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Expectations and User Experiences as Determinants of Technology Adoption and Continued Use

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ABSTRACT OF THE
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Creation and diffusion of knowledge capital has become a significant factor in organisational competitiveness. Therefore, knowledge-intensive organisations have strived to harness the power of knowledge through investments in modern communication technology. Available evidence shows, however, that this technology is often underutilised by knowledge workers and the potential of the tools may not always be met. Against this background, the purpose of this study was to learn, how a new communication tool is actually received among knowledge workers, what the role of expectations and user experiences is in the process and what determines continued usage behaviour.

A pre-post approach was taken to collect the prevailing pre-exposure expectations and learn about the corresponding post-exposure experiences. Research data was created primarily through interviews that took place 1) in the beginning of the project and 2) two months after the employees had been given the access to the new system. In addition, two surveys were conducted to explore the phenomenon in larger context. Research data was analysed through qualitative methods.

The findings suggest that expectations first determine the user's motivation and intention to initially adopt the technology, and then directly influence the extent of post-exposure usage behaviour. User experiences were found to influence the adoption through evaluative feelings that derive from continuous interaction with expectations. User experiences were also found to evolve over time resulting in more advanced needs and expectations. Finally, the study discovered four premises for continued use: expectations – experiences interaction, critical mass, collective practices and lead users.

As the purpose of this study was to create concrete guidelines to support technology adoption in organisations, there are numerous implications for practice. Thus, the study proposes a phased technology adoption model to be considered in future technology implementation projects. Some future research directions have also been suggested.

Keywords: expectations, user experiences, usability, technology adoption, use continuance, expectation confirmation, UTAUT

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Tietopääoman luomisesta ja välittämisestä on muodostunut merkittävä tekijä yritysten välisessä kilpailussa. Asiantuntijaorganisaatiot ovat alkaneet investoida nykyaikaisiin viestintäratkaisuihin valjastaakseen oman osaamisensa tehokkaasti liiketoimintansa edistämiseksi. On kuitenkin esitetty, että tietotyöntekijät eivät omaksu uusia työkaluja ja käyttävät niitä vajavaisesti. Tällöin teknologiainvestointien potentiaali ei realisoidu, ja saavutetut hyödyt jäävät pieniksi. Näin ollen, tämän tutkimuksen tavoitteena oli ymmärtää, miten uusi viestintätyökalu otetaan vastaan, mikä on odotusten ja käyttökokemusten rooli tässä prosessissa ja mitkä tekijät johtavat työkalun kokonaisvaltaiseen omaksumiseen ja jatkuvaan käyttöön.

Ennen käyttöönottoa vallitsevien odotusten ja käyttöönoton jälkeen kertyneiden käyttökokemusten keräämisessä käytettiin ennen-jälkeen –lähestymistapaa. Tutkimusdata muodostettiin pääasiallisesti haastatteluilla, jotka pidettiin 1) ennen käyttöönoton alkua ja 2) kaksi kuukautta käyttöönoton alkamisen jälkeen. Lisäksi toteutettiin kaksi luotaavaa kyselyä, joiden tarkoituksena oli tarkastella käyttöönottoa laajemmassa kontekstissa. Tutkimusdata analysoitiin pääasiallisesti laadullisilla menetelmillä.

Tutkimuksen perusteella odotukset vaikuttavat ensin käyttäjän käyttöönottomotivaatioon ja –aikomukseen. Odotukset näyttävät vaikuttavan myös uuden työkalun hyödyntämisen laajuuteen eli siihen, miten ja mihin tarkoituksiin uutta työkalua käytetään. Käyttökokemukset ja odotukset vaikuttavat olevan jatkuvassa vuorovaikutuksessa, jonka myötä muodostuu arvioita käytettävästä teknologiasta ja sen ominaisuuksista. Lisäksi, käyttökokemukset ja sen myötä käyttäjän tarpeet kehittyvät ajan edetessä. Tutkimuksen perusteella esitetään neljä tekijää, jotka vaikuttavat jatkuvaan käyttöön: odotukset-käyttökokemukset –vuorovaikutus, kriittinen massa, yhteiset käytännöt ja edistyneet pääkäyttäjät.

Tutkimuksen perusteella ehdotetaan asiantuntijaorganisaatiolle vaiheistettua käyttöönottomallia, jota voidaan hyödyntää tulevaisuuden käyttöönottoprojekteissa. Lisäksi esitetään tutkimussuuntia jatko- ja lisätutkimuksille.

Avainsanat: expectations, user experiences, usability, technology adoption, use continuance, expectation confirmation, UTAUT

Preface

This project has been a lengthy and rewarding experience. Not only have I learned a lot about the research subject but also quite a bit about myself both as a researcher and as a person. Now, as the work is finally about to be done, I would like to acknowledge and thank the significant few who have had a strong influence on my work during this project.

Firstly, I would like to thank TeliaSonera Finland and most importantly Mika Hyötyläinen for this unique opportunity to take part in this research project. Mika also functioned as my advisor and his help and guidance especially during the initial phases of the project was very valuable indeed. I would also like to send my greetings to Jari Manninen in TeliaSonera for many useful and practical tips throughout the project.

Secondly, I want to thank my fellow researchers Laura Aaltonen and Kimmo Pekkanen whose contribution in the form of shared effort, group support and counsel was significant and helpful in many ways. Our brainstorming sessions have shaped this study to its current form and all this would have surely been a lot more troublesome and boring without the help of Laura and Kimmo.

Thirdly, I want to thank my current employer Futurice for the opportunity I have been given to tie up the loose ends and finalise this work. My colleagues at Futurice have been very supportive and they always ushered me back to the thesis when other work tasks began to seem more lucrative. Without their understanding and support it would have been very difficult to organise time to carry through this project properly.

Fourthly, Risto Rajala's help has simply been priceless. Risto's valuable and professional insights and broad experience in research work guided me through the project with confidence, and helped me to avoid both the obvious and the not so obvious pitfalls that lurk within the thesis writing process.

Finally, my utmost gratitude and thanks go to my family and dear Anna who have shared this experience with me in its entirety. Without their interest in the project and continuous support it would have been a lot more tedious to make this happen. However, when all is said and done, it all came down to a simple "Now finalise the work and you don't have to cook for a week." –promise that finally sealed the deal.

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1. Introduction

The creation and diffusion of knowledge has become a significant aspect in organisational competitiveness in today's knowledge economy. In the modern increasingly digital and networked world knowledge has become more valuable factor of production than the more traditional physical or tangible assets [1]. Growth is drawn from new knowledge and communication efficiency has become the source of productivity. This shift from product driven to service driven business has prompted organisations to invest in new communication and information technologies.

At the same time modern knowledge worker faces numerous challenges. The substantial advances in telecommunication and information technology have enabled an explosive increase in different sorts of electronic communication at work. The work environment has become more complex due to the increase in the number of subjective knowledge items workers need to attend to every day [1]. Modern knowledge worker receives, sends and processes more information than ever before. Simultaneously he or she is still expected to make more results in less time. An employee's work tasks consist more and more of different sorts of communication, work days have become more fragmented and multitasking is a daily phenomenon. "Knowledge workers are increasingly being asked to think on their feet, with little time to digest and analyse incoming data and information, let alone to retrieve, access and apply relevant experiential knowledge [1]." As the quantity of information processed by an employee steadily increases, eventually a maximum processing capacity is met – normal information stream turns into information overload.

To meet the modern requirements organisations provide various information and communication tools to support their employees. If this set of tools is utilised appropriately as a whole, new technology can drastically increase the productivity both on an individual and organisational level. However, the key reason why many technology initiatives result in failure is simply neglecting the human element [1]. Available evidence shows that new technologies are often underutilised, which may result that the full potential of the tools is not met [2]. Most users generally apply only a basic set of features and are not interested in extending their knowledge with the new applications or systems. Therefore, despite the rapid and continuous development in technological knowhow the growth in an individual knowledge worker's productivity is still rather restrained.

The importance of ICT (Information and Communications Technology) and its impact on productivity is well known and widely acknowledged. The Research Institute of the

Finnish Economy (ETLA) estimates that ICT can provide even eight to eighteen per cent increase in one's productivity [3]. Communication within an organisation has become an important strategic resource: when employees communicate efficiently, work becomes less difficult, employees feel better and the company is more successful [4]. However, the value of new technology is not being realised, when the intended users do not adopt it and utilise it in a manner that contributes to the organisational and operational goals of the firm. In other words, productivity benefits are highly dependent on how the technology is really applied in practice [5].

When every day communication takes place, knowledge worker chooses the channel or method from the set of tools he or she has accepted and adopted for him- or herself as effective means of communication. Often these tools are considerably different from the set the organisation provides. In other words, it does not matter how theoretically fancy and efficient new technology the company has invested in if individual employees have not accepted and adopted the tools as part of their own "communication portfolio". "Old habits are hard to break. The tendency is for people to keep using e-mail because that's what they know [6]."

The benefits of new technologies are not concretised within organisations if the new innovations are not utilised consistently by the employees [7]. This may result in situations where productivity does not increase along with investments made in new technology. Thus it is very important to understand, what influences knowledge workers' perceptions and choices about their information and communication systems and how these change over time. In other words, why some applications and systems are utilised while others are not?

Technology adoption and acceptance is one of the most researched areas in MIS (Management Information System) literature [2]. Numerous streams of science and several perspectives have contributed to the discussion about how new technologies are either adopted or discarded by knowledge workers. Firstly, instrumental research perspective has focused on abstract but still rather measurable system features such as usefulness, performance and complexity to explain technology adoption. Secondly, psychological perspective has described acceptance through quite subjective constructs such as attitude, affect and motivation. And thirdly, research conducted in the field of social studies and social psychology has focused on elements such as other users' opinions and the adopter's own self-image. However, in each of the models results have mainly converged towards the single conclusion that initial usage behaviour is mainly a result of a set of beliefs the individual holds about the product or service at hand. The

core premise in each of these models is naturally dependent on the researcher's own viewpoint and background.

However, the above mentioned research streams explain primarily, what influences the initial decision to adopt a new technology. Deriving from this idea many of these models view use continuance as extension of initial acceptance behaviour: same constructs are being used to describe both initial acceptance and continued use. According to Karahanna et al. [8], there exists, however, a significant distinction between the pre- and post-exposure attitudes and perceptions that should be considered. "Beliefs after use of the product may not be the same as the set of beliefs that have led to initial adoption." Deriving from this presumption it has been suggested that understanding the initial drivers that affect the decision to adopt a system is not enough, but one also needs to understand the path as a whole from initial exposure to continued system use. In other words, what makes people initially to adopt a technology and then also to continue using it as a pivotal part of their everyday work. Consequently, there are models and theories that aim to describe the anomaly that other models are unable to explain: why a user sometimes discontinues using a system, if he or she has initially accepted it. These expectation-confirmation models state that continued use is determined by the system's ability to meet user's initial expectations over time [8].

Regardless of extensive research within the technology acceptance domain something that has not been properly utilised in the studies seems to be the concept of usability. According to Venkatesh [9], the application of usability in information systems literature is actually somewhat limited: "The application of usability to study use can provide an important alternative perspective relative to the psychological models typically employed in IS." Therefore one of the main perspectives and contexts employed in the present study is usability. In addition, the research also introduces another new concept in MIS research: user experience – a concept that has become somewhat a buzzword in interaction design over the last decade [10].

1.1. Research questions

By employing the essence of usability and user experience concepts in the context of technology adoption and continued use, the present study intends to explore the factors that affect the adoption and usage of information and communication technology in the case organisation through the following research questions:

> *1. How do users' initial pre-exposure expectations affect their intentions to adopt and use a new communication system?*

2. What is the role of user's post-exposure experiences in the adoption process?

3. What factors affect users' intentions of continued use?

The study is conducted in a case setting and the research approach consists in an interpretive qualitative case study and an explorative quantitative analysis of survey data gathered within the case organisation. The aim of the study is to improve the understanding of the factors that affect users' communication technology adoption and continued use intentions in the case organisation. In addition to collecting primary empirical data, a concept-centric literature review is conducted to establish propositions that can be investigated quantitatively by future studies.

The research was conducted in a separate business organisation within TeliaSonera, namely in Business Services Finland (BUS). The key driver for the study was BUS organisation's drive to open discussion about the importance of effective interaction between knowledge workers in an advanced technology service industry. It has been suggested that a new technology not only offers a great possibility to enhance one's communication efficiency but it also involves the risk to decrease productivity and job satisfaction drastically if not implemented correctly. Conveniently, at the time of the research TeliaSonera was implementing a new communication solution for its employees, which provided a great possibility to study the adoption process over time.

The remainder of the thesis proceeds as follows. In the next section the core theories, models and definitions concerning the research phenomena are introduced. Building on these key concepts, the second section concludes with introduction of the research framework that aims to answer the research questions. The third section explains the research approach and both data creation and data analysis methods used in the study. More thorough case description and introduction of the case organisation are included in this section as well. In the fourth section the results made in the research are presented. In the fifth section the findings and the limitations are discussed more thoroughly and also implications for future research and practice are suggested. Finally, the sixth section concludes by summarising the key results and contributions of the research.

2. Theory review

The research framework derives mainly from Unified Theory of Acceptance and Use of Technology (UTAUT) and especially from two of its four core constructs, namely *performance expectancy* and *effort expectancy*. The other two constructs, namely *social influence* and *facilitating conditions* are excluded from the research framework. Because UTAUT is a unified theory that consists of eight other technology adoption models, this review follows these models to provide clearer outline about the foundations of UTAUT. Therefore, the theories that contribute only to the excluded constructs (social influence, facilitating conditions) are not described in great detail.

The theory review proceeds as follows. First, the UTAUT model is properly introduced, after which the five theories that contribute to its performance and effort expectancy constructs are explained in more detail. Second, the concept of usability is defined by comparing four relevant usability models and definitions to establish the usability perspective for the study. Third, user experience is introduced as a research phenomenon to incorporate its key contributions to the research framework. Fourth, to establish a pre-post study of technology adoption and continued use, recent expectation-(dis)confirmation models are also introduced. Finally, these key components are incorporated into the research framework which intends to answer the above mentioned research questions.

2.1. Technology Adoption

2.1.1. Unified Theory of Acceptance and Use of Technology (UTAUT)

Unified Theory of Acceptance and Use of Technology, UTAUT, is an extensive theory that combines eight previously developed and widely used and validated models. The reason to develop yet another technology adoption model was that with an extensive range of separate but closely related theories researchers in this area were forced to choose one theory over others for their research and therefore often ignore the important contributions other theories had brought out [11]. In other words, the reasoning behind UTAUT was to create a unified model that captures the main elements of eight previously established models to describe user acceptance even more comprehensively.

In their study Venkatesh and his colleagues first reviewed all significant user acceptance models. They found eight extensively used models, after which they were empirically compared. Based on the research and "conceptual and empirical similarities across models" a synthesised model, UTAUT, was formulated. After having developed the model

it was validated empirically. According to Venkatesh et al. [11], UTAUT was able to explain 70 % of the variance in technology adoption studies, which is "a substantial improvement over any of the original eight models and their extensions".

UTAUT consists of four independent antecedents of behavioural intention: Performance Expectancy, Effort Expectancy, Social Influence and Facilitating Conditions. Behavioural Intention as a predictor of use behaviour has been studied and well-established in IS research [12]. In UTAUT the above mentioned four antecedents are moderated by four moderators, namely gender, age, experience and voluntariness of use. Figure 1 illustrates the model.

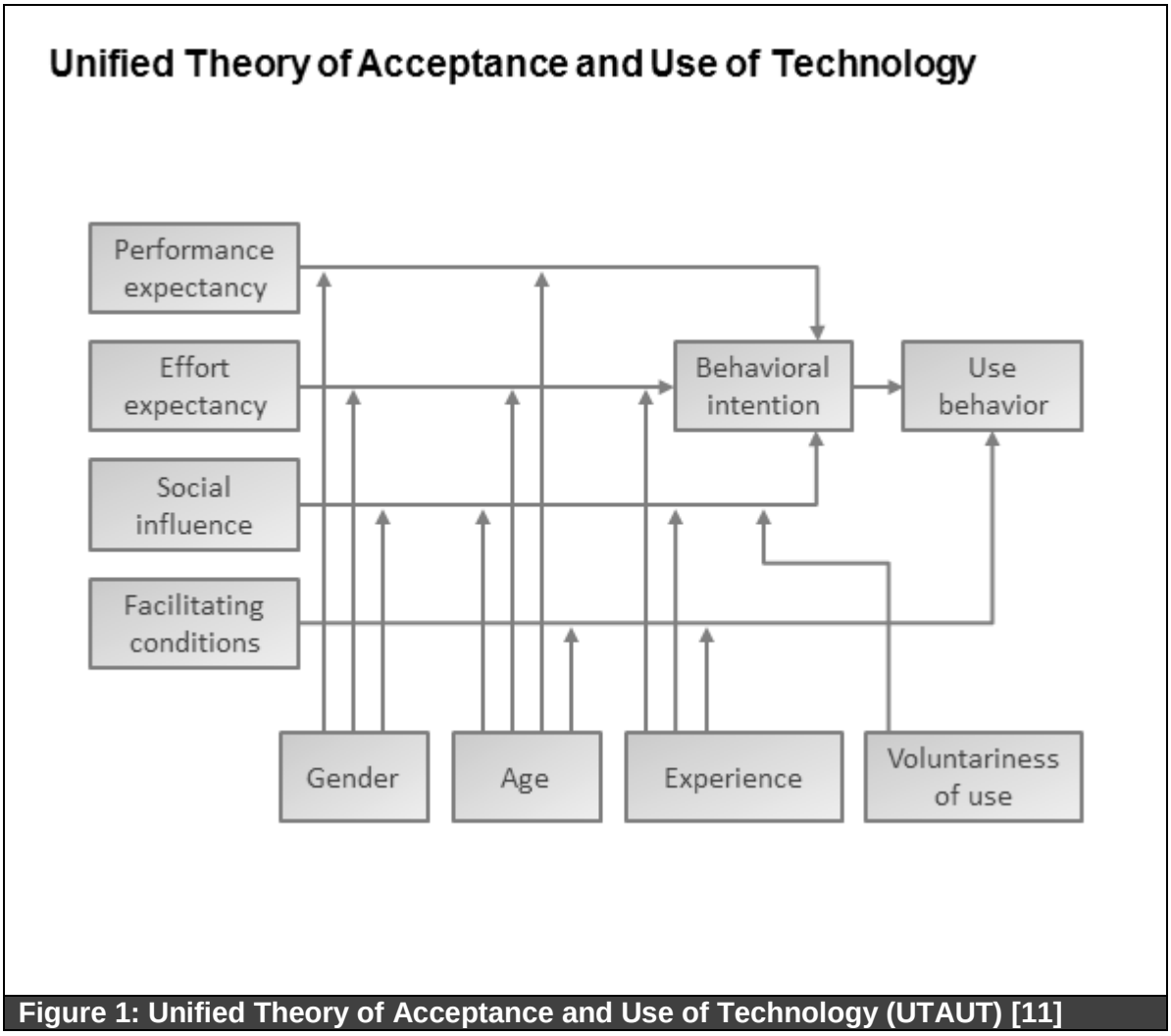

Figure 1: Unified Theory of Acceptance and Use of Technology (UTAUT) [11]

Performance expectancy measures the degree to which an individual believes a system or an application enhances his or her performance at work. User's perceptions of a system's usefulness, instrumentality, job-fit, relative advantage and outcome expectations determine whether the system is of use. According to many researchers (see [11], [13], [14]), performance expectancy has the strongest impact on behavioural intention and usage. In addition, the impact remains significant in all stages of usage and

is not affected by voluntariness of use [11]. Performance expectancy is theorised to be moderated by gender and age so that the effect is stronger for men and particularly for younger men [11].

Effort expectancy is defined as "the degree of ease associated with the use of the system" [11]. In other words, this antecedent measures the effort required to understand and use a system or an application properly. According to Venkatesh et al. [11], effort expectancy is an important construct both in voluntary and mandatory settings. However, some researchers have noted that effort expectancy becomes slowly less significant over periods of long-term usage [11], [13]. UTAUT asserts that effort expectancy is moderated by gender, age and experience with impact stronger on women, older people and those with limited experience [11].

Venkatesh et al. [11] define *social influence* as "the degree to which an individual perceives that important others believe he or she should use the new system". It has been suggested that usage behaviour is influenced by the impression users believe they will give to others by using or not using a certain technology. The inclusion of social influence has varied a lot in recent technology adoption research: some researchers have used the construct and found it to be significant (see [15]) while others have decided to exclude it from their models [13]. Venkatesh and Davis [14] have, however, found social influence to be significant construct but only in mandatory settings. Social influence is taken into consideration in UTAUT, and it is suggested to be moderated by gender, age, experience and voluntariness of use so that the effect is theorised to be more salient for women and older workers, under conditions of mandatory use and with limited experience [11].

Facilitating conditions, in other words "aspects of the technological and/or organisational environment that are designed to remove barriers to use", are defined in UTAUT as the degree to which an individual believes that his or her technology adoption and use are supported by the organisation [11]. Venkatesh et al. [11], [16] theorise that facilitating conditions do not have significant influence on behavioural intention due to the fact that this effect has been theorised to be captured by effort expectancy. Therefore, UTAUT model suggests that facilitating conditions influence usage behaviour directly without it being mediated by usage intention so that the effect is moderated by age and experience in such a way that the impact is stronger for older workers with increasing experience [11].

2.1.2. Technology Acceptance Model (TAM)

Deriving from multiple science areas and research streams Technology Acceptance Model (TAM) was established in 1986 and is one of the first models to actually explain

technology acceptance. Since its establishment TAM has been widely used to describe user acceptance of technology [17], [18]. Albeit fairly old, TAM is still widely regarded as the standard model for understanding individual reactions to technology [9]. TAM's validity and reliability have been validated multiple times in various contexts, and the model has been further developed to meet even higher requirements [14], [19], [20].

Similar to UTAUT, TAM observes usage behaviour through behavioural intention (i.e. intention to use) construct which is described as "a predictor of system use" and is affected by two independent antecedents, namely perceived usefulness and perceived ease of use [13]. These constructs are highly similar to UTAUT's performance expectancy and effort expectancy and not without reason: the items from both TAM's antecedents are largely used in UTAUT as well. There are no moderators in TAM, which makes it less complex and thus easier to operate with.

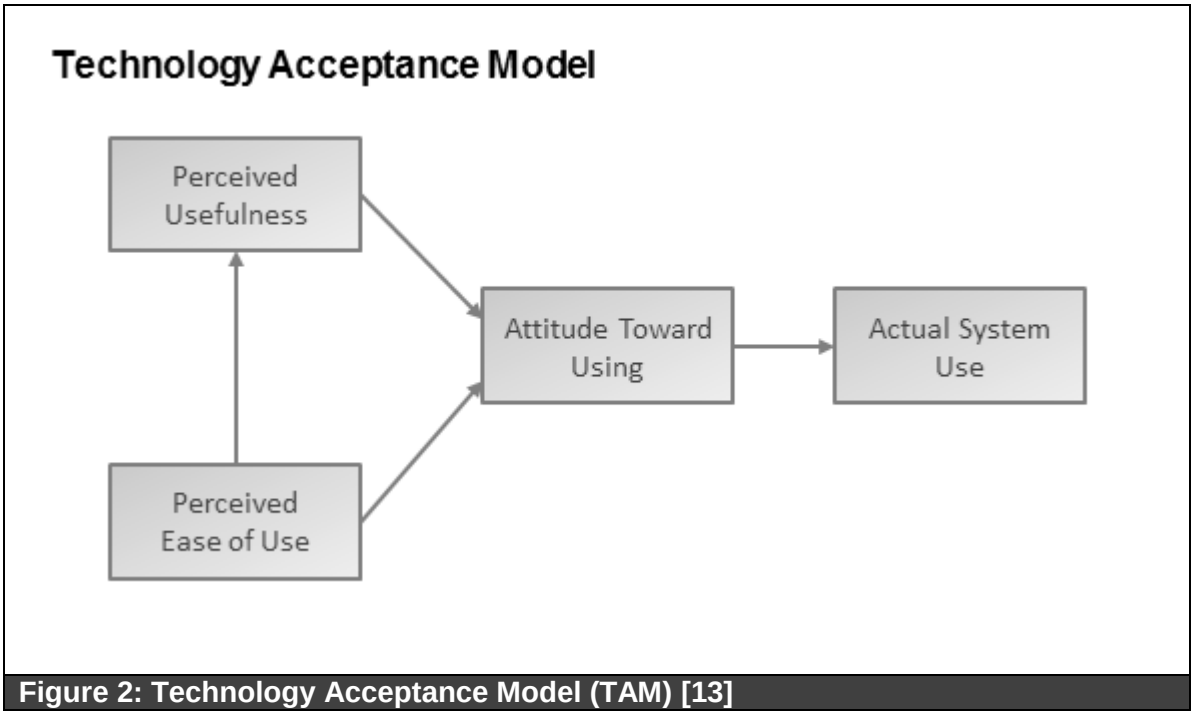

Figure 2: Technology Acceptance Model (TAM) [13]

The importance of system usefulness has been a fundamental issue for knowledge workers for decades. In 1979 Robey [21] pointed out that a system that does not enable people to perform their jobs will not be accepted regardless of implementation efforts made by the organisation. TAM suggests that people will use a system or an application if they perceive it to be useful in their work and help them to complete their work tasks better and faster, and therefore *perceived usefulness* is defined as "the degree to which a person believes that using a particular system would enhance his or her job performance" [13]. In other words, the significance of perceived usefulness is based on the user's belief in the existence of the relationship between usage and performance [22]. UTAUT utilises all the items from perceived usefulness construct to measure performance expectancy.

Perceived ease of use is defined as the degree to which an individual believes that interaction with a system or an application is effortless and free of cognitive burden [22]. All else being equal, users are claimed to prefer a system that is perceived as easier to use [13]. Even if potential users perceive a system to be useful, they may perceive it too difficult to use, and thus the effort needed to become skilful with the system can outweigh the possible performance benefits. These users usually end up discarding the system. All the items from perceived ease of use are utilised in UTAUT's effort expectancy construct. Interestingly, it has also been suggested that perceived ease of use is significant in early phases of usage but it slowly becomes less important over time [20]. Similar effect is suggested in UTAUT model [11].

"Although difficulty of use can discourage adoption of an otherwise useful system, no amount of ease of use can compensate for a system that does not perform a useful function [13]." This suggests that usefulness is more strongly linked to usage behaviour than ease of use. However, in addition to having a direct impact on knowledge worker's usage intention, perceived ease of use is theorised to also operate indirectly through perceived usefulness [13]. In other words: the easier a system is to use the more energy and resources user has for other activities thus increasing the overall performance. In his research Adams [20] found the relationship between usefulness and ease of use to be more complex than is generally thought: according to him, there is some variation between the importance and balance of these two constructs and therefore more research is needed to explain the complex relation between the constructs.

2.1.3. Motivational Model (MM)

"Do people use computers at work more because they are useful or because they are enjoyable to use?" is the question Davis et al. [23] asked when developing Motivational Model (MM) – a theory that can be regarded as an unofficial sequel to Technology Acceptance Model (introduced above). The model was developed to compensate the lack of research that had empirically addressed the relative effects of enjoyment versus usefulness. MM largely builds on the findings Davis made when researching for the Technology Acceptance Model. Both perceived usefulness and perceived ease of use from TAM are included in Motivational Model, accompanied by enjoyment, output quality and task importance [23].

Motivational Model distinguishes two sorts of motivation, namely extrinsic and intrinsic motivation. *Extrinsic motivation* refers to the perception that an individual wants to perform an activity "because it is perceived to be instrumental in achieving valued outcomes that are distinct from the activity itself such as improved job performance" [23]. This effect includes perceived usefulness which was introduced in TAM. According

to the findings made by Davis et al. [23], one's intention to use computer system in the workplace is influenced mainly by his or her perception of how useful the computer would be for improving his or her performance at work related tasks. The items from extrinsic motivation are included in UTAUT's performance expectancy construct.

Intrinsic motivation, on the other hand, "refers to the performance of an activity for no apparent reinforcement other than the process of performing the activity per se" [23]. A good example of intrinsic motivation is enjoyment which was the measure used in the study conducted by Davis et al. [23]: while usefulness was found to be the primary predictor of computer use, the influence of enjoyment was also highly significant and noticeable. Interestingly, MM also states that the impact of enjoyment on computer use is stronger when the computer system is perceived to be more useful [23]. This suggests that the effect of enjoyment is related to the perceived usefulness of the system. Intrinsic motivation was included in the attitude construct of initial UTAUT studies but because the effect of attitude was considered being captured by effort expectancy, items from intrinsic motivation were not included in the final version of UTAUT [11].

Motivational Model also proposes that both ease of use and output quality are important constructs but affect usage only indirectly through usefulness and enjoyment. "Whatever can be done to increase the output quality and ease of use of a system would be expected to have positive effects on both usefulness and enjoyment [23]." However, regardless of ease of use or ability to produce high quality, some applications or systems may not be widely accepted, if they are not suited for the tasks that really are important to the users' jobs. According to the study, task importance moderates the effect of ease of use and output quality on usefulness [23].

2.1.4. Model of PC Utilization (MPCU)

Largely based on Triandis' theory of interpersonal human behaviour Thompson et al. [15] developed Model of PC Utilization (MPCU) to describe how computer systems are utilised and adopted by knowledge workers. Although Triandis' model was generally accepted within psychological literature, it had not been used to predict technology adoption, and therefore it had to be refined and adapted to fit the PC utilisation context.

The original MPCU model consisted of six factors that were theorised to explain technology adoption. These determinants were job-fit, complexity, long-term consequences, affect, social factors and facilitating conditions. These constructs were tested and the final conclusion was that affect and facilitating conditions did not have a significant influence on PC use. In addition, the earlier model proposed by Triandis

included habits as an important determinant. Albeit the importance of habits to describe one's behaviour is widely accepted, the construct was not included in MPCU. [15]

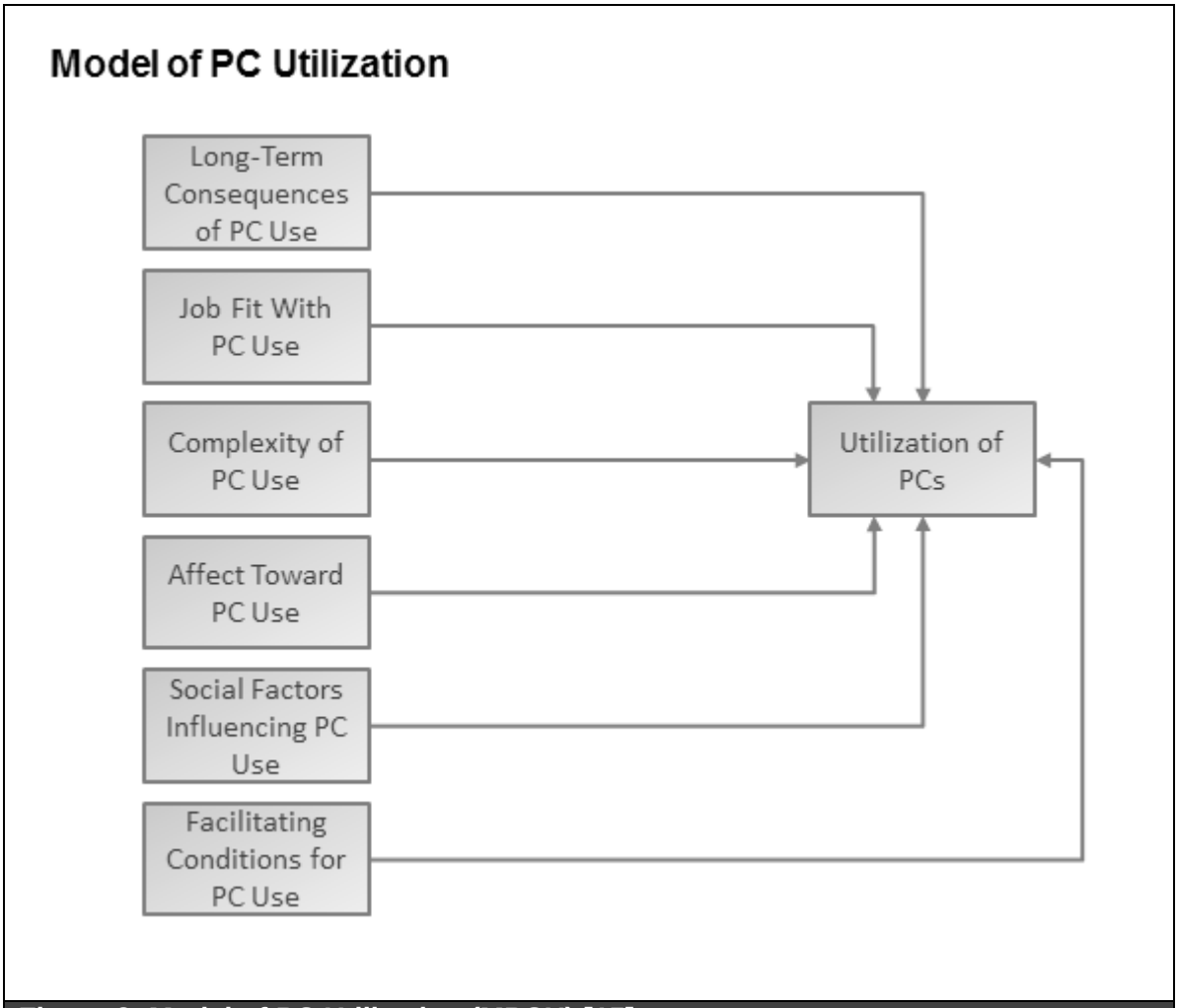

Figure 3: Model of PC Utilization (MPCU) [15]

Thompson et al. [15] define *job-fit* so that it measures how well the technology suits the user's needs in his or her everyday work. In other words, how well is the technology able to enhance the user's work performance? It is very similar to TAM's perceived usefulness construct and is widely accepted and researched determinant of technology adoption. According to Robey [21], performance issues are clearly linked to technology adoption and usage. Goodhue [24] has made similar observation and states: "The correspondence between individual task needs and information system functionality leads to individual performance". The items from job-fit are included in UTAUT's performance expectancy construct.

Complexity of PC use measures closely the same phenomenon as TAM's ease of use – just the opposite way. According to Thompson et al. [15], complexity strives to capture the difficultness of a system to be understood and used and it is based on the assumption that the more complex a system is to use, the lower is its adoption rate. As was the case

between TAM's usefulness and ease of use constructs, similar results were discovered between job fit and complexity: job fit was found to be stronger predictor of technology utilisation than complexity. Complexity is included in UTAUT's effort expectancy construct.

Long-term consequences is a slightly more original construct which suggests that even though a system would not assist a user greatly on his or her current job, the user could adopt the system if there would be positive outcomes in the future [15]. Such outcomes could be, for example, better career mobility, better opportunity for more meaningful work or even a raise in one's salary. According to Thompson et al. [15], "for some individuals, the motivation to adopt and use PCs may relate more to building or planning for the future than to addressing current needs".

MPCU claims that individual's behaviour is influenced by *social factors* which are formed through all sorts of messages received from other people [15]. According to Venkatesh et al. [11], social factors reflect what individuals think they are expected or even required to do. An individual may adopt a system if his or her co-workers have already adopted it, if manager is exceptionally supportive or if the organisation in general has supported the adoption or even demanded it. UTAUT recognises social influence as an independent determinant of behavioural intention.

Thompson et al. [15] discovered that the other two determinants, namely *affect* and *facilitating conditions* were not, quite interestingly, supported in the study. These constructs were, however, utilised in UTAUT research and have been validated in other studies as well [13], [24]. Deriving from Triandis' original research about attitude and attitude change, affect is defined in MPCU as "the feelings of joy, elation, or pleasure, or depressing, disgust, displeasure, or hate associated by an individual with a particular act" [11]. As its counterpart in UTAUT, facilitating conditions are objective institutional factors that make an act, such as technology adoption, for the individuals easier to accomplish [15]. For example through proper training and support some of the potential barriers to adoption and usage can be reduced or even removed completely.

2.1.5. Innovation Diffusion Theory (IDT)

Fourth approach that contributes to UTAUT is Innovation Diffusion theory (IDT) proposed by Moore & Benbasat (see [19]). Their reasoning for the theory was belief that there still was not a model comprehensive enough that would measure the variety of perceptions of different innovations. Innovation Diffusion Theory is mainly based on the characteristics developed by Rogers (see [25]): five constructs from Rogers' initial theory were first utilised and refined, and two additional constructs were then added based on

research of other similar studies. The model itself is used to investigate, how various perceptions affect individuals' actual use of information technology innovations [19]. Similar to previously introduced models IDT proposes that adopters' behaviour can be predicted based on how they perceive the primary attributes of the technologies.

IDT explains behaviour through eight attributes, namely relative advantage, complexity, compatibility, result demonstrability, visibility, trialability, image and voluntariness [19]. The first two, *relative advantage* and *complexity*, are clearly similar to constructs introduced in both TAM (usefulness and ease of use) and MPCU (job-fit and complexity) and thus are not explained here in more detail. Both scales are also included in UTAUT's performance and effort expectancy constructs, respectively. The other six, on the other hand, are somewhat more original and hence require slightly more discussion.

According to Rogers [25], *compatibility*, "the degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters", decreases user's uncertainty and makes it easier and more comfortable to adopt the new innovation. If the technology suits well the user's work style or current situation, the adoption process may seem more natural and the advantages of the innovation may be clearer and therefore motivate the individual to adopt the technology. According to Rogers [25], a new technology or innovation may be compatible or incompatible with the user's sociocultural values and beliefs, previously introduced ideas and/or underlying needs of the user. Items from the compatibility construct are included in UTAUT's facilitating conditions construct.

Moore & Benbasat [19] discovered that Rogers' original observability scale seemed to become more complex to be measured properly presumably due to tapping two distinctly different scales. They solved this problem by dividing the observability scale into two separate constructs, namely result demonstrability and visibility. First, *result demonstrability* concentrates on the tangibility and clarity of the results when using the innovation, i.e. the observability and communicability of the results. According to Rogers [25], observability is "the degree to which the results of an innovation are observable to others". Communicability, on the other hand, describes how well the results can be communicated to others, such as colleagues and superiors at work [19]. Second scale extracted from the original observability construct is the *visibility* of the innovation which measures the degree to which one can see how widely an innovation is being used in an organisation and how people really have utilised it. Although both were considered as important aspects of technology adoption in the context of innovation diffusion theory, result demonstrability and visibility were not utilised in the UTAUT model.

Trialability, the fifth construct derived from Rogers' theory, is defined as "the degree to which an innovation may be experimented with before adoption" [25]. According to Moore & Benbasat [19], trialability is less significant in organisational context but should still be regarded as an important factor, especially by those who would adopt an innovation at their own risk. In practice, it describes, whether potential adopter has been able to try out the innovation and its features before the decision to adopt. Rogers [25] states that trying out an innovation is one way for an individual to give meaning to the innovation to determine how it really works under one's own individual conditions. Similar to result demonstrability and visibility constructs, trialability was not included in the UTAUT model.

Image is the seventh construct of the IDT model, and also first scale identified beyond Rogers' original classification. Image in IDT is defined as "the degree to which use of an innovation is perceived to enhance one's image or status in one's social system" [19]. Interestingly, Tornatzky and Klein [26] found in their meta-analysis that social approval, in other words "status gained in one's reference group", could be an important function of technology adoption. Due to the similarity between social influence and image, UTAUT adopted the items from image scale to measure social influence in the framework [11].

The last construct of the Innovation Diffusion Theory is *voluntariness of use*. Moore & Benbasat [19] define it as "the degree to which use of the innovation is perceived as being voluntary or of free will". Some innovations may be mandated or discouraged by corporate policy. It is probable that these policies may influence the adoption behaviour and motivation to learn and start using an innovation. Interestingly, according to Moore & Benbasat [19], it is often not actual voluntariness which influences adoption behaviour, but rather the perception of voluntariness. In UTAUT, voluntariness of use is regarded as a moderating construct.

2.1.6. Social Cognitive Theory (SCT)

Final technology adoption theory to contribute to the research framework is Social Cognitive Theory (SCT). Originally developed by Bandura to explain human behaviour SCT was extended by Compeau & Higgins (see [27]) to predict computer utilisation and use. Somewhat similar to Technology Acceptance Model (TAM) SCT utilises two sets of expectations: outcomes and self-efficacy. According to the theory, these are the major forces to guide one's behaviour [27]. Other key constructs in the theory are affect and anxiety. Although SCT is originally developed to measure computer use, it was included in UTAUT because "the nature of the model and the underlying theory allow it to be extended to acceptance and use of information technology in general [13]".

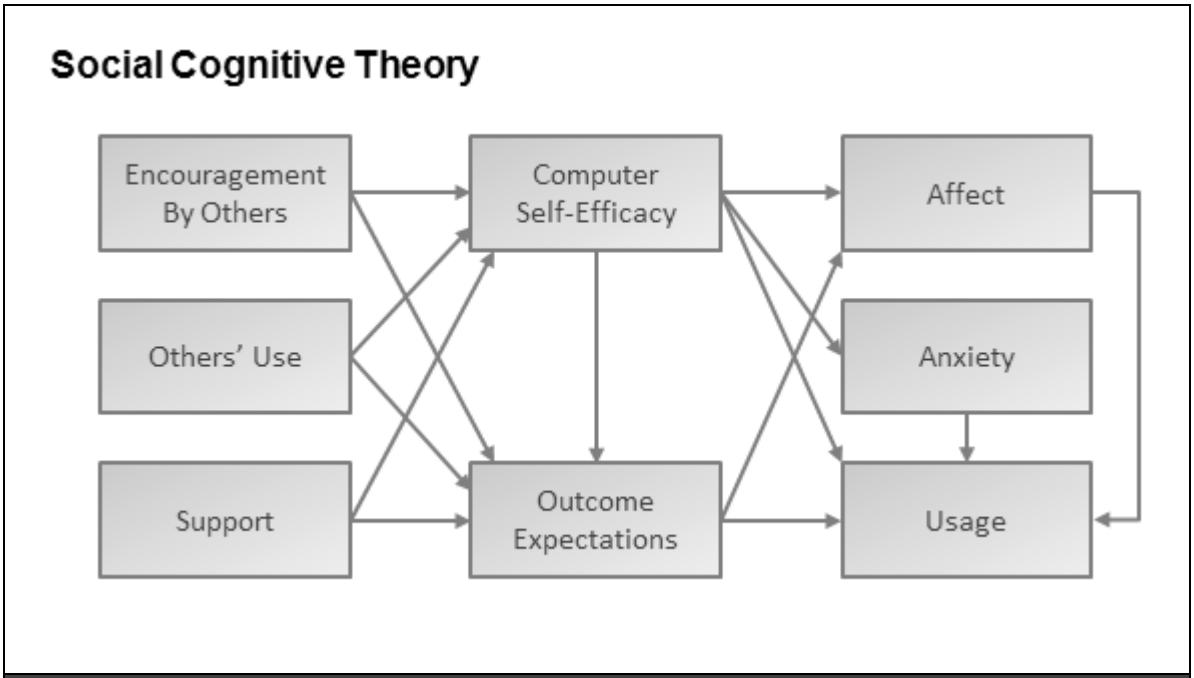

Figure 4: Social Cognitive Theory (SCT) [27]

Figure 4 illustrates the links in Social Cognitive Theory. SCT theorises that *outcome expectations* have two dimensions: performance and personal. Similarly to previously introduced models the performance dimension states that an individual is more likely to take a particular action if he or she believes it will result in desired outcome, such as better performance in work-related tasks [27]. Because this phenomenon has already been described thoroughly in the present research, performance expectations are not explained here in more detail (refer to perceived usefulness, extrinsic motivation, job-fit and relative advantage for further information). Compeau & Higgins [27] considered outcomes such as sense of accomplishment, higher self-esteem and feelings of joy, to belong in the personal outcomes dimension. They discovered that these aspects had some significance but not as much as expectations of performance. Expectations were theorised to affect usage both directly and indirectly through the affect construct.

Self-efficacy represents an individual's perceptions of his or her capabilities to accomplish a particular task, in this case by using a computer. According to Bandura [28], even though an individual would believe that a certain action would provide desired outcomes, he would not necessarily act, if he or she doubted his or her capabilities to perform the required activities. Compeau & Higgins [27] stated that individuals with high self-efficacy use computers more, derive more enjoyment from their usage and experience less computer anxiety. Judgements of self-efficacy differ on three dimensions: magnitude, strength and generalisability. They also suggest that the effect of self-efficacy is quite versatile: it affects usage not only directly, but also indirectly through performance expectations, affect and anxiety. Albeit self-efficacy has been validated and

is regarded as a strong predictor of usage, it was not included in UTAUT as such due to its effect being captured by effort expectancy [11], [27], [29].

As stated above, in addition to having a direct impact on use, *affect* and *anxiety* have been theorised to mediate the effect of outcome expectations and self-efficacy on use. Compeau & Higgins [27] discovered that affect, generally defined as the degree to which users actually enjoy and like using computers, has a significant impact on computer use. Similarly, anxiety about computers was also found to weigh significantly on computer usage. Interestingly however, in separate research (MPCU) Thompson et al. [15] found no relationship between affect and computer utilisation. Furthermore, Venkatesh et al. [11] found that the effect of affect and anxiety were captured by effort expectancy and thus were not included in UTAUT.

Social Cognitive Theory includes also three constructs which influence outcome expectations and self-efficacy, namely *encouragement by others*, *others' use* and *support*. These can be regarded as social influence; similar to some of the previously explained models [11], [15], [19]. In their research Compeau & Higgins [27] found indirect interplay both between encouragement & outcome expectations and encouragement & self-efficacy. There was no direct impact on usage behaviour. Similarly, others' use influenced behaviour indirectly through expectations and self-efficacy. Findings regarding support were, however, puzzling and unexpected. According to their study, the influence of support on outcome expectations and self-efficacy was negative. In UTAUT research, the constructs regarding social influence from SCT were not included.

2.1.7. Other theories (TRA, TPB, TAM2)

In addition to the five theories introduced above, UTAUT also incorporates three other theories, namely Theory of Reasoned Action (TRA), Theory of Planned Behavior (TPB) and TAM2 which is basically TAM and TRA/TPB combined [11]. These theories contribute only to the social influence and facilitating conditions constructs in UTAUT, and are therefore beyond the scope of the present research.

2.2. Usability

Usability is a quality attribute that measures, how easy and satisfying something is to use: "If people can't or won't use a feature, it might as well not exist" [30]. Usability has been defined by International Organization for Standardization (ISO) as follows [31]:

Extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use.

System usability is a component of a larger chain of attributes which together determine the big picture: system acceptability. According to Nielsen [32], system acceptability consists of social acceptability and practical acceptability. The present study focuses on the latter which Nielsen considers to be determined by attributes such as general usefulness of the system. Usefulness, again, can be broken down to two categories, namely utility and usability of the system. Nielsen states that the main difference between utility and usability is that utility measures whether a system in principle can do what is needed and usability, on the other hand, how well users actually can use the system.

Hertzum [33] suggests that usability has become such a ubiquitous term in both literature and general discussion that it is very difficult to have one established definition that would cover the whole essence of the concept. At any given time, depending on the observed system and the context of use, usability can be considered from so many perspectives that there are inherent differences in how the various elements of usability are emphasised on one hand and ignored on the other. Based on his findings, Hertzum [33] has defined six images of usability that describe the essence of the concept from varying perspectives and emphasising different aspects of usability:

- Universal usability: Usability is about embracing the challenge of making systems for *everybody to use*. Key emphasis should be given to user diversity, knowledge gaps in the user base and variety in the available technology.
- Situational usability: Usability is equivalent to the quality-in-use of a system in a specified situation with its users, tasks and wider context of use. Based on this image, usability is an attribute of the interaction between system, user, task and contextual conditions, i.e. the total quality of the use situation.
- Perceived usability: Usability concerns the user's subjective experience of a system based on his or her interaction with it. Perceived usability concerns how people experience the relation between the returns they get from using a system and the resources they must expend using it.
- Hedonic usability: Usability is about joy and satisfaction of use rather than ease of use, task accomplishment and freedom of discomfort.
- Organisational usability: Usability is about groups of people collaborating in an organisational context. Usability is the fit between a system and the organization, and includes structural and collaborative aspects of use situations. Users may be differentially affected by systems and may not share organization-level system goals.

- Cultural usability: Usability is considered and understood differently depending on the users' cultural background.

Regardless of the perspective, usability is not one-dimensional property but it consists of multiple components. Researchers have generally defined usability through usability attributes or criteria which together can be used to determine the usability of a system or an application [32], [34], [35], [36]. The usability criteria of four notable usability definitions are summarised in Table 1. As can be seen, the basic attributes are relatively similar to each other.

Table 1: Four usability definitions and their respective usability criteria and attributes

Constantine & Lockwood [36]	**Schneiderman** [34]	**Nielsen** [32]	**Preece et al.** [35]
Efficiency in use	Efficiency	Efficiency of use	Throughput
Learnability	Time to learn	Learnability	Learnability
Rememberability	Retention over time	Memorability	
Reliability in use	Rate of errors by users	Errors/Safety	Throughput
User satisfaction	Subjective satisfaction	Satisfaction	Attitude

By combining theories and definitions from technology adoption, usability, user experience and system continuance frameworks, the present study ends up touching upon many of the images introduced above, however none of the images is utilised as such. The reason for this is that the images have by definition a perspective of their own, and none of the perspectives contributes directly to the present study and its research questions. The usability criteria in the context of this study derive from the usability definitions listed in Table 1. This definition is used because it provides clear and concrete components that can be easily utilised as such in defining and categorising the participants' expectations.

Because for many users the first experience with a new system is that of learning to use it, *learnability* can be regarded as one of the most fundamental usability attributes, especially from the technology acceptance point of view. Learning is also important because the time an individual worker spends learning to use the system is time that he or she is not being fully productive [36]. Learnability generally refers to the time and effort required to reach a specified level of proficiency with the system [32], [35]. Specified level does not generally refer to complete mastery but to a sufficient skill level

so that the user is able to do useful work with the system and learn more at the same time. In addition to having a specified level of proficiency, it should be noted that user community should be regarded as a set of typical users [34].

Efficiency refers to the performance level a user can achieve with the system once having learned how to use it properly [32]. Performance level is generally measured through carrying out specified benchmark tasks and monitoring the execution time [34], [35]. According to Nielsen [32], efficiency usually describes the throughput of an *experienced* user, and thus a definition of expertise is first required to be able determine the efficiency of a system. However, there is a common trade-off between the ease of learning and efficiency: systems or applications that thoroughly guide a user through a complex task may be easy to learn on one hand, but often prevent a well-trained and experienced user to work effectively on the other [36].

Nielsen [32] states that in addition to being easy to learn and efficient, system's use should also be *easy to remember* so that the user can return to the system after a period of not having used it without having to learn everything from scratch. This is important because in addition to expert and novice users, a third major group also exists, namely casual users who should be able to maintain their knowledge when not using the system. Nielsen also points out that learnability and memorability are closely related criteria and usually improvements in one may result in a better state in the other as well. On the other hand, returning to a system may often be quite different from using it for the first time, which is why these two attributes (learnability and memorability) can often be seen as distinct usability criteria. Finally, Schneiderman [34] remarks that frequency of use is also an important factor in determining the level and extent of system memorability.

When using a computer application *errors* often occur, especially to novice users. Nielsen [32] states that proper error handling is essential usability criterion. It is important to minimise the possibility to make erroneous actions with the system, to discover the errors made by users and to recover quickly from the errors made. Most importantly, catastrophic errors, that either result in crashing the system or a faulty product, should be non-existent. Errors made by the user often have a direct effect on the system efficiency but these attributes should be measured separately nevertheless [34]. It is also possible that errors made by the user may affect his or her motivation to continue learning and adopting the system.

Finally, a system should be pleasant to use and deliver *satisfaction* to the user, which results in positive feelings towards the used technology. User should like using various aspects of the system and find it approachable as a whole [32], [34], [35]. Satisfying application is not only likely to be used more often but it is also used more effectively and

users who are irritated or displeased are likely to make more mistakes and to work less efficiently [36]. In the present research user satisfaction is also theorised to affect continued use of the system through the interplay between pre-exposure expectations and post-exposure user experiences.

2.3. User experience (UX)

Mäkelä and Fulton-Suri [37] have described the relationship between expectations and user experiences as follows: "People's experiences are subjective, resulting from motivated actions in context. Moreover, experiences are influenced by previous experiences and expectations."

As technology has matured rapidly, interactive products have become not only more useful and usable, but also more fashionable and something fascinating to desire [10]. User experience, a relatively fresh approach in Human-Computer Interaction (HCI) research studies, how users form overall evaluative judgements on the quality of used systems [38]. It has extended the HCI focus further beyond the users' instrumental needs. User experience, also known as UX, has been accepted as a viable alternative viewpoint and extension to traditional HCI [10].

Defining user experience is rather difficult because it can extend to nearly everything in one's interaction with an application or a system. For example, a user's knowledge of a product affects his or her attraction towards it. However, because the attraction, in turn, influences the user's will to learn more, it has a clear impact on his or her knowledge. Kuniavsky [39] emphasises the complexity of these relationships and states "understanding the relationship between these elements requires a different kind of research than merely timing how quickly a task is accomplished or testing to see how memorable a logo is."

Albeit the limitations and elusiveness of the user experience concept, some definitions for UX do exist. Alben has provided a relatively early definition for user experience. According to her, experience includes "all the aspects of how people use an interactive product: the way it feels in their hands, how well they understand how it works, how they feel about it while they're using it, how well it serves their purposes, and how well it fits into the entire context in which they are using it [40]". Moreover, Hassenzahl defines user experience as "a momentary, primarily evaluative feeling (good-bad), while interacting with a product or service" [41]. A clear indication of the novelty of UX research is that ISO defined it for the first time in 2010. According to the fresh ISO definition (see [42]), user experience can be conceptualised as follows:

A person's perceptions and responses from the use and/or anticipated use of a product, system or service.

In addition to the definition itself, ISO has added some important considerations that should be taken into account within the user experience concept. First, user experience is considered to include all the users' emotions, beliefs, preferences, perceptions, physical and physiological responses, behaviours and accomplishments that occur before, during and after use. Second, user experience should be regarded as 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. Third, usability can also include similar perceptual and emotional aspects that typically are associated with user experience. Therefore, some usability criteria can be used to assess aspects of user experience, especially when being interpreted from the perspective of the users' personal goals. [42]

As can be seen, user experience research has taken a different perspective compared to traditional task- and work-related, instrumental approach. According to Hassenzahl & Tractinsky [10], UX research can actually be divided into three major streams that together try to capture the essence of user experience phenomenon. First research stream focuses to describe the interplay between the end users' instrumental (pragmatic) and non-instrumental (hedonic) needs.

The first research stream states that users perceive interactive systems along two different dimensions: instrumental (do-goals) and non-instrumental (be-goals) [41], [43]. According to a user experience model developed by Hassenzahl [44], non-instrumental dimension can be further divided into three hedonic attributes: stimulation, identification and evocation. Stimulating products provide users the means for personal development by enabling new impressions, opportunities and insights. Identification refers to a product's ability to communicate the user's identity, and evocation, for its part, to the product's ability to provoke memories. Unlike the instrumental attributes that aim for utility and to fulfil one's behavioural goals, these are meant to emphasise an individual's psychological well-being. Additional non-instrumental needs can be, for example, need for beauty (aesthetics), surprise, diversion or intimacy [10].

This approach is valuable for designers because it provides the possibility to link product attributes with the end-users' underlying needs and values [10], [44]. That is to say, one should always consider both do-goals and be-goals during the design process, since both aspects are related to the general evaluation of products [43]. First, a system has to be useful and thus meet user's pragmatic do-goals but without satisfying the non-

instrumental be-goals, the user may never become really attached to the system [43]. By meeting the be-goals a product contributes directly towards the user's positive experience. Do-goals, on the other hand, influence indirectly by making the interaction easier and therefore more likely in the long run [41]. That is to say, a system or application has to be useful and usable before non-instrumental aspects can be achieved [45]. Figure 5 clarifies this statement. To achieve a balance between both aspects is the primary goal of the first UX research stream but the challenge is that the non-instrumental needs must be first better understood before they can be efficiently used when designing interactive products [10].

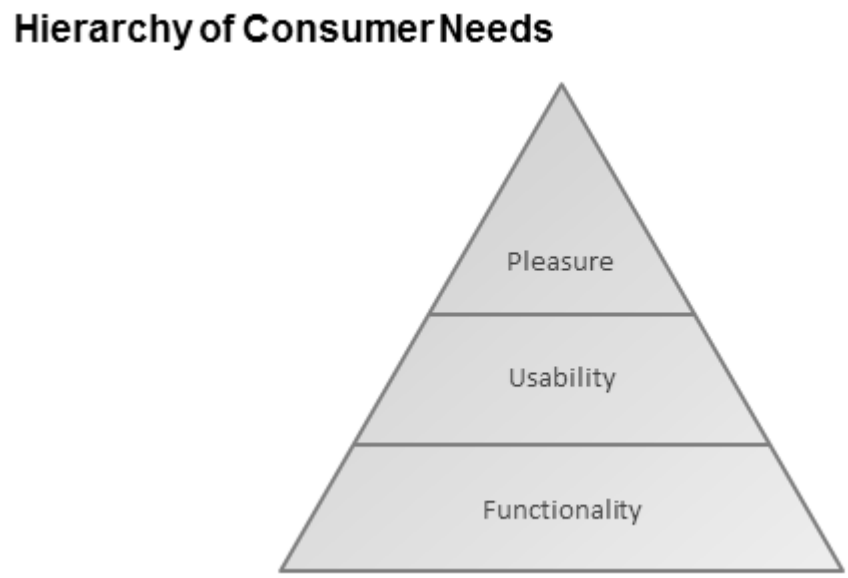

Figure 5: Hierarchy of Consumer Needs (Functionality, Usability, Pleasure) [45]

The second research stream concentrates on affective and emotional aspects of interaction and it is interested in the positive consequences of affection and its role as an antecedent, a consequence and a mediator of technology use [10]. According to Forlizzi & Battarbee [46], emotion is essential from design perspective due to its influence on shaping the gap that exists between people and products in the world. Emotions are at the heart of any human experience and therefore also an important determinant of user-product interactions and user experience: emotions are sometimes utilised to evaluate outcomes from product or service usage.

Traditional HCI research has generally strived, through usability design and testing, to prevent users' frustration and dissatisfaction. However, user experience research is especially focused on the positive emotional results such as joy, fun and pride [10]. In other words, user experience approach is not only trying to prevent usability problems but also creating good and memorable experiences. Or as Hassenzahl & Tractinsky [10]

put it: “Just as there is much more to wellbeing than the absence of malady, so must there be more to UX than the absence or problems.” Therefore, interaction design should always strive for better quality of life through designing for pleasure rather than for absence of pain.

Third main stream of UX research strives to explain, how the nature of experiences develops over time [10]. Karapanos and his colleagues [38] argue for three phases of adoption, namely orientation, incorporation and identification. They propose that the experiences of a user adopting a new technology vary over time. They found out that different product attributes and qualities are appreciated depending on the adoption phase that is currently active. The transformation from one phase to the next is influenced by three forces: familiarity with the product, functional dependency and emotional attachment. They state that due to the temporality of experiences, product qualities that make initial experiences and adoption satisfying are theorised to lose their importance and to be replaced by other attributes during continued usage. This third research stream points out that researchers should allocate more effort to understand continued use – how a system becomes meaningful in one’s daily work.

Albeit different in terms of approach and perspective, the meaning of user experience research is not to underrate or replace the contributions of traditional usability research. Conversely, both viewpoints should work in tandem to achieve richer, more complete and holistic HCI. The present research utilises UX to describe the impact of experiences on user’s expectations about the technology at hand. Through the interplay between the expectations and the experiences, the research aims to describe the phenomenon of continued use.

2.4. Expectation confirmation and use continuance

Although initial adoption of a technology is a significant first step toward realising the potential of the new application or system, long term productivity advantages depend on the technology's continued use rather than first-time use. This is so because infrequent, inappropriate and ineffective long-term usage of new system or application often results in not meeting the expected productivity and job satisfaction benefits [47]. For this reason it is important to understand that post-adoption behaviours and beliefs will change over time and that they do not only intensify but may also diminish under continued usage. Some of the underlying reasons for this stem from users' different ways to relate to and utilise the different features of the systems [2].

The importance of post-adoption behaviours has been noted in MIS research. However, according to Jasperson [2], the research has often been restricted to traditional determinants and thus use continuance has been modelled as being influenced by the same factors as initial acceptance and adoption. One of the problems here is that for adoption, end-user perceptions and expectations are formed prior the exposure, which results in dependent variable being actually intention to adopt rather than intention to use [8].

Extracting expectation-disconfirmation theory (EDT) from marketing research Bhattacherjee (see [47]) integrated it with previous technology acceptance studies and utilised the combination to explain information system use continuance. EDT was originally developed in 1980 by Oliver (see [48]) for marketing purposes: the theory posits that user satisfaction is actually determined by two constructs: user's expectations of the system and post-exposure (dis)confirmation of these expectations. Confirmation is closely related to the magnitude and direction of satisfaction because it implies the way how expected benefits were actually realised in practice. Figure 6 illustrates the key constructs and relationships in the theory.

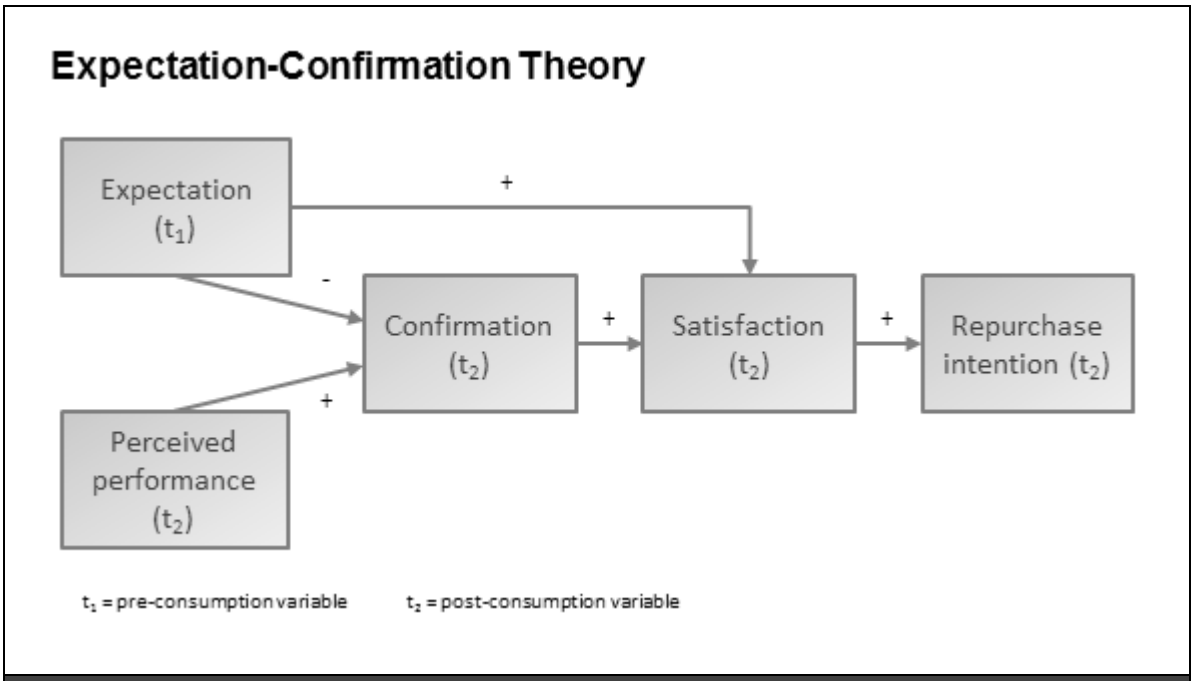

Figure 6: Expectation-Confirmation Theory [47]

The theory consists of five phases which are distinguished as pre-consumption and post-consumption variables. First, an individual user is said to form initial expectations of system, product or service. This is similar to traditional technology acceptance models. Second, the user decides to accept and start using the system. Along with the usage, the user forms a judgement of the system's performance. Third, the user compares the perceived performance to his or her initial expectations to determine the extent to which the expectations were confirmed. Fourth, a (dis)satisfaction is formed based on the confirmation level and the initial expectations on which the confirmation was based. Finally, based on their satisfaction or dissatisfaction, the user decides to either continue or discontinue the use of the system, respectively. In Oliver's model for marketing, continued use is named as "repurchase intention". [47], [48]

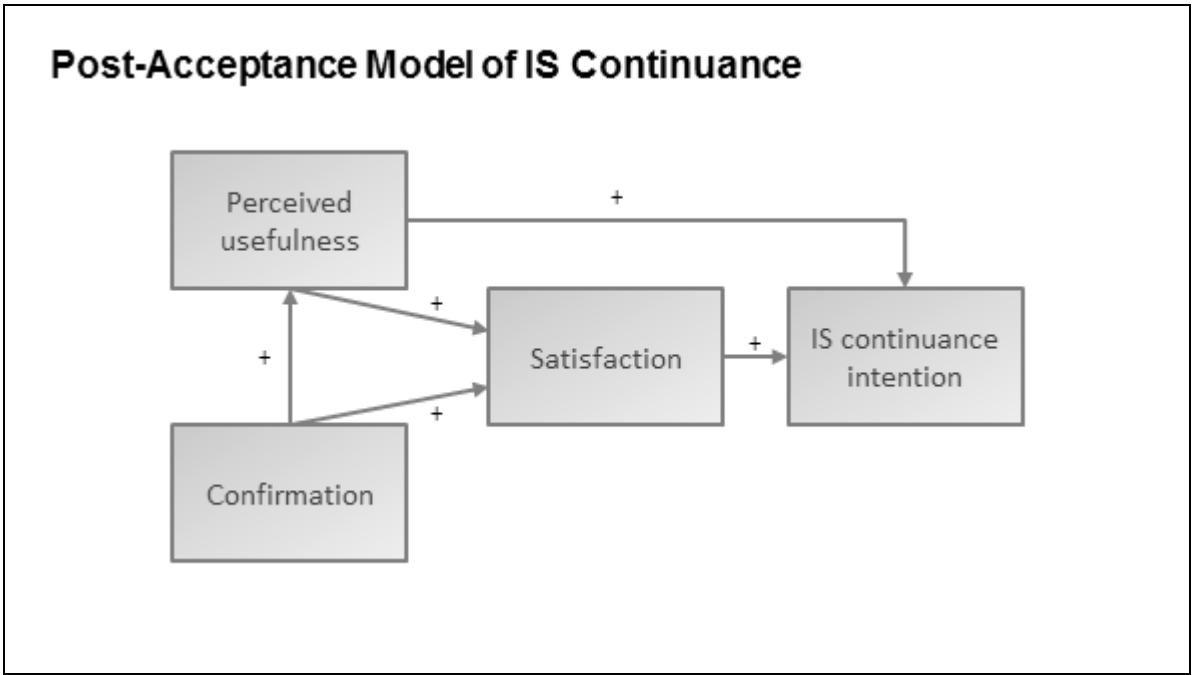

Figure 7: A Post-Acceptance Model of IS Continuance [47]

Figure 7 shows how EDT was applied to describe IS continuance. Similar approaches and utilisation of user satisfaction in particular are not entirely strange concepts in information system and technology acceptance research. Wixom and Todd [17], proposed a theoretical integration of technology acceptance and user satisfaction. According to them, "both research streams offer valuable contributions to our understanding of IT (Information Technology), although each tells only part of the story". Drawing from their study Mahmood et al. [49] stated that users who perceive an information system as providing value are more likely to be satisfied with it. They considered this key factor in leading a new information system to success. They also remarked that information systems have been investigated increasingly from the expectation perspective with strong links found between expectations, increased performance and satisfaction levels. Interestingly, end-user computer satisfaction was also found to be strongly affected by perceived benefit and expectations such as perceived usefulness and ease of use.

These findings are consistent with previously introduced models concerning technology acceptance and expectation-confirmation. Interestingly, in terms of end user satisfaction ease of use is said to be an important factor due to its ability to enable users to become more advanced and therefore better able to take advantage of wider range of features and capabilities the system has to offer [50]. One should also note that emotions resulting from the usage are not only neutral or positive but they can also be negative. In fact, disconfirmed expectations can be disappointing, embarrassing or even enraging [46].

According to Venkatesh and Goyal [18], both positive, and negative disconfirmation of initial expectations have an unfavourable effect on the user's intention to continue usage.

In other words, a disconfirmation even in the positive direction has an adverse effect on the ultimate outcome – the continued usage. Surprisingly, negative effect of positive disconfirmation on usage is also stated to be as bad as the effect of negative disconfirmation, possibly because while users may actually have positive experiences, they still might focus on the negative aspects [18]. Additionally, expectations are theorised to have an impact on the magnitude of (dis)confirmation because they provide a baseline or reference level for users to form evaluative judgements against [47]. Venkatesh & Goyal [18] found support for this statement and noticed that confirmation at low levels of expectations resulted in a lower level of usage intention, compared to confirmation at higher levels of expectations. This suggests that setting high but realistic expectations about a system and its performance and then meeting those expectations is important in achieving highest possible probability of continued usage.

Expectations are also theorised to change over time. As users learn more during the system usage, they may simultaneously adjust their attitudes, beliefs, views and behaviours. Since technology acceptance and use continuance are theorised to be affected by user's perceptions and expectations, one's usage behaviour may reverse from the initial acceptance to later discontinuance at a later time due to developed expectations [51]. Venkatesh & Morris [52] made similar findings in their earlier study when they were researching gender differences in technology adoption: male and female knowledge workers formed their beliefs and perceptions based on different qualities and system attributes but in both cases these were being adjusted over time. Additionally, UTAUT postulates that some constructs lose their significance over time [11].

According to Bhattacherjee and Premkumar [51], (dis)confirmation of a user's pre-exposure expectations and the post-exposure (dis)satisfaction that results will influence his or her expectations and beliefs. They state that as system usage takes place, these altered beliefs and perceptions will have a continuous effect on continued use. Moreover, as user accumulates further experiences through usage, the expectations will be altered in an iterative manner through continuous interplay between experiences and confirmation processes. Figure 8 illustrates this interaction.

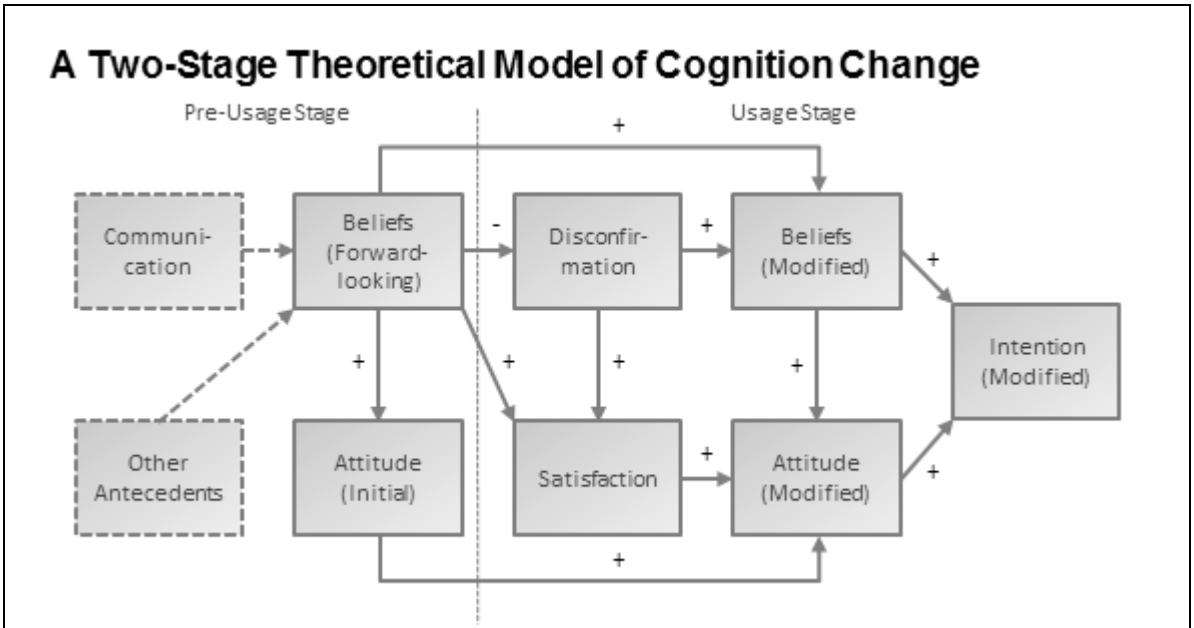

Figure 8: A Two-Stage Theoretical Model of Cognition Change [51]

Another way to capture the essence of changing nature of perceptions is the concept of cognitive absorption (CA) discussed by Agarwal & Karahanna (see [22]). This concept was found to have a significant influence on an individual's performance and ease of use perceptions. Cognitive absorption refers to a state where individual knowledge worker is experiencing gratification and pleasure from the current interaction with the system and task. This state is, especially, postulated to result in higher perceptions of lower cognitive burden, in other words perceptions of ease of use. Cognitive absorption consists of five dimensions that have a positive impact on perceived ease of use. The dimensions are temporal dissociation, focused immersion, heightened enjoyment, control and curiosity. [22]

One, temporal dissociation refers to a situation, where an individual knowledge worker perceives him- or herself to have adequately time to complete a given task and thus feeling less stressful. This is said to contribute to the overall feeling of performance. Two, focused immersion refers to a state where the user is so focused on a task that he or she feels no cognitive burden associated with the task performance. Three, heightened enjoyment is theorised to enhance one's ease of use perception. This is due to the fact that enjoyable tasks are often considered as less burdensome. This dimension is also found to influence positively perceived usefulness. Four, sense of being in control of the system and the task at hand is said to reduce the perceived task difficulty. Finally, if the user is curious about the system or application used, he or she is expected to feel less cognitive burden associated with the interaction. [22]

2.5. Research framework

By integrating the key contributions of the above mentioned theories and research streams, the present research aims to explain the acceptance and continuance of a new technology. Figure 9 illustrates the framework that has been developed to answer the three research questions introduced before:

1. How do users' initial pre-exposure expectations affect their intentions to adopt and use a new communication system?

2. What is the role of user's post-exposure experiences in the adoption process?

3. What factors affect users' intentions of continued use?

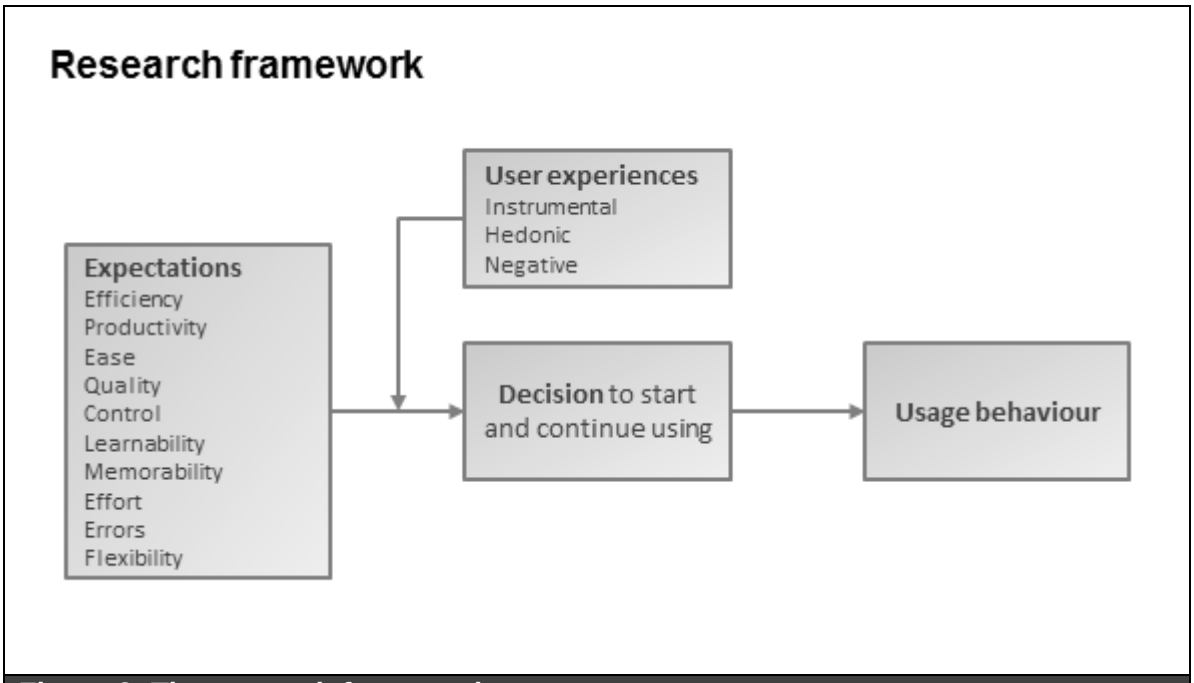

Figure 9: The research framework

One, by utilising performance expectancy and effort expectancy constructs from UTAUT model, this study explores, how these expectations influence an individual knowledge worker's decision to adopt or not to adopt a new communication technology in the case organisation. Since the individual has not yet been exposed to the technology itself, these expectations determine whether he or she is willing to start using the system and learning its use. In the present research the expectations concerning the performance of the system and the perceived effort required to achieve this performance are modelled to be direct and independent antecedents of usage.

Two, in order to establish a more holistic usability perspective for the research, four usability definitions are integrated into the framework. This is due to the fact that

measuring effort expectancy only through items such as ease of use and complexity can be rather superficial and therefore not sufficient from the usability perspective. Instead, the present research strives to understand the underlying reasons for ease of use and thus taps into usability criteria such as learnability, memorability, effectiveness, errors and flexibility.

Three, the present research postulates that the initial pre-exposure expectations will be influenced by post-exposure user experiences. This interaction is expected to result in new post-exposure expectations. That is to say, as individual user decides to adopt and start using a system or application, his or her user experiences will moderate the initial expectations over time. As these pre-exposure expectations transform into post-exposure expectations under continued use, they will influence his or her decision to either continue usage or discard the system. The present research does not only study the difference between the expectations but also delves deeper into the concept of user experience itself. That is to say, different sorts of user experiences are theorised here to moderate the expectations differently thus resulting in different post-exposure expectations and further usage decisions. While Venkatesh and his colleagues discarded affect constructs from UTAUT, the present research utilises these aspects in the UX construct as a moderator of the expectancies.

Four, the final contribution of the present research is to explore the concept of use continuance. That is to say, how the post-exposure expectations influence individual users' decision to either continue usage or discard the system or application.

Figure 10 illustrates the overlap between the core theories of the research. Firstly, technology acceptance is theorised to derive from *expectations* (A.) and most importantly from performance expectancy (B. *usefulness*) and effort expectancy (ease of use/C. *usability*). Secondly, *usability* (C) consists of learnability, memorability, efficiency, errors and *satisfaction* (D). Thirdly, *user experience* (E) has been modelled to be a result of pragmatic (B. *usefulness*) and hedonic (D. *satisfaction*) dimensions. Finally, use continuance and continued use is generally theorised to be a result of user's initial *expectations* (A) and the *user experience* (E). As can be seen from the illustration, all the four key theories overlap and therefore support each other.

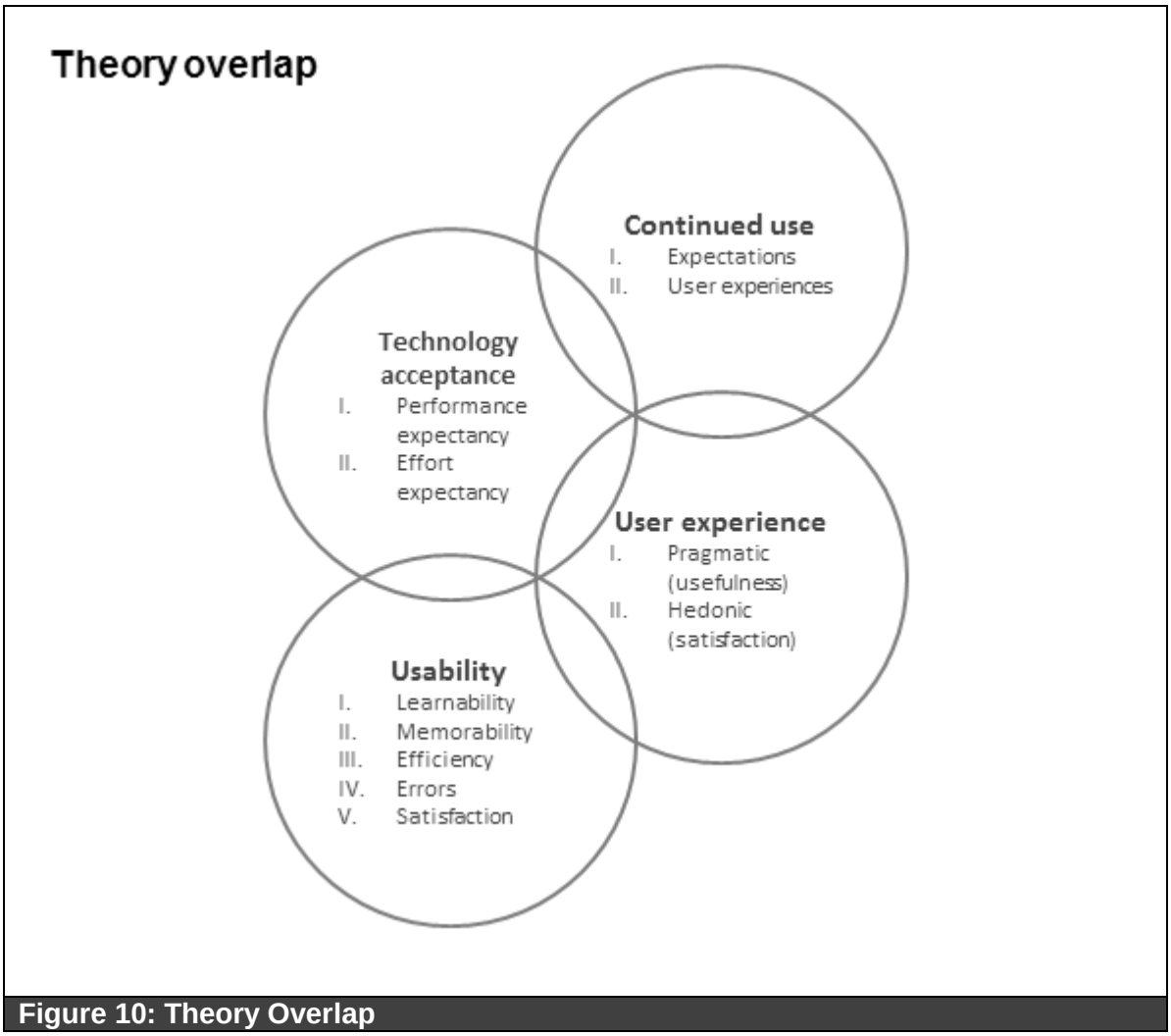

Figure 10: Theory Overlap

3. Methodology

This study was conducted by using case study methodology to investigate information and communication technology adoption and use in a separate business organisation in TeliaSonera Finland. The methodology consisted of an interpretive qualitative case study and an explorative quantitative analysis of survey data gathered within the case organisation. The research phenomena were studied through multi-method approach and using pre-post repeated sampling. The used methods were interview and survey and the methodology followed case study guidelines introduced by Yin (see [53]). Deriving from his principles the multi-method approach was pursued to increase the construct validity of the, mostly qualitative, research data and results. Similarly, external validity was pursued through solid theoretical background both in research design and data collection phases. Furthermore, repeated sampling enabled comparison between different findings over time: in this case between users' pre- and post-exposure expectations and also, whether new technology infused change in employees' existing work and communication methods.

3.1. Case approach

Yin [53] states that case approach is generally preferred method when the researcher has little control over events studied and when the study is focused on some present phenomenon within a real-life context. Moreover, case study is stated to be a fitting approach when answering research questions asking "how" or "why". Figure 11 illustrates three desirable research outcomes introduced by Braa & Vidgen (see [54]). They suggest that a research can generally be conducted to achieve one of the three outcomes, namely prediction, understanding or change. Comparably, Yin [53] distinguishes case studies through three variables: exploratory, explanatory and descriptive. In both perspectives, the first two attributes seem to bear some resemblance to each other but the last constructs are slightly more distinct, possibly resulting from different perspectives. On one hand, Braa & Vidgen [54] seem to focus on the outcome of a research and therefore "change" construct relates to the intervention that takes place during or after the research. On the other hand, Yin [53] seems to concentrate on a study's starting viewpoint, for "predictive" research perspective is said to be advantageous "when the research goal is to describe the incidence or prevalence of a phenomenon".

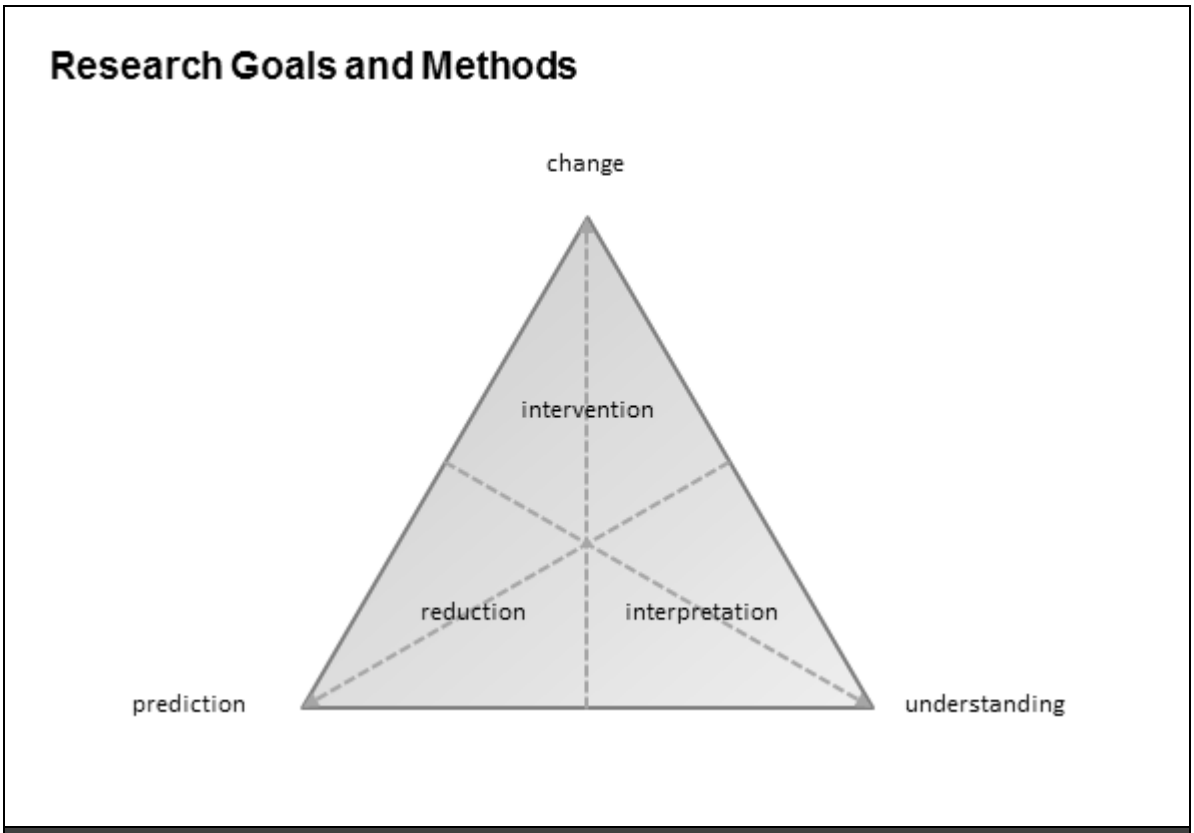

Figure 11: Research Goals and Methods [54]

The primary aim of the present research was to gain understanding of the interplay between technology expectations and user experiences. Hence exploratory approach was utilised to further explain the operational interactions between these constructs and system usage over time. The secondary aim was to induce change: the results of the study were utilised to support the technology implementation process that took place during the research within the case organisation. In their framework Braa & Vidgen [54] refer to this kind of hybrid approach (combining understanding and change) as “an action case”. In action cases the researcher, based on the understanding obtained through in-depth investigation, induces change by questioning the premises of the events and by suggesting new methods and concepts for use. Illustration of different study method combinations and action case in particular is presented in Figure 12.

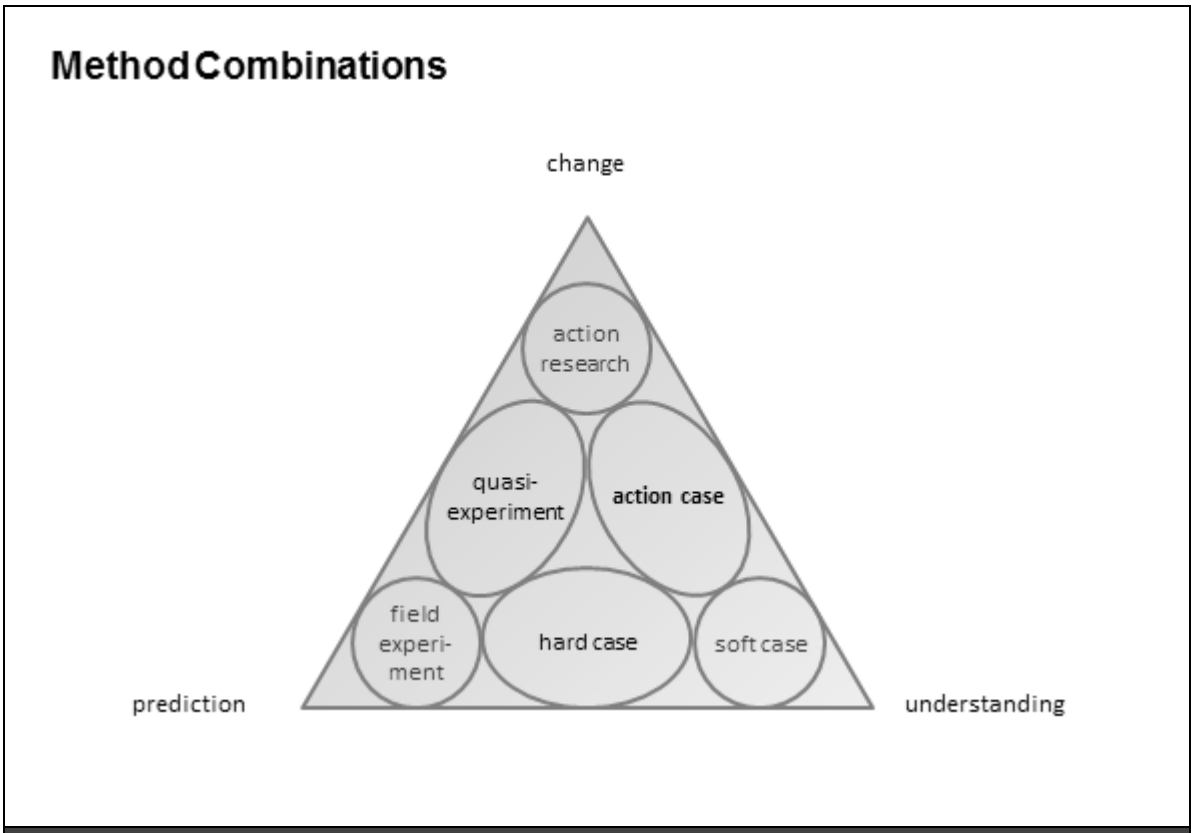

Figure 12: Method Combinations [54]

As has been described above, the main research methods utilised in this action case study were interviews and surveys. The key aspects of these methods are introduced next. Also the development of these methods within the present study will be explained more thoroughly.

3.2. Data collection

The research was made in co-operation between three researchers. Each researcher had his or her own perspectives and therefore the surveys and interview frameworks consisted of each researcher's own questions. The theoretical background and framework presented earlier provide basis on the questions concerning this particular research focus. Other researchers' questions and results were partly applied in the present research to obtain secondary data and provide versatility into the perspective.

A major strength of case study research is the possibility to utilise many different sources of evidence and as has already been stated, construct validity was pursued through multi-method approach [53]. Moreover, data collection and analysis in this study were conducted in such a way that the final empirical results and initial research questions were clearly linked. Yin [53] describes this activity as establishing a chain of evidence to ensure both construct validity and overall reliability. Additionally, all the data collected

during the research was saved into a case study database, thus also contributing to the reliability of the study.

3.2.1. Survey 1 and Pilot survey

In early phases of the project a basic questionnaire was applied in the case organisation to investigate employees' existing and perceived communication culture, habits and policies in a separate business organisation within TeliaSonera Finland. The questions concerned topics such as media use, choice of communication media, communication methods and culture, work meetings, e-mail, circulation and availability of information, perceived work pace, job satisfaction, need for new communication technologies and use of different means of transportation for work related tasks.

Surveys were utilised in the study because survey is basically the only viable way to reach a large number of respondents meaningfully (see [32]). Schneiderman [34] points out that another advantage in surveys derives from that all people are relatively familiar with them and therefore surveys do not require that extensive familiarisation and effort from the respondents. For the same reason it has been said that survey may not be that susceptible to mistakes. Vanhala [55] highlights that survey is a relatively neutral research method, which means that the respondents are not affected by the researcher and his personality. He proceeds by saying that similar to interviews, surveys can be used to measure the respondents' opinions, attitudes and feelings about the studied system, application or phenomenon, and to observe what has been the influence of a process, an event or an intervention. By using surveys in the present study, the phenomena observed in greater detail during interviews were able to be explored in larger context. Both open and multiple-choice questions were used.

In essence, the first survey had three objectives. One, the survey and its results were used to explore the prevalent communication practices in the case organisation and establish better understanding about the initial conditions related to communication tools and communication culture. Two, the findings made from the first survey were applied in the parts of the research that followed namely the interviews and the second survey. Three, the survey results created a baseline against which the final results and findings could be compared to understand how introducing the new communication tool had affected the employees' active communication portfolios and dominant communication practices. Furthermore, the survey had also two open-ended questions to enable more explorative probing as well. In essence, the survey results were utilised as additional and not primary data. The survey took place between 16th of June and 5th of August 2010, and the questions can be seen in Appendix A.

Before the actual survey was sent, an unofficial pilot survey was created and sent to the new system's pilot user group in the case organisation. Actually this questionnaire was pilot in two ways: first, the pilot survey was used to discover possible usability and other problems related with the survey questions and two, since the respondents were pilot users, this survey was a good way to probe key information that could be used to refine the questions and future interviews concerning the introducing and use of the new system. Iterative process where design, implement, test and redesign cycle is essential when developing new products and services [56]. Since survey is actually a usable object in itself, prototyping and learning from previous versions was substantially important here: if something did not work with the pilot survey, it most likely would not work in the actual survey either. When actual survey has been sent to respondents, it has to survive on its own and misunderstandings and biases must not occur [57].

3.2.2. First interview round – Expectations

After having established a good understanding about the initial conditions in the case organisation, a semi-structured interview based on UTAUT, and most importantly its performance and effort expectancy constructs, was created. Interview was chosen for three reasons. One, interviews are considered to be flexible and they can easily be combined with other research methods (see [58]). Two, interviews are efficient in studying aspects that are difficult to be defined objectively such as subjective experiences, impressions, habits, needs, backgrounds and preferences [32]. Finally, interviews suit well for explorative studies where it may not be appropriate to outline the research focus too tightly in early phases of the research [58]. The interviews were conducted between 16th and 30th of August 2010, and the questions can be seen in Appendix B.

As a research method interview is in many ways very much alike survey or questionnaire. In fact, survey has sometimes been referred in research literature as interview in written form [59]. However, interview is considered more flexible because the interviewer has the possibility to explain difficult questions or rephrase them on demand if it seems that the question has been misunderstood. Additionally, interview enables the researcher to look for valuable extra information through follow-up questions, which is not possible in surveys. In fact, close interaction is considered one of the most significant benefits of interviews. All in all, there is more to elaborate interview than asking predefined questions one by one [60].

The questions were derived and adapted from the theories and frameworks that comprise the performance and effort expectancy constructs in UTAUT (see [11], [13], [15], [19], [23], [27]). Additionally, to establish the pursued usability context and to allow for more comprehensive research on the pre-exposure expectations relevant usability criteria were

also integrated into the interviews. Interviews were then applied to investigate and describe the employees' prevalent expectations and general attitude towards new technologies and the technology implementation project that was about to take place in the case organisation.

First question focused on the users' initial knowledge about the new communication tool being implemented in the case organisation. This question was used to understand how the organisation's communication concerning the implementation process had met its audience and whether it had been efficient or not. Additionally this question gave a good impression how employees' core knowledge of this application varied. If the respondent had no knowledge or understanding about the tool, the interviewer provided him or her with a brief introduction.

Next, the interview focused on the employee's expectations. These questions were divided into three sections. First section focused on the employees' expectations about the performance and usefulness of the new tool. Because case studies rely on analytical generalisation instead of statistical, external validity derives from solid theoretical background [53]. To meet this requirement, the questions used in the interview were derived from the items introduced and extensively validated earlier in previous studies (see [11], [13], [15], [19], [23], [27]). The original performance items were categorised into five themes, on which the final performance questions were based on. The themes were quickness, efficiency, quality, control and ease of work. Principally the interviewee was asked how he or she thinks the new system will affect his or her work and what does he or she expect from the application in terms of performance. Depending on the answer, the interviewee was asked more detailed questions regarding the five themes introduced above, for example "Do you think that the system will enable you to work faster?"

Second section focused on effort expectancy. These questions were also based on theories introduced and validated in previous studies (see [11], [13], [15], [19]). However, because the usability contribution in these items is rather superficial, a set of usability criteria was utilised to create more elaborate usability contribution (see [32], [34], [35], [36]). The usability criteria drawn from the usability definitions were learnability, memorability, effort, errors, satisfaction and flexibility. Learnability and efficiency were already present to some extent in the applied technology acceptance theories. Memorability was found in one theory and errors were not mentioned at all. Satisfaction was excluded due to its effect being captured by user experience construct (see theory overlap in section 2.5.). Additionally, one more usability item was included, namely flexibility. Flexibility is "the extent to which the system can accommodate changes to the tasks and environments beyond those first specified" [35].

Again, the interviewees were asked how they think the implementation process will succeed and what factors are likely to have an impact on it. That is to say, how much effort they perceive is required to meet the available performance and usefulness benefits? Follow-up questions focused on the usability perspective, for example "Is it generally difficult for you to learn using new tools or applications? How do you think it will be with the new system in particular?"

Third section of the expectation interview studied how these expectations could affect one's willingness to adopt the new technology and how people responsible for the implementation process itself could affect the expectations, their nature and magnitude. In practice, these questions asked "Do these expectancies affect your willingness and motivation to adopt a new technology and can they be influenced somehow?" The importance of expectations and managerial implications have also been studied and validated extensively and therefore these questions had a solid theoretical background to ensure external validity [18], [47], [51], [52].

3.2.3. Second interview round – User experiences

The second interview frame was built based on relevant user experience theories and use continuance models (see [18], [38], [44], [45], [47], [51], [52]). Similar to first interview round, external validity was ensured through solid theoretical background. The interview was designed to study interviewees' user experiences, post-exposure expectations and plans regarding future use. The second interview round took place between 16th and 30th of November 2010, and the questions can be seen in Appendix C.

Similar to the first interview, the second interview also consisted of three sections. First, interviewee's experiences were discussed in a somewhat general manner. The interviewee was asked to describe what kind of (positive and negative) experiences he or she had encountered when using the application. Additionally, the interviewee was asked to reflect his or her pre-exposure expectations and describe how these expectations had been met in practice: was the user satisfied and had he or she possibly adjusted the expectations somehow already. This section had two goals. On one hand, it acted as an introductory to further UX-related questions. On the other hand, it provided the study an overview of the user experiences and already gave some indication of the possible discrepancy between the expectations and user experiences.

Second section approached the research phenomena in more detail. The primary goal for these questions was to delve deeper into the experiences to understand in detail what the user had experienced and how the experiences had affected his or her willingness to continue working with the application. Both positive and negative experiences, and at

least three from each, were accounted. Individual user experiences and the user's prevailing attitude towards the application were the key points in this interview section.

User experiences were gathered through retrospective recall. Retrospection means that users were asked to look back and explain important experiences and moments related to their usage with the new system between the moment of initial exposure and the time of the interview. In other words, instead of capturing the experiences at the moment of occurrence, the research focused to get a retrospective cross-section of different experiences and their influence on expectations.

However, memory based methods such as retrospection have been claimed to be problematic because of possibilities for biased results [61], [62], [63]. Hence the reliability of memories has been questioned in some studies. According to Karapanos [61], what we remember might be different from what we actually experienced. He suggests that a recalled event generates from act of reconstruction which cannot reproduce exactly the correct past event but usually results in a slightly altered version. The notion of memory bias has received support in past research [62], [63]. Robinson & Clore [62] suggest that every moment that elapses between an experience and its later recall, loss of detail should be expected to take place. They refer to these phenomena as random bias and systematic bias. Random biases occur when the person retrieves some details from events but not others to form the reconstruction. Systematic biases are caused by some details (e.g. the most recent and new moments of an experience) being prioritised over others (e.g. earlier moments of an experience). Other relevant memory biases stem from semantic memory, i.e. from the user's situation-specific and identity-related beliefs [62].

Albeit the possible and alleged deficiencies in memory-experiences approach, the present research utilised primarily retrospective interviews for capturing user experiences. This was done for three main reasons. One, future behaviour has been theorised to be guided exactly by memorised experiences [64]. "We review the past in order to make choices for the future [65]." Since the present research studies the aforementioned phenomenon, memory perspective into experiences was considered to be appropriate and justified. Two, understanding how users actually conceptualised their experiences to form expectations of the future and use was more essential than the actual experiences and emotions at the moment of occurrence. Finally, due to the busy and hectic nature of work at the case organisation, it would have been impractical to use any memory reconstruction methods (e.g. self-reports or diaries), direct observation or contextual inquiry and still get enough empirical data for analysis.

Finally, the last section of second interview framework moved on from experiences and focused primarily on whether the user had adjusted his or her expectations somehow based on the experiences he or she had had with the tool. This section included questions regarding how pre-exposure expectations had actually been influenced by the user experiences discussed in previous section and what kind of expectations and plans the user currently had for future usage. The interview concluded with a simple question concerning, whether the user was planning to continue using the new tool or not. Questions in this section were based on items validated and used in several previous studies, frameworks and models discussing the effect of use continuance and user experience (see [18], [47], [51], [52]).

3.2.4. Survey 2

After the new system had been introduced in the case organisation and the employees had been given access to it, a second questionnaire was deployed. The function of this survey was to enable comparative perspective with the first survey to explore whether the new tool had induced change in the employees' communication practices and culture. For this reason, the majority of the questions stated in the second survey were repeated from the first questionnaire so that the answers could be better and more reliably compared to each other.

The survey continued the iterative trend already started earlier in the research. Some questions stated in the first survey were found to be uninformative and were removed. Some questions were also refined to be easier to understand and more accurate. Questions for the second survey can be seen in Appendix D. The changes made to the questions have been bolded to distinguish new or altered questions.

Like the questions, also the structure of the second survey was in most parts identical to the first survey. In addition to only measuring the actual impact of the new tool, employees' opinions about the technology implementation process, training and support were also studied. Similar to the first survey, two open questions concerning these aspects were also added to enable qualitative probing a) to support the overall results and b) to further refine the last round of interviews. The survey took place between 9th and 29th of November 2010, and the results were utilised mainly as additional data.

3.3. Data analysis

Figure 13 illustrates how the different methods and steps utilised in this research contribute in tandem to the whole research framework and initial research questions. Each step was developed and planned thoroughly to capture a certain aspect of the

framework and phenomenon being studied. Close interplay between theory, framework and empirical analysis was important to ensure iterative explanation building – one of the key techniques in ensuring internal validity [53].

As has been mentioned above, first round of interviews was used to capture the employees' pre-exposure expectations and attitudes towards the new technology. This part was conducted from usability point of view and was solely interested in the expectations. Second interview round, on the other hand, focused on the nature of experiences and their adjusting impact on the employees' expectations that eventually take form of continued or diminished use. Surveys were utilised to produce additional data of the initial condition amongst the employees and also of the possible post-exposure outcomes. The following sections will explain in detail how the data obtained through the aforementioned steps was analysed to reach the empirical findings made in the present research.

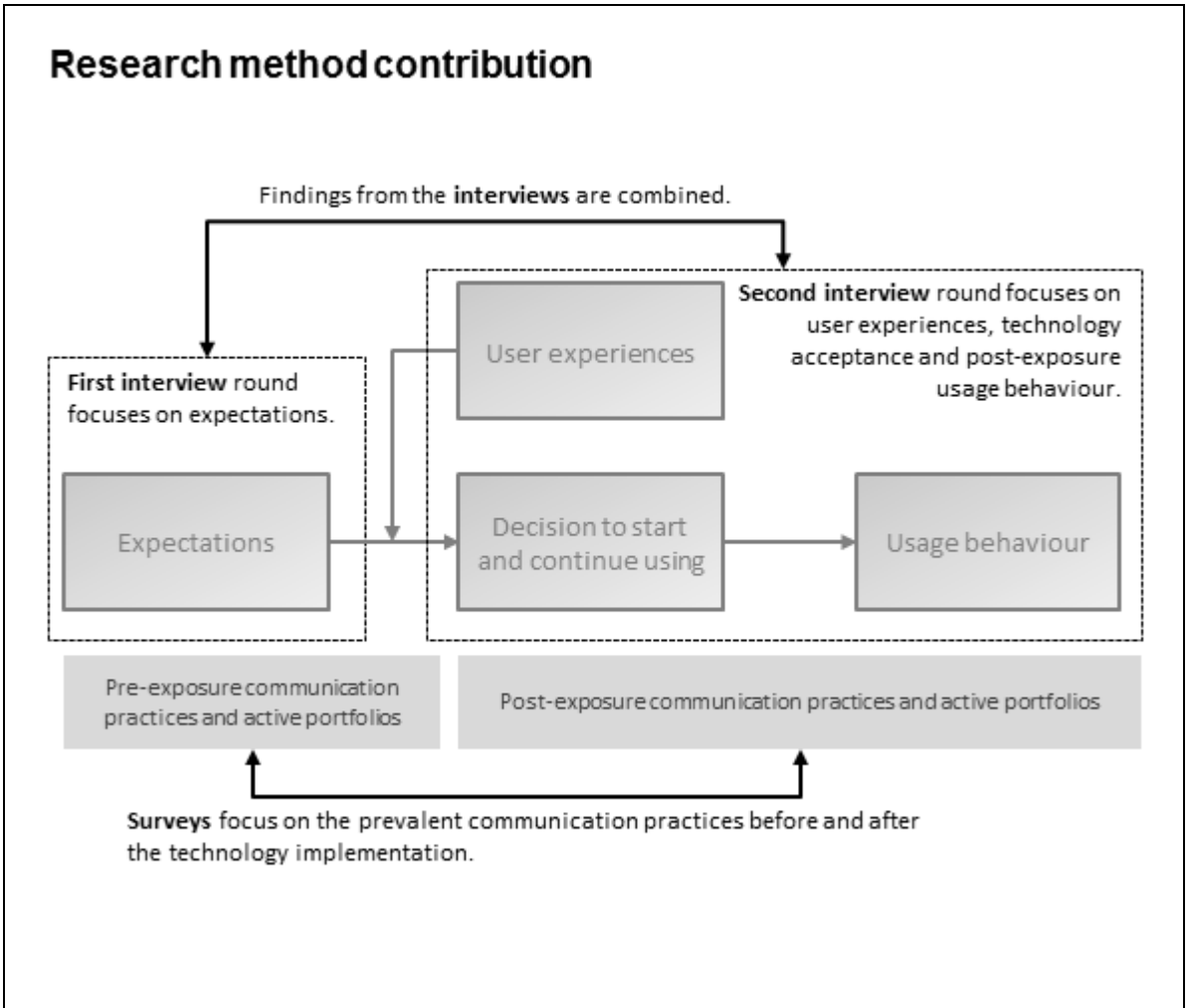

Figure 13: The research is based on comparative pre-post approach and utilises multiple research methods

3.3.1. Interviews (primary data)

Due to the primary data being mainly qualitative data captured from the interview transcripts, the following five-step process was used in the analysis [63]. Firstly, the data was browsed through in great detail. This phase was essential to guarantee the reliability and validity of the results, and was based on an iterative model that involved data being read and reread until valid and relevant quality data was able to be extracted from the transcripts. Secondly, the analysis was focused on the key aspects of the research: expectations in the first round of interviews and experiences and their role related to the expectations and usage behaviour in the second round. Thirdly, the findings were grouped into meaningful pre-set categories to answer the key goals and questions of the research. In addition to pre-set categories, a possibility for emergent categories was kept open. In the final results a combination of both was utilised to answer the initial research questions. This categorisation phase is the core of qualitative analysis [63].

Fourthly, possible patterns and paths between the categories and their items were identified. In this way, the interplay between expectations, experiences and continued use was understood in more detail. Importantly, not only patterns between categories but also patterns within them were studied. Finally, the categories and their influence to each other were interpreted to come up with a meaningful description of the empirical findings of the research. The research's aim was to discover the underlying paths the users followed in their pre-exposure – post-exposure process with the new technology and whether these paths had some similarities that could be interpreted to provide further insight into the implementation process. The following sections explain the pre-set categories used to analyse the data from the interviews.

Figure 14 illustrates the three main topics the analysis was based on, namely expectations, experiences and usage behaviour. As can be seen from the figure, each topic consists of items which represent their pre-set categories. Expectations were investigated through the predefined performance and effort (including usability) criteria. Based on the interviewee's point of view regarding expecting or not expecting a certain attribute from the system, the answer was marked down numerically as 1 or -1, respectively. Neutral, indifferent or uncertain answers were marked as 0. The final expectation score was then calculated for each user to determine the overall nature of their expectations. Based on the expectation scores, all users were categorised into one of the expectation groups: positive, neutral, negative/sceptical and combination of expectations. These groups were then used in analysing the interaction between expectations and experiences during the second interview round.

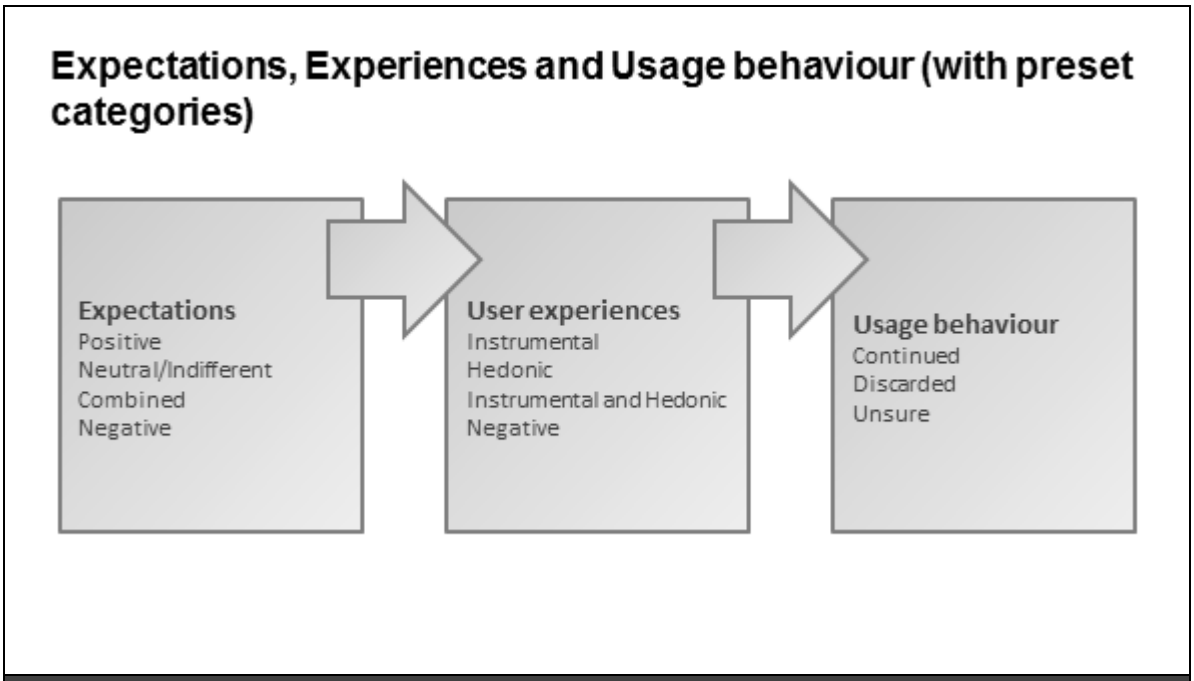

Figure 14: How expectations, experiences and usage behaviour form a chain to determine one's overall technology adoption

After capturing the expectations from the pre-exposure interviews, analysis proceeded to the post-exposure round to investigate the experiences the users had had with the new communication system. To be better able to describe the interaction between expectations and user experiences, the answers from the second interviews were analysed in two different ways based on the emergent user groups. One approach utilised the four user categories that were already presented above. As said, these groups were based on the nature of the interviewees' expectations and were labelled as positive, neutral, combined and sceptical users. This approach aimed to describe how expectations varying in their levels of positivity actually interact with experiences. Second categorisation scheme was based on how the expectations had developed and what had been the key sources contributing in the process. The meaning for this approach was based on the assumption that not only the level of positivity is important but also the confidentiality and intensity of the expectations should be taken into account.

User experiences were analysed by using a two-dimension user experience approach introduced by Hassenzahl (see [44]). Figure 15 illustrates this approach. Reflecting the experienced product attributes the pre-set categories derived from this approach were: strong in hedonic – weak in pragmatic, strong in pragmatic – weak in hedonic, strong in both and weak in both.

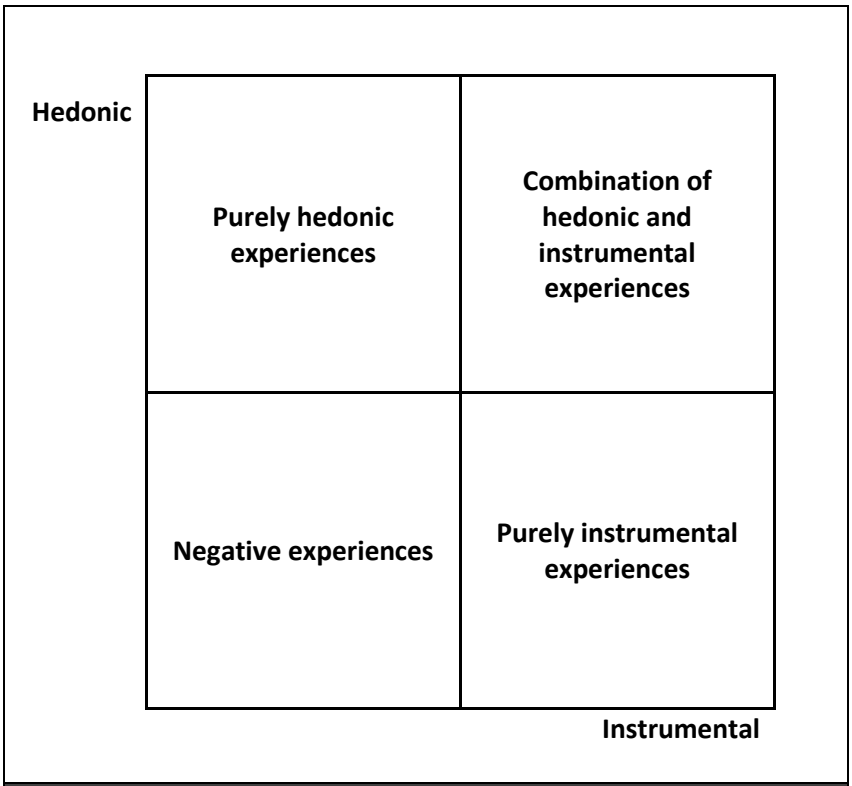

Figure 15: User experiences are categorised by their instrumental and hedonic dimensions

According to Hassenzahl [44], a product that is strong in pragmatic but weak in hedonic attributes is "inextricably linked to its users' behavioural goals". That is to say, a user experiences a system, an application or a service as pleasurable or good if it fills his or her behavioural goals, i.e. is useful. In the case of this research the new communication service being useful would mean that it enhanced the employee's work in some way: making it faster, easier, better quality, more productive, more effective, less erroneous or easier to learn or to memorise. Meeting behavioural goals is said to result in satisfaction [44].

On the other hand, a product that is strong in hedonic but weak in pragmatic attributes is "inextricably linked to users' self, e.g. their ideals, memories and relationships" [44]. Hedonic experiences may relate to both positive experiences such as surprise, fun and enthusiasm and negative experiences such as discouragement, frustration and anger. Furthermore, hedonic goals may stem from things like one's need for stimulation, self-improvement, communication of success and capabilities to others or will to be perceived as a forerunner with new technologies. According to Hassenzahl [44], meeting hedonic goals results in joy and together joy and satisfaction determine the overall appealingness of a service or a system. Needless to say, an application or system that combines both pragmatic and hedonic experiences is the most desired outcome. Vice versa, shortcomings in both aspects are an unwanted result.

Finally, intention for continued use was basically analysed by using three items: continued use, discarded use and unsure. The employees' answers were categorised under these categories based on their answers relating to their plans regarding future usage and post-exposure expectations. Internal validity is a relevant aspect of a case study and essential in terms of quality results. Internal validity can be reached by using various data analysing techniques and by following general research strategies [53]. In addition to the previously introduced explanation building technique the present study utilises time-series analysis (pre-post approach) to trace changes over time. Moreover, to ensure internal validity, the present research relies heavily on theoretical background and utilises both qualitative and quantitative data. A detailed case description has also been provided.

3.3.2. Surveys (additional data)

Surveys were analysed by using general statistical methods. Multiple-choice questions based on 5-point Likert-scale were analysed by capturing their mean values, median values and standard deviations. Open-ended questions were analysed by following the aforementioned five-step analysing scheme. Answers were first collected together and read thoroughly several times after which the analysis was focused to capture the main aspects of the questions. Non-relevant answers were also filtered out at this point. Next, the answers were categorised to form clear groups that would explain the answers. Where applicable, categories were also refined to capture even cleared links and patterns between them. Finally, the patterns and links were interpreted to come up with a description of the phenomenon.

Both pre- and post-questionnaires were analysed similarly. This was done to enable comparative approach that could find possible changes in people's answers. As has previously been mentioned, survey data was utilised as additional data to explore the findings made from the qualitative analysis in larger context. Also some findings made from the open-ended questions were utilised when developing the respective interview frameworks.

3.4. Case organisation: TeliaSonera Finland

The research was conducted in a separate organisation within TeliaSonera Finland. TeliaSonera is an international corporation whose core business is in creating better communication opportunities for people and businesses through mobile and broadband communication services. The corporation's mission is to provide services that enable people from all over the world to communicate in an easy, efficient and environmentally

friendly way. The vision of the company is to be a pioneer of the telecommunication industry – a position that has been gained "by being innovative, reliable and customer friendly". [66]

Albeit being an international corporation with a global strategy and strong common identity, wherever TeliaSonera operates it does it as a local company. All in all, TeliaSonera provides services in 17 countries through majority-owned operations in the Nordics and Baltics as well as in Eurasia and Spain and associated companies in Russia, Turkey and Latvia. The company has 28 412 employees of which 8372 are located in Sweden and 4497 in Finland. In Finland, TeliaSonera operates through two distinct brands: Sonera and TeleFinland. Both brands provide basic mobility and broadband services but are focused in different customer segments and therefore through distinct offerings. Sonera, also known as TeliaSonera Finland, is one of the largest telecommunication service providers in the Finnish market its local key competitors being Elisa and DNA. Sonera's service variety is broad and comprises areas such as mobility, broadband and fixed telephony for both consumer and business customers. The present research was conducted in a unit focusing on the latter, namely in Business Services Finland. [66]

Business Services Finland (BUS) offers tailored and complex services for companies of all sizes: from large global corporations and public operators to small and medium sized enterprises. Complete services are rarely available and hence a lot of customisation is required to meet set requirements and needs. The provided services consist of various products that combine both mobility and broadband solutions and they are usually difficult to be implemented by only one employee but often require a lot of team effort. To be able to assemble these specialists and to refine their individual knowledge into a final solution requires effective and unhindered communication through the whole project life time. Hence BUS emphasises the impact of efficient communication and knowledge sharing on a knowledge workers' productivity.

In practice, knowledge is seen as an important factor of productivity and hence controlled flow of information can be regarded as a competitive edge for organisations operating in knowledge-intensive industries: growth derives from new information and efficient communication results in greater productivity. Additionally, BUS-organisation sees efficient communication transforming into more optimised usage of resources and time, more rapid problem solving and workers experiencing less downtime, not to mention cost savings and sustainable development in the long run. Service industry is founded on creative thinking, innovations and social interaction and hence controlling,

refining and transmitting information form the basis for productivity and successful service solutions.

The present research was conducted from BUS-organisation's initiative to open discussion about the importance of effective interaction between knowledge-workers in an advanced-technology service industry. Motivation for the study was BUS's will to contribute to, not only its own employees' productivity but also, the productivity of Finnish knowledge-workers as a whole. Through deeper understanding of utilisation of different ICT tools one could be able to better describe the productivity of an individual knowledge-worker and simultaneously measure its impact on the productivity of an organisation as a whole.

According to Sonera and Business Services Finland [67], new communication technologies are usually implemented without careful planning and this often results in uneven and uncontrolled levels of utilisation. This is said to lead into a wide and mixed collection of different usage habits and practices. Moreover, this is also stated to lead over time into information overflow that results in important information lost, time wasted, extra effort and job dissatisfaction – each a viable factor on its own to destroy one's productivity in the long run. The research was conducted in Business Services Finland and the results were partly utilised in autumn 2010 in Sonera's new book called "Understanding Neo-Growth – invitation to sustainable productivity".

3.4.1. Microsoft Office Communication Server (OCS)

The new technology being introduced in the case organisation was Microsoft's Office Communication Server (OCS). OCS is a real-time communication service meant for enterprise use. It provides users with various features meant for more efficient information sharing and dissemination such as real-time status information, instant messaging, group chats, video- and teleconferencing services, application and document sharing and group collaboration possibilities. OCS also has mobile capabilities, which makes it accessible from anywhere regardless of user's physical location. OCS is also integrated with Microsoft's other services such as Outlook, Word and Sharepoint and strives therefore to provide integrated solution for modern knowledge workers.

4. Empirical findings

4.1. Survey 1: Initial conditions

The first questionnaire was sent to 220 employees of which 114 returned completed answers. This resulted in answer percentage of 52 %. Figure 16 illustrates the respondents' background information. From all respondents 33 % were female and 67 % were male. Apart from under 30 year olds (1 respondent), all the other age groups, namely 30-40 (39 respondents), 40-50 (39 respondents) and over 50 year olds (35 respondents), were equally represented. When it comes to respondents' position within the organisation, the survey answers consisted of specialists (47 %), customer account representatives (30 %), group managers (8 %), middle managers (11 %) and top managers (4 %). The respondents' IT-skills were distributed as follows: 30 % considered to have high IT-skills, 67 % had intermediate skills and 4 % considered their IT-skills to be low. Finally, 91 % of respondents had worked in the organisation for eight years or longer.

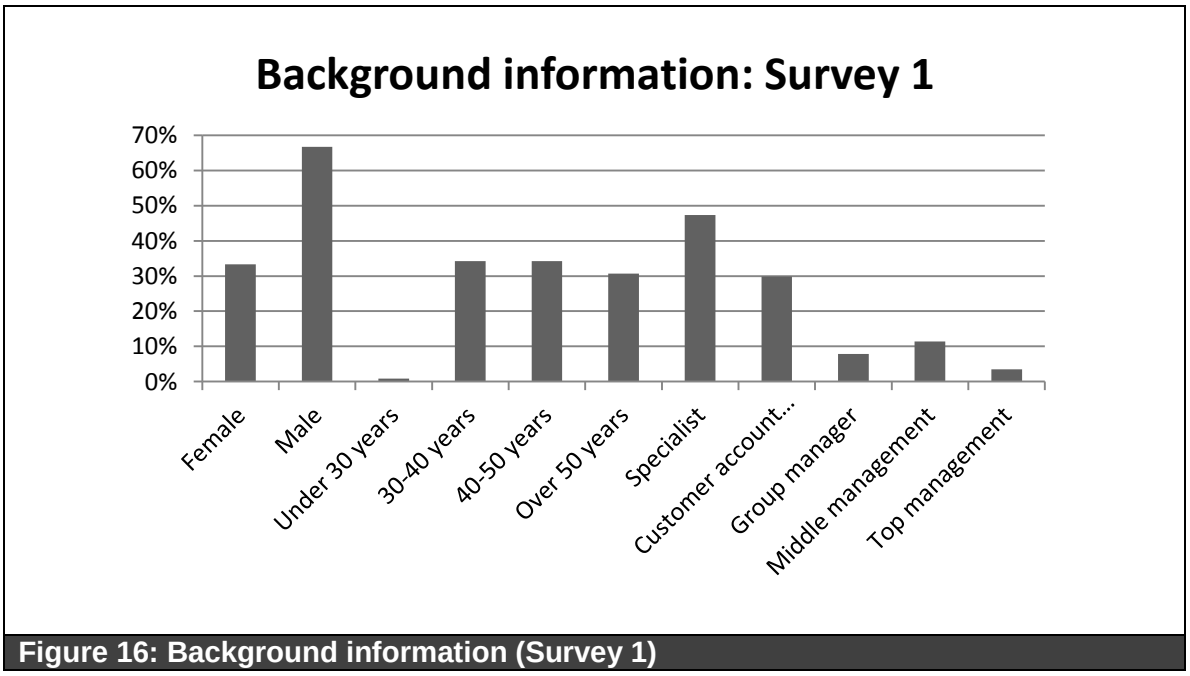

Figure 16: Background information (Survey 1)

Figure 17 illustrates the usage of e-mail before launching the new OCS communication tool in the organisation. The survey results suggest that most of the communication tools available in the case organisation are being underutilised and the usage has concentrated on two main media, namely e-mail and cell phone. All in all 113 (out of 114) of the respondents use e-mail either somewhat often or extremely often. Moreover, reported median time to process e-mail is 2 hours per day. Additionally, 91.15 % of the respondents send up to 50 e-mails daily. Interestingly, the amount of employees who

receive 51 to 75 e-mails a day is 17.86 % of respondents, which is significantly more than the amount of people who send the same amount (7.08 %). In other words, it seems that employees in the case organisation receive more e-mails than they send. E-mail is used both at work and outside one's workstation.

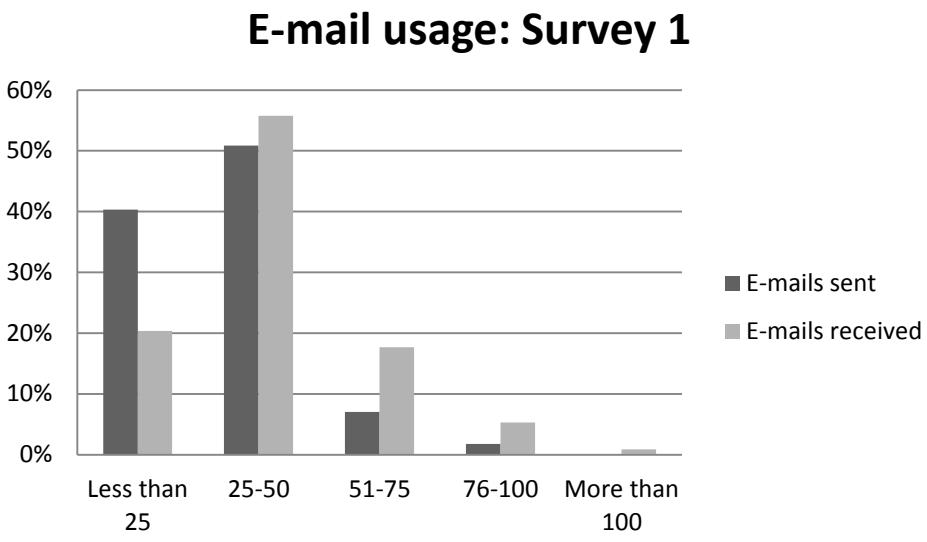

Figure 17: E-mail usage based on Survey 1

Figure 18 illustrates the importance of different communication media to the employees in the case organisation. Cell phone seems to be the second method to e-mail. In addition to traditional one-to-one communication, cell phone provides more versatility in the form of sub-methods, such as teleconferencing and text messaging. Survey 1 shows that the respondents have on average 2.34 personal face to face meetings a day, resulting on average in 10.81 hours spent in meetings a week. Interestingly, on average 1.47 of these daily meetings (62.8 %) are accessed through either a cell phone or a videoconferencing system. The latter, however, was not among the most used communication media, which further demonstrates the importance of cell phone as an essential communication channel. Even 31 % of the respondents use videoconferencing "Extremely rarely" or "Somewhat rarely". Additionally 43.3 % stated to use videoconferencing only "Once in a while".

Behind e-mail and cell phone, the third and fourth most used methods in the case organisation are intranet and personal meeting. For both methods, 78.9 % of the respondents utilise these channels either "Extremely often" or "Somewhat often". However, intranet seems to be used slightly more due to 50 % using it "Extremely often", compared to 39.5 % for meetings. Text message was the fifth important method and also the last method whose average score was above four ("Somewhat often") on a 5-point Likert-scale.

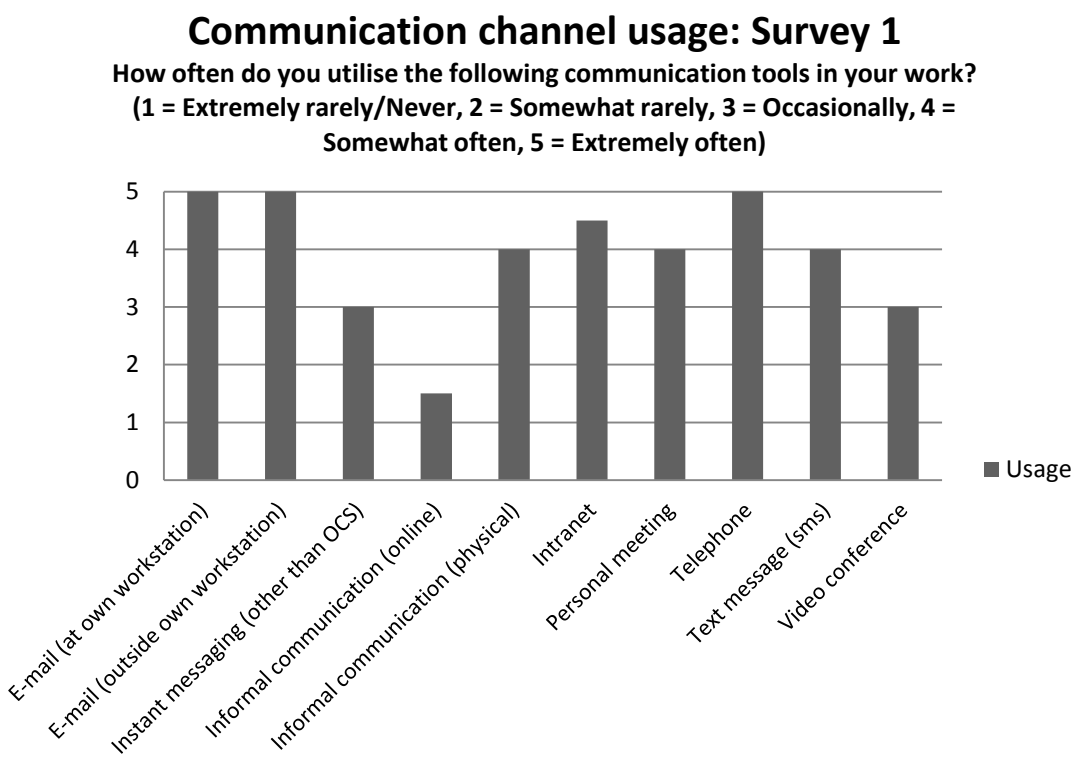

Figure 18: Communication channel usage based on Survey 1 (Informal communication (online) refers to social networks, Facebook, LinkedIn, etc.)

4.2. Interviews

Results from the first interview round continue the trend set by the first survey. It seems plausible to suggest that even though the case organisation offers a wide array of communication tools to its employees, only a few of them are being utilised resulting in uneven, inconsistent and possibly inefficient levels of usage. Nine employees were first interviewed to better understand their work and needs for efficient communication, what kind of experiences they had had in the past and what were they expecting from the new tool. Seven of the interviewed employees took part in the second round which took place two months after the technology rollout had started. These interviews focused on user experiences and plans for continued use. Users 3 and 5 did not take part in the second interview round. Durations of the interviews were between 46min and 1h 22min, 1 hour on average. The interviews in the second round were slightly shorter. Durations of the interviews were between 26min and 54min, 37 minutes on average. Table 2 illustrates the array of communication tools available to the employees at TeliaSonera Business Services. It also shows each interviewee's answers regarding their communication behaviour and media usage and thus their active communication portfolios.

Table 2: Available communication channels in the case organisation and the channels being used by the interviewees									
Available tools	**User 1**	**User 2**	**User 3**	**User 4**	**User 5**	**User 6**	**User 7**	**User 8**	**User 9**
Blog									
Cell phone	X	X	X	X	X		X	X	X
Group collaboration	X			X		X			
E-mail	X	X	X	X	X	X	X	X	X
Extranet				X					
Instant messaging	X	X				X		X	
Intranet						X			
Personal meeting	X	X			X		X	X	X
Social networks									
Tele conference	X	X						X	
Text message			X	X			X		
Video conference		X				X	X		
Web conference			X			X	X	X	
Wiki									
Yammer									

In the following section, the interviewee group is first described in more detail to better understand their everyday work and varying needs for efficient communication. Secondly, the section proceeds to describe the users' expectations: how were they developed, where did they actually derive from and what actually had influenced the forming of the expectations. Thirdly, the study examines the post-exposure user experiences: what sort of experiences had taken place, whether they were positive or negative, instrumental or hedonic and how did they actually compare against the initial expectations. Finally, the section concludes with the interviewees' plans for continued use and the key points of how expectations and user experiences actually influence the decision.

4.2.1. User group introduction

As has been explained above, all in all seven employees from the case organisation took part in both interview rounds. The participant sample was versatile and rich in terms of gender, age and job description. The sample consisted of both male and female employees: three of the interviewees were male and four were female. Ages of the participants were also somewhat equally distributed between 30-40 (3) and 40-50 (4) years of age. When it comes to job responsibilities, two interviewees worked as group managers, four as different sorts of experts and specialists and one participant had sales and customer responsibilities.

The need for efficient communication is prevalent and clear from all the interview answers. As a good example of extensive knowledge-working in the case organisation one participant is responsible for the interface between business clients and solution manufacturing. He is part of a fixed team whose job involves problem solving and making sure that already developed and implemented solutions work as intended. According to the interviewee, the job requires finding the right stakeholders and vital contact points as well as allocating the daily or weekly tasks properly between the members of the team. The participant feels that efficient communication is essential for the team operations and for this reason his group has agreed on shared communication methods and policies. He also thinks that communication tools have the ability to enhance one's work by reducing the time spent on shifting from one place to another and by reducing the need for travelling in general.

Similar statements appear in other participants' answers as well. Everyone seems to agree that communication tools are important in one's everyday work.

> *"You would be totally helpless without them."*

Some interviewees' work revolves around various projects and is therefore constantly shifting in terms of communication needs. The needs tend to depend on the active project phase because the people in the project may change over time and the work might even involve active co-operation with outside stakeholders such as advertising agencies, customers or even other teams. This naturally causes challenges for efficient and unified communication. Additionally, some team members might work from a distance in a different city, which has been an important driver for versatile and active communication. Therefore, groups may try to develop basic rules of thumb to rationalise their communication to make it more effective. These rules seem to be assembled from previous habits and models which have been experienced to work quite well in the past.

It seems that most of the interviewees work in some sort of team or group, which naturally emphasises the importance of communication and knowledge sharing. Reflecting the interviews, this seems to be the most common situation. The situation becomes a little more complex if the team members are located in different sites, cities or even countries, which effectively prevents physical meetings. It also prevents people from handling their *ad hoc* communication in the form of walking to other person's desk and discussing the matter directly. Solid and stable teams seem to have formed unified communication habits and practices over time after having observed what really works. Interviewees who are involved in multiple matrix project teams seem to rely on project leaders' activity to promote unified communication methods. This also causes the variety of different practices to be diverse and greatly differ from one project team to another.

Finally, participants whose work involved co-operating with stakeholders outside the company seemed to report most needs for efficient and reliable communication and also most difficulties to find unified and functioning methods.

In the following three sections expectations, user experiences and plans for future use are discussed in more detail. When referring to individual interviewees, they are for anonymity reasons labelled as users A, B, C, D, E, F and G. These should not be associated one-to-one with users 1, 2, 4, 6, 7, 8 and 9 listed in Table 2 (A-1, B-2, etc.). Users 3 and 5 did not attend the second interview round.

4.2.2. Pre-exposure: Expectations

Based on the interviews, expectations seem to be a significant determinant for successful technology adoption.

> *"If the usage seems beneficial and the adoption process has been made easy, the motivation to adopt is going to be enormous. If it is the contrary, the adoption will be postponed and left on the background."*

Six out of seven users considered expectations to have a significant impact on people's motivation and willingness to adopt new tools and technologies.

> *"If you are interested in the application, your motivation will be higher. When the system feels attractive and meaningful, your attitude towards the whole adoption process will be different."*

Both performance and effort expectancies were emphasised by the participants.

Expectations concerning the new system's performance vary greatly between the people interviewed. Most interviewees seem to agree on the speed enhance the new tool is expected to have on people's work. User A expects to complete his work tasks faster and with greater efficiency by using the new application and most importantly its new status feature. According to him, people should be able to reach key colleagues more efficiently and look for other sources of information after seeing their first contact to be either away or busy, instead of waiting him or her to be available again. Albeit most users agreed on this effect, user C doubted this would really be the case. Additionally, user E was not sure how much her work efficiency would actually be influenced because she was not aware which parts of the organisation would actually receive the new application. When it comes to productivity enhancements, only three interviewees expected to actually become more productive even if work tasks would be completed faster. Most of the interviewees (4) considered the new application to ease their work load. According to user A, work should become easier when tasks are completed with greater efficiency. Moreover, user B expects the tool to ease her communication with others and therefore make her work easier. Additionally, she hopes the tool also to ease remote working.

Interestingly, only user B considered the new system to increase the quality of his work. His expectation was based on the assumption that better and more efficient communication enables faster information search and required checks from other employees. In user B's opinion, this could decrease the amount of 'informed guesses' in one's work and hence to increase the overall quality of work. It should be noted that only one participant was sceptical about the new system's influence on the work quality. Other interviewees were unsure, neutral or did not have strong opinion on the matter. The system's influence on the control an employee would have on his or her work also shared opinions. Three interviewees thought the amount of control would increase after adopting the new system. Others had quite a neutral stance or did not have any opinion at all. According to user F, increased feelings of control could be achieved through active usage of the status feature: when one would have the possibility to define his or her status, this could increase the feeling of overall control.

In addition to expectations concerning the performance of the new system, the interviews focused also on the expected effort required to actually attain the performance potential. The majority of the participants (6) expected the new system to be easy to learn. It should be pointed that the seventh answer was fairly neutral but emphasised a very important point which was later strongly supported by other interviewees throughout the effort section of the interview:

> *"Depending on own enthusiasm and level of interest, the adoption is either easy or difficult. If it seems too difficult, you rather just skip the whole thing."*

All in all six participants considered ease of adoption and amount of effort required during the process to be a very significant factor to determine its success.

> *"If the end-user perspective has not been thought through carefully, many of the employees who are eagerly waiting for the system are most likely going to give up and drop off."*

> *"People are most likely going to get started with the system if it is not made too difficult."*

Questions related to memorability were mostly answered neutrally, which may indicate lack of proper expectations. However, some interviewees explained their neutral answers by saying that memorability is directly influenced by the frequency and amount of use. In other words, if the new system is experienced to be easy to learn and useful, it will adopted fast, used more often after which the use should become easy to remember as well. When it comes to errors made by the user, none of the interviewees expected significant errors to occur with the system. However, the lack of errors was emphasised in the interviews:

"If the first experiences are painful and filled with errors, the adoption process is likely to be aborted."

Finally, only one user expected flexibility and customisability from the system.

As can be seen from the answers, expectations varied greatly from one user to another. There was especially variation in the participants' performance expectations. The importance of effort as a whole was emphasised but individual expectations were somewhat similar to each other. In other words, significant differences in people's expectations related to the effort were not found. Based on the nature of the expectations, the interviewees were categorised into four groups. In addition to the expectations, some users expressed clear positivity or negativity in their overall stance towards the new system. This emergent factor was added to the categorisation scheme because it was considered as having important role in the overall formation of expectations. Based on the categorisation, two users were labelled to have positive expectations, two users were neutral, two users combined positive, negative and neutral expectations and one user was fairly sceptical. Table 3 illustrates how the categorisation was conducted.

Table 3: Expectations and the formation of expectation categories (1 = This property is expected, 0 = Neutral, -1 = This property is not expected)

	Expectation item	User A	User B	User C	User D	User E	User F	User G
Performance expectancy	Speed	1	1	-1	1	0	1	1
	Productivity	1	0	1	0	1	0	0
	Ease of work	1	0	0	1	1	1	0
	Quality	1	0	-1	0	0	0	0
	Control	1	0	0	0	1	1	0
Effort expectancy	Learnability	1	0	1	1	1	1	1
	Memorability	1	0	1	0	0	0	1
	Effort	1	0	-1	1	0	1	0
	Errors	1	1	1	1	1	1	1
	Flexibility	0	0	0	0	0	1	0
Overall feeling	Attitude/Stance	1	1	-1	-1	0	1	0

Categori-sation	Total	10	3	0	4	5	8	4
	Category	Pos.	Neutr.	Scept.	Comb.	Comb.	Pos.	Neutr.

4.2.3. Post-exposure: Expectations and User experiences –interaction

Positive expectations

The positive group's (positive) expectations were mostly met and the interviewees are satisfied and pleased with the application and they plan to continue using it in the future as well. The interaction between expectations and user experiences can be seen from the answers. It seems possible that positive but realistic expectations may have attenuated some negative experiences during the rollout process. For example, one interviewee's software installation failed and he had to take the computer to technical support for full-scale repair and re-installation. This frustrating experience required extra effort, resulted in lost time and greatly undermined his work performance. Additionally, some limitations in the rollout had made it difficult to utilise the application to its full potential. For example, only one third of one interviewee's work team had received the application, which made it very difficult to actually adopt it in work-related tasks. However, regardless of the adversities participants were so determined and motivated to adopt the application that it did not matter:

> *"I wanted this", says one.*

In terms of purely instrumental experiences, the group is satisfied. Useful new features such as instant messaging and automatic status information have worked as expected and are experienced to increase work performance. Apart from the installation problems described above, the application has worked smoothly and configuring and operating it successfully has not required much effort. Additionally, the application has provided some useful and unexpected features which have invoked feelings of joy and pleasure. Therefore, these experiences have both instrumental and hedonic aspect in them.

Similarly, when it comes to purely hedonic experiences, features related to customisation, personalisation and configuration were emphasised. One user highlighted the importance of bringing out some personality in his work environment for example through a profile picture or short biography including the most important work responsibilities. He feels that sharing personal things with his group increases the trust between group members and therefore has positive effect on everybody's work. Also, configuring the application to suit one's individual needs is important in his opinion and should always be possible. Additionally, there were some comments regarding features that are still to be found. The interviewees pointed out that their experiences have

encouraged them to explore the application more and therefore discover entirely new functionalities:

> *"I am sure that one day I will just start to browse through the application just to see what it can do with it."*

The expectations within the positive users differed in terms of expectation source and intensity. On one hand, some expectations, albeit positive, were not based on anything certain and were therefore rather vague and dispersed. On the other hand, some expectations had derived from similar systems in the past, individual effort in the form of familiarising oneself with the new system beforehand and participating in a pilot user group. Regardless of highly positive expectations the user with vague and dispersed expectations had used the system in only a shallow manner.

> *"There haven't been any problems with the system and it works just fine. I just don't know what it actually could solve."*

In contrast, the user with well-founded positive expectations was confident that his expectations were justified and accurate. And as the experiences had confirmed these expectations, he was able to progress further in the user experience lifecycle and adopt the system in a more comprehensive and rewarding way.

Combined expectations

When it comes to the group with both positive and negative expectations, it seems that the users' positive expectations have been confirmed whereas the negatives have not. This means that the users are satisfied with the system and plan to continue its use. Interestingly, similarly to the positive group, these users also experienced some adversities: failed rollout, computer repairs and reinstallations took place here as well. Additionally, some features had been malfunctioning which had caused some ambiguity and frustration. However, these users emphasised once again the importance of understanding the value and potential of the system in dampening the negative experiences.

The experienced instrumental qualities align with the positive users. As expected, the interviewees had experienced performance benefits by using the new service. Additionally, they felt that their work had become easier and that especially taking the open-plan office context into consideration, the new system had really enabled them to discuss with their colleagues about work-related tasks without having to run around the office or shout over the partition screens. Some unexpected new and surprisingly useful features, such as preinstalled old contact lists, status messages and the ability to save one's conversations, had also been discovered. Additionally, the user who had not had

any problems with the installation and initial adoption highlighted the lack of effort it had actually required to start using the system.

When it comes to the purely hedonic experiences, the users' answers reflect deeper understanding of the potential and capabilities of the system. For example, one user emphasised how the service enables entirely new social aspect in one's everyday work.

> *"The ease of thanking people for their good work, the sense of community and being able to stay in touch with people who you don't see that often, they all have a tremendous impact on one's work satisfaction. It's an exciting dimension."*

Additionally, aspects such as new smileys were mentioned as the source of work satisfaction and motivation. The group also expressed their interest in unused features that are interesting and are likely to turn out to be useful in the future. In the users' opinion, the system encourages to explore and self-educate oneself to learn new things.

Neutral and Sceptical expectations

Regardless of the differences in the nature of their pre-exposure expectations, the post-exposure usage behaviour and the user experiences of both the neutral/indifferent and the sceptical/negative user groups have been rather similar. Therefore, in the following paragraphs both groups are discussed together.

Since the neutral and indifferent group did not expect anything special from the new system, it is rather difficult to tell whether the expectations have been met or not. Interestingly however, the neutral users themselves feel that their expectations have actually been met or that in some aspects they have even been slightly undercut.

> *"I think it's a good system. The experiences have pretty much met my initial expectations, because I knew quite accurately what the system is about."*
> *"Maybe my expectations have not been fully met. I was possibly expecting some larger than life changes but as one can see it hasn't been anything major."*

The neutral group's experiences are few and most of them are related to purely instrumental qualities, such as performance through usefulness and ease of work. There were no experiences that would have combined both pragmatic and hedonic dimensions, which may also indicate lack of use and progress in the temporality of experience – lifecycle. Interestingly however, one neutral user described her experiences related to new social dimension provided by the application. This can be regarded as stimulating hedonic experience and is particularly interesting because the user did not have strong experience with similar applications in the past nor has her usage been at high levels with the new system either. As a matter of fact the user points out that surprising new contact

requests and messages from unexpected people at work have motivated her to learn more and become more interested about the new service.

When it comes to the sceptical user, the experiences have met the negative expectations and the use rate at the time of the interview is almost non-existent. The user states that if support and guidance are not put properly in place, it is unlikely that the use would increase at all and become routine practice.

> *"I could be more satisfied with the system if I knew how to use it properly. If the rollout is not supported enough (for example by pointing out the meaning and potential of the system) it will not be successful. I knew that this would happen!"*
> *"Learning should not be left wholly to the user's responsibility. New systems require effort, especially in the beginning. If this research was conducted in half a year's time, you would get exactly the same results if the issue is not solved first."*

Within the first two months of the system rollout the sceptical user has only utilised the instant messaging and document sharing features. Interestingly, the document sharing was due to a colleague's initiative.

The sceptical user's experiences are related to features that were found useful during interactions with the system. For example status information and instant messaging were experienced to be working quite nicely. However, the lack of experiences is rather evident and indicates low utilisation rate. The user did not bring out experiences that could be characterised as hedonic, which is to be expected when reflecting the low usage against the temporality of experience –lifecycle.

Finally, when it comes to negative user experiences, i.e. experiences that did not provide either pragmatic or hedonic value (see [44]), all user groups were relatively similar to each other. Each group had had frustrating moments with the system and none of the groups stood out in terms of negative experiences. Combined, neutral and sceptical users had encountered malfunctioning features during their interactions with the system. Additionally, failed installation had occurred to both positive and combined groups. Furthermore, some positive and neutral users had suffered from organisational limitations which effectively hindered their usage and especially the usefulness of the system. Finally, only sceptical user pointed out the high effort required to adopt the system.

4.2.4. Continued use

Firstly, the importance of expectations and user experiences seems to carry all the way to the long-term usage decisions. All interviewees stated that expectations play a key role

not only during the initial adoption process but also in terms of continued use. Many users emphasised the importance of understanding the benefits of the new technology and linked it directly to the adopter's motivation. Similarly to the earlier stages of technology adoption both performance expectations and effort expectations were mentioned however neither was directly linked to the more accurate expectation items used earlier in the research but remained at somewhat a higher level.

> *"When you're appealed to the new system, and you feel that it actually makes sense to keep using it, your attitude will be completely different."*
> *"One has to be aware of the benefits. It directly influences the willingness and motivation to use the new system. If motivation and proper attitude are in place, even the most cumbersome experiences should not influence badly."*

As said, all interviewees considered user experiences to be of great importance in long-term decisions related to technology adoption. Experiences were said to have both positive and negative dimensions which control the long-term adoption process. Positive experiences were said to increase motivation and commitment to the process while negative experiences were said to quite easily lead to discarding the system and returning to old habits and solutions. The close interplay between expectations and user experiences was emphasised when discussing continued use.

> *"When you personally experience the benefits [of the new system], you gradually become more interested [in it] and simultaneously start using it more and more."*
> *"The potential benefits are attainable if user experiences support the adoption process. If not, the user just has to return back to using old systems."*
> *"It is relatively easy to return to old practices because you know that they work. This happens especially if the user is not informed about the potential benefits."*

Two interviewees also pointed out that there's actually a discrepancy between the influence of positive and negative experiences. According to them, only a couple of positive experiences are required to become dependent on the new system and its functionalities, whereas the impact of negative experiences is determined by the level of initial motivation and commitment. One of the interviewees stated that the influence of a positive experience equals the influence of even three to five negative or frustrating experiences.

Secondly, in addition to expectations and user experiences having a strong role in decisions of system use continuance *critical mass* was also emphasised by all the interviewees. According to Rogers [25], critical mass refers to the stage of technology diffusion at which enough individuals have adopted the system so that the system's further adoption rate becomes self-sustaining. According to Varian & Shapiro [68], the

concept of critical mass is closely related to *network externalities* and *network effects* which are usually associated with products or services whose value to one user depends on how many other users there are. They highlight that communication technologies in particular, such as the one being adopted in the case organisation, are a prime example: as the active user base grows, more and more users find the adoption valuable. Eventually the service reaches critical mass and becomes self-sustaining.

Critical mass manifested itself in two ways in the present study. Some interviewees suffered from limited rollout which meant that some of their co-workers or relevant others had not received the new application yet. This greatly hindered their possibility to attain the potential of the service because they were not able to use it in their work. Additionally, some interviewees said that seeing others using the system and talking about it made their feel that the system is in wider use and therefore influenced their perception of its usefulness. The importance of other users was also emphasised in the second survey.

> *"If 50-75 % adopts the tool, they will guide other people and encourage them to adopt it as well."*
> *"The usefulness of OCS is greatly undermined if one's key stakeholders are not using it."*

Thirdly, five interviewees mentioned collective communication practices having an important role in continued use. Based on the answers, set practices communicate importance and meaning of the new communication service.

> *"Experiences of inefficiency and lack of benefit derive mainly from not having set practices within the organisation. The tool itself does not change anything if it is not integrated properly to the way people actually work."*

One interviewee said that some of his co-workers do not have clear understanding what the new system is supposed to be used for and what its space is in the wide array of already available communication tools. Collective usage practices are closely related to critical mass because positive network effects may not realise if usage practices are inconsistent. This may also lead to experiences of poor usefulness and performance or feelings that the service does not fit into the prevailing work and communication culture in the organisation.

> *"The new system should take root within people's personal working habits and communication styles [for it to establish more stable position in everyday communication between people]."*
> *"Some of my co-workers do not really know what the system is supposed to be used for."*

Finally, four interviewees felt that some sort of lead users or user agents would have a positive impact on the system continuance. This also seems to be closely linked to all aforementioned actors of continued usage: expectations and user experiences, collective practices and critical mass. According to the interviews, lead users could be able to communicate the potential benefits to their co-workers and therefore act as reliable sources for realistic expectations. Additionally, they could reinforce positive experiences and provide support, help and explanations if negative or frustrating experiences take place. Collective practices could be built and communicated through the user agents as they act as exemplary users. They could also strive towards the critical mass and communicate its existence to further boost adoption rates.

4.3. Survey 2: Findings in organisational context

Similar to the first survey, the second survey was also distributed through the TeliaSonera intranet. The second survey was sent to all 287 employees in the TeliaSonera Finland Business Services (BUS) organisation. Altogether 149 employees returned completed surveys resulting in answer percentage of 52 % which was the same percentage as in the first survey. Figure 19 illustrates the respondents' background information in both surveys.

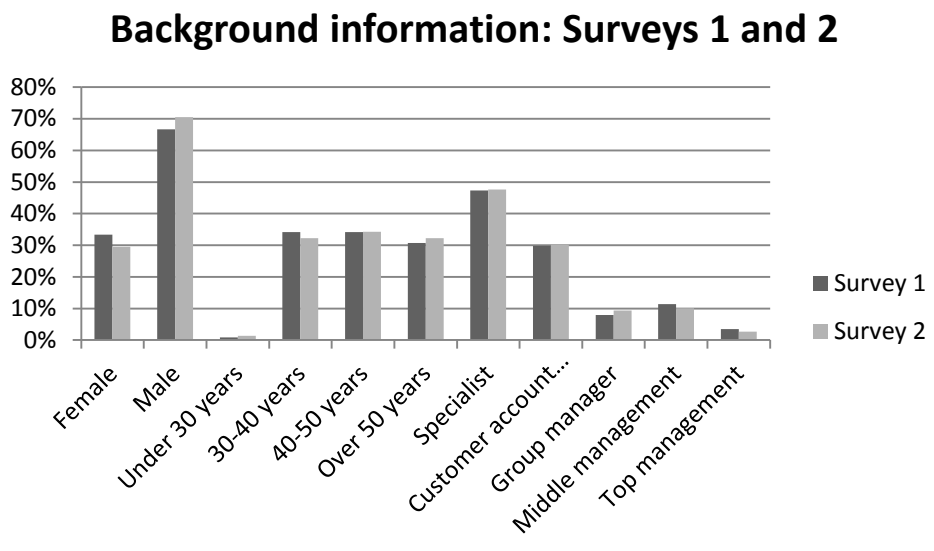

Figure 19: Survey background information comparison

Based on the background information, it seems that the sample in both surveys has been notably similar. Both genders, all age groups and positions within the organisation were quite equally represented in both surveys. This suggests that findings made in the surveys are comparable, which is important in establishing the pre-post approach used in the study.

Figure 20 illustrates the communication channel usage in the case organisation. The changes in communication practices and communication channel usage are minimal. In other words, at the time of the second survey OCS had not yet influenced people's communication practices in the case organisation. Only variation can be found in the amount of informal communication that took place online (social networks, Facebook, LinkedIn, blogs, wikis, etc.), in the usage of intranet and naturally in the distribution of instant messaging between old tools and OCS. This was to be expected because upon installing OCS the prior instant messaging applications were removed from the user's computer. This was not the case with web conferencing and group collaboration (Sharepoint) applications, however. These systems continued to exist alongside OCS but unfortunately there is no usage data from the state before OCS and therefore it is impossible to say whether introducing OCS has influenced the usage of these systems.

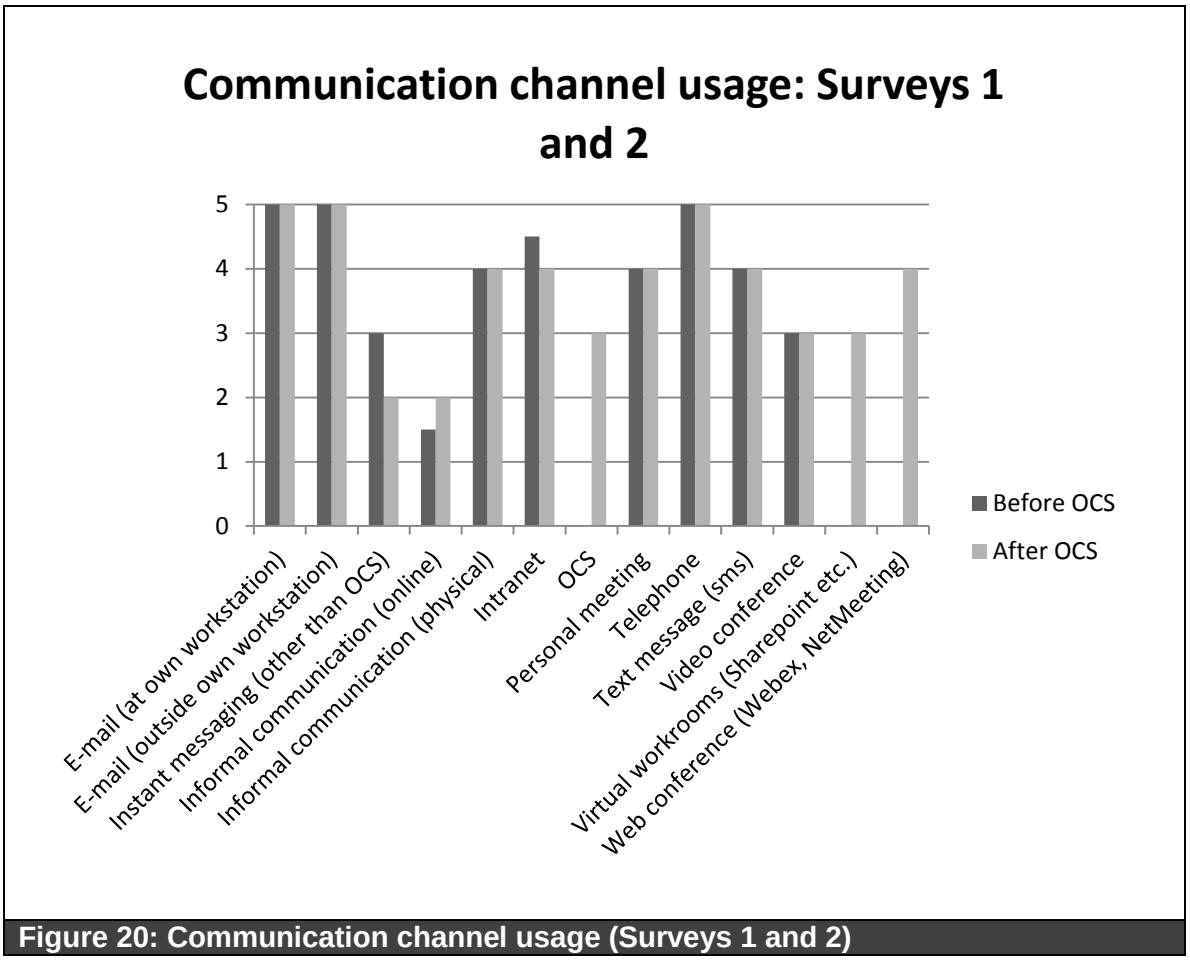

Figure 20: Communication channel usage (Surveys 1 and 2)

Lack of change in communication habits can also be seen from the number e-mails sent and received per day in the case organisation after having launched OCS. Additionally, the reported time used to process e-mails per day remained at 2 hours. There is very little noticeable change in the numbers, and if anything, the situation has only changed to

worse. Figure 21 illustrates the documented e-mail behaviour in the case organisation after the employees had been given access to the new system.

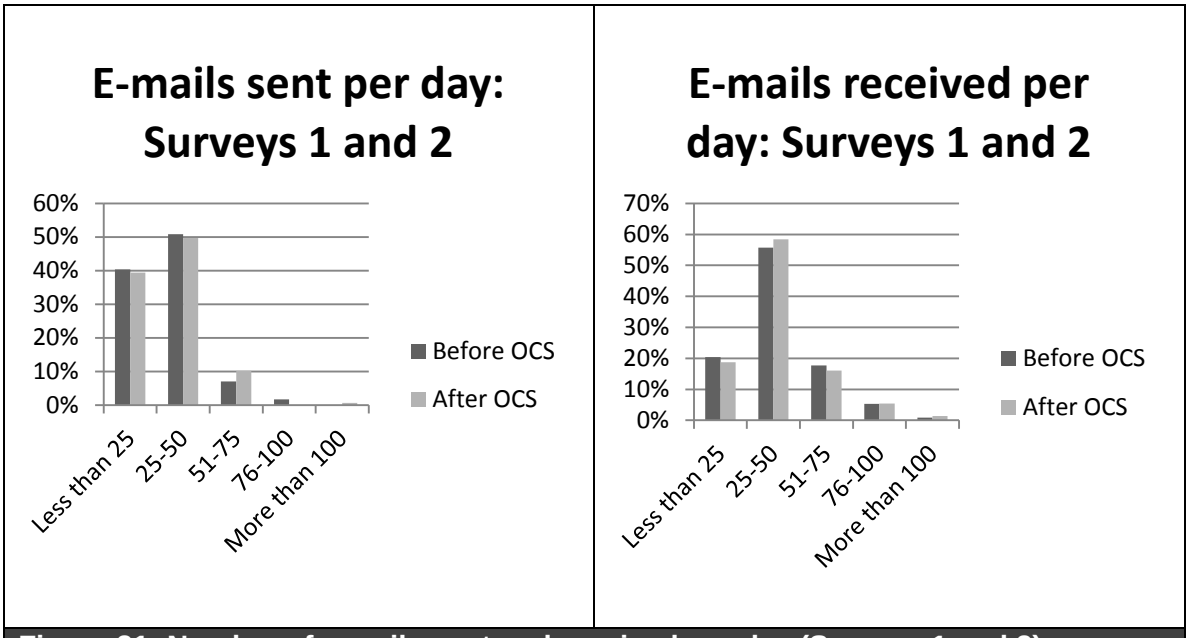

Figure 21: Number of e-mails sent and received per day (Surveys 1 and 2)

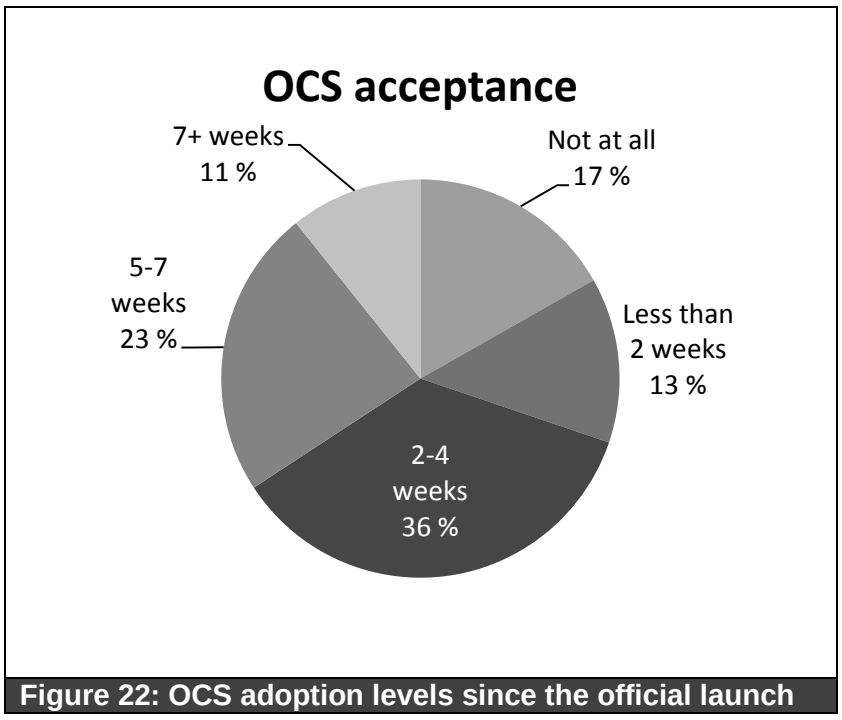

Figure 22: OCS adoption levels since the official launch

The reported OCS usage levels after two months from the initial rollout are shown in Figure 22. All in all 73 % of the respondents had not used OCS before the official implementation in the case organisation. It seems that at the time of the survey even 70 % of respondents have actually used OCS for more than two weeks. However, 30 % of respondents have only just received OCS or have not used it at all.

Finally, the influence of OCS on employees, their work and communication practices was also studied through an open ended question. Altogether 95 out of 149 respondents chose to answer the question. Following the qualitative data analysis procedure described in section 3.3., the answers were first grouped into positive, negative and neutral influences and then once more in greater detail based on the type of influence that was in question. Neutral influences were not grouped again. It should be noted that two of the answers had two different aspects in them and therefore both were accounted two times (N=97). The findings have been summarised in Table 4.

Table 4: Experienced influence of OCS on one's work

Positive influences	41	Quickness, efficiency	Status information	Ease of work, usefulness	Replaced other tools		
		16	10	9	6		
Negative influences	44	No influence	Bad support, guidance	OCS only a new tool	Features insufficient	Others don't use	Lack of collective practices
		17	9	7	4	4	3
Neutral influences	12						

These findings support the discoveries made in the interviews. The quantities of positive and negative influences are somewhat equal and the key aspects in both align well with the findings from the interviews. Quickness, efficiency and useful status information relate to the instrumental positive experiences some interviewees also reported. Similarly, experiences related to ease of work, usefulness and the ability to replace older tools with a new one can even be regarded as hedonic or as a combination of both instrumental and hedonic because for example one's ability to substitute multiple older tools to the one new may well arouse emotions of insight and opportunity. However, instrumental qualities are clearly dominant in the answers.

Additionally, lack of collective practices, lack of other users and bad support were also mentioned multiple times in the survey. These resulted in negative experiences and had negative influence on people's work. Interestingly however, the majority of documented negative influences seemed to derive from employees who reported not having noticed any influence at all. Closely related to this there were some users who regarded OCS as just another useless new tool among the insignificant many communication channels already available in the organisation.

When it comes to the neutral influences, they were reported by employees who had quite a neutral stance towards the new system. It seems that these users either were not particularly interested in the new system or that they expected it to have a positive influence on their work but had not had the time to use it enough to be able to say. Therefore, in the scope of this research it is difficult to say how their experiences develop over time and determine how the new system ends up influencing them.

5. Discussion

Results of the research indicate that when an everyday communication event takes place at work, knowledge worker chooses the used medium or technology from his or her active communication portfolio: the communication tools and channels he or she is the most comfortable with. This active portfolio is only a small subset from the whole array of tools available at the organisation.

> *"90 % of users pick the tool which they are the most used to – the one that's already easy for them – because you know that when you start something new for the first time it's going to be you who fumbles."*

The first survey suggests that there are numerous tools available in the case organisation but the communication practices revolve around a critical few. E-mail and telephone are heavily used while other practices and communication channels may not be that widely adopted. Similarly, all interviewees had adopted only a small part of the available communication tools and there seemed to be variation between the users' active communication sets.

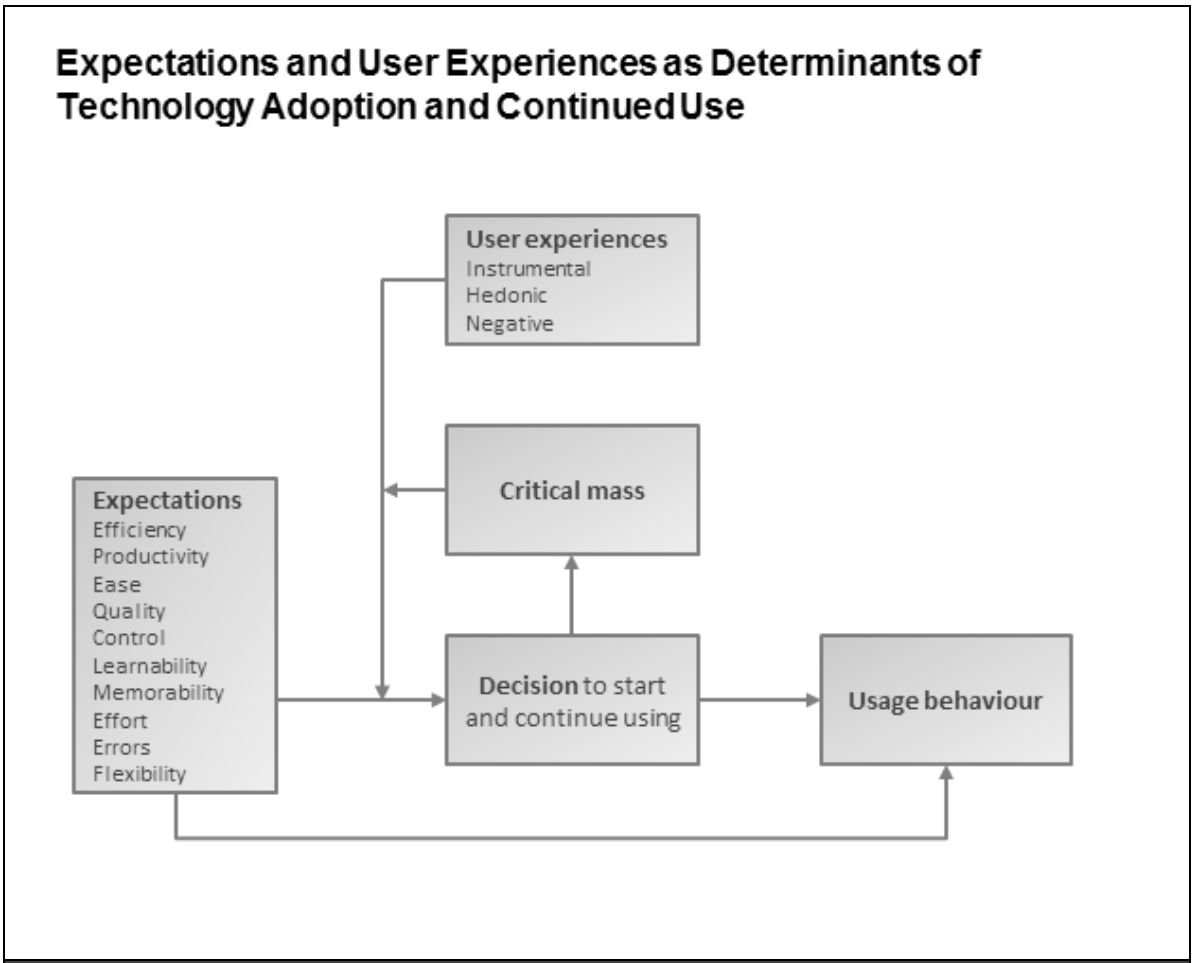

Figure 23: Expectations and User Experiences as Determinants of Technology Adoption and Continued Use (key findings in refined framework)

Figure 23 illustrates the key findings made in the present study in the form of refined framework. The first interview round suggests that there are two important aspects in expectations that should be considered during technology adoption. Based on the collected research data it seems plausible to propose that expectations seem firstly to determine the initial usage intention and motivation to adopt and secondly to influence the extent of usage after the initial acceptance. Based on the neutral and sceptical groups' answers, it seems that if there are no expectations or if the expectations are only negative, there will be very little or no incentive to use the system. Additionally, in the second survey the majority of users responding negatively to the new system had not witnessed it influencing their work in any way or regarded it as just another useless tool among many. The present research suggests that the reason for this may be lack of knowledge about the system and its benefits, lack of proper expectations and lack of trustworthy information to build one's expectations on.

These findings further support previously introduced models describing technology adoption (see [11], [13], [15], [23], [27]). Additionally, when reflecting the participants' expectations against the extent and nature of their usage behaviour, it seems that the magnitude of the expectations influence users' post-exposure usage. That is to say, weak or vague expectations, albeit being confirmed by the experiences, only result in weak or vague usage behaviour. These findings further validate the observations made in previous literature concerning expectation (dis)confirmation and system use continuation [2], [18], [47], [51].

Moreover, interviewees also mentioned broad but realistic and achievable expectations to have key impact on their adoption process. This observation is aligned with Venkatesh and Goyal who proposed that "setting high but realistic expectations about a system's usefulness and meeting those expectations is essential to foster the highest levels of behavioural intention, and unrealistic expectations would always result in fairly low levels of behavioural intention [18]". This indicates the importance of expectations and most importantly the quality of them. This research suggests that if a user understands the realistic value and potential of the system, it seems that he or she is able to build on that expectation and therefore adopt the system in a more versatile, useful and efficient manner and then progress within the temporality of experience –lifecycle discovering and learning more.

Based on the findings, it also seems plausible that experiences in the past have fairly strong impact on expectations about the future. This finding aligns with Mäkelä & Fulton-Suri [37] who suggested that previous experiences in tandem with expectations

have an impact on how present events are experienced. According to them, these factors then result in modified expectations about the future. The findings suggest that when expectations and experiences interact, it not only determines how the present usage is evaluated but the interaction also modifies expectations about usage in the future. Hence, when talking to the users with both positive and negative expectations, the differing aspect that emerged in the answers was awareness: all expectations were mostly well-grounded and based on past experiences, confirmed sources or both. By having had both good and bad experiences in the past made the users even more prepared for the current system rollout. Therefore, the expectations had evolved into being highly realistic and accurate.

That is to say, users who had used similar applications and tools before had more accurate expectations and clearer understanding of what the new system is really able to offer, what the true benefits are and where the key potential comes from. Moreover, some interviewees indicated clear vagueness and uncertainty in their answers. According to them, their expectations relied mostly on rumours, word of mouth, fragmented marketing material, random hype and own assumptions. Additionally, some interviewees expressed their scepticism and concern because some technology rollouts in the organisation had not succeeded well. In the light of present findings it seems that not only the expectations *per se* play key role in technology adoptions but also the source where expectations derive from is of significant importance.

Immediately after having exposed to a new system users begin to accumulate experiences from use sessions and everyday interaction with it. These experiences turn quickly into evaluative feelings about the system, and steer the users through the adoption process. Interviewees emphasise the importance of expectations and user experiences:

> *"If expectations have been increased high due to uncontrolled word of mouth, hype and marketing communication, user is naturally more motivated to begin with the system. However, if the post-exposure experiences do not match with the initial expectations the disappointment may be fateful to long-term adoption process."*
>
> *"When experiencing the true benefits of a new system, one will become more interested in it and simultaneously begins to use it more and more. However, if the experiences are demoralising the threshold to return to old habits and applications is relatively low."*

When it comes to post-exposure user experiences it seems that the influence of user experiences to technology adoption process can be described from two different perspectives – both contributing significantly to the overall evaluation of the system and therefore to the system use continuance. These perspectives firstly focus on how user

experiences interact with expectations to determine the evaluative feeling about the system being adopted and secondly describe how experiences evolve over time and why it matters.

Firstly, many information system continuance models have suggested that users reflect their experiences against their initial expectations to develop evaluative feelings of satisfaction or dissatisfaction related to the used system or application (see [2], [18], [47], [51]). This phenomenon was also observed in the study. It seems that positive expectations had attenuated some of the negative and frustrating experiences. Similar effects have been found in other studies as well (see [69]. This provides good insight into how positive and well-grounded expectations interact with the negative aspects of the adoption process. However, while the positive group may seem ideal from the technology adoption perspective, there were some significant caveats as well. Regardless of highly positive expectations, one of the positive users with rather vague and dispersed expectations had used the system in only a shallow manner. In other words, his usage behaviour seemed to reflect the intensity of his initial expectations. In other words, expectations that are vague and random in terms of intensity seem to result in similar usage behaviour, even if user experiences would be encouraging. Therefore, in the light of the positive group, expectation confirmation seems to be only half of the story. The other half, that is, what actually has been confirmed, is what seems to determine the depth and extent of the usage behaviour. This is something that was briefly discussed in the previous expectations section as well.

The group with both positive and negative expectations reported that only the positive expectations had been realised in the actual usage, whereas the negative expectations were not, at least not at the scale at which they would have disturbed the adoption process. Additionally, the sceptical user felt that her experiences had met the negative expectations and the use rate at the time of the interview was almost non-existent. She was discouraged by the combination of negative expectations and negative experiences that together seemed to have determined the overall evaluative feeling as highly negative.

Interestingly, when reflecting the neutral group's experiences to their stated expectations, it seems that it may be easy to basically feel satisfied with a system when one has not expected anything from it. Additionally, some "larger than life changes" described by one of the interviewees did not really map onto the more concrete expectation items used in the first interview round. This may suggest lack of general knowledge about the value and potential of the system and can therefore equal to not expecting anything at all. This discovery aligns with Venkatesh & Goyal [18], whose research suggests that the popular adage to underpromise and overdeliver does not

provide optimal results. According to them, expectation confirmation at low levels of expectations results in lower behavioural intention. Consequently, even though the neutral users felt that their expectations had been met and that they were rather satisfied with the system, the actual usage behaviour was minimal or even non-existent.

> *"I have been very lazy user of the system, mostly due to not having felt the need for it. There's a risk that OCS will once again turn into just another quite nice but non-important little tool."*
>
> *"I use the system because it starts up automatically and runs in the background. So far it hasn't become a real work practice for me. I think it will influence my practices over time but I'm not sure how and what the most essential and useful features will be."*

Secondly, Karapanos et al. [70] suggest that the way users experience and evaluate interactive products develops over time. According to them, in the early phases of use goodness is often determined mostly based on pragmatic product qualities (usefulness, utility). This happens because users are still exploring the functionality of the system and trying out new things, and as they become more experienced with the system, they begin to put more weight on the hedonic qualities such as attractiveness, satisfaction and pleasure of use. It follows a chain of events where users first familiarise themselves with the system, then become dependent on some of its functionalities and eventually emotionally attached due to incorporating the system into their daily life through routines and personalisation [38]. Findings made in the present research support this idea: users with more past experience with similar systems seemed to pay more attention to product qualities that are considered to be more advanced and are situated further in this temporality of experience –lifecycle. Understanding this in technology adoption context is important because the interplay between expectations and user experiences during usage is continuous, which means that expectations are being adjusted all the time and if the evolving nature of experiences is not taken into account, it may result in a sudden change in one's expectations about future usage.

Both the positive group and the group with combined expectations reported experiences related to both stimulation and identification. Their experiences indicate progress in the temporality of experience –lifecycle: the users had progressed from only getting familiar with the new system, to phases of functional dependency and even emotional attachment. Additionally, there were some comments regarding features that are yet to be found. This again reflects the groups' openness towards new technologies and possibilities they may offer.

> *"Since Messenger (the preceding system) had already been uninstalled, I really had to get OCS on my computer, no matter what."*

"If I could add my own profile picture into the application, I would do it in an instant!"

The experiences of both the neutral and the sceptical group further confirm the findings regarding their low usage rates with the new system. When it comes to the groups' progress within the temporality of experience –lifecycle, the study suggests that if usage level is relatively low, it seems to be difficult to progress within the cycle, learn more and possibly get dependent on the system's functionalities, which may be required to be able to adopt the tool as part of everyday work practices.

Findings made regarding the discrepancy between the strength of positive and negative experiences are interesting. Some interviewees stated that even one positive experience is required to become motivated in the new technology, while the number of negative experiences leading to abandonment would be as high as three or even five times higher. This finding contradicts relevant theories regarding the difference between good and bad events and emotions. According to Baumeister et al. [71], bad experiences and impressions are stronger than good, have more lasting consequences, are quicker to form and are more resistant to disconfirmation than good ones. In the light of findings made in the present research, the explanation for this opposite effect may be the influence of other factors found significant such as expectations, prior experiences, critical mass, relevant lead users or collective practices. The influence of these factors is discussed in the next paragraph.

Although initial user acceptance is important, productivity benefits and long-term viability of a system depend on its continued rather than first-time use [47]. Users may initially have positive stance on a new system but such evaluative judgments may be modified over time due to for example the observed interaction between expectations and user experiences. Modified evaluations in turn may result in discontinued use and therefore lead to little or no long-term productivity gains [18]. Based on the interviews, altogether four core premises of continued usage were discovered:

1. Expectations and user experiences: As has been stated above, the influence of expectations and user experiences does not end to the initial acceptance: the interaction between these two key determinants is continuous and determines the overall judgment about the system in use. Key ideas are the motivation and degree of usage determined by the expectations and the way these expectations meet the actual user experiences that evolve during usage sessions.
2. Critical mass: Based on the data, it seems plausible to suggest that ICT adoption might be dependent on the number of other users that use the system. The study suggests that existence of critical mass may reinforce positive and attenuate

negative experiences, and vice versa. That is, a critical mass of users might make a system more attractive to new users to adopt the system and to the existing users to continue using it.

3. Collective practices: The users that participated in this study emphasised the importance of collective usage practices in their work organisation. In their opinion, collective practices could communicate the importance of the tool being adopted and prevent dispersed and random usage practices from forming. Not having collective usage practices may also lead to experiences of poor usefulness and performance, or feelings that the service does not fit into the prevailing work and communication culture in the organisation.
4. Lead users and user agents: Lead users could be able to communicate the potential benefits to their co-workers and therefore act as reliable sources for realistic expectations. Additionally, they could reinforce positive experiences and provide support, help and explanations if negative or frustrating experiences take place. Collective practices could be built and communicated through the user agents as they act as exemplary users. They could also strive towards the critical mass and communicate its existence to further boost adoption rates.

Based on the data the present study proposes that use continuance is firstly directly linked to the continuous interaction between expectations and user experiences and therefore a consequence from the continuously modified evaluations. However, the research indicates that the other premises are needed to control this interaction and make sure that these evaluations remain positive and keep rewarding and encouraging the user. When all the premises are controlled meaningfully, long-term acceptance can be expected. In fact, based on the second survey it seems that positive influence on one's work had derived from instrumental and hedonic experiences, i.e. positive experiences from actual usage. On the other hand, respondents who reported negative influences focused strongly on conditions not directly related to usage but facilitating aspects such as other users (critical mass), poor guidance and support and lack of collective practices.

The second survey also suggests that introducing OCS in the case organisation had not induced any change in the organisation's communication practices and culture. The answers also suggest that very little had been done to promote change during the implementation project. After the first two months the adoption rates of OCS seem to be somewhat two-fold: 70 % of the employees state that they have installed and used OCS while 30 % have not. It should also be noted that 36 % has only used OCS for 2-4 weeks, which may mean that they have not accumulated enough experiences to determine whether the system is worth using or not.

5.1. Limitations

There are some limitations in the study that should be addressed here. First, the research schedule in the beginning of the study was relatively tight. This meant that the first survey had to be kept relatively simple and superficial and it included only a little of theoretical background. Additionally, to enable the pre-post approach used in the study, the natural consequence was that the second survey had to be to a large extent similar to the first, and therefore the overall contribution of the two surveys remained only at a superficial level, and was therefore utilized as a secondary source of data.

Second, due to some unexpected complexities in the technology rollout, the implementation project was eventually postponed by a couple of months. This had an impact on the study because only the first two months were able to be covered in the given research timeframe. Therefore the results presented here only describe the first two months of the adoption process, which means that there are some inherited pros and cons. On one hand it is possible that the first couple of months are the most crucial moments in technology adoptions: initial user experiences turn rapidly into evaluations of goodness and therefore determine whether the technology is adopted or discarded. This may apply especially in voluntary contexts. However, on the other hand, in large organisations, as the one this study was conducted in, the processes are relatively slow. This means that ramping up the critical mass of users and organising required training may take more time and therefore the results become visible at a later time.

Third, the sources of expectations could have been studied more extensively. The study strived to build better understanding about the ways people had actually formed their expectations and whether these had been influenced by the organisation but the results were not as descriptive and explanatory as was expected. However, the reason why the sources of expectations were not able to be pinpointed accurately may also be that expectations are relatively abstract and it is quite difficult to describe what one is expecting and why. This is something that should be taken into account in future studies.

Fourth, although the study aimed at generating more versatile ways to describe one's expectations through various properties from well-known usability frameworks and definitions, these were not apparent in the described experiences anymore. Therefore, it was relatively challenging to connect expectations with experiences when the various expectation items did not carry on intact in the reported user experiences. Additionally, the expectation items did not provide enough variation in interview context. The questions became quite binary, which lead to categorising users based on the nature (positive, negative, neutral, combined) of their experiences rather than variations in the

properties of the expectations (easy to use, easy to remember, efficient, error-free, increased quality, increased control, etc.).

Fifth, the way experiences were collected has some possible drawbacks that should be addressed here. The experiences were gathered through retrospective recall. In this context, retrospection means that the interviewees were asked to look back and explain important experiences and moments concerned with their use with the new system between the moment of initial exposure and the time of the interview. In other words, instead of capturing the experiences at the moment of occurrence, the research focused to get a retrospective cross-section of different experiences and their influence on expectations. Memory based methods, such as retrospection, have been claimed to be problematic because of possibilities for biased results [61], [62], [63]. According to Karapanos [61], what we remember might be different from what we actually experienced. It has also been suggested that a recalled event generates from act of reconstruction which cannot reproduce exactly the correct past event but usually results in a slightly altered version [62]. However, the bias in the case of this study may not be that relevant because future behaviour has indeed been theorised to be guided by memorised experiences [64]. Since the present research studies how expectations about the future are formed, memory perspective into experiences was considered appropriate and justified.

Sixth, the way the interviewed users ended up being categorised based on their expectations proposes that the amount of interviewees may not have been enough. The formed groups became relatively small and especially the sceptical group had only one user in it. A quantitative analysis in future research could address this issue. Additionally, the research was conducted only in one business unit in one organisation, which has an impact on the generalizability of the results. Also, given the relatively low response rates in the surveys, the results may be influenced by non-response bias.

Finally, the used research methods also have some inherent limitations that should be addressed here. First, it should be noted that interview is indirect research method which means that it does not study the phenomenon itself but other people's viewpoints and opinions about it [32]. Second, due to the close interaction between the researcher and the interviewee, the findings are dependent on the researcher's abilities and even character [58]. Additionally, interviewees can sometimes answer what they feel is expected from them instead of the actual truth [32]. It should also be noted that subjectivity is always present in qualitative data analysis and it should be taken into consideration when interpreting the study. The interview sessions and frameworks were planned so that possibility for all sort of bias was minimised. For example, in the

interviews, the part concerning expectations and the OCS implementation process was chosen to be the last section of the interviews to avoid possible bias in and from other researchers' questions.

5.2. Implications for research

This study has several implications for research and some of them have already been stated above. The research was able to utilise various research streams, namely information system acceptance, human-computer interaction (usability, user experience) and system use continuance, to study technology adoption in a case context. The approach was found to be successful and the key contributions fall into two components. First, the results describe the adoption lifecycle comprehensively ranging from expectation forming through continuous evaluation against evolving user experiences to (dis)continued usage behaviour. Second, the process had also a strong practical dimension and therefore the results are rather approachable and utilisable from both research and practice perspectives. Based on the study, some future research directions can be suggested.

First, critical mass and network effects were found to be important in considerations of use continuance and sustained technology adoption. Critical mass and network effects are not by any means new concepts in IS literature (see [25], [68]) but their moderating effect on user experiences seems to be to my best knowledge. Although the influence of critical mass (*social influence* in UTAUT) was initially excluded in this research, its emergent influence was documented multiple times during the study. Therefore, the study suggests that the existence of critical mass may possibly reinforce positive and attenuate negative evaluations. Opposite effects in the case of non-existent critical mass can be expected. The phenomenon could be examined more thoroughly in future research.

Second, closely related to the influence of critical mass and network effects on technology adoption is the timeframe in which these effects take place. Future research could examine how the adoption rate behaves against time and what are the most crucial periods in technology adoptions. Additionally, the interaction between critical mass and adoption rate could be examined by illustrating adoption rate as the function of realisation of critical mass. In other words, how the adoption rate is affected by the number of existing users and what is the threshold of users (critical mass) that is required to clearly accelerate the adoption process and what factors determine this threshold?

Third, the research of expectations still seems to remain somewhat superficial. A future research stream could focus on, what kind of expectations there really are, what makes up an expectation, where do expectations derive from, what are the key sources for expectations and how are expectations influenced? It seems to be quite widely taken for granted that there are only expectations related to usefulness and effort and research that would have actually delved deeper into these major expectation constructs seems to be quite sparse at least to my best knowledge. Better knowledge about what attributes actually make a product, service or technology more useful and effortless could help in reaching a better understanding about expectations and how they relate to user experiences.

Finally, the key contributions of this research could be further examined in a more comprehensive quantitative study to better understand whether the findings in this research also apply elsewhere and to what extent.

5.3. Practical implications

As the purpose of this study was to create concrete guidelines to support technology adoption in organisations, there are numerous implications for management to be considered. The research suggests that during a technology rollout each employee proceeds from initial pre-exposure expectations through various (evaluative) user experiences to the decision to either adopt or discard the new tool. Figure 22 illustrates this process and also points out how an organisation could influence the employee in these phases of the adoption process.

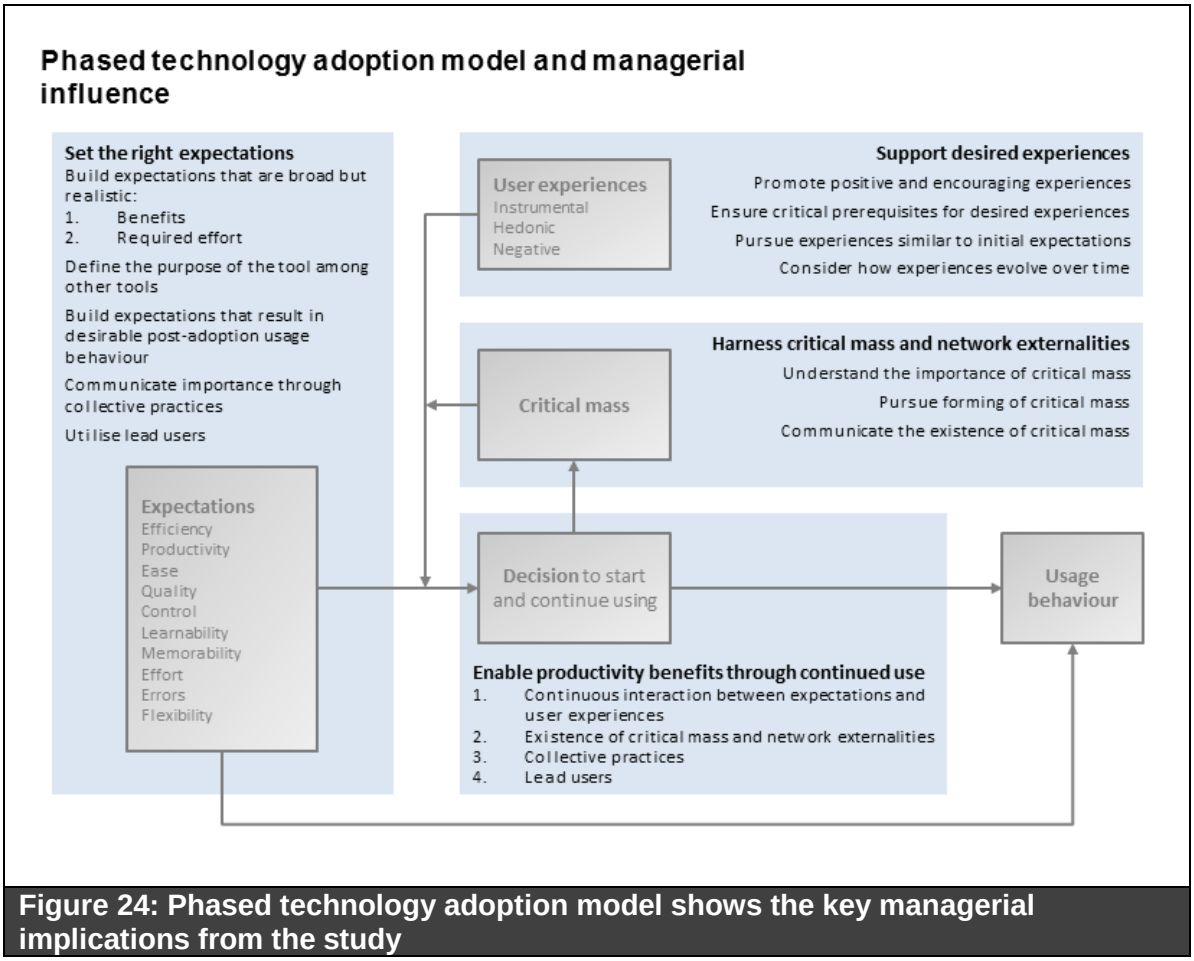

Figure 24: Phased technology adoption model shows the key managerial implications from the study

First, based on the study, the importance of expectations, their multifaceted effect and evolution over time should not be neglected in technology adoptions. Instead, organisation should strive to harness the power of expectations to support the adoption process, to motivate the employees and commit them to the project. Organisation should aim at building proper expectations because, as has been stated earlier, underpromising and overdelivering does not work in technology adoptions [18]. Instead, the organisation should emphasise the benefits and make sure its employees also understand the required effort. For example, based on this research, collective usage practices and lead users seem to be an efficient way to convey this information and build expectations properly. Additionally, people will reserve time to learn and to adopt the tool if they understand its benefits and purpose. Based on the present research, expectations also determine what the usage becomes like and therefore the purpose of the new tool should be communicated already in early phases of the project. This ensures that the post-exposure usage is consistent and provides value to all employees. It should also be noted that when the primary source of expectations is the organisation itself, it has the control and therefore the ability to make sure that expectations remain broad but realistic.

Second, immediately after having exposed to a new system, users begin to gain experiences from usage sessions and everyday interaction with it. From management perspective user experiences should be considered along two dimensions. Users reflect their experiences against their initial expectations and come up with evaluative feelings of satisfaction or dissatisfaction. Therefore organisation's management should promote positive and encouraging experiences and make sure that people actually have the possibility to attain them. This could be done through proper support and counselling and by fostering the formation of meaningful and innovative use practices among the employees. Additionally, based on this study, lead users could reinforce positive experiences and provide support, help and explanations if negative or frustrating experiences take place. In other words, the concrete goal for management should be to enable experiences that correspond to the expectations employees have. Especially if the organisation has been able to generate and nurture good quality expectations, this combination seems to have the strongest effect in terms of both motivation to use and the depth of usage.

Additionally, when it comes to user experiences, it also seems to be important to understand how the experiences evolve over time. Karapanos et al. [70], suggest that in the early phases of use, goodness is often determined mostly based on pragmatic product qualities such as usefulness and utility. This happens because users are still exploring the functionalities of the system and the immediate focus often tends to be how well the new solution is able to handle basic tasks one faces in his or her work. As users become more experienced with the system, they begin to put more weight on the hedonic qualities such as attractiveness, satisfaction and pleasure of use. This effect was clearly visible with users who already had some experience in similar systems than the one that was now being implemented in the organisation. From managerial perspective, it would be beneficial if these phases could be recognised during the adoption process at least to such extent that people in various stages of the temporality of experience –lifecycle would be able to utilise the new system in a way that corresponds to their needs. This way the experiences would be as rewarding as possible and align with the expectations and therefore encourage usage behaviour that is not only valuable to the users themselves but also to the organisation as a whole.

Third, because each user that decides to adopt the new technology becomes part of the network of users in the organisation, at some point the network starts yielding positive network effects. This study suggests that when this critical mass of users has been achieved, it has a positive impact on the whole technology adoption process. This research proposes that realised critical mass can reinforce positive and attenuate

negative effects and vice versa. From managerial perspective, the meaning and importance of critical mass and network effects should be understood. During technology adoption projects, organisational communication should pursue and promote forming of critical mass and communicate its existence as soon as it has been achieved. This way the benefits of critical mass and positive network effects could be harnessed to serve the adoption process.

Finally, as has been stated in this study, productivity benefits and long-term viability of a new system depend on its continued rather than first-time use. According to this study there are four key elements that should be considered to enable smooth and efficient transition from dispersed one-time adoption to long-term continued use. Each element (expectations & user experiences, lead users, collective practices, critical mass) has already been discussed separately but the key factor is to understand how they all contribute together to form such a combined impression that carries the user from the beginning of the adoption to being committed and sophisticated user that brings value to the organisation through his or her work.

6. Conclusion

To meet modern requirements and to support their employees, many organisations generally provide extensive sets of information and communication technology to their staff. Available evidence shows, however, that this new technology is often underutilised which results in that the full potential of the tools is not met [2]. The value of new technology does not realise, if the intended users do not adopt it and utilise it in a manner that contributes to the organisational and operational goals of the firm. In other words, productivity benefits are highly dependent on, how the technology is really applied in practice [5]. Therefore, regardless of the investments in modern communication technology, the growth in a single knowledge worker's productivity and job satisfaction is still quite restrained.

This study was based on the presumption that when an everyday communication event takes place at work, knowledge worker chooses the used medium or technology from his or her active communication portfolio: the communication tools and channels he or she is the most comfortable with. However, this active portfolio is only a small subset from the whole array of tools available at the organisation. Deriving from this idea, the case study set off to learn, how a new communication tool is actually received among the employees in the case organisation, what is the role of expectations and user experiences in all this and what determines continued usage behaviour. The research questions were defined as follows:

> *1. How do users' initial pre-exposure expectations affect their intentions to adopt and use a new communication system?*
>
> *2. What is the role of user's post-exposure experiences in the adoption process?*
>
> *3. What factors affect users' intentions of continued use?*

To collect the prevailing pre-exposure expectations among the employees and learn about the corresponding post-exposure experiences that took place after the technology had been introduced in the case organisation, a pre-post approach was utilised in the study. Research data was created primarily through interviews that took place in the beginning of the project and two months after the employees had been given the access to the new system. Interviews were established to describe the technology adoption, especially from usability and user experience perspective. In other words, what made the new communication tool to be included in one's active co,mmunication portfolio, and especially, how did expectations and user experiences weigh in the decision-making

process? Moreover, what were the requirements for continued use and would there be a way for organisation to influence these when investing in new technologies. Altogether seven employees were interviewed during the project and each participant was interviewed two times. In addition to the interviews, two supplementary surveys were also deployed to explore the research phenomenon in a wider scale; however, it should be emphasised that the role of the surveys was only secondary.

The first interviews suggest that there are two important aspects in expectations that should be considered during technology adoption. Expectations seem to firstly determine the initial use intention and secondly influence the extent of usage after the initial acceptance. Pre-exposure expectations were found to have a direct influence in one's initial intention, commitment and motivation to adopt the new communication tool. The majority of users responding negatively to the new system had not witnessed it influencing their work in any way or regarded it as another useless tool among many. This further supported models introduced in previous literature describing technology adoption (see [11], [13], [15], [23], [27]). Additionally, it seems that the magnitude and certainty of one's expectations has an influence on what the post-exposure use behaviour becomes like. These findings support the observations made in previous literature concerning expectation (dis)confirmation and system use continuation [2], [18], [47], [51]. When it comes to the interaction between expectations and user experiences, the findings suggest that it not only determines how the present usage is evaluated but it also modifies expectations about usage in the future. That is to say, users who had used similar applications and tools before had more accurate expectations and clearer understanding of what the new system is really able to offer, what the true benefits are and where the key potential comes from.

After the employees were given access to the new system and if their expectations encouraged them enough to start using it, they immediately began to accumulate experiences from use sessions and everyday interaction with it. Based on the second survey it seems plausible to suggest that positive influence on one's work derives from instrumental and hedonic experiences, i.e. positive experiences from actual usage. Based on the study, the influence of user experiences to technology adoption process can be described from two different perspectives, namely based on the evaluative feeling from expectation (dis)confirmation and based on the evolution of experiences themselves.

Firstly, many information system continuance models have suggested that users reflect their experiences against their initial expectations to develop evaluative feelings of satisfaction or dissatisfaction related to the used system or application (see [2], [18], [47], [51]). This phenomenon was also observed in the study but it seems that expectation

confirmation is only half of the story. The other half, that is, what actually has been confirmed, is what seems to determine the depth and extent of the usage behaviour. Secondly, Karapanos et al. [70] suggest that the way users experience and evaluate interactive products develops over time. In the present study, users with more past experience with similar systems seemed to pay more attention to product qualities that were considered to be more advanced. Understanding this in technology adoption context is important because the interplay between expectations and user experiences is continuous, which means that expectations are being adjusted all the time and if the evolving nature of experiences is not taken into account, it may result in a sudden change in one's expectations about future usage.

Although initial user acceptance is important, productivity benefits and long-term viability of a system depend on its continued rather than first-time use [47]. In the second survey respondents who reported negative influences from the system focused strongly on conditions not directly related to usage such as other users (critical mass), poor guidance and support and lack of collective practices. Based on the present study, there are altogether four core premises that seem to have influence on an employee's intention to use after first having adopted the technology initially.

The study suggests that use continuance is directly linked to the continuous interaction between expectations and user experiences and therefore it is consequence from the continuously modified evaluations. However, the research also indicates that there are other important factors (critical mass, collective practices and user agents) that control this interaction. The research suggests that the existence of critical mass during technology adoption may reinforce positive and attenuate negative evaluations and vice versa. In other words, critical mass of users might make a system more attractive to new users to adopt the system and to the existing users to continue using it. Collective practices and user agents can have a strong impact on both the expectations and user experiences through more consistent and comprehensive usage behaviour. Critical mass, collective practices and user agents could be utilised strategically in an organisation to make sure that the evaluations remain positive and reward and encourage the user. When all these premises are controlled meaningfully, long-term acceptance can be expected.

Based on the explorative surveys it seems plausible to suggest that within the first two months of the technology implementation project the new system had not induced any change in the prevailing communication habits and practices within the organisation. The employees' active communication portfolios had not changed, people still

communicated through the critical few dominant channels and the OCS adoption rates were relatively modest.

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Appendices

Appendix A: Survey 1

1. How often do you utilise the following communication tools in your work (1 = Extremely rarely/Never, 2 = Somewhat rarely, 3 = Occasionally, 4 = Somewhat often, 5 = Extremely often)?
    a) E-mail (at own workstation)
    b) E-mail (outside own workstation, on the move)
    c) Instant messaging
    d) Informal communication (social networks, Facebook, LinkedIn, etc.)
    e) Informal communication (walking to colleague's desk, asking aloud in the office, discussions in corridors, etc.)
    f) Intranet
    g) Letter
    h) Personal meeting
    i) Telefax
    j) Telephone
    k) Text message (sms)
    l) Video conference
    m) Company wiki
2. How many e-mails do you send during your working day (1 = Less than 25, 2 = 25-50, 3 = 51-75, 4 = 76-100, 5 = More than 100)?
3. How many e-mails do you receive during your working day (1 = Less than 25, 2 = 25-50, 3 = 51-75, 4 = 76-100, 5 = More than 100)?
4. How many hours a day do you use to process your e-mails?

Appendix B: First interview round – Expectations

1. Position at TeliaSonera
    a) What do you do for work? What is your job description?
    b) What is your typical working day like?
    c) Are you in contact with customers on a daily basis?
    d) Describe your physical work environment? Do you have some other workstation in addition to this?
    e) How long have you been working at TeliaSonera?
    f) Has your job description remained the same?
    g) What kind of IT skills do you have in general?
    h) What do you do for work? What is your job description?
    i) What is your typical working day like?
    j) Are you in contact with customers on a daily basis?
    k) Describe your physical work environment? Do you have some other workstation in addition to this?
    l) How long have you been working at TeliaSonera?
    m) Has your job description remained the same?

2. Communication tools and their capabilities
    a) Describe the communication tools used at TeliaSonera. What do you use the most yourself? Do you feel that you have the opportunity to use some other means? What are they? Are there tools that you have not utilised yet?
    b) What do you think about the capabilities of the communication tools you use the most?
    c) Do you feel that communication tools improve your work performance? How?
    d) Do you feel that you need new communication tools?
    e) How do you generally feel when new tools are being introduced at work?

3. OCS
    a) How well do you know the OCS tool?
    b) What do you expect from OCS and its influence on your work?
        i. Do you believe that OCS enables you to perform your job faster?
        ii. Do you believe that OCS improves your productivity?
        iii. Do you expect OCS to make your work easier?
        iv. What kind of impact are you expecting OCS to have on the quality of your work?
        v. Can OCS enable you to have better control on your work?
        vi. How flexible/customisable are you expecting OCS to be?
    c) How effortless are you expecting the technology adoption to be?
        i. Is it generally difficult for you to learn how to use new technologies and tools? What do you expect from the learnability of OCS?
        ii. How easy is it for you to remember learned things and techniques? What do you expect from the memorability of OCS?
        iii. How effortless are you expecting the usage of OCS to be?
        iv. How do you generally react to errors in technologies and tools? What about in the context of OCS?
    d) How do you think the aforementioned types of expectations influence your willingness and motivation to adopt new tools?
    e) Do you think there would be means to influence these expectations?

Appendix C: Second interview round – User experiences

1. Expectations and user experiences
    a) What did you actually expect from OCS?
    b) Do you currently use OCS actively? How much? In what kind of situations OCS is good?
    c) What kind of communication do you use OCS for?
    d) Describe briefly, what kind of experiences have you had with OCS?
    e) How have these experiences met your initial expectations? Are you satisfied with OCS? Have you adjusted your expectations somehow?

2. Please describe in more detail the three most positive and negative experiences you have had with OCS.

3. The capabilities of OCS
    a) Has OCS made your work-related communication easier? Have you now used OCS in communication for which you used some other tool before?
    b) What are the most notable benefits and drawbacks of OCS?

4. Culture and training
    a) Do you feel that OCS is currently being used in TeliaSonera? Why? Why not?
    b) Have there been any attempts to influence the organisation's communication culture along with introducing OCS?
    c) Have you received training related to the usage of OCS?
    d) Have your colleagues assisted you with the usage of OCS?

5. Future expectations and premises of continued use
    a) What do you expect from OCS in the long run?
    b) What are the requirements for continued use? What has to happen for you to adopt OCS extensively?
    c) Are you planning to continue using OCS? Why? Why not?

Appendix D: Survey 2

1. How often do you utilise the following communication tools in your work (1 = Extremely rarely/Never, 2 = Somewhat rarely, 3 = Occasionally, 4 = Somewhat often, 5 = Extremely often)?

    a) E-mail (at own workstation)
    b) E-mail (outside own workstation, on the move)
    c) Instant messaging
    d) Informal communication (social networks, Facebook, LinkedIn, blogs, **wikis**, etc.)
    e) Informal communication (walking to colleague's desk, asking aloud in the office, discussions in corridors, etc.)
    f) Intranet
    g) OCS (instant messages, LiveMeeting, status information)
    h) Personal meeting
    i) Telephone
    j) Text message (sms)
    k) Video conference
    l) Virtual workrooms (Sharepoint, etc.)
    m) Web conference (Webex, NetMeeting)

6. How many e-mails do you send during your working day (1 = Less than 25, 2 = 25-50, 3 = 51-75, 4 = 76-100, 5 = More than 100)?

7. How many e-mails do you receive during your working day (1 = Less than 25, 2 = 25-50, 3 = 51-75, 4 = 76-100, 5 = More than 100)?

8. How many hours a day do you use to process your e-mails?

9. Describe briefly, how OCS has influenced your communication at work.