Mobile Devices in the Public Healthcare Sector
– Perceptions, Experiences and Expectations of Nursing Care Providers

Zara Galzie
Gustav Harnesk

Supervisor: Göran Goldkuhl
Examiner: Fredrik Söderström
Abstract

There are high expectations regarding mobile technology and how it can be used to promote improvements in the quality and efficiency in healthcare. There appears to be a gap between the goals and strategy on the macro level and the micro level experiences of the usage of mobile devices among healthcare professionals.

The purpose of this study is to examine the perceptions, experiences and expectations of nursing care providers at two wards with regards to the recently implemented mobile platform COSMIC Nova Ward and other related IT artefacts. Special emphasis has been on COSMIC Nova Ward Tablet, a part of COSMIC Nova Ward, facilitated in iPad MINIs. It is designed to act as a tool to facilitate the provision of care and has been introduced at both the wards during a pilot project. Even though the two wards are similar in both practice and structure, the pilot project resulted in failure at one of the wards and a relative success at the other.

A comparative case study of the perceptions, experiences and expectations of the nursing personnel at the two wards was conducted in order to highlight the differences in the outcomes of the pilot project. By reflexively comparing these with theory, it was concluded that there are several factors other than adequacy of the IT system that determine the outcome of the implementation of a mobile platform in a clinical setting.

These findings were then compared with existing legislation and policies, in order to identify potential discrepancies between the nursing personnel’s usage of IT with the regional and national goals and strategy. It was then determined that there needs to be a clear connection between the usage of IT and the goals and strategy within healthcare.

Keywords: eHealth, mHealth, USE IT model, policy, healthcare, resistance, eHealth strategy, COSMIC Nova Ward
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1. Introduction

In this section, we present the background and problem area of the study and illustrate how they come together to form the study's purpose and research questions. The study's intended audience and delimitations are also presented in this chapter, in order to describe the future scope of it. A brief disposition and recommended reading paths are presented at the very end of this chapter.

1.1 Background

Of the many countries that can boast of a proud history and tradition in the field of medical innovations, one that is worth mentioning is Sweden. The pioneering efforts of Swedish scientists have led to ground-breaking innovations in medical technology such as the implantable pacemaker, the gamma knife, the incubator and last but not least the first practical dialysis machine. Technological innovations in the field of science however, are not the only measure of the success of a modern society. Putting these innovations into implementation is almost as important as the innovations themselves. A ground-breaking innovation that is not implemented and benefited from, would hardly be ground-breaking (Hollmark et al., 2015).

In a comparative study undertaken by the Swedish Association of Local Authorities and Regions (SALAR) in 2015, it was concluded that the Swedish healthcare sector is one of the best in the world when it comes to life sustaining care (SKL, 2015). Sweden, despite being relatively successful in the field of medicine, is fractured and inefficient in its use of information systems in conjunction with healthcare (Rexhepi et al., 2015). Each region in Sweden has its own healthcare organization, implying that each region has its own procured information system for health records, also known as electronic health records (ibid). Recently, the use of mobile technology in public healthcare (also known as mHealth) has become increasingly prevalent. Although, society as a whole is moving towards becoming increasingly mobile and online (Statistiska Centralbyrån, 2016), the healthcare sector seems to be slacking behind. Healthcare has always been slow to embrace new technologies, which in turn means that medical institutions are lagging behind the rest of the society when it comes to handling and sharing of patient related information through the use of information systems (Wickramasinghe et al., 2005). The use of IT in healthcare, for instance electronic health records (EHR) for decision support, electronic referrals, prescriptions and other exchanges of information, is now viewed as a tool that can be used to improve the quality, safety and efficiency of healthcare. Albeit having great potential, the fact remains that IT is still not been used to its full potential in the healthcare sector (Rexhepi et al., 2015). Mobile technology in public health, also referred to as mobile health or mHealth (Currie & Seddon, 2014b), has the potential to change healthcare and solve many of the challenges that are faced by many European countries with regards to the ageing population. Despite this, many governments in the European Union have focused on privacy legislation rather than promoting the usage of ICT (Information and Communications Technology) and mobile health solutions (Currie & Seddon, 2014b).
It is crucial to understand the driving forces behind work with eHealth solutions, in particular if they affect the work practices of healthcare personnel (Currie & Seddon, 2014a).

1.2 Problem Area

A hot topic of discussion and the number one concern of healthcare professionals in the economically developed world today, is to draw on the innovations in eHealth in order to improve the quality and safety of healthcare. However, as a result of an underlying intricate web of social and technical issues that are essentially interrelated within a wider organizational environment, healthcare in comparison with other industries is slow to adopt technology (Cresswell & Sheikh, 2013). With regards to developments in the field of eHealth, the criticism that Sweden faces is that it is not progressing fast enough, even though Sweden lies way ahead in comparison to other European countries (ehealth, 2012). However, a fact that is fast gaining appreciation is that implementing information technology within complex organizational structures or systems, for instance healthcare, is hardly a simple and straightforward process (Cresswell & Sheikh, 2013).

Sweden, like any other economically developed country faces challenges with regards to healthcare. The ever aging population means that there is an increased need for healthcare, however the available resources in terms of funding and staff remain largely unchanged (ehealth, 2012). The improved living standards in combination with an efficient healthcare system, are the most probable causes behind people leading richer lives in terms of health and attaining a longer life span (ibid). The survival rate of patients with diseases like cancer, stroke, diabetes and other cardiovascular diseases has improved drastically (ibid). Thus, the likelihood of falling ill is usually deferred to a later stage in life. This makes it probable that the need for the care of old and chronically ill individuals will increase further in the near future (ibid).

The need for developments in healthcare, both current and perceived, calls for the efficient running of healthcare institutions, which in turn, necessitates an adequate IT-strategy (Scott and Mars, 2013). Information and Communications Technology (ICT) has been implemented in healthcare to some extent in many countries. However, the process of developing and implementing ICT in healthcare, has always been slow and negatively affected by lacking and/or inadequate use of strategy (Wickramasinghe et al., 2005).

1.3 Aim

The aim of the study is to examine the perceptions, experiences and expectations of nursing care providers at two wards with regards to a recently implemented mobile platform and related IT artefacts. The use of the terms perceptions, experiences and expectations has been a conscious choice to subdivide the narrative of the nursing care providers. This has led to a better understanding of the respondents’ individual narratives in addition to capturing the different nuances of the individuals’ attitudes towards the studied phenomenon. The mobile platform in question is designed to act as a tool to facilitate the provision of care and has been introduced at
the two wards as a pilot project. A comparative study of the perceptions, experiences and expectations of the nursing personnel at the two wards is then conducted in order to highlight differences in the outcomes of the pilot project. By examining this comparison in light of relevant theory, we aim to come up with possible explanations for the different outcomes of the pilot project at the two wards.

The perceptions, experiences and expectations of the nursing care providers are then compared with existing legislation and policies, in order to identify potential discrepancies between the nursing personnel’s usage of IT with the regional and national goals and strategy.

1.3.1 Research questions

Based on the above-mentioned background and problem area, we have formulated the following research questions that are eventually intended to be answered in this study.

- What are the perceptions, experiences and expectations of nursing care providers with regards to the usage of mobile platforms?
- Are there any discrepancies between the experiences of the nursing care providers and the policies and legislations in this regard?

1.3.2 Research delimitations

This study is primarily conducted in order to discuss and reflect on how mobile platforms can be used in a healthcare environment in order to promote the efficiency and quality of care and how this development is viewed by the operational healthcare personnel. Because of this focus, we have chosen not to view this phenomenon from the perspective of consumers of care, i.e. the patients. The patients’ perspective is of course valuable; however, our standing is that what is beneficial for the providers of care is in turn eventually beneficial for the receivers of care. We do not intend to look into the economic aspects of the implementation of mobile platforms into the healthcare practice more than on a superficial level. Neither do we intend to look into the economic effects that the implementation may have on the provided healthcare or the organization itself. Economic metrics provide a clear-cut image of effects, but provide very little information with regards to experiences and expectations, which is the primary reason for this delimitation. Furthermore, we will not look into the technical aspects of such an implementation, like system architecture, programming and the likes. As the focus of our study lies primarily on the perceptions, experiences and expectations of the healthcare personnel regarding the usage of mobile platforms in providing care, we have chosen not to explore the vendor side of the scenario.

1.4 Intended audience

Given the purpose of our study, namely, to explore the potential effects of the usage of mobile platforms in the public healthcare sector, our thesis could be beneficial not only to researchers
but also practitioners in the healthcare sector. It could be a means of providing an insight into the perceived impact that the introduction and implementation of mobile technology could have in the day to day work processes of healthcare providers or personnel. Researchers contributing to the field of healthcare could find our study beneficial when exploring this facet of technology further in relation to healthcare. We believe that our study could be beneficial to fellow students, especially in the field of management and informatics or information sciences in the form of an academic contribution, also the primary intended purpose of the study. Furthermore, our study could be helpful to individuals or organizations involved in the development of mobile platforms for use in healthcare as a starting point with regards to lessons learned from such an implementation and for individuals in the public healthcare sector working towards the development of mHealth and eHealth. Certain specific sections of our study could also be beneficial to policy and decision makers at the municipality level as well at the policy makers in the public healthcare sector as a basis to ground certain decisions regarding development and implementation of mHealth and eHealth on.
1.5 Disposition

This section provides an overview of this thesis structure. The overview is illustrated in figure 1.1 below.

![Figure 1.1 Disposition of the thesis](image)

*Figure 1.1 Disposition of the thesis*
1.5.1 Recommended reading paths

As is our understanding, all of a study’s content is not necessarily relevant to all of its intended audience. It is therefore appropriate that we clearly illustrate which parts of the study are relevant for which reader depending on the reader’s background, role and intentions. We would like to point out that these recommended reading paths are just recommendations; we encourage readers to explore the study in its entirety if they have the time and the energy to do so.

**Healthcare providers**

Our assumption is that healthcare providers primarily are concerned with this study’s empirical and findings. Therefore, it is our recommendation that the healthcare providers read chapter 4. Empirics and chapter 6. Conclusions. We expect that the healthcare professionals who read this study will find both similarities and differences to their own experiences with the discussed phenomena.

**Scientists**

We strongly urge the scientists to read this study in its entirety, as we see it necessary to understand the presented findings. We implore you to especially read and understand the research questions as they make the foundation of this study. This is a strict requirement to use the study as a foundation for further research, whether it is critiquing or supporting the conclusions of the study. Furthermore, we especially encourage scientists to scrutinize the methodologies used in the study and to view the conclusions in the light of the said methodologies.

**Students**

We recommend that students read the entire study. Moreover, we encourage students in need of inspiration to especially study chapter 2. Method and Approach, 3. Theoretical Framework and chapter 4. Analysis. If one is more interested in the study's findings rather than its working methods, we recommend a similar reading path to the one recommended to previously mentioned recommended reading path to healthcare professionals.

**Strategists**

Strategists should especially focus on reading the empirics and findings of this study. Therefore, we recommend chapter 4. Empirics, 5. Analysis, 6. Conclusions. It is also recommended that chapter 2. Method and Approach is read in order to understand our findings and working methods.

**Decision makers**

Decision makers, such as politicians and executives, should primarily focus on the conclusions presented in chapter 6. Conclusions. It is however imperative that these results are viewed in the light of empirics, since they show how the decision makers work directly or indirectly may affect real people’s work environment.
2. Method and Approach

This part of the thesis discusses the methodology used and provides a comprehensive account of the approach used when conducting the study. Moreover, we also argue for our qualitative philosophical assumptions, our interpretive perspective and our thematic analysis.

2.1 Philosophical assumptions

Research is an activity that is not only creative in nature but also leads to the production of new information and relevant knowledge. The new knowledge gained in research leads to the understanding of a particular field or area (Myers, 2013). Although many interpretive studies uses a qualitative approach, the qualitative approach does not by any means have a monopoly on interpretive studies in the field of social sciences.

Myers (2013) claims that research within the field of business and management can be divided into three categories based on their philosophical assumption: positivist, critical and interpretive. According to Myers (2013), all research, both qualitative and quantitative, is based on philosophical assumptions. Therefore, philosophical assumptions are the foundation of the qualitative research design, a design we choose to implement in this study. As the philosophical assumptions build the foundations for a study, we argue that they have a profound effect on the research’s result.

Myers (2013) notes that albeit the three assumptions being distinct, they are less so in practice. Our philosophical assumption is based on the interpretive epistemology. Much of the qualitative research is done with this epistemology, but we would like to underscore the fact that the interpretive approach by no means is the only philosophical assumption, as pointed out by Myers (2013). We therefore see it befitting to present the other two philosophical assumptions and motivate why we chose the interpretive approach as our philosophical assumption for this study. It is essential that the researcher is well aware of his or her philosophical assumptions and in what ways they may affect the results of the research. We would argue that two studies with the exact same theoretical framework and similar empirical data would yield different results depending on the epistemology, i.e. how the researcher views and obtains knowledge. Furthermore, we would argue that a philosophical assumption is more deeply rooted than how a researcher carries out his or her studies; a philosophical assumption is based upon how the researcher perceives the world. With this in mind, it is crucial that the researcher openly shows his or her philosophical assumptions for the sake of transparency.

The key issue with social science is to what degree it should adhere to the classical principles, procedures and ethos of natural sciences. The epistemological consideration, i.e. philosophical assumption, that has this consideration is positivism (Bryman, 2016). Furthermore, this assumption draws a clear line between theory and research. The positivistic approach is meant to
test theories through the use of empirical data (Bryman, 2016), thus making it an assumption suitable for a deductive work method. Although we can see the potential benefits of a positivistic approach, we recognise that research of a social phenomenon, such as IS, is in constant change and in need of a flexible work methodology, thus making a positivistic approach unsuitable for the purpose of this study.

The second philosophical assumption mentioned by Bryman (2016) and Myers (2013), critical theory, is based around the notion that everything in society is a social construct. Because of this critical world view, this epistemology has become popular in the feminist research field and gender studies. We believe that critical theory is useful when one investigates social structures and norms in order to question these so as to generate a better understanding of social phenomena. This being said, we do not think that this epistemology is suitable for this study since the study’s purpose is to discuss perceptions and expectations rather than organizational structures and/or power, although a discussion of these would be rather interesting. Instead, we have an interpretive epistemology, as we aim to discuss the mobile platforms in healthcare from the perspective of healthcare professionals through the utilization of comparative case studies. The combination of interpretive epistemology and case studies in IS allows us to provide both the perspective of the respondents, our interpretation and understanding of the respondents view on the studied phenomenon (Walsham, 1995).

When it comes to generalisability of case studies, a commonly occurring criticism is how one can generalise from a single case study. Walsham (1995) argues that case studies are able to be generalised in relation to theory. Moreover, interpretive case studies can be used to develop concepts and terminology as discussed in Walsham (1995). We would argue that the interpretive case study approach used in this study allows us to generalise from theory and the development of conceptualization.

2.2 Predisposition

The interpretive epistemology is about how the researcher can understand human actions. It is therefore appropriate that we present our own previous understanding of the study’s field of research and how hermeneutics have affected our way of seeing the mHealth phenomenon. A researcher with an interpretive epistemology will not only show their respondents’ worldview; he/she will also most likely combine these with a theoretical framework, making the interpretation double, i.e. that the researcher interprets interpretations (Bryman, 2016). We would like to emphasize the importance of acknowledging this, as not to take the conclusion of this study as the absolute truth. The conclusions of this study are possible explanations for a phenomenon that are based on our own and the respondent’s’ predisposition regarding eHealth.

We will now give a brief summary of our own background. The purpose of this is to provide the reader with an understanding of our respective backgrounds and by doing so hopefully give the
reader insight into our philosophical assumptions and our way of interpreting the eHealth and mHealth phenomena.

We are both students of the Master’s programme in IT and Management at the Department of Management and Engineering at Linköping University. The focus of the programme has been on strategic leadership with regards to IT. The courses that we have read during the programme have had a significant impact on the selection of theory used in this study, since previous studied literature and theories have a tacit or pronounced impact on our own understanding regarding the study’s field of research. We both have experience of eHealth from our respective internships during the course of the programme. The internships gave us both an understanding of the system requirements and the development process behind eHealth solutions. They gave us insights regarding the coexistence of EHR system vendors and procurers. One of us had their internship at Östergötland County as a front end developer of a prototype EHR platform, while the other had their internship at EHR vendor Cambio, specifying requirements and researching possible application scopes for a terminology database.

Zara Galzie has a bachelor’s degree in Engineering and Computer Science and Gustav Harnesk has a bachelor’s degree in Information System Analysis. Gustav Harnesk has also authored his Bachelor’s thesis within the field of eHealth.

The combination of these backgrounds gives us a knowledge and understanding of the intricate interaction between users and information systems; how users and organizations affect and are affected by information systems. Thereof, we have also a great understanding of how information systems can be used as a catalyst for change and the catastrophic consequences that follow improper implementation and change management. We see that our own experiences, both educational and practical, culminate in our own predisposition and understanding of eHealth and IS research. We recognise the relationship between IS and organization, thus meaning that we see them as two sides of the same coin.

Our limited knowledge regarding healthcare in practice makes us dependent on the empirical data collected from the respondents, as we have no real way of verifying the descriptions of the respondents answers other than them verifying or contradicting each other. Moreover, our lack of practical experience in general might lead us to over simplify areas of great complexity, as we will most likely base our findings in theory regarding how change and IS should be implemented in a healthcare environment rather than from actual experience. With this in mind, it is our intention to try to be percipient towards our empirical sources and let their narrative be the foremost architect of this study.

2.3 Knowledge generation

Questions regarding a phenomenon are generally the beginnings of every scientific endeavour. One observes a phenomenon, either through first hand encounters or through some secondary
source. Goldkuhl (2011b) concludes that all research starts with the researcher pondering about the nature of a phenomenon; a curiosity. In our case, this takes form of why adoption of new technology can be so slow in healthcare. Therefore, we have a question that we wish to answer through our research. We intend to come up with an explanation that answers the how and why by comparing two cases; one where the implementation of a mobile health platform thus far has been successful and the other where the implementation has been something of a disaster. The two organizations (wards) are very similar, both in structure and their practice, yet the outcomes were very different when implementing the same system.

The nature of this study is very much based on the following categories mentioned by Goldkuhl (2011b):
- Curiosity (the need to quench our thirst for knowledge)
- Context - due to the comparative nature of this study (i.e. that we need to understand the phenomenon with regards to context)
- Availability - making our research a building block for further research
- Reflection - ability to reflect with regards to our results
- Rationality - that our interpretations of the results are reasonable

Goldkuhl (2011b, p.7) argues for something he calls argumentative rationality, of which he refers to a certain research perspective where the researcher aims to build credible knowledge upon his or her research, where some of above mentioned categories are included. This means that we aim to be clear with regards to context, as we recognize the importance of understanding the comparative nature of this study. It is also our aim to be as accessible and rational as possible, coming up with conclusions that makes sense in a way so that the reader may follow our train of thought without much effort.

Much of our process of generating knowledge is from the hermeneutic circle based on Klein and Myers (1999). In essence, it describes the process in which the researcher gains an increasingly deeper understanding of their own research. The researcher uses his or her previous understanding of the research subject (i.e. predisposition) and puts this previous knowledge in the light of the study. The researcher then refines his or her understanding of the subject at hand in combination with their study. This symbiosis furthers the development of the researcher’s understanding of the research all the while it iteratively furthers deeper findings of the researcher’s study. Like Klein and Myers (1999), we see that our interpretive approach has many advantages when developing our understanding of phenomenon regarding information systems:

"Interpretive research can help information system researchers understand human thought and organizational contexts; it has the potential to produce deep insights into information systems phenomena including the management information systems and information systems development." (p.67)
We acknowledge that our own understanding of the subjects discussed in this study will develop during the course of the research process. Therefore, we see it necessary to acknowledge that we affect and are affected by the study, i.e. that they both affect one and other.

2.4 Research approach

According to Myers (2013), qualitative research methods are designed to assist researchers in their endeavours to understand people in the social and cultural context in which they are active. It allows the researcher to understand the reasoning behind people’s decisions and actions. Myers (2013) concludes that sometimes qualitative research is the only way to gain understanding of human behaviour and that the social and cultural context in which they reside is helping to explain behaviours. In this study, we aim to compare two wards, describe them and their practises and evaluate how data from respondents relates to policy documents regarding eHealth and IT artefacts. This means that we need to understand the context of our respondents, thus making a qualitative research method most suitable for this study. The utilization of an interpretive study with a reflexive approach allows the usage of research methods such as case studies, comparative studies and/or document studies.

During the course of a case study, the researcher aims to study the organization in depth, something that can be done by conducting interviews (Bryman, 2016). According to Yin (2013) interviews are commonly found in case studies and is one of the most important sources of evidence. In contrast with a survey, they are more like guided conversations (ibid). Yin (2013) claims that the challenge of the interviewer is to find a balance between structure and flow in the conversation. The depth of the case study provides answers to why something is the way it is and how it came to be that way (ibid). We also have previous experience of working with case studies from our respective educations and from the Master’s programme IT and Management at Linköping University.

As mentioned above, each case study investigates an individual case (Bryman, 2016), but when the researcher compares several cases by using the same method to extract contrasts, he or she is conducting a comparative study. The fundamental purpose of the comparative study is that a social phenomenon can be better understood in the light of two or more contrasting cases (ibid).

The structure of this thesis can be seen as two parts, each based on the research questions, where the conclusions from the first question lay the foundations for seeking answers to the second one. They are, however, a part of the same conclusion of this study and the eventual theories that can be derived from it as well. Moreover, they use the same reflexive approach to theory and the same theoretical framework.
In figure 2.1, we show this intricate relation between the two research questions. We see the second question as a natural subsequent question to the first one; it is reasonable to question whether the experience of the healthcare staff matches or differs from written policy regarding eHealth, description of the artefact (i.e. the mobile platform) and legislation. The outcome of this study renders both recommendations for the specific case so that change management as well as implementation regarding mobile platforms can be improved upon. In addition, general theory regarding perceptions and expectations of the healthcare professionals as well as how these contrast from both regional, national and international policy on eHealth and mHealth, thus making part of our empirical data a document study regarding policy.

2.4.1 Theory processing

The role of theory is of central importance for all kinds of research, regardless of the philosophical assumption (Walsham, 1995). According to Myers (2013), all qualitative research needs a theoretical framework at some point during the research process. The timing of when the researcher begins to gather theory for their theoretical framework is at large based on their work method (Myers, 2013). Walsham (1995), mentions that the use of theory in IS case studies, like this one, can be used in three scenarios:

- As an initial guide to design and data collection
- As part of an iterative process of data collection and analysis
- As a final product of the research
In our case, we use an interpretive approach with a reflexive reasoning, meaning that we will adapt the theoretical framework during the research process. Therefore, we intend to make use of theory as an iterative process in data collection as exemplified by Walsham (1995), although we may have made use of some theory as a guide to research design. We see a clear correlation between case studies and comparative studies, as comparative studies simply are comparison between two or more cases using similar methods (Bryman, 2016).

We would argue that this stance towards theory is especially suitable for the exploratory nature of this study. One could be critical of this approach and say that we choose theory as we go along to support our narrative. Therefore, we try to be aware of our own possible confirmation bias and be transparent and truthful to the theories cited in this study.

2.4.2 Empirical data collection

Case study

A basic case study, in Bryman’s (2016) opinion entails a detailed and intensive analysis of a single case, the complexity and particular nature of which is under observation. The term “case” is what associates the case study with a particular location, a community or an organization. Case studies, although often associated with qualitative research can be either qualitative or quantitative, depending on the research approach being used. They may incorporate usage of qualitative research methods such as participant observations and unstructured interviews. This is because these methods are viewed as suitable to the generation of an intense and rather detailed examination of the case under study (Bryman, 2016). Case studies, in Yin’s (2013) opinion are the preferred research methods to provide answers to the “how?” and “why?” questions of research.

A case study is when the researcher studies a phenomenon in practice by studying it in the context of a particular organization, community and or location (Bryman, 2016). According to Yin (2013), a case study can be conducted with the following sources of evidence:

- Documentation - policy documents, news articles
- Archival records - publicly available statistics
- Interviews - interviewees answering questions
- Direct observations - studying a real world phenomenon
- Participant-observation- participating in a real life phenomenon
- Technical artefact- description of tools and/or instruments

Out of the different methods for case studies described by Yin (2013), this study consists of a documentation study in the form of policy, physical artefacts when describing the digital tools used by the respondents and interviews for collecting perceptions of the aforementioned.
The case, in a case study is the primary object of interest for the researcher(s), who attempts to provide an in-depth examination of the same. What distinguishes a case study from other research approaches is that the researcher is usually concerned with revealing and bringing to light the unique features and characteristics of that particular case (Bryman, 2016).

Yin (2013) classifies cases into five categories:
- The critical case is chosen where the researcher has a well-developed theory and the case is expected to provide a better understanding of the circumstances in which the hypothesis may or may not hold.
- The extreme or unique case is chosen in case of clinical studies, where some new or existing concept or theory is intended to be proven/disproven.
- The representative or typical case is aimed at capturing the circumstances and conditions of an everyday or commonplace situation.
- The revelatory case provides the researcher with an opportunity to observe and analyse a phenomenon that has previously been inaccessible to scientific investigation.
- The longitudinal case affords the researcher with the opportunity for investigation at two or more junctures. Many case studies however, comprise a longitudinal element as well, making it all the more likely that a case may be selected most likely if it is deemed appropriate to the research questions on one of the previous four grounds, in addition to it having the possibility of being studied over time.

Yin (2013) refers to the representative or typical case as the exemplifying example of a broader category of which it may be a member. Cases are most often chosen because they either exemplify a broader category of cases or they are assumed to provide a suitable context for certain research questions to be answered and not because they are extreme or exceptional in some or the other way. Representative or typical cases are often chosen so as to allow the researcher to examine certain key social processes. An example of this may be a researcher seeking access to an organization that is known to have implemented a new technology. The researcher intends to study the impact that this new technology has had on the organization or the individuals involved. Varying theories regarding the relationship between technology and work may have influenced the researcher and he/she may be looking to investigate and examine the implications of these theoretical beliefs through the collection of empirical evidence to support or refute the his/her beliefs (Bryman, 2016).

The case selected by us for the purpose of our study may be considered to be an exemplifying example of just such a representative or typical case as our intention is to investigate the impacts that new technology has had on individual users of that technology in a specific organization.

**Comparative study**

Comparative studies, according to Bryman (2016), entail studying two contrasting cases using more or less identical methodologies and incorporate the logic of comparison when researching and attempting to understand social phenomenon better. They work on the supposition that social
phenomenon can be understood better when compared in relation to two or more meaningfully contrasting cases or situations, much like the ones we examine for the purpose of our study. Applied to a study which is essentially qualitative in nature, the comparative study takes the form of a multiple-case study or a case within a case study. Whenever the number of cases studied exceeds one, a multiple-case (multi-case) study is said to have taken place. One of the arguments in favour of multiple-case studies is that it leads to a significant improvement in theory building, as the researcher(s) is in a better position to establish the circumstances in which a theory is expected to hold or not (ibid). Case studies, in particular multiple case studies may play an important role in the understanding of causality (ibid).

There are a number of approaches used to select cases for multiple-case studies. Cases can be selected on the basis of certain contrasting features as a means of not only selecting the cases but also for shaping comparisons that allow the data (comparative) to be studied and analysed. Another approach is to select cases based on similarity rather than differences (Bryman, 2016). We believe that focussing on the differences rather than similarities between the cases used is more significant, as the causes and reasons behind these differences are more relevant for the purpose of our study.

**Interviews**

A few of the techniques of data collection in qualitative research include qualitative interviewing, use of focus groups (Myers, 2013), ethnography and participant observation among others (Bryman and Bell, 2003). Rubin and Rubin (2005) consider qualitative interviews to be akin to night vision goggles that not only empower the researcher to visualize that, which is imperceptible but also examine that, which is looked at albeit scarcely perceived. There are however, a number of challenges that are inherent to interviewing. An interview is essentially an artificial situation involving a researcher (the interviewer) conversing with a complete stranger (the respondent), the questions often intrusive in nature and the entire process occurring under time pressure (Myers and Newman, 2007). Emphasizing on the importance of the researcher being competent in the data collection technique intended to be used, Myers (2013) classifies interviews into structured, unstructured and semi-structured interviews.

Structured interviews comprise of a set of pre-formulated questions, put forth by the interviewer in a specific sequence and or within a specific time frame. They are based on a set of close-ended questions, categorized and interpreted by the interviewer accordingly, leaving little or no room for changes. Unstructured interviews on the other hand, comprise of very few pre-formulated questions, if any at all. The respondents enjoy the freedom to narrate what they think is relevant, without any time constraints and at their own pace. For the purpose of our study, we make use of semi-structured interviews, which are the most widely used tool of data collection in the field of qualitative research in business and management (Myers, 2013). Semi-structured interviews may even be regarded as a fusion between structured and unstructured interviews, combining the structure of structured interviews and the freedom of unstructured interviews.
**Semi-structured interviews** involve the use of a set of pre-formulated questions during interviewing. The interviewer may or may not adhere to the schedule or structure of the interview (Myers, 2013). Semi-structured interviews are often used as data collection tools for qualitative research projects. There is substantial room for other questions that may emerge as a result of the dialogue between the interviewer and the respondent. The respondent answering the interviewer’s questions and sharing new information with the interviewer, leads to the emergence of new questions based on the information provided (DiCicco-Bloom & Crabtree, 2006). In our opinion, semi-structured interviews are based on open ended questions that encourage the respondent into providing the information relevant to the topic. They are rather flexible and can be tailored to the needs of the researcher as well as in accordance with the answers provided by the respondent earlier. In order to conduct a semi-structured interview, not only should the researcher be a good conversationalist but also be able to establish as well as maintain a good rapport with the respondent. He/she must be alert and pick up on the things being said and the body language of the respondent in order to think up and formulate follow-up questions the answers to which provide a greater insight into the topic of interest. For an interview to be able to produce rich data, it is paramount that the interviewer develops a good rapport with the individual being interviewed (DiCicco-Bloom & Crabtree, 2006). For this it is essential, in our opinion, that the interviewer not only possess certain qualities that make him/her an expert in the art of holding a conversation, but also has qualities like improvisation, which is well needed if and when the conversation does not flow of itself. According to DiCicco-Bloom and Crabtree, (2006), trust, respect not only for the respondent but also for the information that he/she is providing are important factors that could lead to the building of a good rapport with the respondent.

There is some consistency in semi-structured interviews because the interviewer usually begins with a certain set of questions each time while conducting various interviews (Myers, 2013). According to Myers (2013), semi-structured interviews minimize the risks involved in unstructured and structured interviews, while at the same time providing some consistency throughout the interviews. They allow room for improvisation, and the interviewer need to be good at it in order to carry the conversation further and guarantee the flow of information. The questions, prepared in advance, help in providing focus throughout the interview as well as make it possible to steer the conversation to the main topic whenever it goes astray.

**Document Study**

In addition to collecting empirical data using interviews, participant observations and field work, data can be collected from documents. The usage of documents is one of the methods for case studies mentioned by Yin (2013). Document studies are commonly used in case study research, but should also be combined with other data sources (ibid). In our case, the study of documentations in the form of policies and legislation have been combined with interview data.

2.4.3 Thematic analysis
When it comes to studying and exploring in depth, subjects that are complex in nature, it would be beneficial if one were able to break down the complex into smaller and subsequently more comprehensible parts. This would not only further understanding but make the task less complicated as well. One such tool that could essentially be helpful in such a process is making use of themes. Themes can be used to decompose a subject that is rather complex, into elementary parts that are comparatively easier to understand. Making use of what Ryan and Bernard (2003) call the "cut and sort" method, one may obtain a better understanding of the vastness of empirical data by assorting it into categories and theories. This cataloguing of empirical data into themes that further one's understanding of the subject matter can be described as "thematization". According to Ryan and Bernard (2003), there are four stages involved in thematic analysis, namely:

- Discovering themes and subthemes.
- Concentration of existing themes depending on their relevance to the research.
- Construction of picking order among themes or code books.
- Linking identified themes into theoretical models.

Given the four steps of thematization as stated above, one may argue that thematization intrinsically builds around the idea of hermeneutics, i.e. that the process of learning and reflecting leads to further discoveries and more knowledge. The essence of hermeneutics (refer to 2.3) is that the researcher gains knowledge throughout the research process, which in turn leads to new conclusions and further research. We would argue that there is a strong link between thematic analysis and hermeneutics; they support the idea of acquiring and the need of understanding the collected data and thus also the links between themes in empirical findings and theory.

As mentioned above, analysing text involves several tasks. We see that the implementation of these tasks in our analysis is crucial in order to generate themes that are credible and follow the argumentative rationality proposed by Goldkuhl (2011). Our way of doing this is to present our logic behind the identified themes and to be transparent in our reasoning when weighing theory and empirics.

### 2.5 Ethical considerations

The term ethics has its origins in the Greek term *ethos* and refers to the so-called notions of custom, habit, behaviour and character (Tavani, 2004). Every society designs a set of rules, often expressed as statements that provide and establish guidelines and boundaries of generally accepted social behaviour. These individual rules accumulate into one another to form a moral code that governs how the people in a society should behave. These sets of beliefs that determine right and wrong behaviour are called ethics (Reynolds, 2012). Reynolds (2012) believes that ethics are a set of beliefs that govern right and wrong behaviour within a society that in turn conform to generally accepted universal norms. However, there can exist dramatic differences among individual opinions regarding ethical behaviour (Myers, 2013; Reynolds, 2012). Myers
(2013) emphasizes the importance of ethics in research. He means that many ethical considerations arise as soon as one begins conducting research, especially research in which real people are involved.

Ethics in social research can be quite frustrating, the reason behind it being that different individuals tend to differ greatly from each other regarding ethical issues and considerations. Mostly the difference is between what is considered to be ethically acceptable and what is considered not ethically acceptable (Bryman, 2016). Diener and Crandall (1978, referenced in Bryman, 2016), have broken down the discussion about ethical principles in social research into four essentially important areas:

- **Whether there is harm to participants:** Any research that may cause harm to the participants is generally considered to be unacceptable. But it also depends on how harm is defined. Harm could be anything ranging from physical harm, harm to the participants development, loss of self-esteem, stress or inducing participants to perform reprehensible acts et cetera.

- **Whether there is a lack of informed consent:** This is a highly debated topic concerning research and focuses mostly on what is known as disguised or covert observation. The principle behind informed consent is that the prospective research participants should be provided with as much information as might be needed for them to be able to make an informed decision of whether or not they wish to participate in the study. Covert observation is an infringement on this principle. Participants are deprived of their right to refuse participation; they are involved in the study, whether they like it or not. Informed consent forms are a way of avoiding this problem, as they provide the prospective participants with all the information regarding the nature of the research and the implications of their participation.

- **Whether there is an invasion of privacy:** The right to privacy is a belief that all human beings hold dear and any infraction on that right, even in the name of research is not considered acceptable in any way or form. This principle is directly linked to the principle of informed consent in that research methods such as covert observation violates not only the right to informed consent but also invade the privacy of those involved. Informed consent however, does not repeal the right to privacy. The participant may at any time refuse to answer questions he/she deems inappropriate or invasive to their right to privacy. Since covert methods take away the right of participants to refuse invasions to their privacy, they are in direct violation of this principle as well. The right to privacy is also linked to anonymity and confidentiality and relates to almost all aspects of research.

- **Whether deception is involved:** When researchers present their work as something that it is not or as something other than what it actually is, deception is said to have occurred. Experimental research is often prone to deception, as the researchers wish to limit the participants understanding of the exact nature of the research, in hopes of a more natural response. The ethical objection to deception is often based on two meaningful points. The first
one being quite understandably that, it is not a nice thing to do. The second more substantial is the issue of professional self-interest. If deception were to be associated with research and researchers by large, the image of the work done by researchers would be seriously affected making it difficult not only to gain financial support but also to convince prospective participants to take part in the research. One problem however, that seems relevant to this principle of research is that not only is deception in research widespread, but it is rarely desirable or feasible to provide the participants with a complete account of what the research is about. It is thus, extremely difficult to know where to draw the line when it comes to deception prevalent in research.

As our way of contributing to the ethical considerations embodied in research, we have made a conscious decision to anonymize all the respondents who participate in our study. This has been done primarily to eliminate any chances of reprisals that the respondents may fear facing as well as to get the respondents to feel comfortable and to speak their mind openly and clearly on the issue at hand. We believe that being honest with our respondents is the only way to gain their trust and encourage them to be as truthful as possible in recounting and relating details of their experiences and perceptions. Furthermore, each respondent was informed of our intent to anonymize them, at the very beginning of each interview simultaneously as we asked for their permission to record the interview for transliteration and usage later on. The respondents were also made aware of the aim and purpose of the study as well as of how the data generated from the study would be used and to what end.

While taking part of the artefact description, where we received a walk-through of the mobile application in question, we were also required to sign a Nondisclosure agreement provided by Region Östergötland, so as to ensure protection of any patient data that we may have laid eyes on in the process.

2.6 How the study was conducted

In this section, we present a detailed view of how the study was actually carried out in practice, not only as a means of leading the reader through the actual implementation of the study but also in order to maintain as much transparency as possible throughout the course of the study.

2.6.1 Theory Study

The theory used for the purpose of this study was obtained mainly using Linköping University's access to scientific databases and the e-book library. The study began with a search of various databases using the university's search service named Unisearch. Unisearch is a tool that searches multiple databases simultaneously. Our initial search contained terms such as eHealth, mHealth, IT-strategy, e-Governance, IT-governance, telemedicine, mobile health, electronic health, technology and healthcare and so forth. The results of the search were then evaluated and prioritized according to their relevance to our study and also to the number of references made to each article. Similar searches were also conducted in the e-book library, Books 24/7. We have
also made use of Google Scholar in the search for scientific articles on theories related to our study. In order to broaden our intellectual horizons and gain an even deeper knowledge on the subject at hand, we have not only made use of the items that turned up in the initial searches, but followed up on the sources referenced to in these articles and books as well.

In addition to these sources, we received tips from our mentor and the course in charge on theories that could prove useful to us in the study of this particular social phenomenon. The different types of scientific sources used in our study include printed books, e-books, scientific articles and journals, legal texts and numerous policy documents.

The results of our theoretical study are presented in chapter 3. Theory of our thesis. Here we present the most central ideas and parts of the theories covered in our study, in order to form a comprehensive framework to base our analysis on. In the theory chapter, we have chosen to incorporate the theoretical framework with our own understanding of the subject, as we believe it makes it easier for the reader to follow our line of reasoning.

2.6.2 Case study

The empirical data collection has been carried out at the premises of the same hospital in two different towns in the county of Östergötland. We first came to know about the pilot project involving a mobile platform used in healthcare through one of our contacts at Region Östergötland who also holds the post of Information Architect at the Centre for Medical Information Technology (CMIT) in Linköping. We were further briefed on the project by one of the senior IT strategists at CMIT at a meeting where our initial contact was also present. After deciding to pursue this line of research, we were then introduced to the project manager for the pilot project at Region Östergötland.

At a meeting with the project manager/in charge of the pilot project involving COSMIC Nova Ward at Region Östergötland, we came to know about the two wards which had agreed to take part in the pilot project involving the above named mobile platform. It was here that we found out about the pilot project having been unsuccessful in one of the wards and a success in the other one. This turned out to be an interesting aspect for our study, as we thought it would be interesting to study the implementation of the mobile platform in both the wards and undertake a comparative study in order to try and find the reasons for the failure/success of the mobile platform in the respective wards.

As the aim of our study is to develop an understanding of a certain social phenomenon, we believe interviews to be the most appropriate way to do just that. Interviews, when conducted properly, can give rise to rich data resulting in increased understanding for the researchers. We conducted a total of six interviews, three at each ward with an average time of 45 minutes. These interviews took place at three different occasions, the wards being located in different locations and hospitals in the county of Östergötland. Not only was the location, a decisive factor in the conduction of
these interviews, but holding the interviews at three different occasions also gave us the opportunity to steer and guide our theory collection in parallel with the empirical data collected.

In addition to these interviews, we were also given a walk-through of the mobile platform by one of the respondents who also holds the post of instructions nurse at one of the aforementioned wards and has been deeply involved in the project from its very inception. These six interviews, in addition to our initial meetings with our contact person, the IT strategist at Region Östergötland and the project manager of the pilot project, not only increased our understanding of the extent and purpose of the project, but also pointed us in the right directions to steer our study and empirical data collection in. The interview guide and an excerpt from one of the interviews is included in appendix II and III.

### 2.6.3 Comparative study

The empirical data collection at the two wards gave rise to a large volume of complex data, that in our evaluation could best be utilized through a comparative study, which entails studying two contrasting cases using more or less identical methods. Thus, applied to our study which is essentially qualitative in nature, the comparative study takes the form of a multiple-case study.

Of the number of approaches that can be used to select cases for multiple-case studies, we ended up selecting our two cases based on both similarities (in terms of organizations) and differences (in terms of outcomes of the pilot project). From the information regarding the pilot project involving COSMIC Nova Ward in two separate wards belonging to the same organization, choosing to study both wards separately as two cases seemed like the natural next step in the study. We made a conscious decision to study the impacts of this implementation on the healthcare personnel in both the wards even before we found out that its implementation had been unsuccessful in one of the wards and successful in the other. At this stage, we made use of semi-structured interviews to gain insights into the experiences and expectations of the respondents regarding the object of the study. Semi-structured interviews in our opinion, helped us form a good dialogue with the respective respondents, with the help of open ended questions, the answers to which led to the generation of follow-up questions, based on the answers provided previously. This led to a deeper understanding of the perceptions of the respondents and helped them in opening up to the questions of the researcher, with the researcher forming unique questions that were more suited to the individual respondent.

The empirical data collected during our study was then used to fuel a comparative study in order to understand the effects of this implementation and the reasons behind the success or failure of the mobile platform. In order to maintain a certain degree of homogeneity in relation to the two cases studied, individuals holding different work roles were interviewed at both wards. Our aim was also to provide a just representation of the participants' opinions and leaving out one or the other group of individuals would have created bias. Also, since the experiences of the individuals holding the two roles, in addition to the extent of their interaction of the object of the study were
different, it was important in our opinion to include the views and experiences of both roles (nurses and auxiliary nurses).

As a step forward towards procuring an answer to our secondary research question, the data collected during the case studies was then compared to the content of the policies related to health especially eHealth, in order to evaluate whether there exist any discrepancies between what the policies state and the perceptions of the healthcare personnel at the user level.

2.6.4 Data Analysis

As mentioned in section 2.4.3 Thematic analysis, this thesis uses a thematic approach when analysing data with a hermeneutic approach to knowledge, as we argue that there is a clear link between hermeneutics and thematic analysis. We need to understand the studied phenomenon in the context provided by our empirical data, and we would argue that the hermeneutic approach provides just that - an understanding of a phenomenon in an empirical context and our own understanding.

By gathering theory, we first gained a theoretical foothold on eHealth and mHealth, and other relevant theories regarding implementation and change management. It should be noted however, that we did not start from scratch and that our predisposition has influenced the choice of theories, though it is hard to know to what extent our predisposition and previous experience with eHealth has affected theory selection. Furthermore, our reflective research approach, i.e. combining deduction with induction, has prompted us to constantly change used theories as we built understanding regarding the studied phenomena.

When presenting our empirical data, we have tried to reflect on the questions used in our interview guide. The questions asked to our respondents are heavily influenced by theory and the studied policy documentation regarding hardware, software and legislation. Moreover, our intentions were to reflect on the research questions in our interview and thus help us to generate themes from empirical data. Thus, the empirical material was reduced to the following sub-themes:

- **Policies regarding eHealth and mHealth** - Description of policies related to eHealth and mHealth
- **Artefact description** - Description of studied technical artefact, with focus on COSMIC Nova Ward
- **Description of the organization** - Description of the studied organization, the wards and their practices

In our analysis, these empirical themes are combined with theory and vice versa. This is done in order to see how empirical findings and theory relates to each other, thus generating new theory and knowledge. We compare the two wards in relation to policies and theory in order to come up with possible explanations to differences between the wards with regards to experience and
perception. Thereafter, we explore possible discrepancies between policies and practices, using theory as a tool to explain these differences.
3. Theoretical Framework

This chapter of our study contains theories that the researchers considered relevant for the purpose of the study. This chapter has evolved continuously during the process of writing this thesis, as new theories emerged while we made progress in the Analysis chapter, where we analyse the empirical data collected through the use of various theories in support or refute of our arguments. This chapter contains a presentation along with a discussion of theories used in this thesis.

3.1 The role of ICT within healthcare

EHealth is a phenomenon that is the essential phenomenon in this study. It is an umbrella term used to portray Information and Communication Technology used in healthcare (Wickramasinghe et al., 2005) and includes both electronic health records (EHRs), the support of mobile platforms and more. In this study, we therefore refer to software when discussing the word platform and device when referring to hardware facilitating software. This categorization is supported by Vital Wave Consulting (2009), AHIMA Guide (2013), Levy et al. (2012).

A potential issue pointed out by Scott and Mars (2013) regarding eHealth is that it is defined rather loosely and ambiguously, its definition extending to whatever the author wants it to be. Due to this fact, we aim to narrow down our own definition of the phenomenon and establish why a clear definition is of value for this study.

3.1.1 Defining eHealth

The earliest usage of the term eHealth, according to Della Mea (2001) dates back to 1999. Prior to the term eHealth being defined and established, researchers made use of another term called telemedicine. The discovery that telemedicine and telehealth could benefit greatly from the usage of information technology, led to the term “eHealth” being coined. It then began to be used as an umbrella term to define the combined use of electronic communication and information technology in the healthcare sector that also utilizes electronic storage and distribution of data (Della Mea, 2001). The fact that the term covers so much is a double edged sword; if a single definition covers many things, it risks becoming too ambiguous. We see that the term eHealth covers just enough since it is a blanket definition. Like Oh et al. (2005), we recognize the impossibility of having a universally accepted definition; there will always be some different views on a phenomenon, especially a copious definition like eHealth. Oh et al. (2005) mention no less than 51 definitions of eHealth, and that there is little consensus among them with regards to the meaning of the phenomenon. Therefore, we see the need to develop our own definition of what eHealth means, and what it means in the context of the usage of mobile platforms.

As mentioned above, Oh et al. (2005) claim that despite there being no consensus among the 51 separate definitions of eHealth, they can be sorted into two general categories (health &
technology) and six less general categories (commerce, activities, stakeholders, outcomes, places, and perspectives). In this thesis, we will compare a few definitions that can be sorted into some of these categories. Given the broad scope of these categories, it is likely that many of the definitions discussed in this segment can be put into multiple categories. In addition to discussing the different definitions and comparing them with each other, we will categorize them according to the categories described by Oh et al. (2005). This presentation and discussion of definitions is done to provide a clear cut picture of our own understanding of the phenomenon and to display the diversity of definitions used to describe it. However, we see the benefit of having a broad definition, as discussed in Eysenbach (2001).

In Eysenbach’s (2001) opinion, eHealth, although lacking a clear and concise definition is a widely talked about term. Initially used by industry leaders and marketing people rather than by academicians, this term was coined in conjunction with other “e-words” such as e-commerce, e-business, e-government and so forth. This was done in order to provide an insight into the new possibilities that the Internet, information and communication technology began unlocking in the field of healthcare. However, to emblem something as all-encompassing as eHealth can be seen as akin to label the Internet with a definition: It is defined on the basis of how it is used; the definition cannot be pinned down, it is a dynamic environment that is constantly moving and changing. Keeping in view the discussion above, Eysenbach hopes to provide a definition for eHealth that is broad enough to apply to the Internet while acknowledging the fact that eHealth encompasses a lot more than just “Internet and Medicine”. He defines eHealth as:

“eHealth is an emerging field in the intersection of medical informatics, public health and business, referring to health services and information delivered or enhanced through the Internet and related technologies. In the broader sense, the term characterizes not only a technical development, but also a state-of-mind, a way of thinking, an attitude, and a commitment for networked, global thinking, to improve healthcare locally, regionally, and worldwide by using information and communication technology.” (p.1)

Eysenbach (2001) believes that eHealth is so much more than just a technical innovation; it encompasses entire new ways of handling information within healthcare, therefore making it an enabler of change on an organizational and practical level. The “e” in eHealth, according to Eysenbach (2001) does not only stand for “electronic” but a plethora of other “e’s” which collectively construe what eHealth actually is or what it should be. He goes on to elucidate the 10 e’s in eHealth as following:

**Efficiency:** One of the purposes of eHealth is to improve efficiency and thereby decrease costs in healthcare.
**Enhancing quality**: improving efficiency is not only cutting costs, it is also supposed to improve the overall quality of healthcare. There is a clear causality between improved efficiency and quality of healthcare, according to Eysenbach.

**Evidence based**: eHealth interventions, in other words implementation of new ICT in healthcare, should be evidence driven. There is much to be done in this area, according to Eysenbach.

**Empowerment**: By making journals available via Internet, Eysenbach (2001) argues that patients will be more informed of their own health status and therefore also more empowered and in effect more capable to make better informed decisions regarding their health.

**Encouragement**: Decisions regarding healthcare should be made in unison between patient and healthcare professional.

**Education**: Healthcare staff can get information via eHealth and therefore both education and decision support.

**Enabling**: “information exchange and communication in a standardized way between health care establishments.” (Eysenbach, 2001, p.2)

**Extending**: EHealth should enable healthcare to reach beyond its conventional boundaries, both geographical and conceptual. Patients should be able to access eHealth services online through global actors to get medical advice as well as pharmaceutical services.

**Ethics**: EHealth involves challenges regarding patient safety, e.g. privacy and informed consent.

**Equity**: The goal of eHealth should be to improve equity. Instead, it threatens to widen the gap between those who have and those who have not. Usage of eHealth services requires resources and some knowledge, which threatens to widen the so called “digital gap” (Eysenbach, 2001, p. 1-2).

Some 15 years after Eysenbach wrote his vision for eHealth, one can conclude that the purpose of eHealth still revolves around efficiency, empowering patients and improving quality of healthcare. The need for an adequate IT strategy and the need for increasing the pace of eHealth development is and has always been relevant (Scott and Mars, 2013; Cresswell & Sheikh, 2013; Wickramasinghe et al., 2005). Even though the vision presented by Eysenbach (2001) is rather vague, we conclude that all of the parts presented in his vision for eHealth are still relevant.

Catwell and Sheikh (2009) believe that when developing eHealth solutions or interventions, it is paramount to develop them keeping in mind that the end result is “fit for purpose”, i.e. they are beneficial to the purpose they have been developed for and not a hindrance in the path of fulfilling that purpose. This is because healthcare professionals are, in their opinion justified in their
reluctance towards adopting these new technologies, if that is not the case. They maintain also that at present evaluations of such eHealth interventions are frequently not "fit for purpose" and as a result often rejected or dismissed by the healthcare professionals.

Vital Wave Consulting (2009) has a more technological view of the phenomenon compared to the one presented by Eysenbach. They summarize eHealth as: "Using information and communication technology (ICT)—such as computers, mobile phones, and satellite communications—for health services and information." (p. 8). Therefore, we chose to categorize this definition as technical and very much directed towards activities, granted that one uses the categorization of eHealth provided by Oh et al. (2005). This definition is further supported by Wickramasinghe et al. (2005), who concludes that eHealth can be summarized and information technology that is utilized within healthcare.

Given the aforementioned definitions, we conclude that eHealth is a term that encompasses many things, but that the common denominator is that technology that affords exchange and providing of information within healthcare. We acknowledge the fact that the definition of eHealth could be viewed as ambiguous, as umbrella terminologies often are. However, we see that eHealth is more than simply information technology used in a healthcare context. As suggested by Eysenbach (2001), the "e" in eHealth stands for more than just "electronic". It is a plethora of concepts that encompasses a vast diversity of concepts, of which one can conclude that eHealth is both the technology and the drive for organizational change all at once.

Ahonen et al. (2016) also embrace Eysenbach’s (2001) definition of eHealth and conclude that the "e" in eHealth stands for so much more than just "electronic". It is also all of the aforementioned "e:s" described by Eysenbach (2001). Moreover Ahonen et al. (2016) conclude that the International Council of Nurses have the following definition for eHealth:

"eHealth is the use of information and communication technologies (ICT) for health. This has implications to treating patients, conducting research, educating the health workforce, tracking diseases and monitoring public health." (p. 204)

A similar definition is used by Scott and Mars (2013), that conclude that eHealth can be anything we want it to be but that the bottom line is that eHealth simply is: the application of information and communications technologies (ICTs) to the health sector (p.1).

Given the wide support for the definition of eHealth, we chose to embrace the definition of eHealth as ICT used in healthcare as our own. We also recognize that the "e" in eHealth is more than just "electronic" as argued by Eysenbach (2001); eHealth also embodies the effects that is hoped to be achieved through its utilization, e.g. efficiency and quality of healthcare.
3.1.2 The role of eHealth

There are incitements with regards to exploiting the possibilities of using ICT in healthcare (Cresswell & Sheikh, 2013). It is evident that eHealth interventions will play a pivotal role in shaping healthcare systems in this century, although they will not be accepted by healthcare personnel until the eHealth solutions are adequately adopted for their intended purpose (ibid).

Catwell and Sheikh (2009) state that there is a widespread belief that the introduction of ICT systems within healthcare could lead to substantial reduction in costs and improve efficiency. Another anticipated benefit of eHealth according to is the belief that it could lead to a reduction in the number of patients who inadvertently come in harm's way as a result of medical errors or violations. This however, is possible if the ICT systems are introduced within healthcare in combination with the necessary social (i.e. organizational and behavioural) changes (ibid). Harkke and Collan (2005) agree that merely implementing new technology does not solve problems within healthcare. It takes proper implementation and wide enough usage of the technology. In their opinion, there may even be adverse effects on efficiency and quality of healthcare if the new technology is not utilized to the full effect in terms of process automation and system implementation.

This is easier said than done and is hindered by a number of obstacles. Harkke and Collan (2005) claim that the absence of up to date governance of IT in healthcare is a major contributor to uncertainty and obstacle for development in eHealth. They emphasize on the need for up-to-date legislation and the need for constant work on changing laws so as to not make them a liability for the development of eHealth. Improved work regarding legislation has, in Harkke and Collan’s (2005) opinion, the potential to improve acceptance of eHealth development and thereby decrease resistance to change. Spil et al. (2005) are also of the belief that the implementation of ICT in healthcare organizations has proven to be a difficult task. Information technology is seen as an enabler of change, but the environment surrounding healthcare is very complex and adequate change management is needed in order to handle this complexity (Spil et al., 2005).

Catwell and Sheikh (2009) emphasize however, on the importance of differentiating between the potential and actual empirically demonstrated benefits of eHealth. They believe that these cannot be equated in any way and one must not ignore the potential risks that are associated with the implementation of ICT in complex environments such as healthcare.

EHealth has become an integral part of nurses’ daily activities (Ahonen et al., 2016). This means that interaction with some kind of electronic medium nowadays is the norm rather than exception. Given this, it is crucial that to secure the adequacy of the eHealth solutions provided for nursing staff, as they are the main provider of care in the patient’s healthcare process.
3.1.3 Defining MHealth

Mobile health, henceforth referred as mHealth, is a sub segment phenomenon within the sphere of eHealth (Vital Wave Consulting, 2009). Despite there being no widely accepted definition of mHealth (ibid), the general consensus seems to be “mobile devices used for health services and information” (see ibid; Currie & Seddon, 2014b). The perhaps most clear illustration of this definition is in Currie and Seddon (2014b):

“Mobile technology in public health is also referred to as mobile health or mHealth.” (p. 188).

Given this definition, one can draw the conclusion that mHealth is also an umbrella term, much like eHealth. It is, however, more specific than eHealth as it is defined by a much narrower scope. Since it is limited to the usage of mobile platforms and mobile platforms alone, its scope is defined by the hardware used. With this in mind, we define mHealth as eHealth that is conveyed via hardware that is categorized as mobile. There are however, many other definitions of mHealth, which provide a general picture without allowing for a consensus to be established.

The American Health Information Management Association (AHIMA) describes mHealth as:

“The use of devices such as smartphones or tablets in the practice of medicine, and the downloading of health-related applications or “apps”. This helps with the flow of information over a mobile network and can improve communication, specifically between individuals and clinicians.” (AHIMA Guide, 2013, p.1)

Kathleen Sebelius, the US Health and Human Services Secretary, in her keynote address at the 2011 annual mHealth Summit conveyed that:

“Mobile healthcare (mHealth) is the biggest technology breakthrough of our time being used to address our greatest national challenge” (Levy et.al., 2012, p.3).

Despite gaining a lot of attention and hype in the recent years, healthcare consumers and providers suffer from a scarcity of adequate relevant information around and about mHealth. Academic researchers have failed to pay attention to mHealth in the way that it deserves. It may very well have the power to change key elements of the healthcare industry for example primary care as well as chronic care management (Malvey & Slovensky, 2014). Levy et.al. (2012) emphasize viewing mHealth as a tool and not a new type of medicine; its meaning emerging from how it is applied within existing healthcare systems. They define mHealth as:

“The provision of healthcare or health-related information through the use of mobile devices (typically mobile phones, but also other specialised medical mobile devices, like wireless monitors). Mobile applications and services can include, among other things,
Due to the fact that it is a sub segment to eHealth, one could question the legitimacy of the term. We would argue that the term’s usefulness comes from its ability to specify the term eHealth further, providing more depth and accuracy when one is referring to mobile technology used in healthcare.

### 3.2 User perspectives on ICT in healthcare

A vital part of understanding the role of ICT in healthcare is to understand how they may affect the users, in other words healthcare professionals. Therefore, we see it suitable to discuss these matters from a user perspective. We have chosen to base this understanding in the USE IT model and User Centred Design, which are presented in the following segments of this section.

#### 3.2.1 Information in healthcare

The importance of information in healthcare, especially when related to nursing personnel is very clearly emphasized by Kisilowska (2006), who states that:

> "one of the authors writing about the quality of nursing care listed the core nursing components, including: patient's safety, protection against infections, hotel service, informing, subjectivity, self-care, medical and nursing care, organization and documentation of nursing care." (p. 323)

In the list above, the terms information and documentation are differentiated, however, many other researchers have used these two terms synonymously. We also believe that these two terms are two sides of the same coin and therefore can be used synonymously.

The Medical Records Institute (now known as the mHealth Initiative) (Healthcare IT News, 2017), conducted a survey in 1999, that emphasized that improving the ability to share patient information among healthcare providers was one of the most important factors driving physicians to incorporate information technology into their practices, in addition to other factors such as improving the quality of care, and improving clinical processes and workflow efficiency (Noffsinger, et.al., 2000).

#### 3.2.2 Communication in healthcare

According to Ågerfalk (2004), the purpose of information systems is to be tools for social action and communication. We interpret this as that the purpose of information systems is to provide a mean of communication between actors. Like mentioned by Goldkuhl (2011a), we view ICT as tools for communication within organizations. According to Goldkuhl, the communicative actions performed by actors can be facilitated by information systems, why we interpret the information
systems used in healthcare (i.e. eHealth) as tools for healthcare staff and as communication channels. Moreover, the ICT:s consists of affordances, which Goldkuhl (2008) defines as the following:

"An affordance is a characteristic (or set of characteristics) of an object, which offers a potential for action." (p.5)

We choose to utilize the definition of affordance provided by Goldkuhl (2008), as it imbibes the afforded actions that actors can perform, including communicative actions which Goldkuhl (2008) defines as the following:

"[...] Actors in (or related to) an organization are communicating (i.e., sending and/or receiving messages) through an IS. Sending a message through an IS means performing a communicative action. The IS affords a communicative action repertoire to its users. This repertoire enables and constrains the users in their communicating." (p. 2)

According to Schoop (1998), cooperative documentation, i.e. electronic health records, are an important tool for communication between healthcare staff. Like Coiera (1996) suggests, lack of adequate communication is a great source of inefficiency in healthcare. Given that the assumption that the healthcare environment is very information intensive, we would suggest that lack of accurate information and ways to communicate information leads to inefficiency; healthcare professionals needs information to make decisions in their work and to coordinate their work efforts with their colleagues. This communication can be performed either synchronous or asynchronous. Synchronous communication is performed in real time between actors, while asynchronous communication has the sender and receiver exchange information at different times, e.g. via voicemail or email (Coiera, 1996). According to Coiera (1996), the greatest benefit of using asynchronous communication is that it decreases interruptions in healthcare staff's workflow. In other words, synchronous communication requires healthcare staff to stop what they are doing to communicate with their colleagues, while asynchronous ditto gives them opportunity to respond when they are available.

Moreover, different kinds of healthcare professionals have to communicate in order to provide care, e.g. physicians and nurses. There is an inherited problem where each group of healthcare professionals have their own system their own requirements regarding system design, something that creates communication problems as the information needs among the groups differ. The language within the systems used in healthcare therefore needs to be coherent and comprehensible for all groups (Schoop, 1998).

According to Schoop (1998), this problem with communication can be approached from the Language-Action Perspective (LAP), which the author defines as:
“LAP argues that language can be action and is used to coordinate activities and to create a reality shared by the communication partners as the basis for their interactions. It is emphasised that the main role of an information system should be to support organisational communication.” (p. 2)

Given the aforementioned definition of communicative action by Ågerfalk (2004) and the LAP provided by Schoop (1998), we conclude that information systems are tools for communicating information and a way of coordinating work efforts between healthcare professionals. The language used within these systems needs to be coherent and comprehensive between different groups of healthcare professionals.

3.2.3 USE IT Model

The USE IT model is based on theories about the adoption and diffusion of innovations and comprises of four dimensions that predict and evaluate the fate of innovations, thus predicting whether they might be adopted or rejected. However, at the individual level, the fate of an information system depends to a large extent on how it is perceived by the user. An information system that is brought into use by the user and furthermore, satisfies the user can be considered to be successful (Michel-Verkerke & Spil, 2013).

The USE IT Model is described in Spil et al. (2005) where the following table is used to describe the dimensions of the model:

<table>
<thead>
<tr>
<th>USE IT MODEL</th>
<th>User domain</th>
<th>Information technology domain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product</td>
<td>Relevance</td>
<td>Requirements</td>
</tr>
<tr>
<td>Process</td>
<td>Resistance</td>
<td>Resources</td>
</tr>
</tbody>
</table>

Table 3.1 USE IT model, based on Spil et al. (2005, p.128)

Table 3.1 is made to illustrate the relationship between the four dimensions of the USE IT model. Moreover, its purpose is to illustrate the difference between the product and process as well as what domain the different categories in the model. The categories listed in Table 3.1 are explained below.

Resistance

Spil et al. (2005) defines resistance in the USE IT model as the following: “Resistance is the personal attitude of all stakeholder groups towards the introduction of an information system (IS). The main IS-quality is the attitude and the willingness to change.” (p.128). According to Forducey et al. (2005), the so-called change champions are stakeholders who embrace a new concept or idea and that they are vital for championing a project. Moreover, Forducey et al. (2005) suggest that usage
of so called administrative, clinical and technical champions can prove to be crucial in a system integration project in a healthcare environment. The administrative champion communicates with and educates the system support staff; the clinical champion rallies support for the system and educates its users. Forducey et al. (2005) claims that the technical champion is critical for the success of a system integration and should not be overlooked at any stage during the development process. Forducey et al. does not state why the technical champion is important, but we assume that he/she is important due to the fact that they have a developed skillset regarding technology and a significant social influence. Seale et al. (2005) also discusses the importance of champions. They state that a leader of a development process should identify two co-champions that will assist the implementation and change process; one with administrative/business expertise and one with clinical expertise and management skills. In order to understand champions, Seale et al. claims that one also has to understand what personal or professional interests they have in telemedicine (i.e. eHealth) in terms of organization, personal and societal gain, and what motivates them in terms of money, prestige and power. We recognise that it is necessary to understand what the motivational factors for champions, since they have such a crucial role. The champions are necessary allies for handling the “resistance” part of the USE IT model.

According to Spil et al. (2005), there are three kinds of resistance with two detail levels of resistance, micro and macro. As the names of the two levels suggest, the micro level is more detailed and individual, while the macro level is on a more general and organizational level. The following levels are mentioned in Spil et al. (2005):

- Attitude (will) to change (micro-resistance)
- Ability to change (macro-resistance)
- Opportunity to change (macro-resistance)

The first level, attitude (will) to change is indeed very individual and is the primary focus of this study, even though the other two parts of resistance are necessary to explain resistance in full. We would argue that the word “resistance” has a negative connotation towards it, however. Attitudes towards an IS and the willingness to adapt to it is not necessarily negative, they are interpretations of reality, i.e. perceptions. Therefore, we prefer to speak of perceptions before labelling these perception as resistance and acceptance. This means that our primary focus is on the micro-resistance in the form of attitude (will) to change. We would argue that discussing attitudes is much more nuanced when it comes to experiences regarding information systems, as stakeholders can have positive and negative attitudes towards different aspects of the information system in question.

Relevance
The relevance part of the USE IT model provides answers to the expectations that the user may have of an information system and to what extent it should support their needs. In a healthcare setting the term relevancy is described by Michel-Verkerke and Spil (2013) as the following:
Information systems that do not promote the ability for healthcare providers to do a better job are therefore not relevant to healthcare providers, who we would argue are major stakeholders in eHealth projects. Spil et al. (2005) therefore imply that the lack of relevancy for the user often leads to failure when implementing information systems.

Requirements
Spil et al. (2005) define requirement as the evaluating factor of the system in order to see to what degree the user needs are satisfied, something that also includes usability and affordances. End-user’s requirements usually consist of e.g. system quality, information quality, system speed and stability.

Michel-Veerkerve and Spil (2013) conclude that lack of meeting of requirements or misinterpretations regarding relevancy of end-user’s requirements can lead to negative attitudes towards an information system among the end-users.

Resources
Resources are defined as the following in Spil et al. (2005):

"Resources are defined as the degree to which material and immaterial goods are available to design, operate and maintain the information system. The main focus of the determinant resources will be on the people and on the cost these people cause. Next to that the reliability of the IT and the information systems are considered. Resources defined in this way refer to service and system quality, management support and mature IS function." (p.130)

Given the definition of resources by Spil et al. (2005), we conclude that resources are the immaterial and material means that are available when designing and implementing an information system.

3.2.4 User centred design process in healthcare
The ability for employees to influence their working environment is stipulated in Swedish law, i.e. the working environment act. The law determines that all workers are expected to be able to affect their own needs. The second chapter of this law stipulates that the working environment should be satisfactory with regards to the work’s nature and the social and technical development of society (Arbetsmiljölag, 1977:1160). With this in mind, it is only natural that one can assume that staff members of any organization can and should be able to have influence of the development of the information systems that they use in their daily work processes. Gulliksen and Göransson (2002) therefore suggest that every professional is ought to take part in the development of information systems, not only due to legal reasons, but also because it has great effect on the
working environment. Despite of this, there are numeral projects where the user input has been neglected and/or not collected in a manner that makes the input useful (ibid). The development and implementation of an information system is therefore best viewed as a process that allows changes based on user input while the information system is in development (ibid).

Moreover, there are more incentives for a user centred development approach. User centred design grants a better understanding of what the needs are of the actual users and thus also better understanding of the requirements needed in order to make the system adequate for its intended purpose(s). Because of factors like these, there are many cost based incentives to the user centred design. Vredenburg et al. (2002) found that cost reduction plays a major role in the adoption of a user centred design approach.

![Figure 3.1 Based on ISO 13407 - Human centred design processes for interactive systems (Gulliksen & Göransson, 2002, p. 105)](image)

Based on figure 3.1 above and the scope of this study, we can determine the parts of the design process that we will look further into, namely the evaluation of the design and determination of...
whether the evaluated systems are adequate with regards to the requirement of the organization. This approach requires a deep understanding of the organization and its business; what the organization needs to function well and thus also what a system requires in order to support its business adequately. Moreover, the User Centred Design process can be connected with the requirements and relevance part of the USE IT model (refer to Spil et al., 2005; Michel-Verkerke & Spil, 2013).

3.3 Governance in healthcare organizations

We would argue that a necessary part of governance is adaptation, i.e. change. According to Bruzelius and Skärvad (2012), change management can be summarized as the work processes meant to deliberately transform an organization from its current condition to a desired state. ICT can be utilized as a tool to bring such change, although it is never certain if the implementation of ICT will have the intended effects; one should be aware that change is always associated with risk to some degree. According to Scott and Mars (2013), a recurring problem in eHealth is the lack of adequate strategy. In the following sections, we will explain the importance of long term planning regarding eHealth and why it is of such great importance.

3.3.1 E-governance within healthcare

The emergence of ICT has not only changed how citizens live their lives, it has also changed how governments work with regards to handling of information. Chun et al. (2010) concludes that the digital government, also called electronic government (i.e. e-government) has started a reformation of how states’ services to citizens and employees are structured. It restructures how citizens, employees in the public sector and other stakeholders communicate, as they now use ICT as a means of communication, often utilizing internet as a mean to distribute and consume information. The purpose of utilization of internet based services is to improve the performance and processes of the government (Chun et al., 2010).

Beckers and Hornsburg (2005) explains that there are different levels of the evolution of e-governance. These levels are determined by to what extent ICT is utilized, i.e. how much ICT is used in order to improve governance. At the first level, e-governance is merely a tool to distribute information in a passive manner, e.g. via a web site. Thus, the first step in the e-governance evolution consists of digitalization of government information. The second step in the e-governance evolution consists of information distribution via web pages and provides services to citizens and businesses through email and interactive forms that can provide information to the user dynamically if needed. The third level of e-governance evolution affords online transaction services such as renewal of licenses, permits, application and tax payments. The following step in the evolution is when e-governance transforms how the government operates with regards to flow of information and decision support (Chun et al., 2010).

Chun et al. (2010) refers to the three first step of the e-governance evolution as “web based e-government 1.0” or simply “Government 1.0”. However, the definition of what comes thereafter, i.e.
Government 2.0, and what this entails is not defined. It is clear however, that the outspoken goal with e-government is supposed to lead to an increased interaction, collaboration and transparency between citizens and the governing bodies of the state. We interpret that e-government is a tool that can be used in order to create better governing entities that serves its citizens better.

As previously mentioned, eHealth requires adequate governance in terms of legislation in order to properly support the change process that follows implementation of eHealth (Harkke & Collan, 2005). There are clear risks with strict legislation stifling innovation. Scott and Mars (2016) describe South African guidelines regarding electronic referrals and sharing of images of patients’ various illnesses (e.g. a wound) and how practitioners chose to do what is practical for themselves and the patients rather than to strictly follow guidelines and legislation. Even though this description is especially true in so called "developing countries" (Scott & Mars, 2016), the usage of smartphone applications is said to be widespread in hospitals in the British Isles (Keane, 2015). Smartphones are efficient tools for social learning and communication in healthcare, although more research is needed for using commercial application, such as WhatsApp, in a clinical environment. Scott and Mars (2016) argue that usage of such applications is discouraged for valid safety reasons, but argues that their utilization should not be forbidden in policy, but rather that they should be formed into solutions that complies with policy. Scott and Mars (2016) conclude that guidelines should be realistic to be accepted by practitioners and that unrealistic guidelines will not be followed. Moreover, guidelines should keep pace or even foresee possible changes in attitudes with regards to ethics, i.e. social norms and attitudes (ibid). Most reputable healthcare organization already have ethical guidelines, there amongst patient’s consent to the publication of clinical photos (Kamel Boulos et al., 2016).

Findikoglu and Watson-Manheim (2016) discusses that there needs to be coherency between goals on macro and micro level when it comes to work with electronic health records as ICT is a cornerstone for the enhancement of healthcare management’s ability to lead. In order to better understand the consequences of EHRs, one also needs to comprehend the link between micro-level system usage and macro level goals (ibid).

3.3.2 IT-governance

In this segment, we try to establish our own view on the rather broad subject that is IT-governance. In a nutshell, IT governance is a framework or model of how an organization should work strategically in order to promote desirable usage of IT, i.e. governing and ensuring quality. Inadequate ability to lead an organization’s strategic work with regards to information systems leads to diminished ability to compete and loss of revenue (Weill & Woodham, 2002). IT governance is about stability and to provide a structure that enables desirable effects from the usage of IT. In essence, IT-governance is about stability through clearly defined distribution of responsibility, as described in Weill and Ross (2004). This is further supported by Weil and Woodham (2002) that concludes:
“We define IT governance as specifying the decision rights and accountability framework to encourage desirable behaviour in the use of IT.” (p. 1)

The framework or model provided by IT governance allows the distribution of responsibility and centralization of decision making. According to Weill and Woodham (2002) and De Haes and Grembergen (2004), the decision making is the responsibility of the organization’s leadership, thus making centralization of decisions regarding IT necessary. The major difference between an IT-governance framework and a model, as we see it, is that the latter describes a predetermined methodology that specifies IT-strategy related work in depth, while a framework works more like a guideline. Since this study is to not scrutinize whether a healthcare organization follows a certain model, we feel no real need for a comparison between different IT-governance models and/or frameworks. The interest in IT-governance rather stems from a desire to explain the need for strategic work with regards to IT within healthcare.

Goldkuhl and Nordström (2014) argues that there is a widespread use of IT governance frameworks, such as ITIL (Information Technology Library), that is supposed to use so called “best practice”, i.e. a generic IT governing solution. These “best practices” are used for standardization of work processes, activities, objects and artefacts. Like Goldkuhl and Nordström (2014), we view the use of these kind of practices as problematic as they disregard the unique nature of organizations.

3.3.3 IT-strategy within eHealth

The policy makers’ inadequacy with regards to developing and implementing relevant and workable IT-strategies, especially in the relatively new area that is eHealth, results in tremendous impacts on the future development of the healthcare sector (Scott and Mars, 2013). As a result, we deem it necessary to discuss strategy as a whole and strategy specifically within an IT context imperative to the purpose of our study. We begin by providing a general definition of strategy along with a brief history of the origin of the word itself. The term strategy is derived from the Greek word "strategos" meaning "office or command of a general or generalship". It is defined as a plan, scheme or a course of action designed to achieve a long-term or an overall aim (Oxford English Dictionary, 2017). Strategy, in its most basic form comprises of an “end” as well as a “means” to reach that end. In the managerial sense, it encompasses what an organization aims to achieve, in terms of goals and how these goals are intended to be achieved, in terms of the means to the end. Strategy, can thus be thought of as a link between where an organization presently is and where it wants to reach, the desired goal (Bruzelius & Skärvad, 2012). According to Mintzberg (1978), a classic definition of strategy has been provided by Chandler in 1962. He defines strategy as:

"the determination of the long-term goals and objectives of an enterprise, and the adoption of courses of action and the allocation of resources necessary for carrying out these goals". (p.935)
In the words of Ward and Peppard (2002), the development of an IS/IT strategy entails thinking strategically and planning towards:

- the development of effective long term management and
- the optimal impact of information in all its forms.

By information in all its forms implies data originating from information systems (IS) and information technology (IT) including manual and computer systems as well as computer technology and telecommunications. In addition to these, it also includes the organizational aspects of the management of information systems and information technology. IT strategy defines the capabilities required to support and enable business strategies, the argument behind this being that IT resources and capabilities, in combination with contemporary business resources create value (Reynolds and Yetton, 2015).

IT strategy is a remarkably broad field, embodying several dimensions, especially when a large number of systems are involved. Regardless of the services and products that they provide, organizations today rely on information technology (IT) as a support for their business goals. Business and IT alignment together play a critical role – IT provides value to the business and as a result should clearly be developed together with the business strategy. The term IT strategy implies a multitude of aspects ranging from technology selection to the business process structure (Tapandjieva et.al., 2013).

According to Goldsmith (1991), “IT strategy is simply Business Strategy with an information hat on”. An effective IT strategy, in his opinion is an integral part of the business strategy and as such should be developed using the techniques used to develop business strategy. The IT techniques are aimed at creating the framework and aiding implementation. Ward and Peppard (2002) believe that there is a significant difference between having an IT strategy and having an IT strategy that is closely aligned and integrated with the business strategy of the organization in question.

Many healthcare organizations lack adequate IT-strategies and there is a need for better and more pronounced IT strategies regarding eHealth. According to Scott and Mars (2013), lack of proper IT strategy within eHealth is a major barrier for ICT within eHealth to reach its fullest potential and is also a contributor to inefficiency regarding cost. Therefore, there needs to be a clear direction regarding eHealth strategy in order to prevent waste regarding cost and resources.

In a Finnish study, where strategies of eHealth for nurses were explored, it was concluded that “A strategy should describe and define the mission and vision of the nurse association as well as objectives and means of how to achieve them.” (Ahonen et al., 2016, p. 206).

Ahonen et al. (2016) describe that there are clear set out goals from the European Union to make healthcare more efficient and thereby also more cost efficient, much like described by Eysenbach
In the study presented in Ahonen et al. (2016), six themes were concluded for the eHealth strategy. Each strategy theme was given three goals and five actions to these goals. Like previously stated, strategies should describe the vision and mission, thus making it imperative to present them before one describes the strategic themes presented in Ahonen et al. (2016).

**The mission:** Nurses develop and use e-Health in client’ nursing care, rehabilitation, alleviating suffering, promoting health and increasing well-being of citizens.

**The vision:** Nurses are courageous reformers of health care practices, who have the expertise to use and develop e-health utilities with multidisciplinary cooperation with the client and other stakeholders. (p. 205)

The above mentioned mission and vision formulates the strategy and goals for eHealth used by nurses. The result of formulating the strategic themes presented in Ahonen et al. (2016) is the result of rigorous empirical research, thus making the strategies inductive and close to empirics.

<table>
<thead>
<tr>
<th>Strategy theme</th>
<th>Goals and actions</th>
</tr>
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</table>
| **Client participation.**       | • Electronic services are an integral part of citizens’ everyday life.  
 |                                 | • Citizens’ participation is strengthened by:  
 |                                 |   o National archives of health data.  
 |                                 |   o Assessment tools of well-being.  
 |                                 | • Increased use of social media and self-assessment tools for health by citizens.  
 |                                 | • Data networks afford nurses to be available for the patients at all times.  
 |                                 | • The nurses guide and support citizens to enable them to take responsibility to their own ability, both inside care units and outside of them.                                                                                                                                                 |
| **Nurses’ daily work.**         | • eHealth services are becoming an increasingly integral part of nurses’ daily activities.  
 |                                 | • The nurse searches for information and comprehend the health information both for patient self-care and nursing care.  
 |                                 | • The nurse is the patient’s partner and encourages the patient to use eHealth services.  
 |                                 | • Nurses use the data provided by patients and national health archives.  
 |                                 | • Usage of social media in healthcare requires nurses to understand the difference between private and professional roles.                                                                                                                                                                      |
### Ethical aspects.

- In social and in healthcare, technology is used to support the citizen's:
  - Quality of life
  - Dignity
  - Autonomy
  - Participation in human care
- It is vital to make sure that the availability of eHealth is equal for all citizens.
- There should be no compromise with regards to quality of service, social interaction or human aspects of care. All citizens are not computer literate, which should be accounted for.
- Citizens should be informed of potential risks of eHealth.
- Nurses providing in eHealth services should follow ethical guidelines at all times.

### Nursing management.

- Nursing leaders are in a key position when developing eHealth solutions, both on an organizational and a national level.
- There is a need for strong leadership and vision when developing client-centred eHealth process that involves citizens and gives flexible working conditions for healthcare staff.
- Nursing leaders are required to make sure that there are adequate resources and competence so their knowledge, skills or attitudes do not interfere with eHealth services provided for citizens.
- Knowledge-based management and usage of data warehouses are ought to be the essence of leadership to secure quality and safety of care.
- Visibility and availability of outcomes regarding nursing -sensitivity strengthen the commitment and satisfaction among nurses.

### eHealth competency requirements.

- European Qualification Framework (EQF) has three dimensions when describing learning outcomes:
  - Knowledge
  - Skills
  - Competence
- Nursing education includes five learning areas:
  - Learning
  - Ethicalness
  - Working skills
  - Innovations
  - Internationalism
- Nurses need to use ICT responsibly and efficiently.
Nurses need to have adequate skills of using technology and information literacy. 
Nurses need to have resources and the willingness to use eHealth services. They also need the necessary tools to ensure good clients care and citizens’ health and welfare.

<table>
<thead>
<tr>
<th>Research and development.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Currently, eHealth is expected to be able to make healthcare more visible, accessible and equal for citizens.</strong></td>
</tr>
<tr>
<td><strong>The ‘Big Data’ concept is used to describe the increased amount of data that is being gathered in healthcare.</strong></td>
</tr>
<tr>
<td><strong>Reliable usage of data elements will allow gathered information to be used multiple times and for multiple purposes.</strong></td>
</tr>
<tr>
<td><strong>More and more data is gathered via ‘smart devices’ e.g. smart phones and watches.</strong></td>
</tr>
<tr>
<td><strong>There is need for the development of reliable and fast methodology and how to use to use large amounts of data for improving nursing practices and public health.</strong></td>
</tr>
</tbody>
</table>

Table 3.2 Strategic themes, goals and actions. Based on Ahonen et al. (2016)

The strategic themes, goals and actions regarding eHealth and stated in Table 3.2 are, as aforementioned, based upon nurses’ role in eHealth and the role that eHealth has in relation to nurses.
4. Empirics

This part of the thesis presents the results of the performed empirical data collection. The results from the evaluation of the wards studied and the interviews conducted are presented here. The wards under study presented in this section are situated at different hospitals in different cities (belonging to the same county), which may or may not have affected the empirical data.

4.1 Policies regarding eHealth and mHealth

In the following sections, we present policies from different governing bodies regarding eHealth and mHealth. Furthermore, we will also present the legislations that affect eHealth and mHealth and how these have prompted solutions regarding authentication with the usage of eIDs (electronic identification). The theory pertaining to eHealth and mHealth, presented in the previous chapter (especially section 3.1) is meant to be used an introduction to the concepts as well as to gain understanding into the content of it. In this section, however, we focus on the terms eHealth and mHealth as well as other related terminology from the focal point of the policy makers, in other words, not what eHealth and mHealth are but what they are supposed to do and provide to the world.

4.1.1 EHealth

The concept of eHealth is based on the definition of health coined by the World Health Organization, i.e. “health is a state of complete physical, mental and social well-being”. Furthermore, the WHO defines eHealth as: “eHealth is the use of information and communication technologies (ICT) for health.” (World Health Organization, 2017). According to the Ministry of Health and Social Affairs (a public organization directly under the Swedish government), adding the “e-” to the term health suggests the maximized achievement of benefits in relation to the individual making use of information and communication technologies. The definition of eHealth expands the concept of health from something that primarily affects a single individual to a change process that has the potential to act as a catalyst for reforms throughout the healthcare sector. The work within National eHealth is directed towards creating visible and tangible improvements for three main focus groups. These include the individual, the health care personnel and the decision makers in healthcare and social services (Socialdepartementet, 2010).

The individual in his role as a citizen, patient, client or family member should have access to readily available and quality assured information on healthcare as well as access to documentation from various previous healthcare efforts and treatments. He or she should be offered individualized service in addition to interactive e-services to be able to exercise participation as well as self-determination based on their own conditions. Healthcare personnel should have access to effective and interoperable electronic decision support in order to ensure high quality and safety while facilitating their daily work. The availability of necessary and
structured information is an important ground in order to be able to make decisions regarding medical efforts and treatments. The decision makers in healthcare and social services should have appropriate tools in order to continuously monitor and follow up on the organization’s quality and security and to have a current and comprehensive basis for performance management, planning and resource allocation. Public and private healthcare should be provided easy access to high quality data, all the while respecting the individual’s integrity. The healthcare sector is one of the most information copious institutions in the Swedish society, thus making the distribution and supply of information between actors crucial (Socialdepartementet, 2010).

4.1.2 MHealth

According to a document authored by the United Nations, mHealth can be summarized as a sub segment of eHealth. Furthermore, it is stated that while there is no widely supported definition of either eHealth or mHealth, there are some broad definitions regarding the two. MHealth specifically, can be summarized as the utilization of mobile devices such as smart phones and tablets to accomplish the effective consumption and distribution of information in a healthcare setting (Vital Wave Consulting, 2009).

According to a green paper published by the European Union, mHealth is an emerging field that is growing rapidly and has the potential to transform healthcare in terms of efficiency. Moreover, mHealth solutions cover a vast array of potential measurements of vital signs e.g. heart rate, blood pressure, glucose level, body temperature and brain activity. Moreover, there are several applications for smartphones that not only offer tools for communication, information and motivation for its citizens, but also afford individuals with a better overview of their own health. MHealth can also be used to support healthcare providers in terms of decision support and efficiency, thus enabling improvement of healthcare quality. All in all, mHealth has the potential of empowering patients while providing healthcare providers with tools that enable them to be more efficient and make better informed decisions (European Commission, 2014).

In 2010, the Swedish Association of Local Authorities and Regions (SALAR) concluded that mobile devices will have a significant importance in healthcare. MHealth will not only enable healthcare professionals to provide care with improved efficiency and monitoring of patient’s health, it will also enable a more individualized healthcare where the patient’s specific needs are the focal point in the treatment plan. With an increasingly aging population, it is crucial to find ways to improve both the efficiency and the quality of healthcare, something that the Swedish Association of Local Authorities and Regions hopes to solve through efforts in e- and mHealth (SKL, 2010).

4.1.3 Electronic health records (EHR)

According to the American government body, Centre for Medicare and Medicaid Services (CMS), electronic health records (EHR:s) can be summarized as the following:
“[...] an electronic version of a patient’s medical history, that is maintained by the provider over time, and may include all of the key administrative clinical data relevant to that person’s care under a particular provider, including demographics, progress notes, problems, medications, vital signs, past medical history, immunizations, laboratory data and radiology reports. The EHR automates access to information and has the potential to streamline the clinician’s workflow. The EHR also has the ability to support other care-related activities directly or indirectly through various interfaces, including evidence-based decision support, quality management, and outcomes reporting.” (CMS.gov, 2012).

The above mentioned definition provided by CMS suggests that EHR is a tool that enables practitioners to carry out their daily activities and streamline their workflow. In the Swedish legislation, it is stated that “the coordinated patient summary is an electronic system that allows a healthcare provider to give or receive direct access to personal data stored at another healthcare provider.” (Time Lex & Milieu, 2014, p.24). Given this definition, we interpret patient summary as being equivalent to the EHR (refer to 3.1, 3.1.8)

Swedish legislation regarding EHR stipulates that the person who is responsible of maintaining a patient’s journal is also responsible for making sure that the information in the EHR is correct and that its content is not tampered with to obscure or erase information. These responsibilities are stipulated by the Patient Data Act (Patientdatalag) (2008:355), as described in section 4.1.5 The Swedish Patient Data Act.

4.1.4 Electronic identification

Directive 1999/93/EC of the European Parliament and of the Council of 13 December 1999, on a Community Framework for electronic signatures, establishes the legal framework for electronic signatures (eSignatures) at the European level. It is aimed at making eSignatures not only easier to use but also legally recognized within all EU countries, thus giving rise to new ideas and definitions. It defines electronic signature as “data in electronic form which are attached to or logically associated with other electronic data and which serve as a method of authentication”.

It also defines advanced electronic signatures as:

"An electronic signature which meets the following requirements:
- it is uniquely linked to the signatory
- it is capable of identifying the signatory
- it is created using means that the signatory can maintain under his sole control and
- it is linked to the data to which it relates in such a manner that any subsequent change of the data is detectable
is known as an advanced electronic signature” (The European Parliament, 1999).
The signatory in this definition, is a person who holds a signature creation device and acts on his own behalf or on the behalf of the natural or legal person or entity he represents. In addition to defining and describing the encompassing characteristics of eSignatures, this directive also states that these are to be used in the public sector within community as well as national administrations. These may also be used while promoting communication between the citizens and the economic operators such as those within public procurement, taxation, social security, justice systems and last but not least health.

In Sweden, there is a national Enterprise Architecture for the health and social care sector and an eID for professionals, which includes the SITHS-card. The SITHS-card will be explained further in this chapter. The eID solution is an answer to cope with issues regarding interoperability as Sweden’s public administration and County Councils have much freedom compared with the Ministries. Because of the decentralized governing, Sweden has a very special relation to policies compared with other countries (Grönlund, 2010).

### 4.1.5 The Swedish Patient Data Act

The Patient Data Act (Patientdatalag) (2008:355) is a Swedish law regulating how information regarding patients should be handled. The purpose of this law is to protect the personal integrity of patients and ensure that information about them can only be accessed by authorized personnel. As such, it has a significant effect on the development of ICT-systems in healthcare, in other words eHealth. This law regulates healthcare providers’ handling of information regarding patients and states that they are obligated to maintain journals of the care provided to the patients. If healthcare providers are to break this law, they are not only at risk of losing their employment, they also risk fines and, in some extreme cases, prison sentences. The individuals accountable for maintaining journals (regulated in § 3rd chapter of the Patient Data Act (2008:355)) are the healthcare providers who have authorization or a mandate to practice a certain profession. § 4 of the same chapter concludes that "The one maintaining a patient journal is responsible for his/her entries in the journal.". § 5-12 3rd chapter regulates that only information necessary for the treatment of the patient is to be recorded in the journal, that the information in the journal should be truthful and that the information written in the journal should be treated with integrity. More importantly, § 10 3rd chapter concludes that "A journal entry should, if there is no significant impediment, be signed by the person responsible for the entry.". This means that an entry in the patient’s journal should only be signed by the person responsible for making the entry, unless and until there exists certain exigent circumstances that excuse that particular individual from signing the journal himself/herself.

The 4th chapter of the Patient Data Act (2008:355) regulates electronic access and confidentiality of data regarding patient’s health records. In summary, the purpose of the 4th chapter is to further secure the integrity of the patients and make sure that information about them is treated with appropriate confidentiality via electronic access. In § 1 of the same chapter, it is regulated that only healthcare providers who are directly involved in the care and treatment of the patients may have access to information pertaining to their health.
Moreover, the policies regarding eHealth pertaining to efficiency regarding cost and improved quality of healthcare can clearly be seen in the law. According to 2 § 1st chapter of the Patient Data Act (2008:355), the purpose of the law is to regulate the handling of information within healthcare and make sure that it is organized in a way that ensures patient safety, good healthcare quality and to enable cost efficiency.

4.2 Artefact descriptions

In the following sections, we present a description of the various Information and Communication Technology artefacts used in providing healthcare to the patients admitted at the two wards studied. Since this study deals with the experiences of healthcare providers’ usage of mobile platforms, we have tried to provide a brief, albeit explanatory description of all the IT artefacts, that we deemed relevant for the reader’s understanding and ease to follow our line of reasoning.

![Figure 4.1 ICT Artefact overview](image)

4.2.1 The SITHS-card

The SITHS-card, short for Secure IT in Health and Social Care (translated from Swedish Säker IT i Häls- och Sjukvård), is an electronic identification used by professionals in health and social care. Inera, an organization for standardization of eHealth belonging to the Swedish Association of Local Authorities and Regions provides a definition of the SITHS-card as follows:

“The SITHS-card is a tool that people, servants or agents, in county councils, municipalities and private healthcare providers use to meet the requirements for strong authentication. This means that a person’s identity is checked with two-factor authentication. In SITHS case, this is accomplished through every person having a personal SITHS-card and knowing their personal pin code.” (Inera, 2017).
Among the first of our inquiries when interviewing the respondents at the ward(s) was regarding the SITHS-card. The SITHS-card is a very important ICT artefact used in the daily routines of the personnel at both the wards. Not only is it used for identification and legitimation purposes, but also to gain access to many of the services at their place of work. Its most basic, albeit paramount usage might be that of gaining access to the premises of the wards where the healthcare providers work. However simple or basic this use of the SITHS-card may seem to be, it is one of the most essential as it pertains to security and safety of both patients as well as the staff members. The entrance to the ward(s) can only be accessed by authorized personnel possessing a valid SITHS-card, a swipe of which opens the main doors as well as any other secure doors inside of the ward. These could be the personnel rooms, the toilets, the changing rooms, the utility rooms and the like. The SITHS-card also provides the authorized personnel with access to the medicine rooms, which are required to be locked at all times. Only personnel having the required authorization can enter and leave the rooms, with the required doses of medicines or mixtures of antibiotics for specific patients to whom these medicines have been prescribed.

Another purpose of the SITHS-card is as a tool for identification when accessing the electronic health records of the patients. It is required for logging into, reading and signing off on patient journals existing in the EHR system. Thus, it can be used both as an identification device, facilitating two-factor authentication as well as a key card for gaining access to various premises at the hospital and the ward(s). At present, there exists another key card that was being previously used (and is still being used by many of the personnel), which is now in the phase of being liquidated, to allow for a single, homogenous means of identification, the SITHS-card. This process is being furthered by providing all new employees with only the SITHS-card as a key card as well as an identification card.

The properties of the SITHS-card are essentially related to the role of the card owner/holder. As an example, the SITHS-card used by a nurse gives him/her access not only to patient journals, but also the medicine room, in addition to the possibility of making and signing of on particular entries in the electronic health record, which an auxiliary nurse may not have access to. Similarly, the SITHS-card issued to a physician may have certain other properties, allowing for access to certain other functionalities in the electronic health records that for example nursing personnel may not have access to, or other personnel such as occupational therapists or physiotherapists may not have access to. Thus, in essence, the SITHS-card not only imbibes the functionality of a universal key but also leaves traces to allow for transparency when it comes to the electronic health records, i.e. healthcare providers access to patient information is traceable.

4.2.2 Cambio COSMIC

Cambio Healthcare Systems is one of the leading suppliers of healthcare information systems in Scandinavia and a growing player in the European market. It is essentially an e-healthcare company that provides smart, reliable and user-friendly solutions that are intended to improve healthcare and patient safety (Cambio.se, 2017). In the county of Östergötland and a few other
counties, Cambio COSMIC is the most prevalent electronic health record (EHR) system used, not only at the university hospitals but also at the primary healthcare clinics and private nursing homes.

Cambio COSMIC is an all-inclusive healthcare information system used for all types of healthcare, from university hospitals to primary care clinics. Not only does the system provide cohesive and patient-focused operational support, it ensures that important patient information is readily available to the users. It comprises of various subsystems that work together to provide the users with a variety of functions. COSMIC is an all-encompassing system that provides the users with all necessary functions that are required to provide healthcare to the people. Some of the functions available in COSMIC are:

- **Patient administration**: includes functions for resource planning, referrals and care administration, ensuring that healthcare administration functions properly
- **Clinical care support**: this includes healthcare documentation, medication management, ordering and response of diagnostic services, as well as clinical overviews, where all the information can be presented based on current operational needs
- **Specialist support**: includes a number of business specific features that help various units function while keeping all patient information together across the entire chain of care
- **Clinical decision support**: is a computerized clinical decision support system that improves patient safety and allows for new knowledge in the form of medical rules to be continuously added and quickly put into use in everyday clinical practice
- **Mobility**: through the use of COSMIC Nova, a set of applications that are designed for situations where it is not always suitable or possible to use a computer, and provided through the use of tablets or touch screens (Cambio.se, 2017).

The possibilities and functionalities that COSMIC provides to the user are many in number and varied in character, and as such do not fall under the scope of this study. The focus of this study being on the usage of mobile platforms in healthcare we have tried to describe COSMIC in such a way so that it furthers the readers’ understanding of the subject matter. Later in this chapter, we try to further clarify and explain the relevant artefacts, so that there is no doubt in the mind of the reader as to the functionalities pertaining to the various artefacts.

### 4.2.3 COSMIC Nova Ward

In order to be able to collect empirical data for the purpose of our study, we have decided to look into the implementation of a product from Cambio Healthcare Systems, named COSMIC Nova Ward. COSMIC Nova is an extension of the primary product i.e. Cambio COSMIC. It provides healthcare personnel with greater opportunities to work with COSMIC in all kinds of situations. Included in the COSMIC Nova series is the COSMIC Nova Ward, which is a custom made product intended to aid healthcare personnel in the day-to-day activities in the ward. COSMIC Nova Ward comprises of two products:
• **COSMIC Nova Ward Whiteboard**, a digital electronic ward overview, displayed on a large touchscreen that provides a direct overview of the situation at a specific ward, including, number of patients, ailments that the patients have been admitted for and other details existing in the patient journal. It is developed to support staff collaboration and facilitate the allocation of resources for the patients at the ward.

• **COSMIC Nova Ward Tablet**, a tablet application that allows for comprehensive patient information in addition to a checklist of activities that need to be done.

Both can be used separately or together and are integrated with Cambio COSMIC, allowing for a quick overview as well as access to as much detailed patient information as required (Cambio.se, 2017).

The COSMIC Nova Ward Tablet is meant to act as a digital companion for its users as they carry out their everyday work at the ward all the while providing constant access to all patient information. Providing a multitude of functions, it allows the user to access information like which investigations need to be done, which samples need to be taken and so forth. It also allows the documentation of the patient's vital parameters, reading notes pertaining to the patient, checking the drug list and following up test results and referrals. COSMIC Nova Ward Tablet makes all this possible, right at the patient's bedside while in dialogue with the patient. With the checklist function allowing for documentation, planning and follow-up activities both during rounds and the ongoing patient care become more structured and organized. In addition to being able to make quick additions and alterations to patient related activities, checklists make it easier to allocate resources to patients and vice versa (Cambio.se, 2017).

We were also provided with a brief review of COSMIC Nova Ward by an IT-strategist at Region Östergötland, which not only introduced us to the system, but also facilitated and furthered our understanding of it. In table 4.1 below, we present a brief review of the ICT artefacts presented above in terms of the relevant areas (features/functionalities) that are pertinent to the discussion that follows in the next chapter.
<table>
<thead>
<tr>
<th>Area</th>
<th>COSMIC</th>
<th>COSMIC Nova Ward Tablet</th>
<th>Cosmic Nova Ward Whiteboard</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>System</strong></td>
<td>Main product</td>
<td>Extension of COSMIC allowing work on COSMIC in a situation based environment</td>
<td>Extension of COSMIC allowing work on COSMIC in a situation based environment</td>
</tr>
<tr>
<td><strong>Hardware used</strong></td>
<td>Stationary computers and laptops</td>
<td>iPad Mini</td>
<td>Interactive screen (much like a large sized TV) placed in the ward</td>
</tr>
<tr>
<td><strong>Information overview</strong></td>
<td>Detailed patient overview that is easily navigable with the help of a mouse or a touchpad</td>
<td>Overview of all patients but also specific patients for whom the user is responsible (the tablet is personal to the user).</td>
<td>Overview of all the patients at the ward, with a possibility of going deeper into an individual patient's records.</td>
</tr>
<tr>
<td><strong>Reading the patient journal</strong></td>
<td>Available</td>
<td>Available</td>
<td>Available</td>
</tr>
<tr>
<td><strong>Writing text in the patient journal (documentation)</strong></td>
<td>Available</td>
<td>Not available</td>
<td>--</td>
</tr>
<tr>
<td><em><em>Entering MEWS</em> (see explanation under table)</em>*</td>
<td>Available</td>
<td>Available</td>
<td>--</td>
</tr>
<tr>
<td><strong>Medication lists</strong></td>
<td>Available; making changes and editing the list also available</td>
<td>Only medication lists of patients under the user’s care available</td>
<td>--</td>
</tr>
<tr>
<td><strong>Signing off on prescribed medications</strong></td>
<td>Available</td>
<td>Not available yet</td>
<td>--</td>
</tr>
<tr>
<td><strong>Reading test results and imagery</strong></td>
<td>Available</td>
<td>Not available yet</td>
<td>--</td>
</tr>
<tr>
<td>Area</td>
<td>COSMIC</td>
<td>COSMIC Nova Ward Tablet</td>
<td>Cosmic Nova Ward Whiteboard</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>--------------</td>
<td>-------------------------</td>
<td>----------------------------</td>
</tr>
<tr>
<td><strong>Entering notes/reminders</strong></td>
<td>Available</td>
<td>Available in the form of checklists</td>
<td>--</td>
</tr>
<tr>
<td><strong>Staff collaboration</strong></td>
<td>--</td>
<td>--</td>
<td>Available, due to large screen and placement at the ward</td>
</tr>
</tbody>
</table>

*Table 4.1 COSMIC, COSMIC Nova Ward Tablet and COSMIC Nova Ward Whiteboard explained at a glance.*

**MEWS** — stands for Modified Early Warning Score and is a tool used for assessing patients’ vital functions so that deterioration of status can be detected early and the adequate treatment initiated.

**4.2.4 Other ICT systems**

There are a few other ICT systems used by the nursing staff at the two studied wards. Although they are not the primary focus of this study, we would deem it necessary to provide a brief description for the purpose of our study. These systems are separate systems used in combination with COSMIC and COSMIC Nova Ward. These systems are depicted as “Other ICT systems” in figure 4.1. The table below (Table 4.2) describes these systems.

<table>
<thead>
<tr>
<th>ICT System</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MEDDIX</strong></td>
<td><em>Used for planning patient care activities.</em></td>
</tr>
<tr>
<td><strong>LABROS</strong></td>
<td><em>Used for ordering lab tests, e.g. blood samples and imagery.</em></td>
</tr>
<tr>
<td><strong>LISA</strong></td>
<td><em>Intranet and official mail.</em></td>
</tr>
<tr>
<td><strong>DOKUMENTA</strong></td>
<td><em>Used for handling patient care documentation.</em></td>
</tr>
<tr>
<td><strong>PASCAL</strong></td>
<td><em>Used for handling dosage dispensed medications.</em></td>
</tr>
</tbody>
</table>

*Table 4.2 Other ICT systems*

**4.3 Description of the organization**

The empirical data gathered for the purpose of this study is drawn from two different operational units of the same organization, two healthcare units providing essentially the same service to its
clients, albeit in different forms. Despite the fact that both the healthcare units operate under internal medicine, it came to light that they had widely different requirements in terms of support from a mobile healthcare platform. This, in our view is of great significance to the context of the study and thus also relevant while providing a fair description of the roles of the participating respondents.

Here under, we provide a description of the two operational units, both located in the county of Östergötland. We have chosen to describe these units from our own understanding of the practices and structure of the respective organizations, which in turn are based on the primary and secondary empirical data, i.e. interviews and documentation. We also provide a description of the respective respondents and their basic IT competencies. An understanding of the basic IT competencies of the respondents, is in our opinion, important to develop an understanding of the attitudes of the various users towards the ICT artefact examined in the study.

As described in section 2.5 Ethical Considerations, we have chosen to anonymize the respondents in this study. This is done in order to ensure that the respondents are free from any form of reprisals, thus making sure that their answers are as close to their actual perception as possible. Moreover, we would like to emphasize the importance of the context in which the respondents appear. The environment in which the respondents work is likely to have a great impact on their perceptions of mobile platforms.

4.4 Ward 0

Ward 0 is a combined planned and emergency orthopaedics ward and is part of a larger clinic that provides treatment and care for patients with fractures and injuries to the musculoskeletal system. The ward has a total of 26 beds for patients with acute orthopaedic ailments and patients who have undergone elective surgeries of the hip and knee. The ward comprises of four sub wards, two of them for emergency medicine and two that are for the planned patients. On the planned side of the ward, the most common procedures include putting in of hip and knee implants, treatment and care of acute fractures, the most common types being hip fractures, particularly among the elderly in addition to ankle, wrist and pelvic fractures. The emergency side of the ward deals with all such procedures, the difference being that the patients come in unplanned, mostly as a result of emergency situations such as an accident or a fall. The patients consist mostly of individuals in the advanced stage of life who may have experienced a fall and as a result, some kind of complication that requires medical attention. The implementation of the mobile platform COSMIC Nova Ward has not been entirely successful at this ward and the pilot project has been terminated prematurely.

4.4.1 The respondents

This section provides a brief description of the backgrounds of the respective respondents along with their own perception of their respective IT competences, with the focus being on their degree of interest in technology.
Respondent 01 from ward O
The respondent is a nurse by profession and has been working at this ward for approximately five years now. The respondent describes her IT competence as being above average compared with other nurses, being able to learn new technology with ease. Previous to her employment at this ward, she had been working at a newspaper, where she gained a lot of knowledge and experience in handling computer systems and as such feels herself at home among the various systems she gets to work with. As a teenager, she has been an avid blogger, learning the tricks of the trade as she went along like working on design and layout, in addition to testing and making use of various photo editing software. Having been exposed to computer lingo and logical thinking from an early age, she is used to finding her way around on computer screens, even though she is of the opinion that IT systems used in healthcare are not as user friendly as other more common systems.

Respondent 02 from ward O
The respondent is also a nurse by profession and has been working at the ward for approximately five years now. After the completion of her nursing studies and previous to her employment at ward O, she has worked at other clinics at the same hospital, including the rheumatology clinic and medicine clinic. The respondent describes her IT competence as being quite adequate. She possesses a basic understanding of how IT systems work. She is not very much involved nor interested in the emergence of new IT systems and technology, but is overall accepting of change with regards to eHealth.

Respondent 03 from ward O
The respondent is an auxiliary nurse at ward O. She has had previous experience in pedagogics before she changed her career path and decided to study to become an auxiliary nurse. When asked about her IT competence, the respondent was clear to point out that she is not very fond of computers and other information technology. She has the skills to handle the technology used in her daily work at the ward in an adequate way, but prefers not to use information technology unless it is essentially required of her. She is however, accepting of the changes in technology related to healthcare, as she points out many other professionals are.

4.4.2 A day at ward O
Every day at the ward is a unique one, however there are repeating patterns of each day. The ward is active every day around the clock and is divided into three shifts: morning, afternoon and night shifts. On a typical day, the morning shift starts at a quarter to seven. The staff beginning their shift receive a report from the staff working the night shift and are divided into teams accordingly. Each team is responsible for approximately six patients at any given time. When divided into teams, the nurses and auxiliary nurses start attending to their patients, providing them with the care and help they need. The primary responsibility of the auxiliary nurses in the morning is to assist the patients with their personal hygiene and sanitary needs while the nurses are primarily responsible for administering the correct dosages of prescribed medications to the patients. In addition to these morning routines, both nurses and auxiliary nurses help patients with
mobilization of extremities. Breakfast is then served to the patients by the auxiliary nurses at 8 o’clock.

After breakfast, it is time for rounds. This is when nurses, auxiliary nurses, physiotherapists, occupational therapists and physicians come together to discuss and plan the healthcare routine of the patients for the day, what needs to be done for specific patients with certain specific conditions or changes in their health. After rounds, the nurses and auxiliary nurses administer care and carry out the decisions that have been taken during the rounds. When the planned activities are undertaken, the nurses then take care of all the administrative tasks. This includes discharge of patients, inspection of wounds, booking taxis for discharged patients and so forth. If a patient lives at a nursing home, some health record documentation is made through a system called MEDDIX in order to provide the home’s healthcare staff with information regarding the patient’s health. Furthermore, nurses and auxiliary nurses maintain the health records of the patients using COSMIC, transferring notes from paper to the electronic health record (EHR). After lunch, the nurses administer medications to the patients and write reports in COSMIC for the next shift that starts at three o’clock in the afternoon. The afternoon shift is much like the morning shift, the workload varying in accordance with the number of patients and the amount of care needed. A typical day is very much based around routine, however.

The need for ICT varies greatly when one compares nurses with auxiliary nurses at the ward. Nurses spend a great deal of time in maintaining the patient health records, while the auxiliary nurses primarily use ICT for documentation of vital parameters (better known as MEWS). MEWS stands for Modified Early Warning Score and is a tool used for assessing patients’ vital functions so that deterioration of status can be detected early and the adequate treatment initiated. At times, the MEWS is communicated verbally to nurses, who then transfer this information to the EHR COSMIC. This practice is quite common in spite of the legal ramifications of it being well known to the healthcare providers. All personnel at the ward have undergone an obligatory course that focused on the SITHS-card, its usage and the rules and regulations surrounding it. Moreover, it is common knowledge that a healthcare provider is personally responsible for all the entries that he/she makes in the journal and to ensure that no other person has had access to his/her login information and user account (refer to 4.1.4).

This is ignored for practical reasons, usually because it is quicker to ask someone already logged in to make entries in the patient’s record. Also, as a result of the availability of a limited number of stationary computers at the ward, which are often occupied either by other staff members or students, the verbal communication of MEWS to a colleague is sometimes the only option in order to get the work done, instead of spending time in waiting for a computer to get free. With the implementation of the COSMIC Nova Ward pilot project, this problem was partially solved. Instead of having to wait for any stationary computer or laptop to get free, the auxiliary nurses could make use of the tablets to directly enter the MEWS into the EHR. This also alleviated some of the bottleneck effect surrounding the available stationary computers.
The SITHS-card is described to be used on a daily basis by all of the ward’s healthcare staff. Respondent O1 and O2 from ward O expressed that, even though it is used everywhere and for almost everything, it is easy to forget it when the work pressure is high and patients are in need of assistance. Respondent O1 also recounted the countless number of times when she had left her SITHS-card in the stationary computer and ran out to run an errand or attend a phone call, in the process being locked out of the ward and having to ring the bell in order to be let back in again. All the respondents were unanimous about the SITHS-card being a document of value and the importance of having it on person at all times, so as not to inconvenience oneself and others.

4.4.3 Experiences and expectations regarding COSMIC Nova Ward

Previous to the initiation of the pilot project involving COSMIC Nova Ward, the nursing personnel at Ward O had a specific patient care planning system that worked well, especially in this ward and both its units (the emergency and the elective units). The patient care planning system comprised of an A4 sheet called the “report sheet’. The report sheet was a template that contained information such as the name of the patient, gender, age, when they arrived at the ward and for what purpose, what they had been operated for, past medical history, what was required to be done for each patient, how many hands were needed to do what had to be done, do they take medicines on their own or if they have to be administered medicines, what their specific blood values are, what is done and what remains to be done when a patient is to be discharged etc. All of the nursing personnel were provided with this report sheet at the beginning of their shift, which helped them not only in getting a good overview of the patients that they were in charge of, for the duration of the shift but also in performing the various care activities. The report sheet allowed for entering the vital parameters for patients as well as for the personnel to strike over the care activities already performed or take their own notes on the condition of the patients, which they could then enter into the patient journal at the end of the shift or whenever they had the time to do so. With the introduction of COSMIC Nova Ward tablet, the A4 paper took a back burner, as all the nursing personnel made a conscious effort to make use of the tablet instead of the report sheet. However, they soon started experiencing issues that interfered with their way of work at the ward and the tablet started becoming more of a burden than a resource.

All the respondents at Ward O were unanimous in their opinion regarding the complicated process of logging in to COSMIC Nova Ward tablet. The login was possible only at a specific stationary computer at the ward, where all the personnel beginning their shift had to wait in turn to be able to login to the tablet. Not only was it time consuming, it also generated a password that was only valid till 6 o’clock the following day. Though this did not affect the people working the morning or afternoon shifts much it did cause unnecessary inconvenience to the personnel working the night shift. Since the night shift ends at 7 in the morning, all the night shift personnel were forced to login twice in order to continue working till the end of the shift and present their report to the morning shift personnel. This was a known cause of dissatisfaction among the personnel.
According to respondent O1, the patient overview on the COSMIC Nova Ward tablet was not very comprehensible, as it involved a lot of scrolling and clicking on the various fields to get to the actual patient information, which earlier could be accessed with the help of a single cursory glance at the report sheet. Also, there was no easy way to enter one’s own notes or to strike out care activities that had been performed. The respondents also mentioned the application hanging or getting suddenly logged out of the tablet, not only because of a period of inactivity but anytime, even while using the tablet.

When it came to the nurses, the tablet did not allow for much of the administrative tasks that they actually had to perform in their daily routine, e.g. in case a patient is to be discharged, one could not see whether their recommended medication is complete, whether some means of transport has been booked whether all their test results are in order etc. As respondent O2 put it:

“During the pilot project, the tablet was absolutely not fully furnished with all the functions that I needed to perform which meant that I still had to use the stationary computer to perform all the administrative tasks and it led to a great of double work. That is one of the reasons why many of the nurses just stopped using the tablet. However, the auxiliary nurses used the tablet to enter most of the blood values and controls that they took. They could use the tablet to perform this task easily and did not need to use the stationary computer. So in their case, it did work better providing them with the functionality they required.”.

Respondent O1 agrees in that the tablet did provide opportunities for the auxiliary nurses to read the journal entries and enter the MEWS into the journal especially when there was a shortage of stationary computers at the ward, with students making use of them. Respondent O3, who is an auxiliary nurse supports this argument that the tablet did make things easier for them, as they did not need to search around for a stationary computer to do their tasks and could do almost everything on the tablet.

Respondents O1 and O2 further clarified that there was no way of making journal entries in the tablet, which is a large part of their work, making, updating and maintaining journal entries. In the absence of this functionality, the respondents made use of the tablet’s functionality of entering one’s own notes pertaining to different patients. This although not a journal entry, is seen as a form of communication amongst the staff members, so as not to miss out on small details about the patients that could have large consequences. The tablet allowed for making minor modifications in the patient care planning in the form of enter your own notes. However, since there was no easy way to enter these notes without avoiding a particularly large number of clicks, both respondent O1 and O2 were of the opinion, that this functionality was also soon abandoned as it failed to improve communication in any remarkable way. Furthermore, the tablet did not allow for reading test results or checking out x-ray images previously ordered by the nurses, neither did it allow for the viewing of the medication administering lists, which both respondents O1 and O2 agreed upon were very important tasks and needed to be performed at the stationary
computers. The report sheet used previously gave a better view because it was updated in real time with any details that were noteworthy for particular patients. All of the functionalities mentioned above, that the tablet did not afford to the user, are available in COSMIC on the stationary computers.

Respondent O1 further narrated that "The tablet is rather large and bulky, and my work being mostly physical in helping the patients move around and mobilize, a lot of bending and kneeling involved, I’m always afraid I’ll damage or even break the tablet. So in many ways, it gets in the way of my work.". Respondent O2 agreed, pointing out that the report sheet used previously could easily be folded and put in one of the pockets along with the plethora of things that they already carry around in their pockets. She even clearly pointed out that although the tablet is small in size and is meant to increase mobility, it is still not in the same size category as a smartphone, making it a little difficult when handling the tablet with wet hands. Both the respondents pointed out the practical difficulties of handling a tablet in their work environment, which is remarkably different from the environment in a test laboratory.

Respondent O1 had a very clear opinion of why the tablet did not work at their specific ward, in comparison to if it had been introduced in some other ward. She felt that the pilot project resulted in a failure at Ward O mainly because, they already had a very well-functioning patient care planning system, which everyone was not only used to but which was effective as well. Upgrading to COSMIC Nova Ward felt in many ways more like a downgrade than an advancement or improvement as a result of all the practicality and functionality issues named above. She was clear to state however that "Ward O was a very tough ward to test this pilot project in. It would probably have been a huge success in some other ward which did not have a well-functioning system that worked."

Enquiring about their expectations from a functioning mobile platform, respondent O1 wished for the patient overview on the tablet to be a lot more detailed so as to avoid the large number of clicks required to get to the information required. She was however uncertain of how this could be accomplished without making the tablet even bigger. With regards to the login process, respondent O1 wished to make the process somehow quicker and more effective by for example being able to identify oneself using the SITHS-card albeit with the help of a mobile device, i.e. utilizing the near field communication properties in the SITHS-card to log in.

Respondent O2 on being inquired about her expectations from a functioning mobile platform was clear that she wished the mobile platform to provide all the different roles with the functionality that they required in their daily work, which could make the platform a valuable asset to the entire organization thus increasing effectivity. She was of the belief that after an initial wave of resistance, everyone starts getting used to any new technology, stating that "it is a matter of habit". Respondent O2 was also very positive to the role that the tablet’s camera could hold in their daily work, if used to take pictures of wounds in various stages of recovery and directly being uploaded into the electronic health record.
4.5 Ward N

Ward N is one of the wards that fall under a larger clinic that is responsible for investigating and treating patients with renal diseases and chronic renal failure. Ward N is a combined kidney and rheumatology ward, the primary purpose of which is to investigate, diagnose and treat patients suffering from some sort of kidney disease. However, since it is a combined ward, patients with rheumatological diseases are investigated, diagnosed and treated here as well. The patients are mostly referral patients referred to the Ward by healthcare personnel at the primary healthcare units. The implementation of the mobile platform COSMIC Nova Ward has, thus far, been described as a success at Ward N by one of the IT-strategists at Region Östergötland. There have however, been some issues with regards to the dependability of the system, including the application shutting down or crashing unexpectedly and the users being logged out unexpectedly.

4.5.1 The respondents

This section provides a brief description of the backgrounds of the respective respondents along with their own perception of their respective IT competences the focus being on their degree of interest in technology.

Respondent N1 from Ward N
Respondent N1 is a nurse at Ward N. She is one of the most experienced nurses interviewed during this study. After having completed her education to become a nurse almost 25 years ago, she has gained professional experience working in wards and clinics specializing in cardiology, rheumatology and endocrinology. Her career at ward N began approximately 16 years ago and she currently holds the post of "instructions nurse" at the ward. As an instructions nurse, she is responsible for overseeing all other nursing personnel and making sure that everybody knows what to do, when to do and how to do it. Not only has the respondent been immensely involved in the pilot project involving the introduction and implementation of COSMIC Nova Ward in this particular ward, she has also been the driving force behind making this ward paper free. The respondent describes her IT competence as good, although she does point out that she is self-taught. She belongs to a generation that did not have access to computers and technology in the same measure as the current generation and all that she has learned has been with her own efforts and growing interest in medical information technology. She views technology in the field of medicine as being favourable, having many positive effects and thus in her opinion, she has not had a very difficult time learning everything.

Respondent N2 from Ward N
Respondent N2 is a nurse at Ward N. After completing her nursing studies, she started working at ward N and has been working here since the past 6 years. The respondent describes her IT competence as above average. In her opinion, she is not one of the super users of any of the systems used at the ward. She does however manage to solve the simpler IT-related problems before calling in for help. As an example, if COSMIC doesn't start then she would try and get it
started herself, calling the technical support team only if all her efforts to restart it failed. She makes use of social media but is not overly active on it.

**Respondent N3 from Ward N**

Respondent N3 is an auxiliary nurse at Ward N. She has been working at the ward since the past 10 years. Starting her career in the telecom business, right after high school, she then decided to study to become an auxiliary nurse. The respondent describes her IT competence as medium. In her opinion, she is not one of those people who are very interested in IT or the usage of it, however she makes do and gets well along with the systems she works with at her place of work. She views the IT-systems around her as good resources that have been put out there to provide assistance in her daily chores and making work effective.

### 4.5.2 A day at ward N

The respondents who were interviewed for the purpose of the study have different roles at the ward and work at different times of the day and night. The overall functioning of the ward does not differ much over a day, however, there are slight differences in the activities performed by the various healthcare personnel during the day and the night. The work at the ward is performed by teams of healthcare personnel working different shifts. These teams include physicians, nurses, auxiliary nurses, physiotherapists and so forth and usually work 8-hour shifts (morning shift, afternoon shift and night shift) during a 24-hour period.

A day at the ward usually begins with a small meeting where the team working during the night provides the team starting work in the morning with an overview of the condition of the patients during the night, with important notes regarding specific patients. Each individual on the team is assigned their patients and a short go-through of what needs to be done during the shift is also provided. With this overview, the team starts its work with a daily monitoring of the patients' vital parameters, also known as MEWS. At this point the auxiliary nurses help the patients who require help in getting out of bed, seeing to their hygiene needs, helping them to dress up and to get ready for breakfast. Breakfast is served to the patients in their rooms or in the common area depending on the general condition of the patients. After the patients have eaten, the team has breakfast and gets on with the next stage, that of going on a round of the ward. The rounds are done in conjunction with the physicians who are primarily responsible for coming up with diagnoses and deciding on the course of action to be taken with regards to every patient. If an auxiliary nurse is not present during the round because she/he has been taking care of a patient, the head nurse makes sure that the absentee auxiliary nurse is updated with the course of action. The nurses and auxiliary nurses take part in the rounds taking blood work, checking blood sugar levels, administering medicines and so forth. Everyone at the ward starts working on and helping the patients assigned to them. At times, an extra pair of hands is required so as to provide the patients with the care they require, as a result there is a lot of movement in the ward with everyone helping everyone, making sure the entire ward functions as it should and that all the patients are receiving the care they require. With this, the personnel begin preparing for lunch. When the patients have
eaten, some are sent off for scheduled investigations or surgeries, some for dialysis, while the ones recuperating from surgery stay behind at the ward, where there every need is tended to. The vital parameters of the patients are taken once again, medicines are administered etc.

The work process during the night shift is essentially the same as the morning or afternoon shifts, with the exception that no meals are required to be served to the patients. The afternoon shift personnel provide the night shift personnel with a report of the patients, to give an overview of the patients and what they are in the ward for, any underlying conditions that need to be thrown light on. The nurses and auxiliary nurses then visit all the patients in order to assess their current state and to ask them if they require any help and also to tell them that they will be monitored during the night by the staff on duty. In addition to assuaging the patients’ requirements, they administer medicines if required, antibiotics (or antibiotic mixtures), take tests, administer injections and infusions etcetera. With the patients tucked away for a good night’s rest, the personnel return to their tasks of putting everything in order, cleaning and organizing and preparing for another new day at the ward.

After talking to the respondents, it became clear that there was a significant difference between the administrative functions of the nurses and the auxiliary nurses. The nurses are responsible not only for maintaining the health records of the patients in their care, but also keeping it as updated as possible at all times. Every significant action performed while providing care to the patients’ needs to be clearly stated in the journal. This is done, so that other people involved in the patient’s care and accessing the journal have all the correct information at all times. Each action, related to the patient’s care needs to be retraceable back to the actor. This helps to avoid mistakes, reduces risks and works towards building a safe and secure work environment, not only for the patient but also for the healthcare professionals.

The SITHS-card, as aforementioned, is a very important artefact that is used by the healthcare personnel working at both the wards. At the start of the day, the SITHS-card is what they require to enter the ward, it acts as a key that opens different doors like the door to the toilet, the door to the personnel room and the door to the medicine room and so forth. When asked about their opinion on the importance and usage of the SITHS-card, the respondents were quick to point out that it is very important to have it on person at all times. Otherwise, as respondent N1 points out “If you show up at work without your SITHS-card, you might as well just go back home. Because you are not going to survive your shift, let alone get anywhere without it”. Respondent N3 was even more explicit about the consequences of forgetting the SITHS-card. According to her, “If you forget your SITHS-card, you are really screwed as it is used everywhere and for everything”. Respondent N2 pointed out that one could not even use facilities like the WC if one did not have the SITHS-card. Respondent N2 also agreed with respondents O1 and O2 (refer to 4.4.2) in that it is very easy to misplace and forget the SITHS-card which can be quite dangerous at times as well. She went to relate an account of how once when she was the lone nurse working the night shift and was inside the medicine room that a colleague called her to look at a patient whose condition was deteriorating. So, she ran out of the medicine room, forgetting that her SITHS-card was still inside.
As soon as she went out, the room automatically locked and since she was the only nurse on night shift, she was the only one with authorization to enter the medicine room. There was no one else who could let her in to retrieve her SITHS-card, as the rest of the personnel did not have authorization to enter the medicine room and as such could not open it for her. At that time however, she was able to resolve the issue by making use of the old key card retrieve her SITHS-card.

All the administrative work done around the ward is dependent on the usage of the SITHS-card; it is essential for gaining access to the healthcare records of the patients. Reading and writing into the patient journals is possible only through the use of the SITHS-card. In emergency situations, nursing staff disregards laws regarding patient data in order to access patient information needed for adequate medical action. This means that nurses and auxiliary nurses sometimes uses devices where colleagues to access the EHR. This is never done without the explicit consent from the person already logged in, however.

The respondents make use of COSMIC Nova Ward for a number of activities, that they usually would have had to use a stationary computer or a laptop for before. They put in all the vital parameters, like temperature, pulse, blood pressure, directly in the system and check off the tests and controls conducted from the checklist. If a nurse or auxiliary nurse deems something to be of great importance, they put it in as notes, or reminders along with the patient data so that the individuals on the next shift can take note of and monitor the patient more than usual.

Of all the duties performed at the ward, the nurses are responsible for putting in drips for the patients, administering medicines, taking up contact with home service providers and other clinics which may be involved in the care of the patients, in addition to maintaining a clear, concise and updated patient health record. The primary function of the auxiliary nurses is to look out for the welfare of the patients, help them in performing their everyday functions like getting out of bed, dressing up, looking to their cleanliness and hygiene et cetera.

4.5.3 Experiences and expectations regarding COSMIC Nova Ward

Respondent N1 describes that COSMIC Nova Ward has improved the patient safety and the continuity of care provided at the ward, i.e. that the mobile platform has standardized the work processes. Moreover, respondent N1 describes that despite some issues with functionality, there has been vast improvements as a result from the active work with removing handling papers since documentation in the form of paper was a great source of information anomalies.

N2 describes that much of her work is administrative tasks. It is estimated that it takes up to 50% of her workday in her role as a nurse. Many of these work tasks involve the mobile platform. Although she was opposed the mobile platform in the beginning of the pilot project, she has become accustomed to the routines surrounding it and sees both benefits and disadvantages with using mobile devices and the mobile platform. N3 experiences many advantages with using the mobile platform in her work as a nursing assistant. She experiences that there is less need for
meeting with nurses since the nurses now only needs to look at the notes and measurements taken
by the nursing assistant in their mobile devices. Moreover, there is functionality to add reminders
for nurses and auxiliary nurses. N3 describes that:

“You can type a reminder that this one [the patient] needs this nutrition beverage three
times per day and you can tick [the checkbox] so there is no need to ask if he [the patient]
has got this or if you [a colleague] has done it One can see that it is ticked and that it is
done.”

This means that there are improvements with regards to asynchronous communication all the
while decreasing the need for synchronous communication.

There is, however, still some need for the old method of using pen and paper. N2 admits that it is
useful to use pen and paper when she has not been to work for some time, e.g. due to sick and/or
maternal leave. Moreover, N2 describes that there are too many steps in the mobile platform:

“When I go in blank [without knowing the patients], there are too many button presses
to come in [in the system] and ‘Oh, that’s right, you [the patient] are here because of this
and you have this background’ [...] so that there are many tasks. When we had papers,
everything was in the same place. When I have worked, one shift is enough, then I know
the patients. Then I think it works great!”

Respondents N1 and N2 have very different perspectives on the ability to read on mobile devices.
N1 describes that the mobile platform has improved readability while N2 claims that there is too
much text for the display of the iPad MINI to present. N3 did not experience any real difference. It
is important to point out that the administrative tasks of maintaining the patient journal is less
substantial part of the auxiliary nurses’ job description in comparison to the nurses’ job
description.

Before COSMIC Nova Ward pilot project, each member of the healthcare staff had their own paper
sheet with notes of patients. Vital parameters taken during morning rounds (8–9 o’clock) could
not be put in the journal until just before noon, according to N1. N2 notes that the mobile platform
contributes to improvements with regards to readability, i.e. that it is clear how one should treat
the patient. This readability is assisted further by the different coloured circles used in COSMIC
Nova Ward that indicates if a patient is in isolation, vulnerable to infection or if they should not
receive CPR.

There are however, some difficulties with the mobile platform in terms of functionality and
stability has been described by all of the respondents at Ward N. N1 describes that there are
difficulties with “recurring activities”. For instance, when one wants to put in that vital parameters
three times per day and then change it to two, one has to delete the recurring activity and put in a
new one. N2 describes that it is easy to accidentally strike off tasks from the checklist and that
tasks marked as done takes up a substantial amount of space. Overall, N2 believes that there is too much information in too little space, making it difficult to sometimes read and navigate through the information on the small screen of the iPad Mini. Respondent N3 describes that the tablet does not allow entering of notes anywhere in the patient journal, only at very specific places. As a result, she is forced to make certain notes on paper and then transfer them onto to the journal using a stationary computer, which means double the amount of work and thus time wasted.

When asked about their future expectations from mobile platforms in healthcare, respondent N1 stated that she would prefer being able to sign journals in the mobile platform, something she now needs to do on a computer. She expects that the developer of COSMIC Nova Ward, Cambio, solves the authentication for the mobile platform so that this function can be afforded in a future iteration. She also hopes that a mobile platform similar to the one used by nurses and auxiliary nurses will be released for physicians so that they can get information asynchronous, similar to the current information exchange between nurses and auxiliary nurses. Moreover, she wishes that the quality assurance system (a system that collects data from healthcare for evidence based assessments of healthcare) will be available for the mobile platform. N2 wishes that patients should be able to use mobile devices, e.g. when specifying preferences regarding meals. There should also be improvements with regards to striking tasks from the checklists as there is no need for completed tasks to remain in the checklist for the entirety of the day. It would not surprise N2 if there were more utilization of monitoring of patients via cameras and increased possibilities for patients to affect their treatment. N3 expects more utilization of speech to text technology and of cameras on the mobile devices, e.g. pictures of wounds.

Overall, nurses and auxiliary nurses at the ward are both positive and negative towards the mobile platform, according to N2 and N3. Generally, healthcare providers from other wards coming to work at Ward N are hesitant to the mobile platform and prefer to use paper, as well as nurses and auxiliary nurses who have been on leave. The healthcare staff who are used to working with COSMIC Nova Ward are leaning towards being positive to it, although the attitudes towards it vary among individuals at the ward according to N3.
5. Analysis

In this chapter, we analyse the data collected and described in the previous chapter with the help of various theories, that may support or refute our argument regarding the usage of mobile platforms in a healthcare setting. Here we have chosen to incorporate the theoretical framework with the facts deemed relevant for the study from the Empirics chapter, as we believe it makes it easier for the reader to follow our line of reasoning.

5.1 A glance at the research questions

Before we present the themes used in the analysis of this study, we would like to reiterate our research questions since they are to be answered through the discussion conducted in the following sections.

- What are the perceptions, experiences and expectations of nursing care providers with regards to the usage of mobile platforms?

- Are there any discrepancies between the experiences of the nursing care providers and the policies and legislations in this regard?

Moreover, we would like to reiterate how these questions relate to one another. This relation is depicted in Figure 5.1. The groundwork established from a discussion around the first question regarding perceptions and expectations of mobile platforms is used as a foundation to build a discussion around the second question, which in turn deals with possible discrepancies between the perceived reality of healthcare staff and the policy documentation on eHealth and the studied artefact.
5.2 Selection of themes

In this section, we present the themes identified by us. The identified themes are based on Ryan and Bernard’s (2003) four steps of identifying themes (refer to 2.4.3 Thematic analysis). In order to identify the themes, we searched for recurring topics and/or patterns that surfaced in the empirical data as well as the theoretical framework, both of which are derived from the original purpose and research questions. This sorting of empirical data may be categorized as what Ryan and Bernard (2003) call the “cut and sort” technique. Using the cut and sort technique, the researcher looks for patterns in his/her theoretical as well as empirical material.

An analysis of the empirical data collected, brought to light many recurring issues and problems related to the usage of mobile platforms in the healthcare setting studied. A number of strengths and weaknesses of the system under observation as perceived by the healthcare personnel using the system were also elucidated during this process, in addition to many of the practical usage issues related to other Information Technology artefacts. In the sections below, we attempt to highlight and analyse all the issues identified and deemed as relevant for the purpose of our study.
We even feel it pertinent to mention all other practical issues associated with a healthcare setting so that the reader is able to comprehend the actual nature of the work involved as well as the workload and work processes.

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*Table 5.1. Themes and areas of discussion*

**5.3 Focus on mobility**

This section is dedicated to discuss the different artefacts that are scrutinized in this study. The main focus is on COSMIC Nova Ward, but we see that there is relevant to discuss some of the other artefacts in the everyday life of the healthcare staff at the two studied wards. The approach angle when discussing these has been on mobility and how they affect the mobility of the healthcare staff.
5.3.1 SITHS-card

In addition to the wholly physical usage of the SITHS-card, it is also what provides the personnel with access to any patient data they require access to. Even then, the rules regarding who can access which patient's data are clear cut. The individuals accountable for maintaining journals (regulated in 3§ 3rd chapter of the Patient Data Act (2008:355)) are healthcare personnel who have authorization or a mandate to practice a certain profession. It is paramount that only personnel responsible for the care of specific patients access data pertaining to those specific patients. For a staff member to access information pertaining to a patient not under his/her care would be an infringement of the Patient Data Act's 4§ of the 3rd chapter. Despite of this, there were instances of this conduct at both of the studied wards. Based on section 4.4.2 and 4.5.2 (descriptions of the everyday activities at both wards) the SITHS card serves multiple purposes, e.g. key card, authentication and identification. This makes the SITHS card an absolute necessity in the healthcare staffs' everyday work and is a necessity for using COSMIC Nova Ward since it is required when logging in.

All access to patient data is required to be retractable, i.e. one should be able to clearly ascertain which individual has accessed a certain data pertaining to a certain patient. The primary reason behind this is to establish and maintain transparency in healthcare so as to ensure that the citizens trust the healthcare system. This means that the SITHS card is means of affordance, deriving from the definition of affordance by Goldkuhl (2008). Moreover, it also affords login as a means of the so-called two-factor authentication.

As mentioned above, the usage of the SITHS-card provides the healthcare personnel with the opportunity to use the other Information and Communication Technology artefacts present at their place of work.

5.3.2 COSMIC Nova Ward Whiteboard

The COSMIC Nova Whiteboard (refer to 4.2.3) was quite well liked and used at both the wards, as it generated some real value for the nursing personnel. It was described as serving the function it was intended for. The staff at both the wards described the board as one the first things that one would look at when they arrived at work. The board was located centrally at both the wards and was described as providing a good overview of the patients that were being treated at the ward, with some additional information such as which team is responsible for which patient etcetera. A passing glance at the board was described as being sufficient to provide the information required. One could however, also use the board if one needed additional information pertaining to the patients, or the teams responsible for them. All in all, the nursing personnel at both the wards seemed to be satisfied with the Nova Whiteboard.
5.3.3 COSMIC Nova Ward Tablet

The hardware used for the Nova Ward tablet is an iPad Mini, which is quite small in size, the reason behind it being that it should be able to fit into the already full pockets of the personnel using it. The purpose of using the Nova Ward tablet is partly to increase mobility so that the nursing personnel can perform many of the activities that they perform in their daily routine at the bedside of the patient.

Despite these intentions, there are multiple instances from the two wards where the tablet has been inhibiting the mobility of healthcare staff. This is especially true for the auxiliary nurses, who have a much more physical work in their everyday work compared with nurses. This includes lifting the patients, helping them with their personal hygiene. Respondents at ward O especially described issues when using the tablet, stating that the size of the tablet was too large to fit their pockets and too small to be able to not appear cluttered. In this case, we see a clear discrepancy when comparing the description of COSMIC Nova Ward (refer to 4.2.3) with the experience of the respondents. They described inconveniences with regards to the size of the iPad MINI, stating that its size and weight caused it to fall out of the pocket and that it sometimes was in the way when tending to the patients.

The usage of the tablet is in line with some of the eHealth strategy for nurses described by Ahonen et al. (2016), namely that nurses should use so called "smart devices" for healthcare documentation and thus also data collection. There is, however, little or no emphasis on the physical aspects of the artefacts used for keeping and reading of patient’s health records.

There are tremendous expectations surrounding what mHealth and mobile devices can achieve in healthcare. Levy et al. (2012) mentions that mobile technology has the potential to promote efficiency in healthcare. We see that technology, such as COSMIC Nova Ward has the potential to provide healthcare staff with the means to perform their activities faster and make the information in the electronic health record more accessible. There are, however, problems with regards to mobility of the hardware in a way that makes some of the nursing staff inconvenience. Levy et al. (2012) views mHealth as tools, and we therefore see no need to make a distinction between hardware and software when discussing the e- and mHealth phenomenon as it is not of any relevance to the nursing staff; they are only interested in what the tools (hardware and software) can offer them in assisting in their daily work activities.

5.4 Information comprehensibility

Our experience of the two wards studied for the purpose of this study, in addition to the insights gained into the healthcare providers perspectives and their work processes, led us to the conclusion that patient care is an information centric job. A lot depends on the information surrounding patients, information that is both old and new. It is this information that allows the healthcare personnel not only to provide care but also to make informed patient healthcare decisions. Our argument regarding the importance of information in healthcare is supported by a
survey conducted by the Medical Records Institute (now known as the mHealth Initiative) in 1999, that states that improving the ability to share patient information among healthcare providers is one of the deciding factors that affect physicians and clinicians drive to incorporate information technology into their practices (Noffsinger, et. al., 2000). Therefore, it is of paramount importance that all information pertaining to the patients be as accurate as possible so as to minimize the possibility of mistakes and errors, as mistakes in a healthcare setting can have dire consequences. Not only is it important that this information is correct and accurate, it should be updated and timely as well. With the usage of ICT systems in the field of healthcare, this information now being available to a large number of users in real-time, the reliability of this information holds an even higher value than ever before. Noffsinger, et. al. (2000) support our argument regarding the accuracy and reliability of all information in a healthcare setting by stating that for information to fulfil its purpose, it is paramount that it is timely and reliable. Kisilowska (2006) also emphasises the importance of information in healthcare, especially in relation to nursing personnel by listing information and documentation of nursing care as two of the core components viewed as representatives of the quality of nursing care.

5.4.1 Information overview

The nursing personnel at the two wards studied had greatly varying experiences with regards to the patient information overview that the COSMIC Nova Ward tablet provided. The staff at Ward N described the patient information overview to be a satisfactory one, with all necessary information pertaining to each patient being presented in the tablet. They described the information in the patient overview as being well-structured, with patients being colour-coded and the possibility of not only entering MEWS but also the entering of notes (both as a means of communication as well as information) (refer to 5.5), which fulfilled their requirements to a great extent. They even emphasized the actions or affordances (refer to Goldkuhl (2008)) that the tablet did not provide, for instance, viewing the medicine lists, viewing the lab results and especially not being able to sign off on medicines prescribed to the patients or document the care provided, directly from the tablet.

We believe that the Nova Ward tablet was accepted at this ward because of a variety of reasons. Before the implementation of COSMIC Nova Ward tablet, the staff members used a simple pen and paper approach to document the care provided to the patients. Everything was documented on an A4 sheet of paper and entered into the system when time was available to do so. Also, the staff members were required to attend the meeting at the start of each shift to get a report from the previous shift. A lot of reading was also involved in order to get to know the patients, which was typically done at the stationary computers or laptops available at the ward, which not only meant time spent away from the patients but also time wasted in looking for a stationary computer or laptop that was available to perform these important administrative tasks. With the introduction of the COSMIC Nova Ward tablet, many of these tasks were simplified and facilitated with a swipe of the finger using a tablet with proper fields for entering information, making it easier for others involved in the healthcare process to find and use this information. Thus, we believe that it was a lot easier for the healthcare providers at this ward to accept COSMIC Nova Ward tablet as it made
the performance of all such tasks much more effective and quicker, adding value in the form of communication in the form of entering notes. As Cresswell and Sheikh (2013) put it, the new technology was accepted as it proved to be more useful and offered greater relative advantages over the existing practices at the ward. In addition, the tablet was perceived as being relevant to the work processes involved and fulfilled the requirements of the healthcare providers to a great extent in accordance with the USE IT model (refer to 3.2.1).

A majority of these issues were also highlighted by the staff at ward O, in addition to laying emphasis on the amount of scrolling and navigation involved to get to the relevant patient information as a problem. However, we believe that having a previously functioning patient information overview system at ward O may have greatly affected the way in which the staff members perceived the COSMIC Nova Ward tablet. The report sheet used (refer to 4.4) previous to the implementation of the tablet, had been fully incorporated into their daily work routine and provided them with a good overview of all the patient data that they required at the start of their shift, in order to perform their duties. In other words, the report sheet fulfilled not only the requirements of the personnel but was also relevant to the care providers, in that it provided all the necessary patient information at a glance, which was made much more complicated due to the navigational issues on the tablet. The tablet was thus perceived as not fulfilling the requirements (refer to 3.2.1) of the healthcare personnel neither did it prove to be more useful or provide any relative advantage over their existing work processes as argued by Cresswell and Sheikh (2013).

5.4.2 Navigation issues

The nursing personnel at both the wards described the COSMIC Nova Ward tablet as being difficult to navigate. The standard hardware used to support the COSMIC Nova Ward tablet application is the iPad Mini. Not only is the screen on the tablet very small in comparison to the screens of the stationary computers and laptops, the information displayed on the tablet is customized to be favourable to the handheld experience of the device. With a large amount of information required to be displayed on a comparatively smaller screen, the tablet displays patient information differently than the other devices.

The design of the tablet is such that the various aspects of the patient information on the COSMIC Nova Ward tablet are displayed as separate tabs containing similar or relevant information residing under the same tab under a collective name representative of the particular common denominator. As an example, “my patients” lists all the patients that a particular user is responsible for, “check-ups” lists all the vital parameters e.g. blood pressure, blood sugar, temperature, etcetera of a specific patient with blank fields for the parameters that have not been noted yet. Similarly, clicking on the name of a specific patient displays more detailed information on the patient in addition to all the care activities performed and the care decisions taken for every patient. Due to the small size of the screen, the information is grouped together under different headings at different levels in the application. Due to this grouping of information, a larger number of taps or clicks are required in order to access more detailed information. Also, the deeper the user goes into the different information levels, the greater the number of taps that are required to
navigate back to the main page of the application. As a result, not only is accessing the information required and navigating back and forth experienced as difficult but also time consuming.

The nursing personnel at ward O had a hard time accepting these additional, time consuming steps (clicks or taps in this case) as a part of their daily routine, which lead to the gradual dismissal of the COSMIC Nova Ward tablet. We believe that this is attributed to ward O having a previously well-functioning report sheet system, that the nursing personnel could revert to, in case the implementation of the Nova tablet did not succeed. As Spil et. al. (2005) state, that an individual’s attitude lies at the root of user satisfaction. We believe that the nursing personnel were very satisfied with their previous system, which led them to quickly revert back to it as soon as things started getting out of hand with the Nova tablet.

The nursing personnel at ward N although also experiencing the same difficulties with regards to these additional time consuming steps as a part of their daily routine, still continued with the use of the tablet. The personnel at ward N, in addition to having no previously functioning system, also were at the time of the implementation working consciously towards making their ward a paper free ward, which in our opinion did not leave them with any choice but to accept the tablet and make the best use of it. Also, one of the instructions nurses working at the ward was a strong driving factor in making the ward paper free as much as is possible. With this role, she became one of the co-champions who played a pivotal role in not only making the ward paper free but also as a stakeholder championing the COSMIC Nova Ward pilot project at ward N, as mentioned in Forducey et al. (2005) and Seale et al. (2005).

5.4.3 Information fragmentation

The primary ICT system used for the storage of and access to patient information at both the wards is COSMIC, a product of Cambio. The information stored in electronic health records is essential for healthcare providers, not only because it enables them to carry out their daily work routines but also streamlines their workflow, facilitating decision making with regards to the provision of care (refer to 4.2.1). The aim of implementing the COSMIC Nova Ward tablet was to provide access to the information stored in COSMIC right at the bedside of the patient. However, the healthcare personnel at both the wards described the information in the Nova Ward tablet as being fragmented, or incomplete. This was because the tablet does not provide access to some information. Medicine lists could not be accessed using the Nova tablet, signing off on prescribed medicines was also not available as a function in the Nova, one could not order laboratory tests or x-rays from the tablet. Similarly, one could not read the laboratory test results or access the x-rays and other imagery that is accessible through COSMIC. Also, the tablet does not allow for healthcare documentation to take place directly from the tablet. We believe that these problems and issues are attributed to the fact that the tablet is still in the pilot phase, where continuous feedback from the users is used in order to improve upon the various features and affordances that the system provides to its users. This is also pointed out by Gulliksen and Göransson (2002) who emphasize the importance of user participation during the developmental phases of the information system under consideration.
In addition to the COSMIC Nova Ward tablet still being in a stage of development as a source of the fragmented nature of information experienced by the personnel at both wards, we were able to pinpoint another factor that we believe is responsible for this fragmentation to a much larger extent. At both the wards, in addition to COSMIC, a plethora of other systems having varying functions are used. These include LABROS, MEDDIX, LISA to name just a few. All these systems are connected to COSMIC so as to facilitate the work flow and are accessible from the stationary computers and the laptops. While working thus, the personnel find it extremely difficult to perform some of their administrative tasks on the tablet while the others are required to be performed on the stationary computers or laptops. As a result, the information in the Nova Ward tablet is experienced as fragmented or incomplete, since the care providers requirements (refer to 3.2.1) are not fulfilled using the mobile platform.

5.4.4 Temporal delays in patient information

The COSMIC Nova Ward tablet allows for certain entries to be made into the patient journal, however, the entries that it allows to be made are of a minor nature. As an example, it allows for MEWS to be added into the journal. It also allows the adding of notes pertaining to specific patients, however, it does not allow entering large amounts of patient care documentation directly into the tablet, neither does it allow the signing off on medications prescribed to the patients. In addition, the tablet does not allow the users (the nursing personnel in this case) to access results of previously ordered laboratory tests or imagery including x-rays.

At ward N, the patient notes entered into the tablet serve not only as documentation or reminders to oneself, but also work as a form of communication amongst the staff members. The notes help the nursing personnel to remember for example checking on a patient every two hours, in case a note has been put in to do so, or check a patient's blood pressure and sugar level hourly instead of three hourly, or book transport for a certain patient or order a special meal for a certain patient with certain allergies. At the end of the day, these notes have succeeded in serving two purposes, one is that of communication and the other is that of documentation. Every care activity performed is documented in the form of notes which leads to the patient information entered into the tablet being updated in real time at all times. The only condition being that all the personnel are required to use the tablet and update the patient information in real time, for this system to succeed. We attribute this development to the tablet not only becoming a source of effectiveness at the ward but also solving their communication problems and meeting the relevant goals of the staff members, as can be seen from the definition of relevance (refer to 3.2.1).

The personnel at ward O describe the entering of notes into the Nova Ward tablet as being a complicated process, involving a large amount of scrolling as well as a large number of clicks to navigate back and forth between patients. When compared to the report sheet previously used, not only is the entering of notes described as ineffective and time consuming but also as double the amount of work at the end of the day. They feel that instead of giving the staff more time with the patients, it takes away the patient time as first the notes are required to be entered into the
tablet and then into COSMIC at the end of the day in the form of documentation. Also, at the beginning of the pilot project, some staff members still kept on using the report sheet which resulted in the information present in the tablet being not only inaccurate but also unreliable. This led to temporal delays in the patient information existing in the application, as the information was neither updated nor reliable and communication was required to happen in person between the staff members. As a result, the effectiveness of the work processes was reduced which resulted in the gradual dismissal of the tablet and the gradual adoption of their former report sheet, with which all the staff members were not only familiar but comfortable as well. We believe that the COSMIC Nova Ward tablet did not fulfil the requirements of the staff members neither did it provide any specific advantage over their existing processes (refer to 3.2.1). Also, the new system failed to satisfy the specific needs and requirements of the staff members at this ward, which Michel-Verkerke and Spil (2013) consider to be one of the important factors leading to the success or failure of an information system.

5.5 The communication dilemmas

Documentation in healthcare is an absolute necessity (Schoop, 1998) and is mandated by law (Patient Data Act, 2008:355). Healthcare documentation is, above all, a tool for communication among healthcare staff (Schoop, 1998). In Ågerfalk's (2004) opinion, a communicative action is said to take place when someone tries to convey information with the intent of generating some response in the form of an action. With regards to the two wards, it is clear to us that the interactions between the nurses and auxiliary nurses directly or via the different eHealth systems are communicative actions, i.e. communications that are made with the intent of generating some sort of action. The kind of communication between the wards are very similar, as it is displayed in the descriptions of their everyday activities (refer to 4.4.2, 4.5.2). Even though the patient care provided at the two wards is different, the processes in which the healthcare procedures and the information documented in these processes are nearly identical. Therefore, we see that the explanation for the differences regarding perception of COSMIC Nova Wards stems from something other than the implementation of the system. The system's fit with the organizations is, of course, a part of the explanation but we would argue that there is a significant social aspect that cannot be ignored as our empirics have shown that it has a major impact on acceptance of eHealth solutions such as COSMIC Nova Ward.

5.5.1 Synchronous versus asynchronous communication

One of the strengths with regards to COSMIC Nova Ward is the affordance of asynchronous communication. At ward N, it was described to decrease the number of physical meetings and thus also the way healthcare professionals communicate with each other. The communication was described to be more efficient, especially the auxiliary nurse described that she experienced more freedom when she was able to communicate via an asynchronous communication channel.

There are however some restrictions to this in COSMIC Nova Ward, as notes about patients can only be made in designated places. Additional information about the medical condition of the
patient is instead made in COSMIC on the PC, which requires the healthcare professional to do the
time-consuming task of seeking out an available PC to log in yet again. This is avoided at ward O;
all additional notes about the patient can be made on the report paper sheet. The lack of available
resources in the form of hardware that facilitate ability to perform inputs in the electronic health
records makes the auxiliary nurses at ward O more dependent on the nurses, who are usually
already logged in at the available computers. Auxiliary nurses at ward O communicates
information directly to nursing staff (nurses or auxiliary nurses) already logged in on available
computers. This practice is also used at ward N but to a lesser degree. The person responsible for
a certain task also makes the input into the electronic health record, either via COSMIC Nova Ward
or COSMIC on the PC.

The communicative actions performed at ward N is therefore more asynchronous compared to
the ones performed at ward O. There is an experienced advantage when it comes to using the
asynchronous way of communication at ward N, especially expressed from the interviewed
auxiliary nurse.

Coiera (1996) suggest that inadequate communication is a large cause to inefficiency in
healthcare. Coiera concludes that there is a need to decrease the amount of interruptions in the
healthcare staff's work activities and sharing of information, something that is supported by our
empirical data. Ward N exhibited that such effects could be achieved via the usage of COSMIC
Nova Ward. Like it is suggested in Coiera (1996), the synchronous communication is a source of
interruption in healthcare staff's workflow since it interrupts them from what they are currently
doing. This kind of conduct is common at ward O, where auxiliary nurses often interrupt nurses
in order to inform them or inquire information. By utilizing asynchronous communication in the
journal either via Nova Ward or on the PC, nurses and auxiliary nurses can communicate
information that can be consumed at any time rather than synchronously.

In the goals for eHealth for nurses, presented by Ahonen et al. (2016), it is concluded that the
mission of eHealth should be to improve the quality of healthcare for the citizens through the
enablement of nurses' usage of eHealth. We see that asynchronous communication has the benefit
of lessening interruptions in workflow and therefore also improving efficiency of the healthcare
provided by the nurses given that they utilize the asynchronous communication channel provided
via the EHR-systems rather than communicating directly with each other as soon as they need to
communicate something regarding patients’ health.

5.5.2 New work processes and channels for communication

EHealth has become an integrated part in many of the daily activities performed by nursing staff
(Ahonen et al., 2016). The introduction of COSMIC Nova Ward included many changes regarding
work processes at the two wards, especially ward O. The respondents at ward O described that
there was a perfectly adequate work processes in place before the introduction of the mobile
platform and that the new communication and work processes that followed the introduction of
the systems was a liability rather than an asset.
By viewing this aspect in the light of the USE IT model described in Spil et al. (2005), we can see a difference in attitudes between the wards with regards to relevance (if the system is relevant for the user) and resistance (attitudes towards the implemented IS). To understand the difference, we would argue that one has to understand the predispositions of the two wards, i.e. how they worked before COSMIC Nova Ward. The attitudes regarding COSMIC Nova Ward Tablet, the resistance part of the USE IT model, will be further explored in section 5.6 in this chapter.

Spil et al. (2005) argues that relevancy by no means is equivalent with if a user views the system as "positive". The relevancy is rather what the users, in this case nurses and auxiliary nurses, expect from the system. In other words, what affordances they expect from COSMIC Nova Ward Tablet in terms of functionality. As it is suggested by Spil et al. (2005), the lack of relevance for the user is a major contributor to failures in IT projects in healthcare, something that can be alleviated by utilizing user participation during the development and implementation process. We would argue that there are no better suited individuals than healthcare staff when it comes to understand the practice of healthcare and we therefore see it befittingly that they are also involved as much as possible when designing systems such as COSMIC Nova Ward to ensure the relevancy of the system.

The requirement part of the USE IT model (refer to 3.2.1) is to ensure whether the information system is adequately fulfilling the needs of the user and is therefore a determining factor to the user satisfaction. In the case of COSMIC Nova Ward, there were distinct differences between the wards with regards to requirements. Ward O displayed a dissatisfaction with the system, wanting functionality from COSMIC for the PC in the tablet, while ward N primarily had issues with the checklist and authentication. The common denominator when it came to user dissatisfaction stemmed from system crashes of COSMIC Nova Ward, something that can be connected with resources in the USE IT model. By connecting the nurses’ and auxiliary nurses’ opinions from ward O with the USE IT model, we would argue that the dissatisfaction can be explained with that there is a discrepancy with regards to relevance for the user, i.e. what nursing staff at ward O can perform in terms of communicative actions (refer to Ågerfalk, 2004). Ward O wants to have all of the available communicative actions afforded on COSMIC for the PC in tablet form, while ward N expects COSMIC Nova Ward to be a complement to COSMIC for the PC. If the expectations of a system are different among the nursing staff at the two wards, then the user satisfaction will vary accordingly.

5.5.3 Temporal delays in user communication

By using the report paper sheet, information regarding health the patient cannot be entered in the electronic health record until much later. At ward N, it was described that information about the patient’s health taken in the morning could not be put into the electronic health record until around 11 A.M. With COSMIC Nova Ward, these inputs could be made instantaneously. The nature of healthcare is one of the most information intensive parts of the Swedish society (Socialdepartementet, 2010) and is an important and necessary part of healthcare (Schoop, 1998),
therefore we see it as a significant advantage to make real time changes in the electronic health record as it ensures the accuracy of the information therein. By using the paper report sheet, we would argue that there is a significant risk of increase of inaccurate information since there is a temporal delay of information inputs into the electronic record.

All in all, there are clear advantages with an information system like COSMIC Nova, in terms of decreasing temporal delays, which is supported by the empirical data from ward N (refer to 4.5.3). This is also in line with one of the goals for eHealth technology for nurses, described in Ahonen et al. (2016), where the availability of accurate information is a pronounced goal for eHealth. We see that the temporal delays, as the one exemplified in this study, could lead to information anomalies due to double documentation. In the case of ward O, where there was simultaneous documentation with COSMIC Nova Ward and the paper report sheet during the pilot project, there were examples of such conduct during the pilot project (refer to 4.4.3).

The real time information regarding patient’s health information is a great potential benefactor for healthcare professionals as it provides healthcare staff with more accurate information to make decisions from. As stated by the European Commission (2014), mHealth has the potential of enabling healthcare professionals to be more efficient and to make better decisions. We would argue that the delay caused by using the paper report sheet has potential damaging effects that can be solved by implementing a mHealth system such as COSMIC Nova Ward. This is in line with the eHealth strategy for nurses provided by Ahonen et al. (2016) that concluded that the mission of eHealth, in summary, is ought to be enabling nurses in their work and in doing so also improving the care provided to citizens.

5.6 Attitudes towards change

In this part of the analysis, we will compare the experiences and attitudes towards the digital working tools that we have surveyed in the studied wards, Ward N and Ward O. We have deliberately made little or no distinction between hardware artefacts and software artefacts used in the routines of nurses and auxiliary nurses (refer to 5.3.3). There are of course differences between the mobile platform COSMIC Nova Ward and the SITHS card, but we see it more important to discuss the artefacts as tools used in the daily activities and how they are perceived by the nursing staff.

During the course of describing the experiences and attitudes towards digital working tools, we compare strengths and challenges described by the two wards with regards to the studied artefacts and tie these observations to theory discussed in chapter 3. Theory.

In our opinion, the introduction and implementation of an information system into an organization is subject to a large number of factors. It is also expected to bring about changes into the organization, both major and minor.
5.6.1 Change as experienced improvement

A number of changes that the introduction and implementation of the COSMIC Nova Ward tablet brought about were perceived and experienced as being favourable and in turn leading to improvements in the existing work processes at the wards both individually as well as collectively. A few of the changes that were perceived as favourable and a discussion of why they were perceived as such follows below.

The COSMIC Nova Ward tablet gave the nursing personnel the opportunity to get some of the administrative work done right at the patients’ bedside, which was not possible earlier. The nursing personnel experienced that they were able to spend more time at the bedside of the patient and in providing them with the care that they needed, than they were able to previously as a result of the large amounts of administrative work that took time away from the patient. This was because the tablet provided the function of entering small amounts of data especially the vital parameters and small notes as reminders in real time. Reading the patient journals also became easier could be done at the patients’ bedside instead of at the stationary computers or laptops as was the case previously.

The nursing personnel at ward N also experienced that communication improved markedly with the use of the COSMIC Nova Ward tablet. Earlier they described as spending a great deal of time in trying to locate each other at the ward in order to communicate one small, albeit essential thing about a specific patient. They describe that a large amount of time, which could otherwise be spent wisely and usefully with the patients was lost in this process. With Nova, a single note or marking under the patient’s name did the trick, as the note was visible to all other personnel in charge of that specific patient and could be acted upon or considered when making care decisions for that patient. They also described communication as improved to a great extent between the auxiliary nurses and the nurses, who previously had to be notified every time an auxiliary measured the vital parameters of patients. With Nova, which allows the entering of the vital parameters directly into the tablet, the communication improved drastically as the auxiliary nurses did not require to locate the nurses in order to notify them of any changes in the condition of the patient, as every value entered into the tablet was then accessible to all the personnel in charge of a specific patient.

In addition to the above, the nursing personnel at ward N also experienced that detailed documentation performed at the end of the shift became easier and quicker, and more accurate. All that was needed was to check on all the notes, markings and vital parameter entries pertaining to a specific patient and write it into the patient’s electronic health record. Since the nursing personnel noted all care activities and decisions taken regarding a specific patient as notes, it was easier at the end of the shift to translate it into text and perform the documentation.

Since the Nova ward tablet fulfilled the requirements (refer to 3.2.1) of the personnel and even went a step further in improving communication at ward N, it became not only one of the means of communication but was gradually accepted and used, despite the design problems faced.
5.6.2 Change as experienced deterioration

The changes brought about by the introduction and implementation of the COSMIC Nova Ward tablet had both favourable and unfavourable reactions at both the wards. In this section, we describe a few of the factors that were perceived and experienced as unfavourable by the users of the system. Many of these factors that even led to the gradual dismissal of the tablet were of a design nature, while some of these were related to the usage of the tablet or how it affected work processes. Some of the issues that we believe were design issues are described below.

- The hardware used for the COSMIC Nova Ward tablet being an iPad Mini, the size of the screen is small, which means that a large amount of text is fit into a smaller area in comparison with the screen of a laptop or a stationary computer. As a result, the text on the tablet is experienced as being smaller and thus difficult to read. It was described as being especially straining on the eyes when one had to read large amounts of text.
- Another issue related to the size of tablet was that accessing the information required to provide care entailed a large number of clicks and a great deal of scrolling as well as many back clicks in order to navigate to the desired information.
- When entering text into the tablet, the users experienced difficulties in typing. They had to type every alphabet individually with one hand, making the typing of long texts especially challenging, especially when one is used to typing on a keyboard, which is much faster. The reason behind having to type each alphabet individually was that when the autocorrect option on the tablet was enabled, it resulted in various mistyped or strange word suggestions, which in turn led to mistakes while typing. The autocorrect option was then disabled as a solution to this problem, giving rise to another issue of having to type letters individually. Also, when in the pocket or as a result of an accidental touch, undesired and un-meaningful text could get typed into the fields meant for entering specific parameters, which gave rise to the possibilities of errors.
- At one of the wards where the work of the nursing personnel is more physical experienced the tablet as being bulky, heavy and clumpy. They described a constant fear of the tablet in their pockets getting damaged during all the bending and kneeling, as a result of which, they preferred to place it aside when performing these physical care activities.
- Another design issue that personnel at both the wards pointed out was that of getting logged out right in the middle of all the work and being forced to endure the entire login process again. They also described as the application sometimes freezing and not responding, making the user wait or restart.

In our opinion, the above factors led to the users feeling unsatisfied with the product, which was supposed to fulfil their requirements and reach all the relevant goals (refer to 3.2.1). Since the product could not achieve either, it became subject to dismissal at the aforementioned ward.

In addition to the above mentioned design issues that the users experienced with the COSMIC Nova Ward tablet, the nursing personnel at ward O described that documentation in the tablet was complicated and resulted in double the amount of work, when the more detailed and
complete documentation had to be done at the end of each shift so as to have an updated electronic health record. They were also not satisfied with the information overview that the tablet provided, which they described as requiring a large number of clicks and a large amount of scrolling, in order to navigate to the information required. They also experienced the login process at the beginning of the shift to be unnecessarily long and complicated, lasting only till 6 o’clock the next day, thus forcing the night shift personnel to perform the login twice in order to keep working on the tablet. In our opinion, the personnel at ward O experienced these issues, as the tablet did not fulfil their requirements (refer to 3.2.1) as well as the previously used report-sheet did. The transition from the report-sheet to the tablet was not as smooth in our opinion, also because the tablet application is still in the developmental phase. Also as Spil, et. al. (2005) point out, fear of the new and unknown are not the only factors that decide the success or failure of an information system, the attitudes of the individuals that lie behind the feeling of user-satisfaction are more decisive in this matter.

5.7 Policy meets reality

In this section, we will discuss previous perceptions regarding the studied artefacts and practices with policy regarding eHealth and combine these with theory regarding policy and legislation.

According to Harkke and Collan (2005), policy and legislations needs to be in accordance with the business of healthcare in order to not be a barrier. There are examples in both of the studied wards where policy has been ignored due to practical reasons. Most notably, this occurs at ward O to avoid the time consuming process of logging into the EHR-system by asking colleagues already logged in to perform entries in the journal (refer to 4.4.2 & 4.5.2). Given the empirical data at Ward O, we conclude that this problem in part can be attributed to two factors:

- Competence and confidence to use information technology. People who described themselves as less confident at using information technology relied more on colleagues for making entries in the electronic health record.
- A lack of hardware to make entries in the electronic health record.

Given the empirical data collected at ward O, we see that there is a combination of the above mentioned circumstances; there is a lack IT literacy and confidence to use IT, in combination with a lack of hardware that facilitate the EHR systems (refer to 4.2.1, 4.2.3 & 4.4.3). There are, however, instances when this happens at ward N, although it is not as frequent when comparing it to ward O. Moreover, we believe that one has to understand that the primary objective of the nursing staff is to do what is best for the patient than to do everything “by the book”. If there is a stipulation like the Patient Data Act (2008:355) and no realistic way to enforce it, as described in Scott and Mars (2016), we would argue that there is no real use for the legislation other than to satisfy politicians. There is for instance no way of telling if someone uses a colleague’s login to make an entry in the journal. The mobile devices facilitating COSMIC Nova Ward are more personal due to the fact that they are carried in one’s pocket. As aforementioned, we believe that
the difference between the wards can be, in part, explained with the increase in devices that can be used for reading and making entries in the EHR, i.e. the iPad MINIs and COSMIC Nova Ward. We see that the bottleneck effect regarding available devices where entries can be made in the EHR has a significant impact on the nursing staffs’ ability to obey the Patient Data Act (2008:355).

As it is mentioned by Findikoglu and Watson-Manheim (2016), decision makers need to connect micro level usage of EHR-systems with macro level effects. In this instance, there needs to be coherence between set out goals from Östergötland county, Swedish governmental organizations and the EU, and the design of mHealth systems like COSMIC Nova Ward. This kind of linkage between practice and policy requires adequate eHealth strategy (Scott and Mars, 2013). This can be done with IT governance, i.e. promoting desirable usage of IT (Weill & Woodham, 2002). We recognize that every organization is unique and would argue that so called “best practice” only exists in theory, as implied by Goldkuhl and Nordström (2014). This is likely the explanation between the two wards experience of COSMIC Nova Ward; they might appear very similar in their respective practices and structure, but there are elements of social nature that are unique to every organization. This makes legislation incredibly difficult as it is impossible to make laws that suit every part of an organization. Instead, we would argue that decision makers should aim to make legislation and policy that is not prohibiting healthcare professionals to carry out their everyday work activities, nor inhibit the development of eHealth, as described by Harkke and Collan (2005). We would argue that this can be made by understanding the healthcare practice and utilizing the vast knowledge of the nursing staff, as we would argue that they are experts regarding healthcare practice and that they have a more in-depth knowledge regarding healthcare practices than the decision makers responsible for creating policies.
6. Conclusions

In this section, we intend to present the conclusions of our thesis. The purpose of this chapter is to answer the study’s research questions (refer to 1.3.1):

- What are the perceptions, experiences and expectations of nursing care providers with regards to the usage of mobile platforms?
- Are there any discrepancies between the experiences of the nursing care providers and the policies and legislations in this regard?

6.1 Perceptions and experiences regarding usage of mobile platforms

It is without a shred of doubt that the factors regarding eHealth are very complex in nature. It is therefore difficult to pinpoint the exact reasons as to why the implementation of e- and mHealth solutions are successful in some organizations while not in others (even organizations with very similar conditions). We believe that the answer is found in the implementation process and the nature of the organization, in addition to the information system itself.

We conclude that the adequacy of an eHealth solution, either in part or in its entirety, is dependent on the organization it is implemented in and as a direct consequence, the actors involved therein. When performing the comparative study of the two wards, it became clear to us that their day-to-day practices and routines were mostly identical, despite the medical care being provided at both the wards being widely different (nephrology versus orthopaedics). Moreover, there were no substantial differences between the two studied wards with regards to the perceived problems or current inadequacy related to any of the ICT artefacts, neither regarding the EHR on PC or the iPad MINI. In fact, the only substantial difference that we established was the perceived effect that the COSMIC Nova Ward Tablet had on its users and the attitudes of the users towards the change that its implementation brought about.

Another difference that we were able to pinpoint and establish was the attitudes of the actors at the two wards towards their work environment, especially with regards to documentation and administration. Ward N strived towards being completely free from paper, performing all documentation and administrative tasks using digital tools only, while ward O was more cautious and reluctant to embrace the COSMIC Nova Ward Tablet. We believe that this is a consequence of the perceptions and attitudes of the actors towards the system. It could also be the result of the users’ not being able to completely understand the relevance that COSMIC Nova Ward Tablet had for their work.
Also, there was an adequate work process already in place at one of the wards, before the initiation of the pilot project. This resulted in a perceived deterioration with the implementation of the COSMIC Nova Ward Tablet, which we believe to be a major reason behind the premature ending of the project. We believe that it is paramount to be perceptive to the nursing staff, as they are experts in their respective field of providing care to the patients in addition to performing their administrative tasks like the maintenance of the patient journals. We thus conclude that a perceived deterioration with regards to the work processes caused the resistance towards the change at ward O. Moreover, the physical size and perceived fragility of the hardware involved (iPad MINI) was a cause of scepticism at both the wards.

In addition, the presence of a clinical champion at Ward N was not only the driving force behind the process of making the ward paper free, it was also a facilitator for the change involving the implementation of the COSMIC Nova Ward Tablet. The main argument for this change was to reduce the number of anomalies that arise when using the paper "report sheet". There was also a perceived improvement at ward N in terms of work processes as a result of the implementation of the COSMIC Nova Ward Tablet, which we would argue is a contributing factor leading to the acceptance of the system.

We conclude that the adequacy of ICT is not everything. It needs to be accepted as the new work method. It certainly helps if it is adequate, especially if it is an improvement compared to previous work methods. In the case of COSMIC Nova Ward Tablet, the old work process with the paper "report sheet", in combination with later documentation in COSMIC, was a preferred method, especially at ward O. At ward N however, the use of the tablet was a preferred method. We believe that change needs to be encouraged and sometimes also enforced so as not to fall back into old ways. Change also needs to come from within and the presence of a so-called champion has proven to be successful at ward N.

Our study has led us to understand the importance of information in healthcare. Not only is healthcare an information-centric practice, it also relies to a great extent on the reliability and timeliness of this information. We have also come to the conclusion that even if the importance of information in healthcare is realized, the information would still be useless, if there is no good way to communicate it to others. We see information and communicating this information in the most effective way as two sides of the same coin. And as such a system that not only displays this information but communicates it in an effective manner would work in a healthcare setting. However, these are not the only two constraints that are decisive for the success or failure thereof of an information system. There are a large number of other factors at play. One cannot simply put information systems in the hands of the healthcare providers and expect them to work, the implementation of these information's systems has to be carefully planned and thought out using an extensive process that not only includes the healthcare providers but the policy makers as well. The healthcare providers need to be seen as an important part of the process and involved at an early stage.
The generalization from this research question is in two parts; it provides a conceptualization of terminology with regards to information systems used by healthcare providers, and a comparison consisting of two examples where information technology was implemented. We would argue that the latter is especially important in terms of generalization as it highlights the differences and similarities among healthcare providers in terms of their attitudes towards information technology used in their work environment.

6.2 Discrepancies between policies and experiences of nursing care providers

During the course of this study, we identified a couple of discrepancies between clinical practice and policy. We can conclude that the primary objective of nurses and auxiliary nurses is not to follow the policies meticulously, but to perform well and do what is best for the patients. If a nurse or auxiliary nurse has to violate policy to do what is best for the patient, they will do it. Thus, the generalizability with regards to this part of the study lies within how policy compares with real examples.

It also became evident that there were some breaches of the Patient Data Act. These breaches were made despite the nursing staff being educated and aware of the Patient Data Act. The identified breaches of the Patient Data Act were committed when a nurse or auxiliary nurse made use of a colleague’s user account (with permission) in order to enter information into the electronic health record. The reason behind this being that the process of logging into the PC is a time consuming task and in certain situations there is no time for it. Moreover, it usually takes less effort for auxiliary nurses to verbally communicate something to be entered in the journal to a nurse who is already logged into a PC instead of logging in and making an entry themselves. This is partially due to confidence and competence regarding IT, but also due to a lack of available devices where entries can be made in the journal. This kind of conduct was more common at ward O in comparison with ward N based on the collected empirical data. Because of this, our conclusion is that COSMIC Nova Ward Tablet alleviated some of the bottleneck-effect surrounding available PCs as the iPad MINIs had the ability to perform some of the activities. Therefore, we would argue that COSMIC Nova Ward Tablet has the potential to decrease the differences between policy and healthcare practices performed by nurses and auxiliary nurses.

Moreover, it is clear to us that legislation needs to be consistent with actual practice. It should not obstruct the practices of healthcare providers, nor hinder the development of e- and mHealth solutions. We see a great challenge in this as the development of new technology is fast, while the creation of legislation and policies is a time consuming process. Therefore, we see our highlighting of coherence between legislation and healthcare in practice as a significant contribution to theory.
7. Reflection

This chapter is a reflection over the study that we have conducted. We take a look back over the research process and reflect over it as well as over the product of this study. In addition to these, we also reflect on the possibilities of our study being used in future research and provide recommendations for possible research questions.

7.1 Reflection regarding the process

After initiating contact with Region Östergötland, it became clear to us that we had a very unique opportunity to perform a comparative study and to explore an area of research that thus far has been scarce. Our original thought was to evaluate the pilot project’s main artefact: COSMIC Nova Ward. Instead, we found that there was a much more interesting aspect to explore. How is it that the outcome of the pilot project of implementing COSMIC Nova Ward was so different at the two wards? They seemed so similar in terms of practice and structure.

At our first contact with the strategic leadership at Region Östergötland, it was clear that COSMIC Nova Ward Tablet had been a failure at one of the two wards that were selected for the pilot project, while it had been a moderate success at the other. There was, however, no real explanation as to why this had happened. We felt that there should be more to the equation than to brush it off as resistance to change. We understood that there was more to be explored; this was a real opportunity to use a qualitative study in order to explain how the perceptions and experiences of healthcare providers can affect the outcome of implementing mHealth solutions.

Moreover, our respective backgrounds and previous knowledge regarding eHealth led us to understand the extensive policy and legislation regarding the phenomenon. We therefore expected that some of the current healthcare practices could disregard some policy; either where it is not possible or when it is impractical to follow policy. The study also led to insights as to why policy is sometimes disregarded in practice.

7.2 Reflection regarding the product

A major part of this study consists of the comparative study where we compared the two wards, describing the studied technical artefacts and how they were perceived. It gave us insights into the practices of the nursing staff and what theories we could use to explain the perceptions that the nursing staff had regarding the mHealth artefacts discussed in this study. One could argue that this is a weakness of this study; that we only rely on the stories told by nurses and auxiliary nurses. Therefore, one could argue that the nature of the semi-structured interviews used in this study could lead to an unfair portrayal of the wards, i.e. that a few individuals’ personal agendas construct the narrative on which this study is built around. We acknowledge this argument, but would not regard it as a weakness. This study is not meant to be representative for all kinds of
medical institutions, but rather an insight in cases describing possible scenarios from which one can generalize theory.

As the study aims to portray perceptions regarding e- and mHealth, one could also question our qualitative interpretive perspective. One could argue that a quantitative method could yield a more comprehensive view of the perceptions among nurses and auxiliary nurses with regards to the mHealth phenomenon. We would argue that a quantitative survey lacks the ability to provide and make use of the necessary follow-up questions that are needed to explore why a nurse or auxiliary nurse perceives an mHealth system in a certain way. Moreover, it would mean that we would steer the narrative, rather than letting the respondents, whose actual perceptions on the artefacts are studied, steer the narrative. We do however see the potential use of quantitative methods that uses the findings of this study and deductively prove or disprove them.

Lastly, we would like to discuss the originality of this study, something that we aim to do with humility. At the beginning of this study, it was clear that there was scarce research regarding the perceptions and experiences of healthcare providers regarding eHealth in general and mHealth in particular. The purpose of information technology in healthcare is, in our opinion, to promote the physical and mental health of citizens. We would argue that cannot be done without also focusing on the eHealth solutions for healthcare providers. By looking at some of the policy documents regarding mHealth, it became clear to us that there was more focus on how mobile technology could be used by citizens rather than healthcare providers. Therefore, we see our study as a necessary change of pace as it focuses on how it can be utilized by healthcare providers. Moreover, the study also sheds light on the very delicate change process that is a result of implementing mHealth solutions such as COSMIC Nova Ward and the necessity of understanding the end-users’ expectations.

7.3 Future research

We see that there is still much research to be done within the scope of this study, not only with regards to inquiring about healthcare provider’s perspectives on mHealth but also on how they can contrast with the current policy and legislation. Using this study as a vantage point, we think that it could be particularly interesting to conduct quantitative surveys with similar questions as the ones used in our semi-structured interview guide (see Appendix II). We are of the opinion that a survey would be an interesting way to test the validity of the findings found in the conclusion of our study.

Moreover, it would be interesting to use this study as a basis for observational and/or participative studies. This kind of qualitative study would grant further insights into practitioners’ perceptions on mHealth solutions as it would allow for first-hand accounts of how technology is used by healthcare providers in a clinical environment. The themes and questions used in our interview guide would be interesting to be used as a basis for the evaluation of certain ICT systems.
used in the healthcare sector, as they are rather explorative in nature, prompting answers that could provide explanatory and descriptive stories on the experiences of practitioners.

Based on the aforementioned possible scope of further research, we have developed the following research questions:

- Are healthcare providers positive or negative towards mobile technology used in a clinical environment?
  - What are the contributing factors that would interest and encourage healthcare providers in making use of mobile technology in a clinical setting?
- What effects do the introduction and implementation of mHealth solutions in a clinical setting have on the behaviours of healthcare providers?
Published References


Myers, M. (2013). Qualitative research in business & management (2nd ed.).


Time Lex, & Milieu (2014). Overview of the national laws on electronic health records in the EU Member States and their interaction with the provision of cross-border eHealth services. Final report and recommendations.


http://dx.doi.org/10.1057/ejis.1995.9


https://ssrn.com/abstract=664612 or http://dx.doi.org/10.2139/ssrn.664612

https://ssrn.com/abstract=317319 or http://dx.doi.org/10.2139/ssrn.317319

http://dx.doi.org/10.1504/ijeh.2005.006478


Electronic references


### Appendix I: Description of recurring concepts

<table>
<thead>
<tr>
<th>Concept</th>
<th>Description</th>
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<tbody>
<tr>
<td><em>Cambio COSMIC</em></td>
<td>The primary product from Cambio</td>
</tr>
<tr>
<td><em>COSMIC Nova Ward</em></td>
<td>An extension of COSMIC that is facilitated on either tablets or screens.</td>
</tr>
<tr>
<td><em>COSMIC Nova Ward Tablet</em></td>
<td>Mobile platform containing the electronic health record. Facilitated on iPad MINIs.</td>
</tr>
<tr>
<td><em>COSMIC Nova Ward Whiteboard</em></td>
<td>A patient overview, presented on a screen. Used to coordinate healthcare at wards.</td>
</tr>
<tr>
<td><em>EHR</em></td>
<td>Short for electronic health record. An electronic patient summary, containing previous treatments and medical parameters.</td>
</tr>
<tr>
<td><em>Nursing staff/personnel/providers</em></td>
<td>Nurses and auxiliary nurses.</td>
</tr>
<tr>
<td><em>Mobile platform</em></td>
<td>Software facilitated on a mobile device in the form of an application.</td>
</tr>
<tr>
<td><em>Mobile device</em></td>
<td>A smartphone or tablet.</td>
</tr>
<tr>
<td><em>SITHS-card</em></td>
<td>Tangible identification card and universal key and authentication device used by all healthcare providers.</td>
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Appendix II: Interview guide

Summary of the objective of the study
The purpose of the study is to investigate the expectations and experiences with regards to the usage of mobile platforms in healthcare. Previous research on these aspects is very limited, as a result we see a need to collect practitioner's perspectives on this phenomenon. In this way, we hope to contribute to the betterment of e-health and ultimately, a better working environment for practitioners.

The purpose of the interview
The purpose of this interview is to gather information regarding your experiences and expectations with respect to the usage of mobile platforms in healthcare. The aim is that this will lead to a greater understanding of the mobile platforms' potential challenges and opportunities, as seen from the perspective of practitioners.

Our background and usage of data generated through the interview
We are Masters students engaged in the writing of our Master's thesis on the influence/impact of mobile platforms in healthcare. The reason why we are inquiring about Cosmic Nova Ward is that it is a mobile platform that is used in Region Östergötland. The data obtained from this interview will be used to substantiate our arguments around how mobile platforms are experienced by the personnel in its current usage. We have chosen to anonymize all the respondents participating in the study.

Do you have any questions before the interview begins?
Is it okay if we record the interview?

Respondent's name: Date:
Ward: Place:

Introduction & Background

1. Can you briefly describe your educational background and your background career wise?
2. Have you thought about how it was that you were chosen to participate in this interview?
3. Can you describe the type of care provided in your ward? What you do when at work, which patients get care and treatment here and what kinds of treatments are provided here?
4. Can you describe your daily tasks? What is a typical day like for you?
5. Which or what kind of technology (information technology) do you use currently in order to perform your daily tasks?
6. How would you describe your IT skills (on a scale perhaps)? If good, do you like to poke and prod around in a new system so as to familiarize yourself with it?
7. Speaking of administrative work in your role as …….., how much of your work would you describe of as consisting of purely administrative work in the form of record-keeping, maintenance and the like?

8. Doctors at the South Hospital in Stockholm have remarked that the administrative work they must perform causes patients to feel they are not getting the attention they deserve and need (Söderström, 2010).

“The best solution would be if 'the doctor did what the doctor should do' thinks Dan Anderson. Much of the administrative work can be handled by other personnel, who with their knowledge could fix it much faster.” (Söderström, 2010, s. 31).

MHealth

9. Can you tell us a little about how you make use of the SITHS-card in your daily work? What all it is used for and in what context?
   a) What good have you experienced from its usage?
   b) Do you experience any difficulties with the usage of the SITHS-card (provide details if required --- for example bottlenecks at the computers etc.)
   c) What is the general perception regarding SITHS card amongst you and your colleagues? What are you talking about SITHS card? (Please clarify if necessary.)

10. Do you have any idea how your colleague’s experience the usage of the SITHS-card?
    a) Does it happen that people use each other’s SITHS-card?

11. If we’re talking about a scenario where a colleague’s SITHS card is in the computer, and you have an urgent need to use the computer to access, say a patient’s records, how would it go about? (Supplementary questions.)

12. Do you have any knowledge about what rules exist regarding the use of SITHS card?
    a) If yes, ask the respondent to explain what these are. (supplementary questions)

Impact of the mobile Platform (Cosmic Nova Ward)

13. How has a mobile platform like Cosmic Nova Ward influenced your daily work? (supplementary questions)

14. How has this affected the amount of administrative work you do today in comparison to how it was before?

15. What strengths did you experience with the system?

16. What weaknesses/shortcomings did you experience with the system?

17. In what ways could the system better adapt to the needs and requirements of the organization (in this case, the ward) in your opinion?
    a) In what ways could the system be designed to better meet your needs?
    b) How would you like it to be?
    c) What all do you think that a future system would include?
18. What was your experience of using Cosmic Nova Ward in the ward? Is there any colleague who thinks the same or the opposite?

**Concluding Questions**

19. Is there anything in your opinion that we may have missed to inquire about, or anything else that you would like to add?
20. Do you have any other questions about the study or the interview?
21. Do you have a colleague in mind, who might be interested in participating in our study?
22. Would it be okay to contact you again if need be, in case we have some other questions that need answering?

We thank you for taking the time to participate in our study. Please do not hesitate to contact us if you have any questions or queries about the interview or the study!
Appendix III: Sample interview transcription

(Translated from Swedish)

Interviewer: We start off with describing the purpose [of the study and the interview]. It is to examine the perceptions, experiences and expectations regarding mobile platforms and their usage within healthcare. We would like to have the perspective of practitioners.

The purpose of the study is to collect your personal experiences and expectations regarding this phenomenon as these could lead to a better understanding of the potential possibilities and challenges from a practitioner’s perspective.

Interviewer: Do you have any questions before we start?
Respondent: No.

Interviewer: Could you briefly describe your background; career and education wise?
Respondent: Absolutely. I have studied to become a registered nurse 25 years ago, I have since then worked in different departments including cardiology, nephrology, rheumatology and endocrinology. But I have worked with nephrology the most, at this establishment for 16 years now, and I am [removed for anonymity purposes]. I take care of everyone, make sure that everyone knows what to do, how to do it, when to do it and also teach them how to do it.

Interviewer: Why do you think we are interviewing you, do you think?
Respondent: I think I know a lot about the system and how it went when we implemented it and what problems we may have had with it. I also work in it, so that is probably why.

Interviewer: Could you briefly describe the type of care provided at the ward, typical patients and medical procedures?
Respondent: We conduct emergency health care here, specializing in nephrology, which means that the patients here usually have reduced kidney function, which leads to them having problems with fluids in their bodies, that they collect toxins that they cannot get rid of. You also come here if you have acute renal failure, where we try to halt the renal failure so that the kidneys can function. Many of them have dialysis here where one purifies the blood mechanically. Then you need various peripheral venous lines and they get here to get surgery for that. It is medicinal and surgical at the same time. We give a lot of drips, we use many peripheral venous lines, make many injections and give many pills. We also deal with other issues such as dressing of wounds, significant nutrition problems where one has to give other things than food for preventing them [the patients] to starve to death. We also have many multi-morbid elderlies because we are a part of the department of medicine. Renal illness is often considered to be multi-morbid, because the kidneys affect the entire body. They usually have more than one disease, they have heart
conditions, they have diabetes, leg wounds, renal failure. And if you have all of them, you have a pretty varied practice.