 21. 2005

[57] de Chernatony, L., Dall'Olmo Riley, F., & Harris, F. *Criteria to assess brand success.* Journal of Marketing Management, 14(7), 765 781. 1998

[58] BrandTags, 2011. Referred: 27.04.2011. Available: http://www.brandtags.net/

[59] Watzman, S. & Re, M. *Visual Design: Principles for Usable Interfaces: Everything Is Designed: Why We Should Think Before Doing.* The Human–Computer Interaction Handbook Fundamentals, Evolving Technologies, and Emerging Applications. Second Edition, 2007

[60] Boven, Leaf Van. *Experientialism, Materialism, and the Pursuit of Happiness*. In Review of General Psychology, 9 (2) pp. 132-142. 2005

[61] Norman, Donald Arthur. *Emotional Design*. New York. Basic Books. 2004

[62] Lidwell, W. & Manacsa, G. *Deconstructing Product Design: Exploring the Form, Function, Usability, Sustainability, and Commercial Success of 100 Amazing Products.* Rockport Publishers, 2009

[63] Judd, T. & Black, S. *Apple's iPod seals iconic status with record-breaking sales figures*. The Independent, April 2007 Referred 22.05.2011. Available: http://www.independent.co.uk/news/science/apples-ipod-seals-iconic-status-with-recordbreaking-sales-figures-446401.html

[64] Oatley K & Jenkins. J. M. *Understanding Emotions.* 2nd edition. Blackwell Publishing, 2006

[65] Damasio, A. R. *Descarte's Error.* New York: Putnam. 1994

[66] Hill, Dan. *Understanding and Harnessing Consumer's response.* The Economic Times, 2009. Referred: 22.05.2011. Available: http://articles.economictimes.indiatimes.com/2009-01-14/news/27646449_1_brain-emotional-reactions-evolutionary-terms

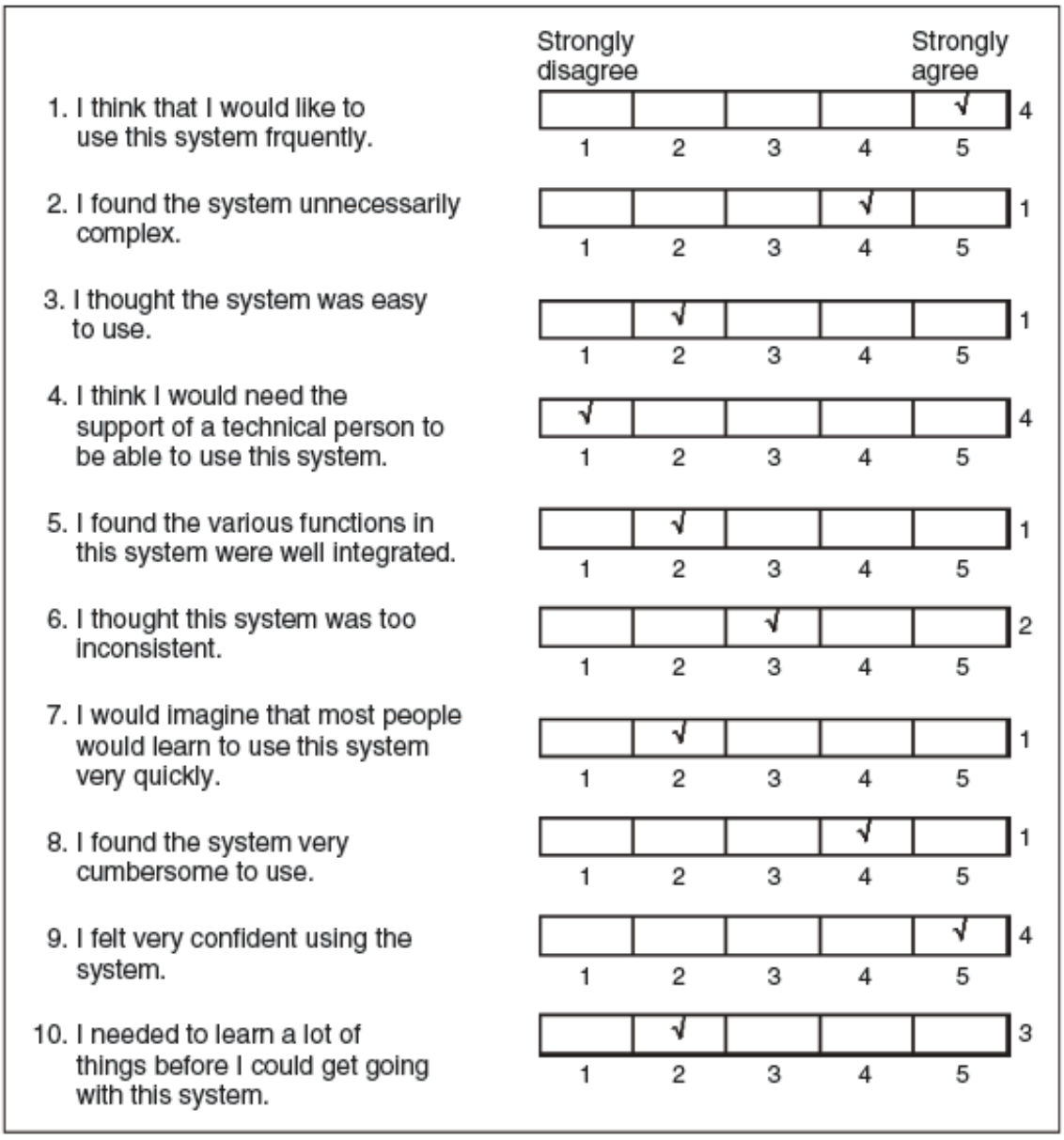
[67] Swart, A. Serco *ExperienceLab: Is Fashion More Important than Usability?* UX Alliance, 2009. Referred: 23.05.2011. Available: http://www.uxalliance.com/ideas/publications/serco-experiencelab-fashion-more-important-usability

[68] Kotler, Philip & Kevin Lane Keller. *Marketing Management,* 12th ed.. Pearson Prentice Hall. 2006

[69] Garvin, D. A. & Levesque, L. C. *Meeting the Challenge of Corporate Entrepreneurship.* October, 2006. Harvard Business Review.

[70] Floren, Jenny. *The Innovation Generation*. New Year Publishing, LLC. USA. 2010.

A System Usability Scale



B Computer System Usability Questionnaire

	1	2	3	4	5	6	7		NA
1. Overall, I am satisfied with how easy it is to use this system ☐	strongly disagree	○	○	○	○	○	○	strongly agree	○
2. It was simple to use this system ☐	strongly disagree	○	○	○	○	○	○	strongly agree	○
3. I can effectively complete my work using this system ☐	strongly disagree	○	○	○	○	○	○	strongly agree	○
4. I am able to complete my work quickly using this system ☐	strongly disagree	○	○	○	○	○	○	strongly agree	○
5. I am able to efficiently complete my work using this system ☐	strongly disagree	○	○	○	○	○	○	strongly agree	○
6. I feel comfortable using this system ☐	strongly disagree	○	○	○	○	○	○	strongly agree	○
7. It was easy to learn to use this system ☐	strongly disagree	○	○	○	○	○	○	strongly agree	○
8. I believe I became productive quickly using this system ☐	strongly disagree	○	○	○	○	○	○	strongly agree	○
9. The system gives error messages that clearly tell me how to fix problems ☐	strongly disagree	○	○	○	○	○	○	strongly agree	○
10. Whenever I make a mistake using the system, I recover easily and quickly ☐	strongly disagree	○	○	○	○	○	○	strongly agree	○
11. The information (such as online help, on-screen messages, and other documentation) provided with this system is clear ☐	strongly disagree	○	○	○	○	○	○	strongly agree	○
12. It is easy to find the information I needed ☐	strongly disagree	○	○	○	○	○	○	strongly agree	○
13. The information provided for the system is easy to understand ☐	strongly disagree	○	○	○	○	○	○	strongly agree	○
14. The information is effective in helping me complete the tasks and scenarios ☐	strongly disagree	○	○	○	○	○	○	strongly agree	○
15. The organization of information on the system screens is clear ☐	strongly disagree	○	○	○	○	○	○	strongly agree	○
16. The interface of this system is pleasant ☐	strongly disagree	○	○	○	○	○	○	strongly agree	○
17. I like using the interface of this system ☐	strongly disagree	○	○	○	○	○	○	strongly agree	○
18. This system has all the functions and capabilities I expect it to have ☐	strongly disagree	○	○	○	○	○	○	strongly agree	○
19. Overall, I am satisfied with this system ☐	strongly disagree	○	○	○	○	○	○	strongly agree	○

C The Questionnaire for User Interface Satisfaction

OVERALL REACTION TO THE SOFTWARE		0	1	2	3	4	5	6	7	8	9		NA
1. ☐	terrible	○	○	○	○	○	○	○	○	○	○	wonderful	○
2. ☐	difficult	○	○	○	○	○	○	○	○	○	○	easy	○
3. ☐	frustrating	○	○	○	○	○	○	○	○	○	○	satisfying	○
4. ☐	inadequate power	○	○	○	○	○	○	○	○	○	○	adequate power	○
5. ☐	dull	○	○	○	○	○	○	○	○	○	○	stimulating	○
6. ☐	rigid	○	○	○	○	○	○	○	○	○	○	flexible	○
SCREEN		**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**		**NA**
7. Reading characters on the screen ☐	hard	○	○	○	○	○	○	○	○	○	○	easy	○
8. Highlighting simplifies task ☐	not at all	○	○	○	○	○	○	○	○	○	○	very much	○
9. Organization of information ☐	confusing	○	○	○	○	○	○	○	○	○	○	very clear	○
10. Sequence of screens ☐	confusing	○	○	○	○	○	○	○	○	○	○	very clear	○
TERMINOLOGY AND SYSTEM INFORMATION		**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**		**NA**
11. Use of terms throughout system ☐	inconsistent	○	○	○	○	○	○	○	○	○	○	consistent	○
12. Terminology related to task ☐	never	○	○	○	○	○	○	○	○	○	○	always	○
13. Position of messages on screen ☐	inconsistent	○	○	○	○	○	○	○	○	○	○	consistent	○
14. Prompts for input ☐	confusing	○	○	○	○	○	○	○	○	○	○	clear	○
15. Computer informs about its progress ☐	never	○	○	○	○	○	○	○	○	○	○	always	○
16. Error messages ☐	unhelpful	○	○	○	○	○	○	○	○	○	○	helpful	○
LEARNING		**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**		**NA**
17. Learning to operate the system ☐	difficult	○	○	○	○	○	○	○	○	○	○	easy	○
18. Exploring new features by trial and error ☐	difficult	○	○	○	○	○	○	○	○	○	○	easy	○
19. Remembering names and use of commands ☐	difficult	○	○	○	○	○	○	○	○	○	○	easy	○
20. Performing tasks is straightforward ☐	never	○	○	○	○	○	○	○	○	○	○	always	○
21. Help messages on the screen ☐	unhelpful	○	○	○	○	○	○	○	○	○	○	helpful	○
22. Supplemental reference materials ☐	confusing	○	○	○	○	○	○	○	○	○	○	clear	○
SYSTEM CAPABILITIES		**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**		**NA**
23. System speed ☐	too slow	○	○	○	○	○	○	○	○	○	○	fast enough	○
24. System reliability ☐	unreliable	○	○	○	○	○	○	○	○	○	○	reliable	○
25. System tends to be ☐	noisy	○	○	○	○	○	○	○	○	○	○	quiet	○
26. Correcting your mistakes ☐	difficult	○	○	○	○	○	○	○	○	○	○	easy	○
27. Designed for all levels of users ☐	never	○	○	○	○	○	○	○	○	○	○	always	○

D Usefulness, Satisfaction, and Ease of Use questionnaire

Usefulness

- It helps me be more effective.
- It helps me be more productive.
- It is useful.
- It gives me more control over the activities in my life.
- It makes the things I want to accomplish easier to get done.
- It saves me time when I use it.
- *It meets my needs.*
- It does everything I would expect it to do.

Ease of Use

- It is easy to use.
- It is simple to use.
- It is user friendly.
- It requires the fewest steps possible to accomplish what I want to do with it.
- *It is flexible.*
- *Using it is effortless.*
- *I can use it without written instructions.*
- *I don't notice any inconsistencies as I use it.*
- *Both occasional and regular users would like it.*
- *I can recover from mistakes quickly and easily.*
- *I can use it successfully every time.*

Ease of Learning

- I learned to use it quickly.
- I easily remember how to use it.
- It is easy to learn to use it.
- *I quickly became skillful with it.*

Satisfaction

- I am satisfied with it.
- I would recommend it to a friend.
- It is fun to use.
- It works the way I want it to work.
- It is wonderful.
- I feel I need to have it.
- It is pleasant to use.

Users rate agreement with these statements on a 7-point Likert scale, ranging from strongly disagree to strongly agree. Statements in *italics* were found to weight less heavily than the others.