Medical Information Systems & the Nursing Profession - a Sociotechnical Approach

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Foreword and Acknowledgements

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ABSTRACT
Due to the digitalization era and challenges faced by the healthcare sector, Medical Information Systems are now being extensively used at hospitals. The implementation of the systems is a complex task which entails a need for careful considerations from a managerial view, since the main purpose with implementing the systems is for managerial control. One of the things management should consider is the professional aspect. The nursing profession is a highly specific one, and this could implicate special considerations.

The aim of this master’s thesis is to take on a sociotechnical approach towards the implementation of Medical Information Systems and investigate how the nursing profession is affecting the implementation process, and what it may implicate for hospital management. To answer the research question a qualitative approach has been chosen. The empirical data has been gathered through semi-structured interviews with nurses from the case organization.

The result implies that the nursing profession have a substantial impact on the implementation process. Instead of embracing the instructions and support offered by management, the nurses develop their own way of working within the system.

**Keywords:** Sociotechnical theory, digitalization, healthcare, nursing profession, management research, knowledge transfer, user involvement, user acceptance, management support, external support.
Table of Contents

1 INTRODUCTION .............................................................................................................. 7
  1.1 PROBLEM STATEMENT ......................................................................................... 8
  1.2 PURPOSE ................................................................................................................ 9
  1.3 RESEARCH QUESTION ....................................................................................... 9
  1.4 DELIMITATIONS ................................................................................................. 9
  1.5 CONTRIBUTION ..................................................................................................... 9

2 THEORY SECTION ........................................................................................................ 11
  2.1 THE NURSING PROFESSION ........................................................................... 11
  2.2 SOCIOTECHNICAL THEORY ........................................................................... 12
  2.3 DELONE & MCLEAN FRAMEWORK .................................................................. 14
    2.3.1 CRITIQUE AND USE OF DELONE & MCLEAN FRAMEWORK .................. 15
    2.3.2 INFORMATION QUALITY ........................................................................... 16
      2.3.2.1 KNOWLEDGE TRANSFER .................................................................. 16
    2.3.3 SYSTEM QUALITY ...................................................................................... 17
      2.3.3.1 USER ACCEPTANCE ........................................................................... 18
      2.3.3.2 USER INVOLVEMENT ....................................................................... 19
    2.3.4 SERVICE QUALITY ...................................................................................... 20
      2.3.4.1 EXTERNAL SUPPORT ....................................................................... 20
      2.3.4.2 MANAGEMENT SUPPORT ................................................................ 20

2.4 DIGITALIZATION OF HEALTHCARE ........................................................................ 21
  2.4.1 MEDICAL INFORMATION SYSTEMS (MIS) ..................................................... 21
  2.4.2 IMPLEMENTATION OF MEDICAL INFORMATION SYSTEMS ................. 22
    2.4.2.1 IMPLEMENTATION PHASES ................................................................ 23

2.5 SUMMARY OF THEORY CHAPTER ....................................................................... 24

3 METHODOLOGY SECTION .......................................................................................... 25
  3.1 QUALITATIVE RESEARCH ................................................................................... 25
  3.2 CASE STUDY ........................................................................................................ 25
    3.2.1 CASE CRITERIA AND CASE ORGANIZATION ......................................... 26
  3.3 LITERATURE REVIEW ......................................................................................... 26
3.4  **INDUCTIVE APPROACH** .................................................................................................................. 27

3.5  **DATA COLLECTION** .......................................................................................................................... 27
  3.5.1  **STRATEGIC SELECTION OF RESPONDENTS** .............................................................................. 27
  3.5.2  **PILOT INTERVIEWS** .................................................................................................................... 28
  3.5.3  **SEMI-STRUCTURED INTERVIEWS** .................................................................................................. 28

3.6  **DATA ANALYSIS** ............................................................................................................................... 30
  3.6.1  **TRIANGULATION OF DATA** ......................................................................................................... 31

3.7  **LIMITATIONS AND REFLECTION ON THE CHOSEN METHOD** ....................................................... 31

3.8  **ETHICAL PERSPECTIVE** .................................................................................................................... 32

4  **EMPIRICAL RESULTS** ............................................................................................................................ 33
  4.1  **KAROLINSKA UNIVERSITY HOSPITAL** .......................................................................................... 33
  4.2  **KNOWLEDGE TRANSFER** ............................................................................................................. 34
  4.3  **USER ACCEPTANCE** ......................................................................................................................... 36
  4.4  **USER INVOLVEMENT** ....................................................................................................................... 38
  4.5  **EXTERNAL SUPPORT** ...................................................................................................................... 41
  4.6  **MANAGEMENT SUPPORT** ............................................................................................................ 44

5  **ANALYSIS** ............................................................................................................................................ 46
  5.1  **INFORMATION QUALITY** ................................................................................................................ 46
  5.2  **SYSTEM QUALITY** .......................................................................................................................... 47
  5.3  **SERVICE QUALITY** ........................................................................................................................ 49
  5.4  **CONCLUDING DISCUSSION** ........................................................................................................... 49

6  **CONCLUSION** ...................................................................................................................................... 53

7  **FUTURE RESEARCH** ............................................................................................................................... 55
  7.1  **REPLICATION OF THIS STUDY** ...................................................................................................... 55
  7.2  **OTHER HEALTHCARE PROFESSIONS** .......................................................................................... 55

8  **IMPLICATIONS FOR PRACTISE** .......................................................................................................... 55

REFERENCES .................................................................................................................................................. 56
Table of figures

FIGURE 1. DeLone & McLean Framework (DeLone & McLean, 2003) ......................................................... 14
FIGURE 2. Visualization of the Implementation Factors (Figure created by the authors) .......... 16
FIGURE 3. Different phases of system implementation (Figure created by the authors, based on
Bosser et al., 2013) ............................................................................................................................. 23
FIGURE 4. Conceptual Framework (Figure created by the authors) .................................................... 24
FIGURE 5. Inductive Approach (Figure created by the authors, based on Farquhar, 2012, p. 24) ..... 27
FIGURE 6. Interview overview (Figure created by the authors) ......................................................... 30
FIGURE 7. Different phases of system implementation (Figure created by the authors, based on
Bosser et al., 2013) ............................................................................................................................. 34
FIGURE 8. Updated Framework (Figure created by the authors, based on DeLone & McLean, 2003)
........................................................................................................................................................... 52
1 INTRODUCTION
We live in an era of technological development and digitalization is changing the conditions for many professions Wells et al., 2017). Digitalization can be described as the largest and most influential driver of change across all sectors of the economy (Kagermann, 2015). This is also the case for the healthcare sector (Frey & Osborne, 2017). However, even though the technology needed already exists, other sectors of the economy are far ahead of the healthcare sector when it comes to taking advantage of this potential (Iveroth et al., 2013; Sligo et al., 2017). Therefore, Haggerty (2017); Iveroth et al. (2013); Tresp et al. (2016) suggests that there is a lot of potential for increased digitalization of the healthcare sector.

The healthcare sector is also facing challenges. Frey & Osborne (2017) discuss that job assignments and job specifications are changing due to an increased use of computers and digital systems. Also, the need for healthcare is increasing while the supply of physicians and nurses is consistently on a balanced level (Sargen et al., 2011). Studies show that no increase in the number of healthcare employees is expected in the immediate future (Darzi & Evans, 2016; Kaissi, 2012) while there are signs confirming the increase in need for healthcare (Sargen et al., 2011). To face this challenge, healthcare managers on all levels are seeing digitalization as a possible solution (Agarwal et al., 2010; Tresp et al., 2016). Digitalization allows employees to get instant access to the information they need while managers easily can perform control and evaluation activities (Cuciniello et al., 2016).

Medical Information Systems (MIS) are computerized digital systems that are being used daily by different professions at a healthcare unit (Clifford et al., 2008). When a hospital or healthcare unit is planning to implement a new Medical Information System, there are several phases they go through (Bossen et al., 2013), and different important factors to consider (DeLone & McLean, 1992; DeLone & McLean, 2003). Among those factors are knowledge transfer, user acceptance, user involvement, external support and management support (Bossen et al., 2013; Christiansen et al., 2017; Dillon & Morris, 1996; Nah et al., 2001; Nguyen et al., 2014). Considering those factors during implementation or not is suggested to impact the way the employees feel and act towards the system (Bossen et al., 2013). It will have an impact on user satisfaction and how the users actually use it even a long time after the initial implementation. According to Iveroth (2011), it is also important that the considered factors during implementation covers both the technical and the social aspects. The technical aspects include for example the system design and architecture, while the social aspects include employee satisfaction, employee needs and skill enhancement (Berg, 1999).
At a large hospital, there are a lot of social interactions happening daily. The facility is filled with doctors, nurses, biomedical scientists, administrators, paramedics, medical secretary and other professions, that use the Medical Information Systems in their daily work (Clifford et al., 2008). The different professions all have their own professional identity and with that comes their perceptions and opinions about what their profession is and does (Flexner, 2001; Nolin, 2008).

1.1 PROBLEM STATEMENT

Research suggests that having a nursing professional identity is closely connected to an individual’s thoughts and beliefs about what being and acting as a nurse means (Rasmussen et al., 2018). But also, being a nurse is a very specific profession with a large amount of personal interaction, that affects the way nurses perceive themselves and their work (Johnson et al., 2012). On the other side there is the process of implementing a new system, which is a complex process that can disrupt existing work routines and therefore have an impact on the nurses and their work (Campbell et al., 2009) As the sociotechnical approach argues, the performance of the Medical Information System can be developed and improved only if both social and technical aspects are considered (Andargoli et al., 2017; Iveroth, 2011). A common mistake that organizations do when implementing and using a Medical Information System is that they focus too much on the technical view of the system (Baxter & Sommerville, 2011; Iveroth, 2011).

The social part of the sociotechnical theory is the part that is more often overlooked during implementations (Iveroth, 2011). When the social aspects are not taken into consideration when implementing Medical Information Systems, unintended consequences may appear, and this can lead to serious problems for the whole process of implementation and the use of the Medical Information System (Harrison et al., 2007; Sittig & Singh, 2010). There is also an important connection to make here to the nursing profession since it is the nurses (among others) that are the end users of the Medical Information Systems. Only if hospital management can combine the technical aspects of the implementation with the social aspects regarding the nurses, the organization will be able to benefit from the implementation of the systems (Flexner, 2001; Nolin, 2008).
1.2 PURPOSE
The study aims to investigate how the nursing profession is impacting the implementation process of Medical Information Systems at a large Swedish hospital. To do this, the thesis is intending to gain deeper insight on how working with Medical Information Systems is experienced by the nurses by asking questions regarding five implementation factors. The study takes on a sociotechnical approach that focuses on the importance of both social and technical aspects when implementing a digital system. Furthermore, the study wishes to provide feedback to healthcare management that would improve the work with the systems and implementation process.

1.3 RESEARCH QUESTION

“How is the implementation process of Medical Information Systems affected by the nursing profession?”

To be able to answer this research question, a case study has been made at a large Swedish hospital. Through interviews, empirical data has been collected and analyzed, leading up to a concluding answer to the research question.

1.4 DELIMITATIONS
The research process for this thesis has been carefully prepared, and there were some important delimitations to consider. The medical staff discussed in this study belong to the nursing profession. The authors will not include doctors or any other medical profession because of the perception of the authors; making the targeted scope too broad could decrease the level of quality of the study. Another important choice that was made is about management. When the study mentions healthcare management it does not cover the political management side since healthcare in Sweden is heavily controlled by the county councils. We only discuss the local management located at the case organization. As this study takes the employee view, the management view has not been studied in-depth, only indirectly when mentioned by the nurses.

1.5 CONTRIBUTION
This thesis will make a contribution to profession research by investigating how the nursing profession affects the implementation work regarding Medical Information Systems. It will also contribute to sociotechnical theory since it digs deeper into how the nurses experience the social and technical aspects during implementation. This is done by using the DeLone & McLean framework. Furthermore, it will contribute to hospital management practice and management
research theory since the purpose of implementing Medical Information Systems from a managerial view is to control hospital operations and therefore it is important for them to have information about the employee view.
2 THEORY SECTION
In this section, previous research regarding sociotechnical theory, the DeLone & McLean framework and the nursing profession is presented. There is also a short introduction to the digitalization of healthcare, with a closer look into the part of digitalization which was used for this study, the Medical Information Systems. To sum up this section, a conclusion of its content is presented. It includes the conceptual framework which will be used to analyze the collected data.

2.1 THE NURSING PROFESSION
Nurses are licensed and autonomous clinicians that work with preventing diseases and managing health conditions (AANP, 2013). Due to increased nursing research together with its academic education, the nursing profession is today acknowledged as a profession (Swedish Society of Nursing, 2014). According to Flexner (2001); Nolin (2008), there are six profession criteria. Those criteria states that a profession has a foundation in academia, has an education leading to a certificate, follow certain ethical rules, is autonomous, is highly valued by society and it belongs to a national organization which contributes to the spirit and keeps the professional group together (Flexner, 2001; Nolin, 2008). All of these criteria can be applied to the nursing profession according to the Swedish Society of Nursing (Swedish Society of Nursing, 2016).

The Swedish Society of Nursing has six core competencies for all nurses to strive for and improve. Those competencies are; person centered care, teamwork & collaboration, evidence-based practice, quality improvement, safety, and informatics (Swedish Society of Nursing, 2017). To be able to work for improvements, the nurses will have to identify and prioritize problems, analyze why those areas should be improved and what the benefits and outcomes will be, measure how far one has come in the process, and to take action and be responsible for one’s own development. The responsibility for development rests with the nursing profession. Only if the nurses are able to provide to their own development, then they can contribute to the development of healthcare. However, management has an important role as well, as they are the ones that allocate resources and provide support when it is needed (Nolin, 2008).

Previous research support that the nursing profession is existing in a special context. It has been described as a calling and a social definition of professionals (Liaschenko et al., 2004). It is a very specific profession with a large amount of personal interaction. This affects the way that nurses perceive themselves and their work (Johnson et al., 2012). Having a nursing professional
identity is closely connected to an individual’s thoughts and beliefs about what being and acting as a nurse means (Rasmussen et al., 2018). The professional identity of the nurse is described by how the person perceives himself or herself as a nursing professional (Öhlen et al., 1998). The professionalization of nurses begins during their education and is ongoing and evolving throughout their whole professional life (Johnson et al., 2012). Öhlen et al. (1998) it also states that the professional identity has a large role in the personal identity of nurses. Nursing is being described by Keogh (1997) as a lifetime commitment and a strong feeling of serving the society, both on the personal and professional level. To develop the professional identity in their aim to improve the core competencies mentioned above, some personal characteristics mentioned as important, are self-knowledge, generosity, curiosity, stress tolerance, high level of knowledge, and believing in one’s own capabilities and feelings (ibid.). The most important professional identity aspect according to the Öhlen et al. study (1998) is the feeling of being a nurse, while Rasmussen et al. (2018) develops this further, stating some factors affecting the mentioned feelings. Some of those factors are the ability to adapt, sense of belonging, problem solving, multitasking, good communication skills, teamwork, support and knowledge sharing. All of those contribute to the feeling of what it means to be a nurse (Rasmussen et al., 2018).

2.2 SOCIOTECHNICAL THEORY
Sociotechnical theory is a management theory that emerged in the mining industry in England but has spread to cover different industries as well (Koontz, 1980; Eason, 2014). Sociotechnical theory consists of two parts. First, there is the socio part, which is about people and society. Secondly, the technical part which is about machines and technology (Walker et al., 2016, p. 6). The name itself tells about the meaning of the concept, namely the connection between people and technology (ibid.). Researchers have found that it is not enough for management to consider only the social or only the technical aspects in the organization, as they influence each other (Koontz, 1980). Considering human, social and organizational factors as much as technological ones is important as those factors have an effect on how information systems are functioning and how they are being used in the organization (Andargoli et al., 2017; Baxter & Sommerville, 2011). A sociotechnical approach considers employee satisfaction, needs and skill enhancement just as much as technical design, efficiency and managerial control (Berg, 1999). Both implementation and evaluation of Medical Information Systems should be done with a sociotechnical approach, where the user of the system is affected by both other users as well as the technical factors of the system (Andargoli et al., 2017).
According to Andargoli et al. (2017); Iveroth (2011) the performance of information systems and employees can be developed and improved only if both social and technical aspects are considered. A common mistake that organizations do when implementing and using an information system is that they focus too much on the technical view of the system (Baxter & Sommerville, 2011; Iveroth, 2011). The social part of the sociotechnical theory is the part that is more often overlooked by managers (Iveroth 2011). Doing so may increase the risk of failure as social and technical aspects affect each other, the technical features interact with the social ones (Ludwick & Doucette, 2009). If the social aspects are not compatible or considered, the system may end up as a failure, even if all technicalities have been investigated thoroughly to fit the organization (Baxter & Sommerville, 2011). There is also a risk that the system is not as beneficial for the employees as it could be (Iveroth, 2011).

The main issue for management is to control the work in a way so that the combination of the social and the technical part adds value to the organization, a phenomenon commonly called joint optimization (Appelbaum, 1997). According to sociotechnical theory, to achieve joint optimization, an organization should strive to create self-managing work groups (ibid.). With such groups, the organization can achieve both increased productivity as well as increased work satisfaction. Leading and managing a self-managing work group requires a certain way of managing and controlling (Druskat & Wheeler, 2003).

When the social aspects and the creation of self-managing work groups are not taken into consideration when implementing a Medical Information System, unintended consequences may appear (Eason, 2014; Harrison et al., 2007; Sittig & Singh, 2010). Unintended consequences can lead to serious problems with employee satisfaction, organizational efficiency and even patient safety (Anderson & Agarwal, 2011; Eason, 2014). Examples of such unintended consequences can be when employees make their own adjustments to the Medical Information System, and this adjustment simplifies the work process for that employee or a group of employees, but at the same time the adjustment can lead to some other negative effect. Such an effect can be loss of data if employees e.g. believe that the system is too slow, and they choose not to add information into the system (Vogelsmeier et al., 2008). These consequences then happen because management has not considered the interaction between the system as a technical tool and the surrounding work environment and social interactions (Harrison et al., 2007; Sittig et al., 2016).
2.3 DELONE & MCLEAN FRAMEWORK

The DeLone & McLean framework, is a model showing relationships between the six different factors during all phases of implementing a Medical Information System (DeLone & McLean, 1992). These relationships are connected to the sociotechnical theory since they are relationships between the social and technical parts of the organization (Eason, 2014).

![DeLone & McLean Framework](DeLone & McLean, 2003)

To the left in the figure, the framework presents what is described as three implementation factors that are affecting how the system is being used, how the system and usage is perceived by the employees and the users of the system (Information Quality, System Quality and Service Quality) (DeLone & McLean, 1992).

- **Information quality** – Concerns the question of whether the data in the system is relevant and comprehensive (Bossen et al., 2013).
- **System quality** – Addresses whether a system has the required functionality to support the work being done (Bossen et al., 2013).
- **Service quality** – Addresses the support available to users of the system (Bossen et al., 2013).

The three factors described above will have an effect on both how the system is used, the user intentions to use the system, as well as the user satisfaction with the system (DeLone & McLean, 2003). How the system is used, user intentions and user satisfaction will in turn have
an effect on the overall net benefits received from the system. By, for example, increasing the system quality, the user satisfaction can be increased and thus the net benefits will also increase. If all three factors are on a high level, net benefits will also be high and according to the framework, the system is considered successful (Bossen et al., 2013; DeLone & McLean, 2003).

According to Bossen et al. (2013), the DeLone & McLean framework is most suitable to use when a system has passed the initial implementation process and is in phase four, the onward phase. In this phase, the initial implementation and potential disturbances have passed, and it is during this phase that the most benefits can be realized in the organization (Zhu et al., 2010). The system is being used in the daily work whilst regular maintenance, upgrading, monitoring and evaluation is ongoing (Bossen et al. (2013).

2.3.1 CRITIQUE AND USE OF DELONE & MCLEAN FRAMEWORK
This framework was first presented in a study in 1992 (DeLone & McLean, 1992). Since then it has been revised and updated (Delone & McLean, 2003), and numerous academic researchers have been using the DeLone & McLean framework (Bossen et al., 2013; Nguyen et al., 2014). While those studies have mainly been using the framework for coming to a conclusion on whether or not the digitalization or implementation of a system is a success or a failure, this is not the aim of this study.

The term success is complex and can be interpreted differently by different people (Sligo et al., 2017). Therefore, this study excludes the success part, and aims to look into the relationships between the social and the technical features within the framework, in accordance with the sociotechnical approach.

Instead of determining if the implementation is a success or not, the framework will here be used to investigate how the social and technical aspects affect each other according to sociotechnical theory. This is in line with the sociotechnical approach since it considers both technical as well as social aspects of the implementation process (Eason, 2014). The linkages between the different parts of the framework show how they influence each other according to DeLone & McLean (2003). With increasing digitalization and rapid technological change (Sligo et al., 2017), it can be argued that this is a more relevant aspect than deciding on success levels.
The implementation factors as presented by Bossen et al., (2013); DeLone & McLean (2003), can be investigated by looking into several different organizational factors that have an effect on them. The following is a presentation of such factors:

![Figure 2. Visualization of the Implementation Factors](Figure created by the authors)

2.3.2 INFORMATION QUALITY
Adding and accessing information in a Medical Information System is about transferring knowledge throughout an organization (Christiansen et al., 2017). If the data in the system is relevant and accurate, the use and user satisfaction will be positively affected (Bossen et al., 2013). Since healthcare employees add data into the system themselves, the quality of information added can be of various levels. Therefore, the way knowledge is transferred between individuals is impacting the quality of the information (ibid.).

2.3.2.1 KNOWLEDGE TRANSFER
Through technology, Medical Information Systems can facilitate communication and knowledge transfer in healthcare (Christiansen et al., 2017). In the systems, various types of knowledge are stored for many employees to access simultaneously. Information exchange between nurses and hospital staff is critical because it have an effect on the quality and safety of care (ibid.).

Knowledge transfer includes the possibility to transfer knowledge and data within the system, and also transferring knowledge about the system itself, across the organization through different ways of communication. Knowledge transfer can take place when employees are talking to each other face to face but also through the information systems. If knowledge is
transferred easily through a Medical Information System, communication and knowledge levels in the whole organization may be improved (Dobrzykowski & Tarafdar, 2015). Some studies show that bottom-up communication seems to be the preferred way of communication for nurses when it comes to Medical Information Systems (Lambooij et al., 2017). This means that they prefer discussing with colleagues than being directly told what to do by managers.

Healthcare knowledge and data have to be relevant, accurate and accessible (Pentland et al., 2011). Nguyen et al. (2014) describes how information quality was improved after implementing a new digital system. The data added into the system was accurate, accessible and complete. However, other studies show that this is not always the case. When processes in the daily work and the Medical Information Systems are not compatible, it may result in poor data accuracy (Närman et al., 2010). Ali et al. (2012) discuss that knowledge sharing in healthcare is mainly about sharing documents and not as much about sharing or gaining new knowledge. When it comes to how easy it is to find relevant data, there is a risk for information overload (Bossen et al., 2013). The amount of information available in healthcare systems has grown rapidly with increased digitalization (Klerings et al., 2015). Nguyen et al. (2014) explains one reason for excessive amounts of data in medical electronic systems to be free text fields, where employees can write down a lot of information.

However, the information exchange can also be difficult because healthcare processes have a high level of complexity, a large amount of information, employees are working with several different information systems, interacting with many different people and different professions/patients and so on (Andargoli et al., 2017; Dobrzykowski & Tarafdar, 2015). It has been discovered that those factors have led to barriers to knowledge transfer within healthcare, and that knowledge is not being transferred as much as it could be (Pentland et al., 2011). As the information in the systems is mostly data added by colleagues, there is a risk that data is left out and not added for different reasons, for example that the system is too complicated to use (Lambooij et al., 2017). Another reason for leaving out information is the hierarchy that exists within healthcare units (Jefferson et al., 2014). This hierarchy is believed by Jefferson et al. (2014); Ten Hoeve et al. (2014) to limit the performance of the nurses, which also includes their work with the Medical Information Systems.

2.3.3 SYSTEM QUALITY
The system quality is about the technical functionality of the system, and how the users of the system is perceiving that functionality. The functionality of a Medical Information System can
include for example how easy it is to use and how well it is fitting in with daily work routines of the employees (Bossen et al., 2013). Medical Information Systems require numerous technical functions to integrate and work together, e.g. medication information, picture archives, employee notes, patient information, test results, bookings and administrative information.

2.3.3.1 USER ACCEPTANCE
When it comes to accepting or rejecting a new technology, studies show that the quality of the system is an important factor (Dillon & Morris, 1996). If the user is perceiving the Medical Information System to be useful, easy to use and that is can help with making the daily work tasks easier or more efficient, Legris et al. (2003) describes how the user acceptance is affected in a positive way. The attitude towards the Medical Information System is changed in a positive direction as well as the intentions to use the system as well as the actual use of it.

Results show that the overall acceptance of working with Medical Information Systems is increasing (Nguyen et al., 2014), but user resistance is still high enough to imply actions being taken against it (Escobar-Rodríguez & Romero-Alonso, 2014; Sligo et al., 2017). Resistance against Medical Information Systems often result in lower usage of the system and not all of its benefits are realized. Just because the system is fully implemented and in the onward phase, it does not mean that the system is being used to its full capacity or the way it is intended to be used from a managerial perspective (ibid.).

User acceptance towards a system is often considered being an issue for the early implementation process. However, studies show that it is just as an important factor to consider even during the onward phase (Escobar-Rodríguez & Romero-Alonso, 2014). According to Escobar-Rodríguez & Romero-Alonso (2014), there are early and late adopters of new technology in hospitals. The early adopters show a more positive attitude and greater interest in learning new systems and tools than late adopters. The Escobar-Rodríguez & Romero-Alonso study (2014) show that being an early or late adopter often depends on what ward or clinic the employees are working.

Sittig et al. (2016) describes how the lack of innovations decrease the acceptance among users. They mention that many of the systems that are being used today are on the same technological level as 15 years ago, which often results in poor user friendliness and usability. Even though nurses have an overall positive attitude towards Medical Information Systems, there are three
major factors affecting their attitude in a negative way (Huryk, 2010). Those factors are; poor system design, slow systems and downtime (ibid.).

2.3.3.2 USER INVOLVEMENT
User involvement is connected to the system design, which has been described as an important technical factor regarding Medical Information Systems (Bossen et al., 2013). By involving the ones who will be using the system when designing the system, it is possible to make it a better fit with the work tasks and the needs of the employees (Nguyen et al., 2014).

Involving the actual users of the system, the employees, is considered as a critical factor during all implementation phases (Huryk, 2010; Standing & Cripps, 2015). It is seen by some research as being especially important during early implementation, when the system is not yet up and running. There could be a greater chance of adapting the system to all work processes and with all details needed for performing their work if the users have the possibility to say what they want and need from the system before implementation (ibid.). However, other studies show that this is crucial even during the later implementation phases and even the onward phase. Involving nurses in the design of a Medical Information System will increase their positive perceptions about the system even during the later phases of the implementation (Huryk, 2010). In situations when the system does not work properly or does not fit the daily work processes, it could be beneficial if the users of the system can make their voices heard (Nguyen et al., 2014).

But system design and architecture on a technical level may make this kind of involvement difficult. There is most likely a limit to how much the system can be adjusted and adapted (Walker & Clendon, 2016). Previous studies show that focus groups and additional training of employees can have a positive impact on Medical Information Systems design (ibid.). However, it has also been shown that even if employees are involved, activities where the technology already exists and is being used in other sectors like the banking industry, have not yet been adopted by healthcare Medical Information Systems. One such example is having multiple logins for systems which is perceived as an obstacle by nurses as it slows down their work processes (Walker & Clendon, 2016). Hospital employees are requesting simpler login and authentication solutions (ibid.). Technical limitations are often what is limiting effects taking place from user involvement (Nguyen et al., 2014). Even if employees have the possibility to get involved, the limitations of the system itself can make their efforts useless (ibid.). Even if the system design allows for adjustments, changes and upgrades in the system also often include
system downtime (Bulson et al., 2017). The system being down has several effects for employees, e.g. longer time to perform daily work and lack of routines or knowledge working without the system (Huryk, 2010; Bulson et al., 2017).

2.3.4 SERVICE QUALITY
Service quality is about the support that is connected to the Medical Information System (Bossen et al., 2013). The support can be external (coming from outside of the organization) or internal (support from within the organization) and both are considered important when going through an implementation process (Beheshti et al., 2014).

2.3.4.1 EXTERNAL SUPPORT
External support is regarding the possibility for employees to have someone outside of the organization, to turn to for support (Zuh et al., 2010). Sometimes this also refers to support from within the organization but from a supporting department like an IT-department (Bossen et al., 2013). This support can also be explained in different ways. One is the possibility for employees to get continuous education and training within the system. This includes learning new functionalities (Nguyen et al., 2014).

The support can also include the possibility to call someone outside of the organization (or IT-department) for technical support. There, employees should have access to extensive knowledge about the system. This has to be available any time of the day if the system goes down or in some way does not function in the way it is supposed to (Zuh et al., 2010). Nguyen et al. (2014) show a connection between the user acceptance and ongoing technical support and training for employees throughout the fourth phase of implementation. Nurses have been found to need support for 6 months to 1 year after initial implementation, with ongoing training even after that period to increase realized benefits from the system (Rantz et al., 2011).

2.3.4.2 MANAGEMENT SUPPORT
For all phases of implementation, having support from management is also considered an important factor (Nah et al., 2001). Hospital managers should support the implementation process and clearly communicate the benefits with using the new system to employees (Escobar-Rodriguez & Romero-Alfonso, 2014; Nah et al., 2001). If there is dissatisfaction or resistance among employees, the chances of decreasing it are higher if management intervenes and show their support (ibid.).

According to Iveroth (2011), clearly communicated management support is an important aspect through all phases of implementing a Medical Information System. During the onward phase,
which is the focus of this study, communicated support is also important to keep stabilizing the new activities that came with the new system (Iveroth, 2011). It is important for management to communicate the purpose and benefits with the system, not only during the initial implementation period but also in the long run (Standing & Cripps, 2015). If the users of the system do not know why they should use it or what the purpose of it is, it is more likely that the system will not be used in the intended way or to its full extent (ibid.).

2.4 DIGITALIZATION OF HEALTHCARE

The connection between social and technical factors have been acknowledged in other sectors, e.g. the manufacturing sector, since the 1970s. However, Gough et al. (2014) states that this connection has just recently started to get attention within healthcare and its implications for nurses. One reason for this late entry is the connection to digitalization (Reddy & Sharma, 2016). Digitalization is an ongoing process and the new technologies are affecting industries all over the world (Brynjolfsson & McAfee, 2015).

When it comes to the healthcare sector, digitalization has not yet come as far as in several other industries (Iveroth et al., 2013; Reddy & Sharma, 2016; Sligo et al., 2017). There are numerous reasons for this, of which one is often argued to be the high level of complexity within healthcare (Andargoli et al., 2017; Reddy & Sharma, 2016). According to Sligo et al. (2017), this complexity is due to inter-related clinical, cultural and technical factors. Because of this complex environment, the system itself often have a high level of complexity to fit the organization. Thus, it is more complicated to get the information systems integrated within healthcare compared to other industries (Reddy & Sharma, 2016). Following today, the digitalization of healthcare is continuously increasing and in a faster pace than ever before (Bulson et al., 2017; Risling, 2017). Therefore, this also have increasing impact on the nurses and their daily work (Risling, 2017).

2.4.1 MEDICAL INFORMATION SYSTEMS (MIS)

For this study, digitalization is profiled by the digital systems that are being used by nurses daily. Looking through previous and contemporary research, there are several terms used to describe such systems, e.g. Digital systems, Health Information Systems (HIS), Medical Information Systems (MIS), e-Health systems, Health Information Technology (HIT), Electronic Medical Systems (EMS), Electronic Health Systems (EHS), among others.
The following definition is what this study refers to when talking about Medical Information Systems (MIS):

“Medical Information Systems assist healthcare organizations to gather, process, and disseminate information within the organization and their environment. MIS incorporates a range of different types of systems, which include patient information systems, administrative systems, radiology and pharmacy information systems, telemedicine and hospital information systems, such as computerized physician entry systems” (Sligo et al., 2017, p. 87)

Medical Information Systems are complex architectures that consist of a large storage unit for all data, together with a combination of different modules that are chosen depending on where it will be used, and by whom (Bourgeois, 2014, p. 6). Medical Information Systems are designed for integrating data, processing, reporting and improve efficiency and effectiveness through management at hospitals and other health units. They can be used by all different professionals at a hospital. Depending on their daily work and what tasks and routines a professional has, different parts, or modules, of the system are used. (Bourgeois, 2014, p. 7; Saghaeiannejad-Isfahani, 2014). According to Bourgeois, 2014, p. 6ff), a Medical Information System consist of five parts: hardware, software, data, people and process. The first three are more about the technical aspect of the system, while people and process are the softer parts that also have an important role. By considering both the hard, technical parts (the Medical Information Systems) as well as the soft, social parts (the nurses), the Medical Information System can add value to an organization (Bourgeois, 2014, p. 6ff).

2.4.2 IMPLEMENTATION OF MEDICAL INFORMATION SYSTEMS

There are high expectations on Medical Information Systems in healthcare, and studies show great potential for future benefits from further implementation and use of them (Sligo et al., 2017). When it comes to implementing Medical Information Systems into a hospital or care unit, some of the main arguments for implementation from a managerial perspective is for managerial control as well as to shrink the currently large gap between the level of need and the level of supply within healthcare (Ludwick & Doucette, 2009). Implementing Medical Information Systems is supposed to improve employee efficiency and lessen the resource shortages (ibid.). By implementing the systems, hospital management wants to control the level of and decrease the high workload and pressure on employees, which is continuously increasing with the higher need for healthcare (Sligo et al., 2017).
However, implementing a new system can be a complex task. The success or failure of implementation and use depends on several factors \((ibid.)\). When discussing Medical Information Systems, both researchers and practitioners often look at them as a technical tool, forgetting the fact that it is also affected by the complex healthcare context and the social factors around it (Andargoli \textit{et al.}, 2017). According to Brynjolfsson & McAfee (2015), there can be disadvantages caused by new technology. The implementation phase can cause disruptions and problems in the daily work (Iveroth & Hallencreutz, 2016). Agarwal \textit{et al.}, (2010) also argues that impact of digitalization on quality and efficiency is not overwhelmingly positive since the majority of health providers have not been able to successfully manage the implementation process to turn implementation investments into tangible benefits. Regardless of all the possible quality improvements and cost reduction, the integration of the system is crucial. Even if a new system has different functions, these systems will have little impact on performance if they are not properly integrated into the daily workflows (Agarwal \textit{et al.}, 2010).

According to Edmondson \textit{et al.}, (2001); Campbell \textit{et al.}, (2009) it has been shown that during the implementation process, technology tends to disrupt existing work routines. Brynjolfsson & McAfee (2015) describes that technology is constantly improving and evolving. Because of this, the disruptions are also causing constant changes for organizations, not only during the early implementation phase. For employees, daily work and routines are about to change even if the initial implementation phase is over. This can lead to ongoing problems that did not exist before the new technology was introduced into their work \((ibid.)\). To get the most possible benefits out of a Medical Information System (both on a technical and social level), it is important that managers are aware about the importance of the systems being continuously monitored and evaluated (Andargoli \textit{et al.}, 2017).

2.4.2.1 \textbf{IMPLEMENTATION PHASES}

When implementing and using Medical Information Systems, the process goes through four different phases (Bossen \textit{et al.}, 2013):

\begin{center}
\textbf{1. Chartering Phase}
Preparation, Analysis, Design

\textbf{2. Project Phase}
Configuration & Roll-out

\textbf{3. Shakedown Phase}
Stabilization, Monitoring & Evaluation

\textbf{4. Onward Phase}
Maintenance & Upgrading, Monitoring & Evaluation
\end{center}

\textit{Figure 3. Different phases of system implementation} (Figure created by the authors, based on Bossen \textit{et al.}, 2013)
1. **Chartering phase:** This phase takes place before the actual implementation of the system. The organization prepares for implementation by analyzing and designing the system.

2. **Project phase:** During the second phase, it is decided what modules are needed and the system is rolled out into the organization.

3. **Shakedown phase:** The system is used in daily work routines and is monitored and evaluated. Bugs are fixed, and the system is improved to better fit the workflow.

4. **Onward phase:** This is the ongoing phase, after the initial period of using the system.
   The system is continuously subject for maintenance and upgrades.
   The onward phase does not have an end date until the organization decides to stop using the system altogether (Zhu et al., 2010). If a new system is replacing an old one, then the process starts over from phase one, otherwise phase four can be going on for eternity (*ibid.*).

### 2.5 SUMMARY OF THEORY CHAPTER

The theory chapter have presented the different components that are making up the conceptual framework for this thesis. Previous research presented in this chapter has discussed how the DeLone & McLean framework is connected to the sociotechnical theory since both the social and technical aspects are considered during implementation. Therefore, how sociotechnical theory impacts the nursing profession will be analyzed by using the implementation factors which can be identified within the DeLone & McLean framework. These factors are knowledge transfer, user involvement, user acceptance, management support and external support.

*Figure 4. Conceptual Framework (Figure created by the authors)*
3 METHODOLOGY SECTION
To be able to problematize, discuss and understand the patterns found in the collected data regarding the use of Medical Information Systems at the chosen hospital, a qualitative research was concluded to be the best course of action. In this section the chosen methodological aspects will be presented and discussed in detail, as well as a critical view on the chosen method. To end up this chapter, some acknowledgements regarding the ethical considerations taken during the research period will be presented.

3.1 QUALITATIVE RESEARCH
To get a deeper understanding of how the nursing profession is affecting the implementation process of Medical Information Systems at the chosen hospital is perceived by the chosen respondents, a qualitative method has been used for this study. With a qualitative research method, the aim is to create understanding and explore patterns in the empirical setting. Additionally, a qualitative research process can offer a possibility to be flexible and explore new areas that might arise throughout the research process (Bryman & Bell, 2015, p. 300f).

In order to problematize, discuss and understand how nurses perceive digitalization and implementation of Medical Information Systems within the healthcare sector, it has been concluded that the best course of action will be to conduct a qualitative research method with semi-structured interviews. A common outline when conducting qualitative research is to start with a general research question, collect the relevant data, and interpret it. After interpreting the data, the qualitative research gives the researchers the opportunity to tighten the research question or collect more data before writing up the findings/conclusions (Bryman & Bell, 2015, p. 300f).

3.2 CASE STUDY
Case study is a research strategy that can be described as:

“/.../ an empirical inquiry that investigates a contemporary phenomenon in depth and within its real-life context/.../” (Farquhar, 2012, p. 5)

In this study, the contemporary phenomenon is the digitalization and implementation of Medical Information System, while the context is the chosen empirical setting (case organization). By investigating the phenomenon where it is actually taking place, the researcher gets a clear, in-depth view of the happenings (Farquhar, 2012, p. 6).
3.2.1 CASE CRITERIA AND CASE ORGANIZATION

The healthcare context was chosen based on relevancy due to previous research showing that healthcare has not come as far as other sectors when it comes to digitalization (Reddy & Sharma, 2016; Sligo et al., 2017), but that there is a big potential for further digitalization (Agarwal et al., 2010; Sligo et al., 2017).

The choice of the case organization for this study was based on three factors. First, it is a major Swedish hospital, which is also currently frequently featured in the news due to the expansion and construction of the new hospital buildings and both the possibilities and challenges that come with that. Secondly, it was chosen because of its geographical setting, as researchers could easily go there for data collection. This was for saving time and other resources. Third, there was a possibility to gain access thanks to personal relations. Because of this, access was granted early in the research process. During the research process it has been ensured that those personal relations have not influenced the outcome of the study in any way. This was done by only using personal contacts for pilot interviews, to get a basic understanding about the healthcare sector and daily work of the nurses. The pilot studies have therefore not been included in the actual analysis of the collected data.

For the study, interviews were conducted at different wards and clinics, covering both geographical locations of the hospital. The reason for including the whole hospital was mainly because the same systems are operating in different wards and clinics regardless of the location, and the fact that the hospital is separated in different geographical locations could possibly be of importance for the results of the study. Limiting the study to one ward could therefore also limit the study as an overall picture was the objective.

3.3 LITERATURE REVIEW

For this thesis, a narrative literature review was used (Bryman & Bell, 2011 p. 101). The literature review was made through different data bases at Uppsala University by searching for different topics in relation to nursing profession, digitalization, healthcare, data relevancy, data accuracy, information overload, knowledge transfer, user involvement, user acceptance, management support, external support and more. By doing the literature review both theoretical and conceptual frameworks emerged. The literature review was conducted in parallel with the data collection, as new topics of interest came up.
3.4 INDUCTIVE APPROACH
Inductive research is more common than deductive research when it comes to case studies (Farquhar, 2012, p. 25), and an inductive approach has also been chosen for this study. Compared to deductive research, which is theory testing, inductive research is theory generating (Farquhar, 2012, p. 24). As this study is aiming to study the nursing profession, digitalization and respondents’ opinions on how implementation of Medical Information Systems is perceived to affect their daily work, the objective was to explore and understand while looking for patterns in the answers received. Thus, an inductive approach was considered a more relevant way for this study to be conducted.

![Figure 5. Inductive Approach](Figure created by the authors, based on Farquhar, 2012, p. 24)

3.5 DATA COLLECTION
When data for the study has been collected, the following guidelines have been taken into consideration; data must be traceable, reliable and complete (Farquhar, 2014, p. 91). When choosing how to collect the data, an interpretivist approach with semi-structured interviews, and to some extent also reading written documents and notes, have been selected. The decision to conduct interviews was based on a presumed high possibility to get the most useful information needed and in line with the selected methodological strategy of the study. A presumed complexity of people’s opinions and experiences of the impact digitalization has on their daily work also demands the possibility for researchers to ask follow-up questions.

3.5.1 STRATEGIC SELECTION OF RESPONDENTS
For this study, the nursing profession was chosen. The reason for this choice was made mainly due to nurses being the largest professional group at the chosen hospital as well as access reasons. The respondents were a mixture of both male and female nurses, all working on various locations at the case hospital. Their experience and ward/clinic differ from respondent to respondent. This choice was made by purpose of being able to study their answers in depth when conducting the analysis, i.e. if the perceptions of the Medical Information Systems was similar or differing among the respondents and the possible reasons for the identified similarities/differences.
All respondents were contacted to participate with their knowledge, perceptions and opinions, based on their personal experience and expertise. To begin with, personal contacts were used to conduct the pilot interviews. The rest of the respondents were approached using the snowball effect. Snowball sampling is when the respondents of the study are not identified by the researchers but by others (Farquhar, 2012), in this case the pilot interview respondents. According to Farquhar (2012), snowball sampling is increasing the possibility to reach respondents that have a lot of information on the chosen topic. The pilot respondents were asked to send out e-mails to nursing colleagues and contacts all over the chosen hospital, which they agreed to do. This way, a broad variety of respondents with the needed experiences and knowledge was reached.

3.5.2 PILOT INTERVIEWS
Due to researchers’ previous lack of knowledge about working in the healthcare sector, as well as the level of digitalization and what digital tools were being used, pilot interviews were conducted early during the research process. To get a clear picture of the healthcare sector, daily work and current Medical Information Systems, two pilot interviews took place. According to Farquhar (2012, p. 43f), the question of piloting or not depends on the contextual dimension. For this study, piloting was done mainly because of previously mentioned lack of knowledge. Therefore, piloting was concluded as being a necessary part of the process, both for gaining knowledge and also for increasing the possibility to ask the right questions during interviews, thus increasing the quality of the study.

During the pilot interviews, the possibility to test some topics and questions was used to make sure respondents understood what was being asked. This way, some topics and questions could be eliminated from the study, while others were rephrased or explained differently. Possible problems with piloting can be access and time limits for the study (Farquhar, 2012, p. 43f). None of these were considered being reasonable enough for not piloting in this study, as access was already granted, and the importance of piloting was considered being high.

3.5.3 SEMI-STRUCTURED INTERVIEWS
As the primary data source, semi-structured interviews were conducted. This way of collecting data was chosen mainly based on the focus of the research. To be able to study digitalization and Medical Information Systems in depth, there was a need to have the possibility to ask follow-up questions and conduct follow-up interviews. An alternative choice would have been sending out surveys to a larger number of respondents. This alternative was rejected because of the limited possibility to dig deeper into the data received.
After the pilot interviews, a decision was made to hold all interviews in Swedish. This decision was based on pilot respondents’ reluctance to speak English and there was a risk of not being able to collect enough respondents for the study. It was also believed that both researchers and respondents were able to express themselves better in their native language, which would add to the quality of the collected data. All quotes used in the study have been translated into English.

When conducting the interviews, an interview guide was used. This guide included questions concerning broader topics, as well as more specified questions. The broader topics were in accordance with the framework and the implementation factors identified from previous research as being important for successfully implementing Medical Information Systems (see theory chapter 2.3).

Depending on the answers received, different follow-up questions were asked to get a deeper understanding. Through good preparation, the gap between the respondent and the researcher was minimized as much as possible. The respondents were granted full anonymity and were asked if they agreed to the interviews being recorded. All respondents agreed to this. The respondents also got the possibility to read through the translated quotes used to confirm accuracy of translation. The number of interviews were not decided from the start, more interviews were added until the same and similar answers were received, and empirical saturation was achieved.

After all interviews were conducted, a few follow-up questions were asked to some of the early respondents. The reason for this was that some interesting themes emerged in the responses received during the later interviews and the researchers wanted to investigate this on a deeper level. The follow-up questions were asked on the phone and were therefore not recorded or transcribed, however, notes were taken during the conversation and answers were repeated so the respondent could confirm that the researcher had the correct understanding.
<table>
<thead>
<tr>
<th>Respondent</th>
<th>Experience</th>
<th>Date</th>
<th>Place</th>
<th>Length (min)</th>
</tr>
</thead>
<tbody>
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<td>5 years</td>
<td>2018-03-01</td>
<td>NKS</td>
<td>47:33</td>
</tr>
<tr>
<td>Nurse – Pilot</td>
<td>19 years</td>
<td>2018-03-03</td>
<td>KS</td>
<td>52:06</td>
</tr>
<tr>
<td>Nurse A</td>
<td>4 years</td>
<td>2018-03-11</td>
<td>KS</td>
<td>30:12</td>
</tr>
<tr>
<td>Nurse B</td>
<td>3 years</td>
<td>2018-03-25</td>
<td>KH</td>
<td>23:57</td>
</tr>
<tr>
<td>Nurse C</td>
<td>25 years</td>
<td>2018-03-28</td>
<td>KS</td>
<td>31:13</td>
</tr>
<tr>
<td>Nurse D</td>
<td>10 years</td>
<td>2018-04-16</td>
<td>NKS</td>
<td>29:08</td>
</tr>
<tr>
<td>Nurse E</td>
<td>12 years</td>
<td>2018-04-16</td>
<td>NKS</td>
<td>33:21</td>
</tr>
<tr>
<td>Nurse F</td>
<td>10 years</td>
<td>2018-04-18</td>
<td>KH</td>
<td>37:32</td>
</tr>
<tr>
<td>Nurse G</td>
<td>9 years</td>
<td>2018-04-25</td>
<td>KS</td>
<td>25:00</td>
</tr>
<tr>
<td>Nurse H</td>
<td>5 years</td>
<td>2018-04-27</td>
<td>NKS</td>
<td>44:42</td>
</tr>
<tr>
<td>Nurse J</td>
<td>28 years</td>
<td>2018-05-07</td>
<td>KH</td>
<td>35:14</td>
</tr>
</tbody>
</table>

**Figure 6. Interview overview** (Figure created by the authors)

### 3.6 DATA ANALYSIS

In difference to quantitative data, analyzing qualitative data can start already at the moment when the collection begins (Farquhar, 2014, p. 90). As soon as data had been collected for the study, it was transcribed and stored. The work with transcribing the interviews was divided between the researchers. When a transcription was done by one researcher, the other researcher would read through the document. Transcribing within a short limit of time was a strategic choice, this way the researchers got an immediate repetition of what had been said during interviews and could start thinking about possible patterns in the data. As more and more data were collected, some patterns were dismissed, and others picked up.

When all data had been collected, the transcriptions were printed, and color coding took place. All parts of the transcription where the respondents talked about the same topics were highlighted in the same colors. Those topics were picked out based on the identified important factors when implementing a Medical Information System (i.e. data relevancy, data accuracy, user involvement, user acceptance, knowledge transfer, management support and external support). The empirical results were then presented based on the same themes (see Chapter 4). The color coding helped the researchers to manage and interpret the collected data and trace patterns and emerging themes. For the analysis chapter (Chapter 5) these patterns were gathered into the original division into themes based on the DeLone & McLean framework (Information Quality, System Quality and Service Quality).
3.6.1 TRIANGULATION OF DATA

Triangulation of data is important when conducting case studies since it adds to the strength of collected data. The researcher can view different perspectives on the phenomenon that is being studied, but still within the chosen context (Farquhar, 2012, p. 7). According to Carter et al., 2014; Farquhar (2012, p.44f), there are four different types of triangulation.

Method triangulation is when multiple methods are used for collecting the data. Common methods are interviews, field notes and observation (Carter et al., 2014). Investigator triangulation takes place when there is more than one researcher involved in the study. They collect and interpret data separately, ending up with individual conclusions to provide a broader view on the studied phenomenon (Carter et al., 2014; Farquhar, 2014, p.44). The third type of triangulation is theoretical triangulation. The researcher then makes data analysis based on more than one theoretical perspective. The last type is called data triangulation and is about collecting data from different sources. These sources can be different individuals or groups of people, and the purpose is to get access to multiple perspectives and increase the credibility of data (Carter et al., 2014; Farquhar, 2014, p. 45).

For this study, data triangulation has been made through conducting multiple interviews. As different respondents have their own perspective when being asked the same questions, possible patterns found in the data during analysis are strengthened compared to if only one interview had been conducted with only one respondent. Method triangulation is done by using secondary data combined with primary data (Farquhar, 2012, p. 44). For this research, the focus is on different employees’ perspectives on Medical Information Systems. No secondary data was found or accessed that could add to this topic.

3.7 LIMITATIONS AND REFLECTION ON THE CHOSEN METHOD

Qualitative research is sometimes criticized as being too subjective and impressionistic, as well very dependent on what the researchers find significant and important. One can argue that the research done using a qualitative method can be biased since the researcher is the one who decides what is valuable and what is not valuable data. (Bryman & Bell, 2015, p. 318f). This has been limited in this study by using different sources of data for identifying the chosen topics for investigating the success factors of the framework. Different sources pointing in the same direction towards what is important topics minimizes the risk for subjectivism. The same topics were used as a foundation for the interview guide, which implies that the same limitation of subjectivity has been considered for the interviews.
Bryman & Bell (2015, p. 320) also discuss the problems with generalization. Due to the limited number of interviews and possibility that implementation of Medical Information Systems is perceived in different ways in other hospitals, generalization from this study is not possible directly. However, through the transparency of this study there is always the possibility to replicate this study in other hospitals or for a different profession.

3.8 ETHICAL PERSPECTIVE

Bryman and Bell (2011, p. 128) argue for four important ethical reasons that are considered throughout this study. They are:

- Whether there is harm to participants,
- Whether there is a lack of informed consent,
- Whether there is an invasion of privacy, and
- Whether deception is involved.

It has been prioritized that participants in the study are informed enough to make their own decision about taking part. Before the interviews took place, the respondents were informed about the purpose of the study, their role in the study and how collected data was going to be used. Furthermore, the respondent was informed that the participation was voluntary, with the possibility of terminating their participation in the study at any time. They were also informed that it was not compulsory to answer all questions, and that in the event that the respondent chooses to leave the study the collected material will not be used and deleted. Name and other details of the participant are not to be published. The respondent was promised anonymity throughout the study and afterwards. The collected empirics will not be used in any context other than this study. Before the interview, the respondent also got to the question whether or not they agreed to the interview being recorded.
4 EMPIRICAL RESULTS
In this section, the collected empirics and results from the conducted interviews is presented in themes corresponding with the themes from the theory chapter. Quotes from interviews in the case organization will be used to highlight specific aspects. The quotes have been translated into English after interviews were held in Swedish. The letters (A-J) is referring to the respondents.

4.1 KAROLINSSKA UNIVERSITY HOSPITAL
The chosen case hospital for this study is Karolinska University Hospital (KUH). KUH is one of the largest university hospitals in Europe (Karolinska Universitetssjukhuset, 2018). It has been appointed the Stockholm County Council responsibility for specialized and highly specialized medical care, as well as research and education. KUH is located in two different parts of Stockholm: Karolinska Huddinge (KH) and Karolinska Solna (KS). In Solna, several recent construction projects have resulted in New Karolinska Solna (NKS), described as ultramodern and opened in 2016, being fully operational in 2018. The number of employees is 15,800 including both KH and KS. 52% of the employees are nurses. (Karolinska Universitetssjukhuset, 2017).

The Karolinska Institute (KI) is a medical university which combines medical research and education. Together, KUH and KI creates a large medical center which is well-known worldwide (ibid.). The aim is to be a leading hospital through innovation and collaboration, and there is an ongoing work for improving healthcare for both patients and employees (Karolinska Universitetssjukhuset, 2018). As going through an expansion and investment phase, changes and developments are constantly ongoing. This is also where KUH is wanting to reach their aim to be the leading hospital in the area (ibid.).

At the time for this study, KUH and its Medical Information Systems are in the fourth phase of the implementation process, the onward phase. This can be seen because they have not implemented any of their systems recently. All systems have been used for a longer period of time, which is an assessment made by the authors based on respondents’ comments that they have been working within the systems for several years and have been through phase 1-3.
4.2 KNOWLEDGE TRANSFER
An overall perception among respondents is that communication and knowledge transfer between colleagues is simplified thanks to the use of Medical Information Systems (A, B, C, D, F).

“We can talk to each other at the ward, since it is such a new system we learn things all the time that we share with each other”. (Respondent A)

“It all depends on what it is, if it concerns a patient I can make a note in the system, then you can make it very detailed as well (...) but sometimes I can also have a patient that maybe is aggressive, I can make a note as well”. (Respondent F)

Respondent F adds that it could be even better if all employees knew all functionalities within the systems. Some of the mentioned benefits are that the information added to the system can be seen by everyone and it is easy to see where the colleagues are and what they are doing. It is also seen as an easy way to get a quick overview without having to talk to all colleagues, one simply looks into the system and can see if someone has a lot to do and needs help, and where. Some respondents even regard communication outside of the system as non-existing (D, E). If, for example, communication is taking place verbally, it often happens that the information is forgotten (E). It must be added into the system to be taken into consideration (E).

“Inside the hospital it is sometimes not working, when patients go to a module we lose the actual information system entries (...) the only information I get is the different tasks we have completed, nothing else. Has the patient been making a lot of fuss for example, I don’t know since it does not say anywhere. Then we have a case where we miss things”. (Respondent E)
However, some of the respondents admitted that information is sometimes left out of the system intentionally (A, B, H). This mostly considers more informal information, one respondent referred to this information as “small tips and tricks regarding a specific patient” (B, F). All respondents agree that the communication and knowledge transfer is affected negatively when the system is down (A, B, C, D, E, F, G, H, J).

“People panic when the system crashes since they don’t know how to handle the situation, since it does not happen that often. Especially the younger thinks it is hard since they have not been a part of the crashes in the same sense, so they mostly stand like question marks and do not know what to do”. (Respondent F)

“When we have trouble with the system is it very tough, because once we have a stop we have manual routines. It takes a lot of time and it causes waiting time and it takes us longer to prepare a patient since we need to run and get the referrals. Since everything then gets written by hand, we are very dependent on the systems in order to work quickly”. (Respondent G)

When the system goes down, several of the respondents’ experience that there are no or unclear routines about what to do and how to work (A, B, D, E, F, G, H). One suggestion received from a respondent was that when the hospital know about a planned down time in the system, this should be communicated to all involved and to other hospitals to reduce the inflow of patients during that time (F).

“We have not been trained on any back up routines, we just must solve it among us when it happens. We must divide ourselves and work together with the doctor, so there is like no one that has come to us and told us if it crashes this is what you do”. (Respondent H)

That way the hospital would experience less of a negative impact from the down time and having to use manual routines. However, there was a consensual opinion about a lack of communication about the updates and down time of the systems (A, B, C, D, E, F, G, H, J).

Another communication problem in connection with the used Medical Information Systems appears to be that not all functions in the system are being fully used (A, D, E, F, J). An often-mentioned example is a chat function where employees can text each other and receive
messages instantly in written text. All of the respondents also mention that there is a lot of communication between colleagues, regarding the difficulty with using the system (A, B, C, D, E, F, G, H, J). Communicating with colleagues that have more experience with the system is a common topic of conversation during the interviews.

4.3 USER ACCEPTANCE
Overall, all the respondents have a positive opinion about the use of Medical Information Systems (A, B, C, D, E, F, G, H, J). Everyone believes that they make their work run smoother and faster, helping them to be more efficient and also increasing patient safety.

“I think it gives a more secure care, not necessarily better, but at least safer. It is much easier, when we work with paper everyone has to use the same paper, so you don’t know where it disappears, or who has it, on the computer everyone can see it at the same time”. (Respondent B)

Most of the respondents’ experience is that employees mostly accept the Medical Information Systems, in the way that they use it as they are told or supposed to, but there are different levels of happiness about it (A, B, D, F, G, H).

“When we changed systems there was dissatisfaction everywhere, but that is since it feels insecure when it is about patients, we were terrified that patients would fall through the cracks and that referrals would go missing”. (Respondent G)

Several respondents also mention having the experience that resistance against systems is lower once the employee has learned how to work with the system (E, F, G, H). Many respondents also have the experience that acceptance towards the systems is generation based (A, B, D, E, F, G, H). Those respondents think that older employees are less happy about changes in the system overall. One respondent states that old people do not like change at all (B).

“Well they get annoyed when they cannot click on something directly, it causes a lot of unnecessary irritation since they cannot find the right folder and that it takes them too long time”. (Respondent B)

Two respondents have no experience of resistance against Medical Information Systems (C, J). Respondent B believe older employees should benefit more from additional training than younger employees. None of the respondents mention additional support from management as
a possible solution to decrease the user resistance against Medical Information Systems. Some respondents also talk about the generation aspect when describing how older employees are not using all functions in the system, like chat function which they believe is saving a lot of time (A, F). Respondent J believes that the chat function is being used equally among all ages. On the other hand, some of the respondents also believe that there can be resistance from younger employees (F, J). One of the employees describes how employees coming directly from university have been used to top of the line, modern labs and machines during their education and when they come out to the hospital to start working they are met by older versions of systems and tools (F).

“The younger think it is hard working on the older machines, they want everything new and as digitalized as possible”.

“People prefer working on new versions over old (...) since they do not need to think about the settings. On new systems is everything pre-programmed so they just need to make sure it is correct, on the old ones there are a lot of steps. And that causes panic for them since it is old”.

(Respondent F)

The younger employees are described by one respondent as being lazy, they want everything automated and just have to click a button, they want no manual adjustments (F). Respondent (J) also agrees that younger have no knowledge of how to work with older systems and tools.

Apart from the generation aspect, most resistance against the system appears when the system is not working properly, or when they are experiencing problems or are lacking knowledge about something regarding the system (A, B, D, F, G, H). There are often small technical malfunctions within the system, for example referrals being sent to the wrong wards or even wrong hospital. Such small but severe disturbances affect daily work and the opinion towards the system badly (A, B, E, G). Respondent H says that the hospital wants to be leading when it comes to digitalization but almost no one is cheering about it, as there is a common opinion about all the small technical problems which leads to extra work.

The respondents also mention that the systems are old and slow, which they experience is increasing user resistance (A, D, E, F, G). Similarly, all respondents except one have the opinion that the computers are also very slow, and it takes long time to log in and log out of the
computers and then the systems, which is a task they have to perform many times daily (C, D, E, F).

“The thing that takes time, but it works fine (...) is that you need to log in and log out of the system all the time. If would be good if you just could enter your card and fix things quickly, but the tools are so slow”.
(Respondent D)

After planned updates, the systems do not always work better than before the updates, which further add to the resistance towards the systems (A). Logging in and out is a regular task due to security reasons (F). When you leave a computer, which happens a lot, you have to log out so that no unauthorized person can get access to the system. The constant logging in and out creates a lot of stress and discontent among employees (D, E, F).

“The thing that is good is that it gives a safer care of patient information. Since it is on my computer with a very special system, someone unauthorized cannot enter since they do not know how the use the system because it is very fussy”. (Respondent A)

There are also some malfunctions about the system that has been there for 18 years, but they still have not managed to get it working properly, one respondent mentions (F). The same respondent confirms that even though some of the disturbances in the system have been tried to be corrected, but the conclusion was made that the system was too old, and the changes were not possible to do because of that.

4.4 USER INVOLVEMENT
No respondent mentions having been involved in the very early processes of system implementation, the main decision about which system is being implemented and what it should look like is mainly a top management decision (A, D, E, F, H, J). Most respondents experienced that their involvement in the process, like having the possibility to give their opinions about the system, started after initial implementation when the system was already up and running (A, E, H, J).
“We are not a part of it, it is a managerial decision (...) but in December 2017 when we changed to a more modern version, four people who know a lot about the old system were selected to be super users. (...) at the same time is this a designed system, we do not have any influence, only that we can learn it quicker through super users”.

(Respondent A)

Two respondents were able to give their opinions about the functionality of the system before the system was up and running because they were chosen to take part in trials before implementation (D, G). Two respondents experienced that some employees were assigned to be super users (F, J). They got extra training and the purpose was that they would be experts on the system and find all the malfunctions and things that should be adapted to better fit for the organization. However, the respondents experience from this was that adaptation was limited and the only noticeable result coming from the use of super users was that employees got access to a little bit more of training. The system itself was not improved in any way because of it.

The same system is being used across different wards and clinics, with respondents witnessing about how it works better for some of them, while others use the same functions with worse results and more irrelevant data (J). There is no adaption of the system depending on work tasks that can differ between various wards of the hospital (J). Respondent J also mentions that one of the systems being used is not even adapted for healthcare but for the industrial sector.

“The system is very static, and we have a deviation system that is not supposed to work within healthcare, but the whole hospital has it anyway. So, when we need to report a deviation it can get very angular as the system is meant to work within industry and not healthcare”.

(Respondent J)

None of the respondents are able to make adaptionst to the system to make it better suited for the particular work tasks they are performing. The system is believed to function more or less the same way for all employees regardless of what ward or clinic they work at even if the work processes and tasks performed differ (D, E, F, J). Some of the respondents have tried to adapt the system to their specific needs with different levels of success. Respondent B states that several people have tried but they did not manage to adapt the system the way they would want to. One respondent (H) also explains that you don’t get anything from management for giving suggestions.
“I think it is a case of how much you want to push it (...) we have found our own way to work that is similar to how it was before. If more functions would disappear it would get complicated, maybe then you would say something, but as it is today, the risk is too big that nothing happens”. (Respondent H)

Respondent F says the system was too old to make the changes they wanted. The only option would have been to completely replace the system instead.

“We have brought up a lot of improvements, and they are looking into what they can do. The problem is, that things are located so deep into the system, so if that needs to be changed they will need to install a brand-new system, according to me this is not done in the smartest way”. (Respondent F)

Respondents F, H and J describe how the employees have succeeded in finding their own shortcuts in the systems and have managed to use the system in their own way. The reason for why this has occurred is since the system is not developed in the best way. One respondent explains that they have developed their own flow internally since they feel that there is some sort of ulterior motive from the management side on how they should use the system that is not the best practice for the nurses (Respondent H).

“We use the systems daily and do as we are told to do, otherwise we cannot use them. But we have developed routines internally on how to handle some of the referrals. The administration behind the systems wants us to do it in a certain way, but we have realized that this does not work for us”. (Respondent H)

According to the respondents, there seems to be less possibility to give opinions about the functionality of the system nowadays compared to when the system was first implemented. In the early phases, respondents describe how lists were available, where suggestions and opinions could be written down and taken into consideration (C, E, F, G, J).
“It all depended on what type of function we wanted to change, some things are just not possible (...) it also depends on which clinics that want the same change, if we request something no other clinic is requesting will there not be anything in between. So, it all depends on the demand and what we want changed, then things may change”.

(Respondent H)

Some of the suggestions were realized. No such activities seem to have been taking place more recently though. One respondent mentions that it is not popular to tell people higher up in the hierarchy about suggestions for improvements, and that some people choose to be quiet because of this (D).

“We could leave comments afterwards, we had this list where you could write them, and they were supposed to be looked at. It always takes time, but you could give comments (...) they were accepted, but it is never popular when you give critic to those higher up, especially when it comes to the newly built hospital”. (Respondent D)

Several of the respondents says it is possible to suggest improvements but nothing happens anymore (D, E, F, G). One of the respondents believes one of the reasons for this is the old system, no changes are possible because of it being so old and non-adjustable (F).

4.5 EXTERNAL SUPPORT

All respondents have access to external support in one way or another. More than half of the respondents mention Helpdesk support, where they can call in case the system is not working properly (C, F, G, H, I). Some respondents also have access to written manuals where the system is described, and where one can look for help (A, F, J). However, respondent’s experience with these documents is that they are difficult to understand and that the users often end up experimenting instead of reading the manual.

Regarding Helpdesk, none of the respondents turn to Helpdesk when they experience problems with the system. One respondent is uncertain where to call or even where to find the number to call (C). Other respondents have experience from calling Helpdesk but have the impression that the people working at Helpdesk have about the same level of knowledge about the system as the nurses at the hospital and is therefore not able to help out in many situations (D, E, F, G). Some respondents talk about calling Helpdesk as being a time-consuming activity (C, G, H, J).
First you have to wait in line, then they have to ask a lot of questions about the problem and so on. Several respondent think calling Helpdesk is deselected because of the time aspect.

“We have SLL IT but when we call them can they be like” that sounds like something I don’t know, let me connect you to someone else” and it goes on like that. Then we have the system consultant that are supposed to answer all questions, but they do not have the training for that either, so unfortunately there is no support to call”. (Respondent H)

“The first week consultants were here to help, but they knew nothing. We had learned as much as them, so it was super hard the first week. So, we had to learn ourselves but somehow, we made it work”. (Respondent G)

All of the respondents prefer talking to colleagues, either face-to-face or via phone, rather than calling Helpdesk (A, B, C, D, E, F, G, H, J). The ward where one of the respondent’s (F) work have assigned one person as responsible for the system. This person can be contacted at any time of the day and will come in to the hospital in case of emergency if the system suddenly crashes.

“It is faster to solve it ourselves than calling IT support (...) you have to wait in line, then you need to explain and so on, so it much faster this way”. (Respondent F)

One of the respondents also mean that one reason for why they rather talk to each other is since hospital staff are very solution oriented, there is also a strong tradition of a lot of team work where they are used to helping each other. There would be a positive effect from having one in charge of IT in every department, but the organization is not built in that way. This person would be extra beneficial when someone new starts, but instead as respondent J describes: “We have to take it the hard way, you will just have to learn as you go along”.

All of the respondents are also in consensus about the current level of continuous education and training regarding Medical Information Systems. Training provided by the system supplier was offered shortly before and during the initial implementation phases (A, B, E, F, J). Now in the later phases of implementation, there is no training offered.
“I have not been given any education, we have learned from each other. When I started at KUH I got training from my coworkers, they showed me what to do”. (Respondent A)

During early stages of implementation, most respondents got a few training days (B, C, D, E, F, G, J). None of the respondents believe the amount of initial training to be enough. They think it was too short and too close to implementation.

“They tried to push all of the information on all people four weeks before the system went live, and it was like here you are given one day to learn a brand-new system (…) then we had like two or three stations where we could practice, and we are around 200 employees”. (Respondent F)

“We would want better education and more time, maybe even more. But I understand that it is hard for managers to send several at the same time”. (Respondent G)

Instead of proper formal training, all respondents have improved their knowledge about the system during later phases of implementation by learning from colleagues (A, B, C, D, E, F, G, H, J). There are always some colleagues that know how to perform a task or have been dealing with similar problems with the system.

“We have four “super users” that are supposed to know the system, but they are not 100 % sure either, for them was it the same, here: information – good luck”. (Respondent F)

There seems to be an experienced lack of support among employees. Colleagues talk to each other about the lack of external support. Most of the respondents believe additional training within the system even now in the later stages of implementation would be beneficial (B, F, G, J). There is discontent among the employees due to the lack of support, and respondents say that they wish the support was better than it is (C, G, J). One example mentioned by several respondents is the chat function, which they think is a great tool and makes daily work more efficient.
“Since the latest update employees have started to chat with each other, this was not done two years ago. For example, when someone works alone until 10 pm. without a doctor since they are at a different unit (...) this is much easier. I assume that this is something that a few people started with and that others then started doing as well – “this seems good”. The chat function makes it possible to talk more freely”.
(Respondent J)

However, as many colleagues still do not know how to use it, they cannot fully take advantage of it (A, F, J). One respondents also mention the possibility that there may be other functions or tools like this one that they could be using in their daily work if they just knew about it (F).

4.6 MANAGEMENT SUPPORT
None of the respondents experience any substantial management support regarding the system. Some respondents believe that systems are often being implemented too quickly without considering how it will affect the employees (F, J). There is also believed to be lack of knowledge about the system and implementation at the management level (A, F, H). Some of the respondents’ state that management did not expect there would be so much work with changing the system, or how many complications that would occur (A, F). Yet another respondent has the opinion that management know less about the system than the employees. According to some respondents, management was not involved in the implementation process, the supplier of the system was the face of the system among employees (B, C, F, G). They were the ones presenting and training during early implementation process. However, respondents D and E had a different experience where management was more involved in the implementation process.

According to the experiences of the respondents, when changes are being made in the system (either if it is substantial changes like implementing a completely new system or performing smaller updates) there is hardly any communication from management about why this is being done or what the purpose with the change is (A, B, F, G, H). As they say, changes and updates just happen, and the employees just have to deal with it themselves. Changes and updates often involve down time and this creates extra work and disturbances among employees, but it is never explained why they have to go through it or what will become better afterwards (A, B, F, G, H).
However, some of the respondents received e-mails from management for a short period of time during the early implementation phase about what updates were taking place and what improvements they were expecting with the new system (A, D, E, F).

“We knew about the update already in 2014, the plan for this new system when we opened the new hospital. They were not prepared for how much work it was, there have been a lot of complications that postponed it two years. We got some e-mails with some information, but it was not until last summer that they started contacting us with information (...) there was a high pace, one day we had the old system the next day the new”. (Respondent A)

Some also mention that they receive messages about the system from management today (H, J). The messages are e-mailed or posted on the internal homepage. Respondents H and J says that you have to be active and go there to read those messages. Respondent J says that comments like “I do not have time to read my e-mail” are common.

“I have noticed that some employees do not read anything on the webpage, they only work here and now. Or, they are focused on the patient they have for the day”. (Respondent J)

However, the respondent believes there is plenty of time to read the e-mail, you just have to be interested and active (J). Also, one respondent says that even though information is posted and seen, this may not be given much thought.

“The consultants tried in every way, this will be great, and it will be so flexible. So, some sort of positive aspect has been communicated, but you don’t believe it until you see it”. (Respondent H)

One of the respondents believe that employees get a lot of information about new technologies from management (B). Still, this information is only technical, this system or tool works in this way. There is still a lack of purpose or in what way the new technology would simplify daily work. Overall, none of the respondents believe they get enough information about the purposes and benefits for implementing and using the systems (A, B, C, D, E, F, G, H, J). Often the employee can think of benefits or experience them when working with the system after implementation, but it is believed that hearing about it from management could increase acceptance and interest for new technology (A, B, F).
5 ANALYSIS
This chapter will include an analysis of the empirical data collected during interviews. The analysis will be based on previous research as presented in Chapter 2, including the sociotechnical approach, professional aspect, DeLone & McLean framework and the implementation factors. The analysis will be presented according to the different themes as described by DeLone & McLean (2002), ending up with an analyzing summary of how the individual themes affect each other.

5.1 INFORMATION QUALITY
As stated by Christiansen et al. (2017), we can see that nurses at KUH have the impression that the Medical Information Systems makes knowledge and information more easily accessible and that it is easier to pass on information to colleagues. However, we can also see that some problems exist with the data quality as discussed by Andargoli et al. (2017); Dobrzykowski & Tarafdar (2015). Among the problems that can be seen is the fact that the systems are not being used to their fully potential, for example the often-mentioned chat function. It is being used more and more according to one respondent (J) but at the same time other respondents believe that there is still a substantial lack of knowledge about certain system functions among employees.

From interviews we can see that there are situations, where employees leave out information that they could have written into the systems but do not. This does not seem to be because of the level of training or the complexity aspect as described by Lambooij et al. (2017) but one possible reason could be the profession aspect as described by the Swedish Society of Nursing (2017). Throughout interviews it shows that the nurses are solution oriented and that they want things to happen now. They do not want to wait, so there were situations described where the nurses went to their colleagues to talk face-to-face instead of adding the information to the system. This was not because they had a lack of knowledge regarding the system or that they believed the system was difficult to use, it was simply faster. However, as interviews also showed, nurses thought that information that is not in the system is not considered at all. This shows how the professional qualities of the nurses is a likely reason as to why information goes missing from the system.

We can also see during interviews that nurses like to help others and each other as discussed by Rasmussen et al. (2018). They describe how they teach each other about the system and that they prefer learning from each other instead of waiting for training sessions. This could be a
possible problem though. If or when there is a new functionality in the system, and no one knows about this functionality, it takes a longer time for the functionality to be used to a larger extent in the organization. This way, the nursing profession stands in the way and delays the use of the function that could be beneficial for their work. During interviews it was apparent that a common belief among nurses regarding training and education is that they do not have to attend training or take any initiative to learn, as there is always someone else who will teach them everything later on.

As Jefferson et al. (2014) and Ten Hoeve et al. (2014) states, the hierarchical aspect of the nursing profession is also impacting their willingness to transfer knowledge across the organization. According to nurses during interviews, everybody at the hospital has the same possibility to learn, but it is also up to the individual nurse. Due to the hierarchical aspect, nurses refrain from adding too much information into the systems as well, because of the risk of adding any incorrect information. As it is not popular among those higher up in the hierarchy if a nurse adds incorrect information to the system, they believe it is not worth adding the information at all. The nurses like to help each other and teach each other but the professional identity seem to be an obstacle that prevents larger scale knowledge transfer that the Medical Information Systems enable.

5.2 SYSTEM QUALITY
Regarding the functionality of the Medical Information System, Bossen et al. (2013) highlights the ease of use and a good fit between the system functions and the daily work of the nurses. This study shows that nurses have an overall positive perception about the systems, but that there are problems hiding beneath the surface. One example is that one Medical Information System that is being used at KUH was not developed specifically for the medical or healthcare sector but for the industrial one. This is believed to be an important factor for the system and not making it a good fit for daily work.

As discussed by Huryk (2010); Standing & Cripps (2015), the users of a system should be involved during all implementation phases to increase the likeliness of the system being integrated in the work tasks performed daily by nurses. There are several situations mentioned during interviews showing that this kind of involvement is not happening at KUH. Nurses experience that they are performing different tasks at different wards, as well as having different needs regarding what they want and need from the system. The study also shows that any kind of involvement has only been taking place during the early phases of implementation. This
makes it questionable if it is possible to fix the shortcomings or if it all point towards another solution, to replace the whole system with a new one and make things better from the beginning next time.

The problems with the functionality of the systems have led to nurses at KUH making up their own shortcuts when working with the Medical Information System. This phenomenon can also be connected to the nursing profession since they describe how they want things to happen at once and that they are very solution oriented as described by the Swedish Society of Nursing (2017). When the nurses run into technical problems or when they do not have enough knowledge about a specific function within the system, they do not turn to manuals, training or other support. Instead, they find their own ways around it. This is not only happening when they run into problems, sometimes they invent their own ways to perform tasks which are faster than the intended way of working with the system. This also shows that the profession has influence on how the nurses work with the systems.

The existence of early and late adopters as described by Escobar-Rodriguez & Romero-Alonso (2014), can be seen through interviews. Respondents describe how some employees have been using the chat function for a long time, while others just recently started using it, even the ones who have known about its existence for a longer period of time. So, it is not only the fact that not all employees have been unaware of the function’s existence, there are also other factors involved here. With the tradition and pride that comes with the profession of being a nurse, this could likely be a reason here too. It seems likely that they want to do things the same way as they always did and are skeptical towards the new functions. Not until they have seen that many of their colleagues have also started using it, then they will try using it but with the notion that they cannot believe in the advantages before they have tried using it themselves.

What has also appeared as an often-mentioned phenomenon regarding the acceptance and resistance against the systems, is the generation aspect. The matter of employee ages has not appeared as a factor to consider during implementation while looking through previous research, but during interviews, this seems to be of importance. Both younger and older employees seem to have a certain amount of resistance against the systems. The younger ones have a hard time handling the older Medical Information Systems, while the older employees have similar problems with more modern and more digitized systems. There are no signs of technology development slowing down, but by contrast show a future increase in digitalization (Brynjolfsson & McAfee, 2015). If digitalization is continuing and with there will always being
younger and older employees, this problem could likely be even more urgent in the future. If new systems or functions are appearing more and more frequent, this will possibly cause larger disturbances in the future and this is something that management and researchers should take into consideration to a larger extent than what seems to be the case now.

5.3 SERVICE QUALITY

When it comes to implementation projects, both external and internal support have important roles for the employees (Nah et al., 2001; Zuh et al., 2010). This study shows that the level of support at KUH is perceived by nurses as being low. The common opinion is that there were support during the earlier implementation phases, both from management and external sources. However, this support did not seem to impress the nurses either and they perceived that they mostly had to solve problems and learn everything themselves.

However, as the interviews progressed, there were also signs pointing in a different direction. The respondents mentioned certain things that showed that maybe support was not as unavailable as they perceived and argued it to be. Maybe the role of nursing identity and nursing profession as described by Rasmussen et al. (2018) is standing in the way, making nurses less receptive for any kind of support. If so, this would also explain that independent support systems have formed among nurses, not involving any kind of internal or external support.

Despite all of this, the respondents claim that they all wish for more and better support, both external and internal. As it seems, there is a risk that support would be rejected or ignored by nurses even if management put more resources into improving their support channels. The same goes for the knowledge transfer, where nurses state that they get too little information from management, while all information is available to them via mail or on the internal website. There is a resistance against going to find information themselves but want information to be served by managers. This is a bit contradictory since they want to solve problems on their own but at the same time they do not want to reach out to grab information available right in front of them. One of the possible reason for this, is the profession and traditions that come with it being so strong as described by Flexner (2001); Nolin (2008), and that the nurses feel that they want to manage on their own.

5.4 CONCLUDING DISCUSSION

So, as this study shows there are several influential factors when it comes to nurses at KUH in regard to the digitalization and working with Medical Information Systems. From the perspective of the nurses, which is the focus of the study, according to their perceptions it can
be discussed that management is neglecting the social aspects during implementation phases. The nurses discussed during interviews how the support and training is not enough, and that management has the responsibility for the appearance of self-managed work groups, support and workarounds. But as (Appelbaum, 1997; Druskat & Wheeler, 2003) states, when self-managed work groups have been created, joint optimization can only be achieved if management consider both social and technical aspects. Respondents stated that management had often been absent during the actual implementation among the employees, they had concentrated on the technical parts. They looked into that the system was implemented and which modules to use but did not seem as interested in how the system impacted the daily work or how employees experienced the implementation. Suggestions about improvements and changes that came from the employees have often been ignored or not possible to take into consideration. We can therefore see that from this perspective, joint optimization has not been achieved at KUH and that unintended consequences have appeared in the form of employees’ own support channels, as discussed by (Eason, 2014; Harrison et al., 2007; Sittig & Singh, 2010).

That only management is to be blamed by neglecting the social aspect is questioned by this study since the nurses also make statements that contradict that support and training is non-existing. This study shows that the main reason for this may at least partly be a profession obstacle. From the results it is not possible to say to what extent the management is to blame and to what extent the profession aspect is to blame, but it can be shown that management could be showing their support in a different way to the employees. The current way does not seem to be suitable for the situation. One explanation to why the nurses do not work with Medical Information Systems the way they are supposed to is, whether it concerns adding information to the system or actively seek information, has emerged through this study as a professional factor. They do not do things that are not included in their job description. They strictly follow the nursing description. But as Frey & Osborne (2017) discuss, digitalization is the reason to why job descriptions everywhere are about to change. Maybe the nursing profession is one of the strongest and most difficult to change, but it is inevitable that they must change if healthcare is to harvest as much benefits as possible from digitalization. How to speed up the nurses’ willingness to adjust their view of their profession seems to be the toughest obstacle.

To a certain extent, however, it seems that management are not considering the social aspects enough, especially not during the later stages of the implementation. Late adopters, more support and higher service quality could lead to higher user acceptance if management could
put more work into catching up the later adopters at an earlier stage. The later adopters could in this case also be late adopters due to the professional aspect. This also shows on the importance of continuing the work during later implementation phases, not only give support and training during the earlier phases. If there is only work being done during earlier implementation phases, the late adopters could miss out on a lot of it because they do not care or have too high resistance against the system when they can get support. However, with the profession standing in the way for embracing the offered support, the support offered may have to be adjusted to better fit the characteristics of the nursing profession since the nurses’ view of their profession will probably take longer to change than the support given. Adjusting the way support is offered is likely an easier task.

The DeLone & McLean framework show how the implementation factors (Information Quality, System Quality and Service Quality) affect the Use/Intention to Use and the User Satisfaction (DeLone & McLean, 2003). From the analysis above it can be seen that there are also relationships between the different implementation factors, as well the impact from Use/Intention to Use and User Satisfaction back to the implementation factors. This cannot be seen in the original DeLone & McLean model. One example that can be seen is when respondents are discussing that a high level of internal or external support could lead to higher user satisfaction. That user satisfaction could in turn lead to higher information quality since the employees who are satisfied with the system are more motivated to add higher quality data into the system. Relationships like this one is not being considered in the original DeLone & McLean framework. According to this study, these relationships should also be considered while implementing since they obviously have an effect on the implementation process, the employees and the system. If the quality of the information, system and service is on a high level, the use/intention to use and the user satisfaction is to increase according to DeLone & McLean (2003). This study suggests that a higher level of use/intention to use and user satisfaction is creating an impact back to the information, system and service quality which even further increases the level of use/intention to use and user satisfaction.

There is therefore not an impact in only one direction as the original model shows, but a two-way impact. This shows an even bigger importance of considering the information, system and service quality during implementation since it can create ongoing and continuous improvements. To consider the impact back to information, system and service quality can also be a way to prevent unintended consequences as discussed by Eason (2014); Harrison *et al.* (2007); Sittig & Singh (2010). The reason for this is that increased focus on the social aspects
of the implementation process is suggested to increase the control function of the system since it is a better fit with the nursing profession. The picture shows an updated version of the framework suggested by this study.

Figure 8. Updated Framework (Figure created by the authors, based on DeLone & McLean, 2003)
6 CONCLUSION
This section summarizes the findings of the conducted research. The purpose of this thesis has been to contribute to sociotechnical theory and the nursing profession research. This has been done by investigating and gaining deeper insight on how the work within Medical Information Systems at KUH is impacting nurses and how the nurses work within the systems. Furthermore, the study wishes to provide feedback to healthcare management that would improve the work when implementing Medical Information Systems as a control mechanism. The research question for this study is;

“How is the implementation process of Medical Information Systems affected by the nursing profession?”

This study shows three main findings from the investigation of the implementation factors as described by DeLone & McLean (2003).

• Information quality: The analysis shows that nurses deliberately leave some information out of the system.

• System quality: The nurses develop their own workarounds while working in the systems and are not using the system according to instructions given by internal and external support and training.

• Service quality: It can also be seen that the nurses develop their own support system despite access to both internal and external support.

This study shows that the nursing profession is influencing these phenomena to take place.

By digging deeper into the implementation factors from the DeLone & McLean framework, some further interesting discoveries emerged. It is difficult to draw any conclusions on whether or not the hospital management is neglecting the social aspects during implementation since the professional aspect seems to reject much of the support given. During interviews the first impression is that the social aspects are neglected, but having the fuller picture, this cannot be concluded. The nurses do not voluntarily seek information regarding the Medical Information Systems, and when running into problems they prefer to solve it by themselves instead of contacting support. The major findings from this study is that nurses themselves seem to be a
substantial barrier to getting the most out of the systems due to professional identity reasons, and this is something that should be considered to a larger extent during implementations.

To summarize, self-managing work groups have emerged due to professional and/or managerial reasons. Management should therefore consider both social and technical aspects during implementation to achieve joint optimization. However, most findings from interviews show that nurses do not perceive that the social aspects are being considered by management. Therefore, joint optimization has not been achieved. If this really is due to lack of consideration regarding social aspects from the management side or if it is mainly because of the characteristics of the nursing profession, is difficult to tell from this study nor was it the aim of the study to investigate. Still the authors believe it is important for both management and researchers to be aware of and take into consideration.
7  FUTURE RESEARCH
From what can be seen from this and other studies regarding similar topics, digitalization of healthcare will continue to be a relevant phenomenon for an indefinite future. While writing this thesis, some topics and thoughts have appeared with the researchers, but that are out of scope for this particular study. Based on the results from this study, two topics have been highlighted and are presented here as suggestions for further investigation and future research.

7.1  REPLIICATION OF THIS STUDY
Due to limited possibility to generalize, this study could be replicated but on a different hospital, in another city to see if the results are specific to KUH or not. New conclusions could be drawn from the findings of such a study since it would have a broader foundation than one single study for a single hospital. If the results would differ between hospitals, it would be interesting to look into why those differences appear and how to learn from each other to create a deeper knowledge and better prerequisites for the future of digitalization within healthcare.

7.2  OTHER HEALTHCARE PROFESSIONS
It would also be interesting to look into whether the results from this study is similar if, for example, looking into the profession of doctors and physicians. This could be of importance since the digitalization of healthcare has not come as far as in other sectors, and by increasing the knowledge about the profession’s impact on this fact could be of importance for speeding up the process.

8  IMPLICATIONS FOR PRACTICE
By looking into the current situation in the late phase of implementation, this study makes a contribution to the hospital management to consider for their future implementations. As the situation appears at KUH now, there is no joint optimization and the Medical Information Systems may not work as well as a control mechanism for management since nurses develop their own way of working with the systems. Since one of the reasons to implement the system from a management perspective is to use it for control reasons, this is suggested as an important factor to consider for management.
REFERENCES


APPENDIX

Interview Guide

Introduction questions

1. Tell us about your background, how long you have been working, your education etc.
2. Describe a normal working day for you
3. Can you describe the most important tools you need to do your job?

Digital systems

4. On a normal working day how dependent are you on a computer?
5. How would a normal working day be affected if you did not have a computer?
6. Has the way you work become more efficient in anyway over the last years? If so, can you describe how?
7. Would you agree that IT-based work methods are more efficient? If not, why?
8. How long have you been working in the digital healthcare?
9. Is it important for you to be up to date with the technical development? In what way would you say that healthcare is up to date with the technical development?
10. How hard do you think it is to keep up to date with the technical development of the industry?

Information quality

11. Is it easier to transfer knowledge due to the digitalized systems in your line of work?
12. Do you feel that you exchange knowledge/learning in your line of work?

System quality

14. Do you feel that it is possible to adapt the systems? To what extent, for example between different units?
15. If something is experienced to not work to 100 % is it possible to change that? Or are all systems working in the same way for everyone?
16. Do you think it would be easier to work if all units within the hospital could access the systems you work in?
17. In what way do you experience that your work has been easier due to digital systems?
18. In what way do you experience that your work has been more complicated due to digital systems?

19. Do you think that the data that is available in the systems is sufficient to do a good job? Is there too much information and can it be hard to determine what is enough information or is it clear?

20. If the information is not sufficient, what do you think this depends on? Is it when the information is entered, by whom, or is it due to the layout of the system?

Service quality

21. If something in the system is not working, what type of support do you have?

22. How does your back up routines work when the system is not working?

Intention to use

23. Do you think that the system is used in the best way? Are you using them as they have been planned to use? Could the way you work been easier if it was possible you use the system in another way?

24. Do you experience that there is support from the managers when it comes to the use of digital systems? Have they communicated some advantages about the system?

25. What do you think is the main reason for management as to why digital systems are used? Has the purpose been communicated? How?

User satisfaction

26. Do you have knowledge to work with digital systems?

27. Do you get any education in the matter from the hospital?

28. Do you experience that there is any resistance to digitalizing the healthcare? If so, for what reason? If not, why not?

29. Do you think that you get a lighter workload due to digitalized systems?