Successful ERP system upgrade

Critical success factors and how different project members perceive them
Abstract

An Enterprise Resource Planning (ERP) system implementation is a massive undertaking for any organization, and we have all heard about success and failure stories. This research study has identified the Critical Success Factors (CSF) after a successful ERP system upgrade at a pharmaceutical distribution company. The company of interest stores and distributes pharmaceuticals to pharmacies in Finland and Sweden. The company used an old version of the ERP system from 1999 that had been heavily modified over the years to cater for new regulations, business and customer requirements. The upgrade was a complete success, and the new version of the ERP system has been running without major issues ever since go-live in autumn 2016. The qualitative interpretive research was conducted by using two data collection methods, semi-structured interviews and card sorting to gather data from the participants. The participants were selected from the three (3) central roles in the project team to capture the perceived CSFs from several perspectives. The data was a subject for a thematic analysis process to generate codes, themes, and concepts within the extensive data set.

The findings revealed that the reasons for the upgrade were the end of support for the ERP system, need for new features and to reduce platform dependency. The participants regarded a stable system after go-live with minimal impact on business and harm to customers as the primary definition of success. The ten (10) identified CSFs were; (1) Top management commitment and support, (2) Software analysis, testing and acceptance control, (3) Project team leadership, empowered decision makers, (4) Project management and (5) Strategy planning, scope and vision, (6) Involvement of end-users and stakeholders, (7) Data conversion and integrity, (8) Consultant selection and relationship, (9) Balanced team and (10) Project team: the best and brightest.

Even though the ERP upgrade at the pharmaceutical distribution company was considered a success, there were several areas identified for improvements. The lessons learned was for example related to data quality and test data. The need to introduce new resources by learning from key resources before and during the ERP project. The project model and project organization were other areas that were identified for improvements to reduce administrative work and to obtain a better fit towards the company organization.

Several similar ERP system upgrades and new implementations are planned the coming years, and the outcome of this thesis provides valuable guidelines and recommendations to the company. The research thesis will also contribute to the field of CSF analysis and ERP systems and offer suggestions for further research.

Keywords

Critical Success Factors, CSF, Enterprise Resource Planning, ERP, ERP project, ERP upgrade
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List of abbreviations
BPR Business Process Re-engineering
CSF Critical Success Factor
ERP Enterprise Resource Planning
IS Information System
IT Information Technology
KPI Key Performance Indicator
MPA Medical Products Agency
1 Introduction

This chapter provides the reader with the background of the research, present the problem statement and research questions. Finally, the scope and limitations are described together with a broad outline of the thesis disposition as a whole.

1.1 Background

Enterprise Resource Planning (ERP) systems is an Information System (IS) that helps an organization to coordinate and manage internal business processes to integrate information within departments. ERP systems typically have the following characteristics, they constitute a suite of integrated software modules with a consistent look and feel that support a common range of different organizational functions such as sales, inventory, procurement, production and finance. ERP systems have a unified common database which makes it easier to execute, store, manage and monitor core business processes in real-time throughout the whole organization. An organization with all sizes, small, medium and large need to standardize and automate their business processes to improve and streamline operations and gain efficiency (Ahmad, Haleem and Syed, 2012; Beynon-Davies, 2013; Tarhini, et al., 2015).

ERP systems are often considered to be a vital part of an organization. Successful implementation of an ERP system can reduce costs for inventory, production, labor and IT maintenance and give a better competitive edge through new features. ERP systems have been depicted as a cure-all for the organization both in the literature and in practice. But many companies underestimate the complexity of the implementation. There are many reports about difficulties and companies that run into costly implementations, critical errors and severe maintenance problems throughout the implementation process argues Shaul and Tauber (2013). The implementation is also the most tedious phase of the lifecycle of an ERP system due to changes in the organization's structure, routines and processes. Employees are often stressed and challenged as their ways of doing work are questioned and re-engineered argues Ahmad, Haleem and Syed (2012). Although ERP systems offer many advantages for the business, implementation success is far from assured. Statistics show that over 70% of the ERP projects fail to deliver and achieve according to the business goals. There are many horror stories about failed or out-of-control ERP projects. Previous research has shown that failure to understand business implications is highly related to ERP project disaster argues Olson and Zhao (2007).

I have a background working with design and development of ERP systems as well as business process development in the areas of warehouse management and logistics. IS and especially ERP systems have been my primary focus and interest during my academic studies. During 2015 and 2016 I had the opportunity to be part of a large ERP upgrade project at a pharmaceutical distribution company. The company stores and distributes pharmaceuticals from their own warehouses to pharmacies. The ERP system is a vital component of the company for controlling stock, warehouse systems and incoming orders for pharmaceuticals to be picked. The same brand of ERP system is used in several countries throughout the company and this upgrade project was done in Finland and Sweden. The reason for that was that the countries share a common codebase and use the same technical infrastructure.

My role in the project was workstream lead for label printing, job scheduling and operational reporting were new features and technology were introduced. The company used an old version of the ERP system from 1999 that had been heavily modified over the years mainly driven by business opportunities, customer requirements and new regulations from the
Medical Products Agency (MPA). The pharmaceutical distribution industry has many regulations that must be met and that increase the importance of a successful ERP upgrade not to fail regulations or affect the business. The upgrade was a technical As-Is upgrade and all modifications in objects were retrofitted into the latest version of the same of ERP system. Objects in this context are parts in the ERP system, for example; tables, programs and applications. To do a retrofit means re-applying modifications in objects from the old version to the new version, thus keeping needed customizations in objects made over the years and make them fit into the new version of the ERP system. The need for retrofit is often the result of table changes made by the ERP system vendor, new columns have been added, others removed, or data format changed making the need for changes in the modified objects that are using those altered tables.

The upgrade project took 18-month from start to finish. The go-live was done by big bang approach per country, first in Finland and a few weeks later in Sweden. A big bang approach describes a go-live scenario with two parallel installations were the business switches from their old ERP system to their new ERP system at a single point in time. The upgrade was a complete success, and the ERP system has been operating without major issues ever since go-live in autumn 2016. During and after the project some questions started to arise, what did we do right here, what were the key areas that contributed to the successful upgrade? A key area in this context is called a Critical Success Factor (CSF) and is required for an organization or project to fulfill its mission. It is a critical activity or key element required where ‘things must go right’ for a successful outcome (Magnusson and Olsson, 2005; Jenko and Roblek, 2016; Peppard and Ward, 2016). This research will focus on the upgrade project to examine and identify the perceived CSFs that contributed to a successful ERP system upgrade at the pharmaceutical distribution company.

1.2 Problem statement and research questions

It’s common that CSF research studies use secondary data and compile result by comparing previous studies as meta-studies. The respondents are often top-management and vendors with risk for colored results, at a very high level and with sell tactics. Very few studies look at the different perspectives of project members such as users, IT staff, managers, consultants and other stakeholders after a successful ERP implementation. This research will be a study of the perceived CSFs during a successful ERP system upgrade using primary data. The aim is to identify the CSFs by looking at several levels of the company by examining if there are differences in how project members with different roles perceive what was important for their successful ERP upgrade project.

The research outcome will result in identifying which of the CSFs that were important for this industry and what could have been done even better at the company during the ERP upgrade process. The results of the study will give input to further research and valuable guidelines for the company and their concerned stakeholders in future ERP system upgrades and new implementations. My research questions are:

RQ1 Which were the main reasons for the ERP system upgrade at the pharmaceutical distribution company?

RQ2 How do project members define “success” in the context of the ERP system upgrade at the pharmaceutical distribution company?
RQ3 Which are the main CSFs perceived by project members after the ERP system upgrade at the pharmaceutical distribution company?

RQ4 Which were the lessons learned after the successful ERP system upgrade at the pharmaceutical distribution company?

1.3 Scope and limitations
The research will only focus on the ERP system upgrade project in Finland and Sweden during 2015 and 2016. Any organizational and cultural aspects of the company and vendors will probably also be revealed and taken into consideration. The functionality of the ERP system as such will not be examined in this research study.

1.4 Disposition of thesis
This thesis is organized in the following way. Chapter 1 provides the background and describes the problem domain and research objectives. Chapter 2 presents the theoretical framework and grounding for the research about CSFs and success followed by a literature review about CSFs in ERP system projects. Chapter 3 gives a detailed account of the research paradigm, research approach, methods for data collection and data analysis used. Furthermore, the chapter discusses threats, reliability and validity of the research and the measures taken to mitigate these threats. Lastly, since the research study involves people, the need for ethical considerations must not be ignored. Chapter 4 presents the findings and results from the thematic analysis. Chapter 5 provides discussions about the findings and theories used in the course of the research and Chapter 6 presents the conclusions and general recommendations of this research study. A graphical representation of the disposition can be seen in Figure 1.

Figure 1 - Disposition of thesis
2 Theoretical framework

The theoretical framework for this research study starts with an overview and background of the CSF analysis and measurement of success. Followed by a discussion on how the literature was selected and search terms. The chapter ends with a literature review of CSFs in ERP system projects with a conclusion of the identified CSFs. Main source of literature for the theoretical framework have been Linnaeus University Library together with literature used in the different courses at the 2-year Master Programme.

2.1 Critical Success Factor (CSF)

The science about factors that significantly affect the outcome of a particular process is commonly referred to as CSF in academia as well as industry. The very basic idea behind this is that control and assurance of outcomes in complex processes lie in the sense that we can identify unique key activities and key events that we can then control argues Magnusson and Olsson (2005). There are several definitions of CSFs, one of the most frequently cited is written by Rockart:

“Critical success factors thus are, for any business, the limited number of areas in which results, if they are satisfactory, will ensure successful competitive performance for the organization. They are the few key areas where ‘things must go right’ for the business to flourish. If results in these areas are not adequate, the organization’s efforts for the period will be less than desired” (Rockart, 1979, p.85).

CSF analysis can be used in many ways for the primary purposes to pinpoint areas that should receive careful and constant attention argues Rockart (1979). Similarly, Leidecker and Bruno define CSFs as:

“Those characteristics, conditions or variables that, when properly sustained, maintained, or managed, can have a significant impact on the success of a firm competing in particular industry” (Leidecker and Bruno, 1984, p.24).

The level of performance in each CSF should continuously be measured and monitored argues Peppard and Ward (2016). A similar view is stressed by Rockart (1979) that a company should continuously and carefully manage these particular areas of activity. By adopting CSFs early, an ERP project stands a better chance to identify possible problems and steer towards a successful implementation advocates Kronbichler, Ostermann and Staudinger (2009). They argue further that the majority of problems during ERP projects are due to management, social and organizational problems. Markus, et al. (2000) claim that each ERP implementation process will have problems at some point and many of those can be related to CSFs. Brandt, Carlsson and Nilsson (1998) argue the importance of good communication between the ERP adopting organization and the vendor. This can be seen as a CSF by itself. It's also important that stakeholders are active and committed during the whole upgrade process to achieve success claims Brandt, Carlsson and Nilsson (1998). ERP project can only be achieved when top management is totally committed to the initiative. Top management support and commitment is the ultimate strategy that will secure the essential conditions for accomplishing the change brought by ERP project into the organization argues Aladwani (2001). Françoise, Bourgault and Pellerin (2009) advocate the importance of the right composition of the project team since these members are at the core of critical actions during the whole project. It should be a multidisciplinary project team with the ability to understand
and consider other departments needs and the interactions between them. Magnusson and Olsson (2005) explain further that CSFs can be seen as clearly defined identifiers concerning obstacles on the path to success, or the necessary criteria that must be met to achieve success. CSFs should not be seen as expressions of necessary factors that must be met, but rather as anthologies that can describe the implementation process at an aggregated level.

According to Esteves and Pastor-Collado (2000) and Remus (2007) there are four perspectives in ERP projects and those can be translated to CSFs in a two-dimensional unified critical success factor model. The perspectives are organizational, technological, tactical and strategic. The organizational perspective is regarding the organizational structure, culture and business processes. The technological perspective looks at the ERP system as such and on technical aspects, such as required hardware and platform. The strategic perspective is focusing on long-term goals related to skills, expertise and core competencies needed to accomplish the organization's objectives, while the tactical perspective affects the business activities with short-term objectives.

2.2 Success and measurement

The success of an ERP system upgrade is a somewhat subjective concept. There have been several attempts to define what success means. In the end, it depends on how you measure it, whom you ask and when argues Markus, et al. (2000). According to Markus and Tanis (2000, p.186), optimal success refers “to the best outcomes the organization could achieve with enterprise systems, given its business situation, measured against a portfolio of project, early operational and longer-term business results metrics”.

There are five main views of success in ERP projects to consider, (1) technical success, (2) financial success, (3) success according to the users and managers. It can also be a (4) strategic success or a (5) smooth running of business operations with success for customers, suppliers and investors claim Markus, et al. (2000, p.246). Magnusson and Olsson (2005) write that the top success definition during ERP system projects often is related to not harming the business and causing a loss at the production level. They argue further that the primary KPIs in project management; time, scope, budget and quality is often inherited by the ERP system project and considered as definitions of success with regards to the ERP system as such.

2.3 Scientific literature search and selection criteria

The literature was selected on following criteria using Linnaeus University Library OneSearch and Google Scholar. The literature had to relate to the research topic and research questions. The research must come from trusted journals and conference proceedings, as they often provide the most current knowledge. The papers had to be confirmed as being peer-reviewed. The publication year should be between 2007 and 2015. The publication should have a clear methodology. Example of different search terms used to identify possible candidates for the literature review:

“critical success factors” AND “enterprise resource planning”
“critical success factors” AND “ERP”
“critical success factors” AND “ERP projects”
“CSF” AND “enterprise systems”
“factors” AND “successful” AND “ERP”
After careful read through the final selection of studies was made following above selection criteria.

2.4 CSFs in ERP system projects a literature review

To collect data about CSFs in ERP systems project and build the theoretical grounding, the seven selected articles serve as a foundation of identifying the most used factors in the literature by looking at large research compilations with analysis of secondary data. Several of the selected research studies provide detailed descriptions and definitions behind each of the identified CSFs (Table 1).

Table 1 - Selected studies for literature review

<table>
<thead>
<tr>
<th>Authors</th>
<th>Year</th>
<th>Studies</th>
<th>Range</th>
<th>Topic</th>
<th># of CSFs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finney and Corbett</td>
<td>2007</td>
<td>45</td>
<td>1999-2004</td>
<td>CSFs in ERP system projects with perspectives of key stakeholders</td>
<td>26</td>
</tr>
<tr>
<td>Dezdar and Sulaiman</td>
<td>2009</td>
<td>95</td>
<td>1999-2008</td>
<td>Assigning CSFs to a category in ERP system projects</td>
<td>17</td>
</tr>
<tr>
<td>Ahmad, Haleem and</td>
<td>2012</td>
<td>23</td>
<td>1999-2009</td>
<td>CSFs in ERP system projects, a compilation of other compilations</td>
<td>37</td>
</tr>
<tr>
<td>Syed</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shaul and Tauber</td>
<td>2013</td>
<td>341</td>
<td>1999-2010</td>
<td>CSFs in ERP system projects</td>
<td>15</td>
</tr>
<tr>
<td>Leyh</td>
<td>2014</td>
<td>320</td>
<td>1998-2013</td>
<td>CSFs in ERP system projects, Small and Medium-sized Enterprises</td>
<td>31</td>
</tr>
<tr>
<td>Ram and Corkindale</td>
<td>2014</td>
<td>236</td>
<td>1998-2010</td>
<td>Validity of claimed CSFs in ERP system projects</td>
<td>26</td>
</tr>
<tr>
<td>Tarhini, et al.</td>
<td>2015</td>
<td>35</td>
<td>2000-2013</td>
<td>CSFs from stakeholders’ perspective in ERP system projects</td>
<td>51</td>
</tr>
<tr>
<td><strong>Sum</strong></td>
<td></td>
<td>1095</td>
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</table>

The first study with the title “ERP implementation: a compilation and analysis of critical success factors” was written by Sherry Finney and Martin Corbett and published in 2007. The research by Finney and Corbett (2007) looks at 45 studies published between 1999 and 2004. They used a content analysis methodology with an inductive coding technique to find CSFs related to ERP systems projects together with critical analysis to identify any gaps in the literature base. During the collection phase, the emphasis was not placed on the words as such but the meaning of the words. All CSFs found in the literature base was tagged with the understanding of the factor and then categorized.

One significant outcome and observation was the lack of stakeholder perspective in the cited CSFs. There have been several studies conducted with an attempt to interview stakeholder groups, but they have not reported the findings in such way that the different views of the stakeholder groups are represented argues Finney and Corbett (2007). The researchers advocate further that ERP system projects would need more understanding about CSFs that concern various stakeholder groups to gain understanding if those groups are being addressed effectively in the best possible way. This would increase the probability to reach cost savings, time savings, higher quality, efficiency and ultimately higher success levels in their ERP
system implementation projects. Finney and Corbett (2007) claim that their study provides a comprehensive compilation of identified ERP implementation success factors. They have used a structured methodological approach and advocates that research on ERP systems projects and CSFs can be a valuable step to strengthen the probability of implementation success.

The review of CSFs in ERP system projects reveals that identified CSFs in many cases are based on reviews of already published literature or limited case studies. One key limitation of this research is the risk for duplicate data in the frequency analysis of the CSFs argues Finney and Corbett (2007). It's also common that previous researchers have focused on a specific stage or aspect of the ERP system projects or a specific kind of CSFs. There is little or no research that covers all significant CSF considerations. Earlier approaches to studying CSFs have been conducted in a similar way with a fragmented approach taken for ERP system implementation projects. The ERP implementation process is complex and shall be treated with a non-reductionist approach, with emphasis on the process with a holistic perspective. ERP system projects involve also making fundamental changes in how business is conducted and changes to the organization. Therefore, it's necessary that a CSF approach moves beyond the scope of software and hardware argues Finney and Corbett (2007). The review has provided a foundation, and a wide range of CSFs cited in the literature and the frequency associated with each. An additional critical analysis was conducted to reveal any obvious gaps in the literature base. The outcome of the research was 26 CSFs, and the top 15 CSFs are presented in Table 2.

The second study with the title “Successful enterprise resource planning implementation: taxonomy of critical factors” was written by Shahin Dezdar and Ainin Sulaiman and published in 2009. Dezdar and Sulaiman (2009) have conducted their study by reviewing 95 studies published between 1999 and 2008. They have used content analysis methodology to gain a depth of understanding of different CSFs already identified by other studies in the literature base. Dezdar and Sulaiman (2009) have used four stages of content analysis to collect and analyze the literature, data collection, open coding, axial coding and selective coding. Data collection, in this stage the researcher decides whether to look for a single word or a set of words or phrases. It involves a comprehensive search in many databases and journals that belong to the business and IS field. Open coding, at this stage the researcher opens up the articles found in the previous stage and read them in detail and investigate CSFs. Emphasis is placed on the words themselves and not the meaning of the words. After the first CSF was identified the researcher continued to read until CSF number two was found and compared to CSF one to make sure that they were unique. When CSF number three was found it was checked against CSF one and two for uniqueness. Next stage was axial coding to assign CSFs to categories. The fourth and final stage was selective coding by looking at facts that illustrated or justified CSFs. A comparison between CSFs was made to identify and contrasts or similarities between CSFs. CSFs regarding the implementation of ERP systems have frequently been discussed and analyzed over the years. There have been many inconclusive and inconsistent findings due to how the researchers define and categorize CSFs. In this study, Dezdar and Sulaiman (2009) have found that authors use different terminology to refer to same CSFs and that one single CSF sometimes have been defined as two CSFs. They present a critical perspective and claims that current research is very fragmented to be able to fully conclude previous findings despite thorough research efforts and analysis. The outcome of the study was 17 CSFs, and the top 15 CSFs are presented in Table 2.
The third study with the title “Compilation of Critical Success Factors in Implementation of Enterprise Systems: A Study on Indian Organizations” was written by Naim Ahmad, Abid Haleem and Asif Ali Syed and published in 2012. Ahmad, Haleem and Syed (2012) have conducted their study by reviewing 23 studies published between 1999 and 2009. This study differs from the other selected studies as they have collected other compilations of articles. The researchers have used an exploratory research methodology to summarize the outcomes of earlier compilations and collected detailed descriptions of CSFs found. This research gives a good background of identified CSFs and provides a detailed description and definition of each CSF in its context. An ERP system implementation is a risky and resource draining endeavor, and if not managed properly it can have drastic consequences. This research has studied the implementation process with the adoption of CSF approach and observed that the factors could lead to a positive outcome of the ERP project argues Ahmad, Haleem and Syed (2012). The result of the research was 37 CSFs, and the top 15 CSFs are presented in Table 2.

The fourth study with the title “Critical Success Factors in Enterprise Resource Planning Systems: Review of the Last Decade” was written by Levi Shaul and Doron Tauber and published in 2013. Shaul and Tauber (2013) have conducted their study by reviewing 341 studies published between 1999 and 2010. Shaul and Tauber (2013) provide a comprehensive literature review and compilation on CSFs in the context of ERP system implementations. The first stage was to make a full-text search of each article to eliminate those not related to CSFs for implementation of an ERP system. To avoid duplicates in case the study has been published several times in two or more conference proceedings only the article with most details was collected. The collection of articles was analyzed in light of prevailing CSF constructs described in cited studies. The most recent articles on the subject were also explored in complementary fields related to ERP systems for example in IS, Sociology, Computer Science and Management argues Shaul and Tauber (2013).

Shaul and Tauber (2013) emphasize that certain CSFs are only important in specific stages of the ERP upgrade process. CSFs should therefore be analyzed in each of the different stages of the ERP upgrade process. As an ERP system involves the whole organization, it is important to get a commitment by the employees so that the implementation will not face issues to implement the ERP system effectively argues Shaul and Tauber (2013). This research provides a comprehensive taxonomy of CSFs and presenting those across the life cycle of the ERP system. The outcome of the research was 15 CSFs, and those are presented in Table 2.

The fifth study with the title “Critical Success Factors for ERP Projects in Small and Medium-sized Enterprises - The Perspective of Selected German SMEs” was written by Christian Leyh and published in 2014. Leyh (2014) have conducted his study by reviewing 320 studies published between 1998 and 2013. He used a systematic literature review to identify CSFs for ERP systems at small and medium-sized enterprises. Studies focusing exclusively on small and medium-sized enterprises are rare, around 12%. This research has been recommended by the research community for several years but is still not the primary focus of CSF studies. The research by Leyh (2014) shows that all CSFs that influence the success of ERP implementations at small and medium-sized enterprises are the same as for large-scale enterprises. It was not possible to identify any new CSF not already mentioned in context with large-scale enterprises. The research could show that the importance of the factors differs a lot between small and medium-sized enterprises and large-scale enterprises. Small and medium-sized enterprises tend to put the significance of technological factors in contrast to large-scale enterprises that focus on more organizational factors argues Leyh (2014). The outcome of the research was 31 CSFs, the top 15 CSFs are presented in Table 2.
The sixth study with the title “How ‘critical’ are the critical success factors (CSFs)?: Examining the role of CSFs for ERP” was written by Jiwat Ram and David Corkindale and published in 2013. Ram and Corkindale (2014) have conducted their study by reviewing 236 studies published between 1998 and 2010. They have used a systematic approach with interpretive research methods. The collected material was then analyzed and interpreted using the five-step procedure of gathering, categorizing, coding, analyzing and comparing the data. Ram and Corkindale (2014) claim that prior studies have identified great numbers of CSFs, but many can be questioned as only a few are empirically demonstrated to be critical argues Ram and Corkindale (2014). In many studies, CSFs have been argued as crucial for ERP implementation success, but very few studies have looked at to what degree the CSFs have been related to successful ERP projects. The results can help identify what CSFs to focus on that are empirically identified and proven to be robust, argues Ram and Corkindale (2014). The outcome of the research was 26 CSFs, the top 15 CSFs are presented in Table 2.

The seventh study with the title “Analysis of the Critical Success Factors for Enterprise Resource Planning Implementation from Stakeholders’ Perspective: A Systematic Review” was written by Ali Tarhini, Hussain Ammar, Takwa Tarhini and Ra’ed Masa’deh and published in 2015. Tarhini, et al. (2015) have conducted their study by reviewing 35 studies published between 2000 and 2013. Tarhini, et al. (2015) claim that research of CSFs lacks the view from a stakeholder perspective. CSFs are interpreted and perceived differently by different stakeholders. The consultants are interested in CSFs that relates to business processes and alignment to the ERP system. The top-management is interested in CSFs that concern the project, required resources and budget. One of the most important groups are the users. Tarhini, et al. (2015) argue that the stakeholder groups in ERP upgrade projects in fact are users, top-management, business process experts, IT department, project team, consultants and vendors. The outcome of the research was 51 CSFs, the top 15 CSFs are presented in Table 2.

2.5 Conclusions of literature review

The different research studies clearly lack of standard or taxonomy of CSFs in the literature. It's in the end up to the researcher during analysis to assign names and definitions which makes comparisons between different studies hard. These results will despite that limitation give a good indication of what CSFs that are empirically proved to have some influence on ERP systems implementations. It's also interesting that so few studies have the perspective of user or stakeholders. The top 15 CSFs found during the literature review of each research study have been merged into a netlist of 24 unique CSFs. Each CSF has been given scores on a 15-point scale, top-rated CSF gets 15 points and the lowest rated CSF get 1 point. This allows to summarize the scores and sort the results to get the rank of the CSFs, see Table 2. The 24 CSFs in this list will serve as a reference list and theoretical grounding for input for the interviews and card sorting method.
Table 2 - List of 24 unique CSFs derived from the literature review

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<td>11</td>
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<td>5</td>
<td>Business process re-engineering and configuration</td>
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<td>9</td>
<td>11</td>
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<td>12</td>
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<td>ERP vendor support</td>
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<td>16</td>
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<td>Data conversion and integrity</td>
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<td>Level of customization</td>
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<td>19</td>
<td>Managing cultural change</td>
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<tr>
<td>21</td>
<td>Involvement of end-users and stakeholders</td>
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It’s interesting to observe that the study by Finney and Corbett (2007) doesn’t regard project management even as a top 15 CSF in their study. It was given rank 18 in their study and it
was ranked 3 in this summary. It’s also surprising that testing and acceptance control is found first on rank 22.

### 2.6 Definitions and descriptions of CSFs

Here follows definitions and descriptions of the identified 24 CSFs. All definitions and descriptions are derived from the articles in the literature review.

**Top management commitment and support**, this CSF is maybe one of the most cited in the literature and does ensure that the project gets all needed resources and that the project has taken the right direction. It’s also a key mission statement to sell it to the whole organization and iron out any doubt or dispute to ensure a smooth and successful implementation. This CSF does not end after the completion of the implementation project but is equally important throughout the whole lifecycle of the ERP system (Finney and Corbett, 2007; Ahmad, Haleem and Syed, 2012; Leyh, 2014).

**Training, education and job redesign**, this CSF is often underestimated in ERP projects and can hinder a successful implementation. Training and education are essential to retain knowledge about the business processes to exploit the ERP systems functionality fully. The IT staff and project members need specialized and detailed training in the new version of the ERP system. ERP changes and new features might also force organizational changes and staff restructuring. End users need general training in the system to be able to carry out their daily tasks. Lack of training can lead to frustrated users that will bypass the system and invent workarounds and own processes outside the system to get the job done. (Finney and Corbett, 2007; Ahmad, Haleem and Syed, 2012; Shaul and Tauber, 2013; Leyh, 2014).

**Project management**, this CSF is very wide and refers to the management of the implementation plan to avoid time and cost overruns. It involves time planning, work planning, resource planning, allocating responsibilities, defining milestones and critical paths, training and defining the measures of success. The project manager is also responsible for periodic meetings and communications with key stakeholders and steering group (Finney and Corbett, 2007; Ahmad, Haleem and Syed, 2012; Shaul and Tauber, 2013; Leyh, 2014).

**Change management programme**, this CSF refers to changes in the organizational structure to fit the rules and processes in the implemented ERP system. These enterprise systems dictate their own logic on a company's strategy, culture and organization. The main task of change management is to ensure user acceptance and willingness to change by getting appropriate top management endorsement and support (Finney and Corbett, 2007; Ahmad, Haleem and Syed, 2012).

**Business process re-engineering and software configuration**, this CSF is essential to align existing processes closer to the ones defined in the ERP system. This exercise will reduce modification and make it easier to accept service packs and new releases in future. The BPR will make a To-Be model from the As-Is model of the processes. There are two ways to go here, either re-engineer the processes to fit the ERP system or modify the ERP system to fit the processes if a configuration is not possible. The latter option is sometimes needed due to regulations (Finney and Corbett, 2007; Ahmad, Haleem and Syed, 2012).

**Project team: the best and brightest**, this CSF is about the skills and mindset of the members of the project team. They should be result oriented doers. They should be highly motivated, dedicated and disciplined, in other words, the best and brightest with a proven reputation. It is
also important that they are assigned full-time to the project and not part-time (Finney and Corbett, 2007; Ahmad, Haleem and Syed, 2012).

*Strategy planning, scope and vision,* this CSF regards the business vision and strategy and link the project objectives to the IS strategy. It also incorporates risk and quality management and internal and external best practices of ERP implementations. The three competing goals of time, scope and cost must be met. The ERP project should have a scope statement so that it is clear what should be done and what's out of scope (Finney and Corbett, 2007; Ahmad, Haleem and Syed, 2012).

*Implementation strategy and timeframe,* this CSF regards the implementation strategy for the ERP system. There are several methods like, big bang, phased, parallel, process line and hybrid. Depending on the industry, it's important to select the best strategy in order not to risk incur losses. The time frame should also be set to avoid order peak or peak seasons (Finney and Corbett, 2007; Ahmad, Haleem and Syed, 2012).

*Communication plan,* this CSF is about communication and the importance of open communication in the project team and between business, IT department and vendors. The communication is essential and should clearly tell in advance about upcoming changes and the scope of it. There should be a clear communication plan with scheduled information meeting and usage of e-mail distribution lists to avoid communication failure. Communication is also important for the acceptance of the ERP system throughout the organization (Finney and Corbett, 2007; Ahmad, Haleem and Syed, 2012).

*Consultant selection and relationship,* the consultant(s) hired for the ERP implementation project should be made part of the project team. They are a valuable asset and should transfer knowledge to the company. The needed competence of the consultant(s) should be assessed by ERP system knowledge, business understanding and soft skills. Many of the consultant(s) offer several services and can therefore be involved in multiple stages of the implementation (Finney and Corbett, 2007; Ahmad, Haleem and Syed, 2012).

*Balanced team,* this CSF concern the mix of people in the project team or project members. The individuals should come from the whole organization and have not only technical skills but also a good understanding of business processes and requirements (Finney and Corbett, 2007; Ahmad, Haleem and Syed, 2012).

*Selection of ERP,* this CSF is about the selection of ERP system and or new version. The system should match with overall business strategy and have the best fit for existing business processes. There are five main criteria to consider, affordability, use of latest technology, local support, domain knowledge by suppliers and upgradability (Finney and Corbett, 2007; Ahmad, Haleem and Syed, 2012).

*IT infrastructure,* this CSF is about the needed infrastructure and architecture, if not sufficient to host and run the ERP system it must be upgraded to ensure successful and smooth operation (Finney and Corbett, 2007; Ahmad, Haleem and Syed, 2012).

*Project champion,* this CSF regards the importance of appointing a project champion, can be an internal or external consultant. The project champion should have good leadership and technical, business and personal managerial skills. The champion should be given high authority and be a type of an ambassador for the project and strive to resolve conflicts and
manage resistance to lead the transformation (Finney and Corbett, 2007; Ahmad, Haleem and Syed, 2012).

**ERP vendor support**, ERP systems are no different from any other software, they also require continuous support from vendors and support partners. With new features and business needs the implementing organization needs user training, extended technical support, functional expertise and emergency maintenance (Ahmad, Haleem and Syed, 2012).

**Project team leadership, empowered decision makers**, this CSF regards the members and managers of the project team. They need sufficient authority and delegation to make decisions to meet the milestones in the project. There are examples of ERP projects where the autocratic style of top management led to serious consequences, they overlooked and bypassed the project team and gave the go-ahead for go-live and faced critical problems and issues with the ERP system (Finney and Corbett, 2007).

**Data conversion and integrity**, this CSF refers to data, both business data and system data. Data might reside in different places or be in and different or outdated format that needs conversion to the new format. It's important to test the conversion and see if integrity is kept and to check how long time it takes to complete. Data conversion can take many hours or even days if many tables, the implementation strategy and timeframe might need to be aligned (Ahmad, Haleem and Syed, 2012; Shaul and Tauber, 2013).

**Level of customization**, this CSF refers to the amount of ERP software customization. Customizations to the code slow down the implementation speed as they have to be retrofitted (code has to be rewritten) in the new ERP system with additional testing. Many organizations are therefore committed to “vanilla” implementations. However, ERP vendors and consultants have a different view of course where they consider customizations to be necessary and an evolving process (Shaul and Tauber, 2013).

**Managing cultural change**, this CSF is related to change management but has been regarded as a separate CSF due to the many citations in the literature base. The culture varies by organization and location and can have implications in the culture of knowledge sharing and sharing of information and that can influence the success of the ERP implementation project (Finney and Corbett, 2007; Ahmad, Haleem and Syed, 2012).

**Business case**, the ERP implementation should be considered a business initiative and therefore have an economic and strategic justification. The project like any other IT/IS projects must be aligned with business needs, goals and strategies (Finney and Corbett, 2007; Ahmad, Haleem and Syed, 2012).

**Involvement of end-users and stakeholders**, this CSF is very important to get acceptance by the organization and to ensure that all stakeholders are part of the upgrade. End-users should also be part of setting the requirements and in testing, they are after all the real experts in how to use the ERP system (Shaul and Tauber, 2013).

**Software analysis, testing and acceptance control**, this CSF regards the needed testing effort to ensure a successful ERP implementation. All processes, modules and features have to be tested in several steps such as unit testing, quality assurance testing and user acceptance testing. The overall performance of the ERP system needs to be tested as well to make sure
that it can handle order flow, usage and normal operation. Insufficient testing can reverse the fate of the ERP system (Ahmad, Haleem and Syed, 2012; Leyh, 2014).

*Post-implementation evaluation*, this CSF regards the evaluation of the system after go-live, did the system live up to the expectations, is there any backlog of bugs that need correction etc. An evaluation is also important to retain continued support for maintenance. This also serves as input to further improvements to the performance of the ERP system (Ahmad, Haleem and Syed, 2012).

*Software maintenance*, this CSF regards the support and testing part of the software. Testing of interfaces towards legacy systems, proper troubleshooting tools, development of support skills and techniques in the adopting organization (Shaul and Tauber, 2013).
3 Methodology

This chapter presents the methodology used in this study. This includes the research paradigm, research approach, methods for data collection and data analysis used. The chapter continues with a discussion about participants access and selection. The chapter ends by discussing ethical considerations and threats that might have an effect on the research at the pharmaceutical distribution company.

3.1 Research paradigm

All research both quantitative or qualitative is based on some philosophical ideology with assumptions about what constitutes as valid research, in other words, the correct way to do research and what research methods that are appropriate. For researchers in the field of IS, this relates to the underlying epistemology which acts as a guide for the research. Epistemology is norms stating assumptions about what knowledge is and how it can be obtained. There are three main paradigms or underlying epistemologies in IS research; positivist, interpretive and critical (Myers, 1997; Myers, 2013).

The positivist paradigm assumes that the reality is objectively given and have properties that can be measured and described independently of the observer and the researcher's structured instruments (Myers, 2013). Orlikowski and Baroudi (1991) consider IS research as positivist if it is conducted using measurements of quantifiable variables, having evidence of formal propositions, hypothesis testing and draw conclusions about a phenomenon from the sample to a specified population. Myers (2013) argues that objective reality exists independent of people and this reality is stable and can be described in models and theories. Entities used in the theories can be identified in reality and measured. The measurements can be repeated by other researchers and generalized. Positivist studies often attempt to validate the theory and increase the predictive understanding of phenomena (Myers, 2013).

Interpretive paradigm assumes that participants create and associate their own meanings during interaction with the surrounding world through social constructions such as language, consciousness, shared meanings and instruments. The meanings can be both subjective and intersubjective. Interpretive techniques will allow participants to draw meanings on their own experiences and describe those using their own words and images. The aim of the interpretive research is to understand the phenomena through those meanings that participants assign to them argues Orlikowski and Baroudi (1991). Interpretive research in IS are tools to create an understanding of the situation of the IS and the processes where the system influences and are influenced by the situation. An interpretive researcher does not predefine any variables but focuses instead on human sense-making and the complexity as the situation emerges (Kaplan and Maxwell, 1994; Myers, 1997).

The critical paradigm assumes that social reality has references to history and that it is produced and reproduced by people. Although people can consciously act to change their economic and social conditions, critical researchers recognize that their ability to do so is limited by various forms of cultural, social and political dominance (Myers, 2013). Critical research in IS focuses on social issues like power, freedom, social control and values related to usage, development and impact of Information Technology (IT) (Myers and Klein, 2011). The main task of critical research is to question and critique social constructions with a focus on conflicts, oppositions and contradictions in modern society to eliminate any causes for alienation and restrictions in the potential of people. It is assumed that the current social
conditions restrict people’s achievements of gaining freedom, enlightenment and justice (Myers, 1997; Myers, 2013). Critical researchers should always challenge prevailing assumptions and existing values argues Myers and Klein (2011). An important objective of the critical research is to visualize, create understanding and awareness of different forms of alienation and social domination, so that people can eliminate them through action argues Orlikowski and Baroudi (1991).

This master thesis has adopted the interpretive research paradigm because of the need to understand the CSFs during the ERP project by interpreting the meaning that people assigned to them. The interpretive methods of research “aim at coming to an understanding of the context of IS and the process wherefore IS effects and is affected by the context” argues Walsham (1993, pp.4). The interpretive tradition is chosen because it can contribute to the understanding of the ERP upgrade project from the different perspective of members of the project team.

3.2 Research approach

This research follows the qualitative research approach that is posed in the interpretive philosophical worldview. The main strength of qualitative research methods is that it gives a deep understanding of the meaning and context of the studied phenomena and the processes and events that make up these phenomena in real-life overtime in their natural settings. These contextual issues include organizational, cultural, political and social concerns and how all these are perceived and conceptualized argues Kaplan and Maxwell (1994). Creswell (2014) advocates further that qualitative research is an approach to understand the meaning that groups or individuals assign to a human or social problem. The process of qualitative research involves procedures and questions typically gathered in the participants setting and inductively build the data to the general themes and the researcher making interpretations of the meaning of the data. This form of inquiry honors an inductive style with a focus on individual meaning and the depiction of the complexity of a situation (Creswell, 2014).

3.3 Data collection methods

This study has used two data collection methods; interviews and card sorting. Both methods were conducted in sequence during the same individual interview session with the participants. Myers (2013) argues that it is helpful to create an interview guide to be used during the interviews. The questions should be short and clear that lead to detailed responses. Questions that ask to recall experiences and specific events will help in getting fuller narratives. It's better to use a few broad, open-ended questions than long series of closed-ended questions. To get consistency throughout the interview series an interview guide was created (see Appendix A). Each of the central questions was noted together with the card sorting activity plus a few reminders for essential tasks. The guide was not followed strictly but gave focus on the topic making sure that all pre-defined questions reflecting the research questions were asked in a similar way in all interviews.

3.3.1 Interviews

There are many different kinds of interview techniques. They can all be classified into three main types; structured interviews, semi-structured interview and unstructured interviews. The structured interview technique uses a strict regulation with pre-defined questions and the order of them. The semi-structured interview technique also uses pre-formulated, but no strict adherence to them and new questions can be added during the interview. The unstructured interview technique is the direct opposite of structured interview technique. It uses only a few
if any pre-defined questions, the participants can say what they want, and the time is usually not restricted advocates Myers (2013). Semi-structured interviews are commonly used in qualitative social research. This type of interview technique aims to find answers to specific questions which can be compared and contrasted with data collected in other interviews. The same sequence of questions needs to be asked in each interview argues Dawson (2007). Myers (2013) argues that semi-structured interview technique tries to take the best of both techniques. It gives the researcher consistency across several interviews but also allowing for some improvisation. The participant has the opportunity to add essential insights when they occur during the interview, but the pre-defined questions provide some focus on the topic as well.

The first data collection method for this study were semi-structured interviews to gain an in-depth understanding of the CSFs that lead to a successful ERP upgrade, where the questions are open-ended to allow follow-up questions. This method “allows a more spontaneous, informal and broader examination of the specific experiences of the interviewees in relation to the topic” argues Olson and Zhao (2007 p.133).

3.3.2 Card sorting
An important issue in qualitative research is how to make concepts operational for measures. Some concepts like a person’s weight or height can be measured directly by a single indicator, called observed variable or manifest. But most concepts in social sciences can’t be measured directly. This can be solved by developing a construct with many indicators that together provide a measure argues Santos (2006). One way of doing this is with use of the card sort technique. Card sorting is a user-centered, participatory technique used for knowledge acquisition to clarify desires, values, attitudes and/or behaviors of participants as they relate to the topic in the research. Card sorting can also be used to determine how different groups view the same subject matter to rank or rate items on specific dimensions (Balkissoon, 2018).

There are two main types of card sorting; open sort and closed sort. Within open sort, the participant is given a number of cards and are asked to sort them according to importance or into categories. The respondent can also add own cards that allow for participant-driven discoveries. Closed sort means that there is a fixed number of cards to sort, this approach assumes that the researcher knows the indicators and categories that matter to the participants and/or to the research (Usabilitybok.org, 2018). Cataldo (1970) argues that card sorting is an interesting and fast method of collecting valid and reliable data were the respondents selects their own pace and allows the participant to go back and review how previous cards were sorted. Rugg and McGeorge (2005) stress the importance that the researcher should only ask questions and make comments that clarify the card sorting. It is highly inadvisable to make any comments on participants choices and sorting that could bias the card sorting session.

The second data collection method was the card sort technique that is adopted from participatory design. I have chosen a closed sort based on the 24 unique CSFs identified during the literature review in Chapter 2 and Table 2. The card sorting technique makes allowance for the comparison of results across multiple respondents or groups, in this case, respondents from IT staff, Managers and Consultants. Paper cards were created for each of the 24 CSFs with a clear heading and a definition. Each card had the same size (15 x 5 cm), fonts and paper quality, no numbers or markings that would bias the card sorting, see Figure 2.
### Project management

Refers to the management of the implementation plan to avoid time and cost overruns. It involves time planning, work planning, resource planning, allocating responsibilities, defining milestones and critical paths, training and identifying the measures of success. The project manager is also responsible for periodic meetings and communications with key stakeholders and steering group.

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#### Figure 2 - Example of CSF card for card sorting method

### 3.4 Participants access and selection

Before the study, it’s important for the researcher to obtain needed permissions and approval with individuals in authority (e.g., gatekeepers). This often involves writing a letter that specifies potential impact, timeframe and outcome of the research argue Creswell (2014). Following this advice, I got approval and support from the companies for the study and access to participants. I did this by sending a letter to management as proposed by Creswell (2014) to get necessary approvals and access to participants. The contacted management thought it was a great idea for a thesis and the research study was given the approval to proceed and support by the corporate company as well as the companies in Finland and Sweden.

The participants were selected using purposeful sampling were the researcher finds individuals that match the characteristics. The selection of participants was based on individuals that have good knowledge of the ERP upgrade project and willingness to provide information. Purposeful sampling allows the participants to be hand-picked on the basis that they represent the category they belong to argues Hart (2013). The participants were from the three main roles in the ERP upgrade project team, IT staff, Managers and Consultants. IT staff can be described as internal ERP specialists aka key resources at the company, Managers can be described as department heads within IT at the company. Consultants can be described as experienced external consultants with broad ERP knowledge together with skills in project management, test management, functional design and development.

In qualitative research, there are no rules for sample size. The sample size depends on study purpose, what the researcher wants to know, what will be useful, what will have credibility and what that can be done with available resources and time argues Patton (1990). Bengtsson (2016) share a similar view and argues that the information needs decide the sample size so that the research question can be answered in a confident manner. I have chosen to have 3-4 participants both men and women from each of the 3 main roles in the project adding up to 10 participants in the research study, shown in Table 3.
Table 3 - Participants in interviews and card sorting

<table>
<thead>
<tr>
<th>Participant</th>
<th>Status</th>
<th>Role</th>
<th>IT work experience</th>
<th># of ERP projects</th>
<th>Audio recording</th>
<th>Interview duration (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>M1</td>
<td>Interviewee</td>
<td>Manager</td>
<td>19 years</td>
<td>1</td>
<td>Yes</td>
<td>45</td>
</tr>
<tr>
<td>C2</td>
<td>Interviewee</td>
<td>Consultant</td>
<td>19 years</td>
<td>10</td>
<td>Yes</td>
<td>54</td>
</tr>
<tr>
<td>I3</td>
<td>Interviewee</td>
<td>IT staff</td>
<td>20 years</td>
<td>4</td>
<td>Yes</td>
<td>48</td>
</tr>
<tr>
<td>M4</td>
<td>Interviewee</td>
<td>Manager</td>
<td>15 years</td>
<td>1</td>
<td>Yes</td>
<td>47</td>
</tr>
<tr>
<td>I5</td>
<td>Interviewee</td>
<td>IT staff</td>
<td>27 years</td>
<td>3</td>
<td>Yes</td>
<td>56</td>
</tr>
<tr>
<td>M6</td>
<td>Interviewee</td>
<td>Manager</td>
<td>26 years</td>
<td>4</td>
<td>Yes</td>
<td>39</td>
</tr>
<tr>
<td>I7</td>
<td>Interviewee</td>
<td>IT staff</td>
<td>18 years</td>
<td>2</td>
<td>Yes</td>
<td>47</td>
</tr>
<tr>
<td>M8</td>
<td>Interviewee</td>
<td>Manager</td>
<td>16 years</td>
<td>3</td>
<td>Yes</td>
<td>58</td>
</tr>
<tr>
<td>C9</td>
<td>Interviewee</td>
<td>Consultant</td>
<td>18 years</td>
<td>2</td>
<td>Yes</td>
<td>61</td>
</tr>
<tr>
<td>C10</td>
<td>Interviewee</td>
<td>Consultant</td>
<td>10 years</td>
<td>3</td>
<td>Yes</td>
<td>66</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td></td>
<td></td>
<td><strong>18.8 years</strong></td>
<td><strong>3.3</strong></td>
<td></td>
<td><strong>52.1</strong></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>8h 41m</strong></td>
</tr>
</tbody>
</table>

3.5 Preparations and interview sessions

Each of the selected participants was contacted via mail asking if they wanted to participate in the study. The mail had a description of the research and the main goals of identifying CSFs during the ERP upgrade project and that the interviews should be conducted in Finland and Sweden during March 2018. All of the 10 contacted participants agreed to participate in the research. We agreed on a suitable date and time for the interview to take place. A formal invitation for each interview was sent out with a calendar booking and conference room. The invitation also contained a few action points on their behalf that the participants should start thinking about the ERP upgrade project and prepare before the interview, see example below.

**Few things to prepare before the interview:**

- *Think about 3 critical factors that from your perspective contributed to the successful ERP upgrade.*
- *Think about what a “successful ERP upgrade” means to you.*
- *Were there things that could have been done even better?*

*Also attached an informed consent form, please read through. We will sign this document together during the interview.*

I didn’t want to color the participants or bias the interviews, so no background information about CSFs was given prior to the interviews. The sessions were conducted face-to-face at the respective companies in Finland and Sweden. I managed to fit in all Finnish participants during a two-day visit to the company in Finland. The other interviews were conducted at the company in Sweden. I booked conference rooms for all interview to ensure a neutral, quiet
setting and privacy. The interviews were conducted mainly in English but also Swedish (my native language) when possible. All recorded interview was later transcribed to English.

Each interview started by reading through the informed consent form together and discussing it and signing it in two copies. With participants permission, the audio during the interview was recorded to facilitate the accurate collection of data and later transcribed for analysis. The interview started off with a few background questions followed by questions about CSFs in the context of the ERP upgrade project. If needed they were asked to explain and elaborate the reasoning behind the choices. I also kept quiet waiting for them to answer in their own way.

Next step in the interview session was the card sorting exercise. The stack of cards was reshuffle for each participant. We started by walking through all 24 cards with CSFs and the descriptions were explained. They were then asked to select 10 cards that they believed was the main factors that contributed to the successful ERP upgrade project at the company. The 10 cards should be sorted by importance, the most important CSF at the top. This activity was very interesting, I gave them time to think and encouraged them to think out loud when reasoning during the selection of cards and sorting. When finalized pictures were taken of the sorted CSFs for reference in the analysis.

At the end of the interview, I asked some final interview questions about lessons learned. The interview and card sorting session were now completed and I asked each participant if they had any questions or anything to add. I thanked them so much for their time and participation in the study.

3.6 Data analysis method

There are many different ways to conceptualize data analysis in qualitative research. Qualitative research often uses an inductive strategy. It aims to examine the natural setting as a whole and interpret the ideas, meanings and feelings of those being interviewed. As a consequence, the data analysis also becomes inductive and iterative argues Kaplan and Maxwell (1994).

This study will adopt a thematic analysis method that is a systematic coding process for generating codes and analyzing patterns in qualitative data. Those patterns are in the process referred to as themes, shown in Figure 3. The codes are the building blocks for themes that provide a framework for reporting analytic observations. The aim of thematic analysis is not only to summarize data but also to interpret and identify key features in the transcribed data guided by the research questions. The thematic analysis process has several quality procedures built-in for example two-stage review process of the themes against the coded data and whole data set. The emphasis is to produce rigorous, high-quality data analysis argues (Clarke and Braun (2016). Nowell, et al. (2017) advocates that thematic analysis is a useful method for interpreting the perspectives of different participants, identifying differences, similarities and generating unforeseen insights. Thematic analysis is also useful for summarizing the main features of a large dataset, thus forcing the researcher to use a well-structured approach to handle the data, which helps to create a clear, trustworthy and organized final report.

Braun and Clarke (2006) describe the thematic analysis process using six phases: become familiar with the transcribed data, create codes that describe the data, search for themes in the codes, review the themes, define, refine and name the themes and finally present the findings. Through its theoretical freedom, the thematic analysis provides a flexible approach that can be
modified for the needs of many studies, providing a rich and detailed, yet complex account of analyzing qualitative data (Braun and Clarke, 2006).

A code in qualitative inquiry can be represented with a short phrase, a word or acronym that symbolically assigns the essence of the text being labeled. Coding is a heuristic (from Greek meaning “to discover”) technique for an initial step towards more detailed interpretations for a report. Coding is not just labeling but also linking, it leads from the data to the ideas and the other way around from the idea to all data regarding that idea. Coding and analysis is not the same thing, but coding is an important aspect of analysis. All coding is a judgement call because we bring our knowledge, prerequisites, personalities and attributes to the process argues Saldaña (2009).

Braun and Clarke (2006) advocate that there are two different approaches when it comes to creating codes, those relate to when you should engage with the literature in the theoretical grounding relevant to the analysis. Some think that early reading can limit the analytic field of vision, leading your focus away from potential critical aspects. Others argue that early engagement with the literature will enhance the analysis and make it more sensitive to find subtle features in the data (Braun and Clarke, 2006). I will adopt both approaches, the codes for CSFs will be derived from the CSFs found in literature review using the theoretical approach prior to the analysis. The 24 identified CSFs would be given codes and used for the transcribed data that relates to CSF, if not possible to map to one of the 24 codes a new code will be created, possibly indicating a new unidentified CSF. Codes for the other questions will be created through a more inductive approach by engaging with the transcribed data.
The phases of thematic analysis will be treated as a process described by Braun and Clarke (2006, pp. 87-93). The process has the following six (6) phases:

- **Phase 1:** Become familiar with the transcribed data
- **Phase 2:** Create codes that describe the data
- **Phase 3:** Search for themes in the codes
- **Phase 4:** Review the themes
- **Phase 5:** Define, refine and name the themes
- **Phase 6:** Present the empirical findings after analysis

**Phase 1. Become familiar with the transcribed data,** in this phase, you immerse yourself in the data through repeated readings in an active way to search for patterns and meaning. Identification of possible patterns will emerge and shape though reading the transcribed data.

**Phase 2. Create codes that describe the data,** codes can be a phrase, a word, or the respondents own word that you identified through careful reading. The initial coding can be done directly in the comments field or using paper printouts of the transcribed data. Upon completion of initial coding with one transcript repeat the process for next transcript.

**Phase 3. Search for themes in the codes,** when all transcribed data have been coded, it results in a long list of codes that have been identified. This phase focus at the analysis at a wider level of themes by sorting, collecting and comparing of codes into potential themes.

**Phase 4. Review the themes,** in this phase the list of possible themes is refined. It will probably be evident that some themes are not true themes due to lack of data to support them, while others will be merged into each other. Two separate themes might form one new theme and large themes maybe need to be split into separate themes.

**Phase 5. Define, refine and name the themes,** at this phase you define and further the themes you will use in the analysis and analyze the data within them. This will identify the essence of what each theme is all about, Braun and Clarke (2006) argue that it’s important not to get themes that cover too much. This can be adjusted by going back to the transcribed data for each theme and organize them to get a more coherent and consistent account together with the narrative text.

**Phase 6. Present the empirical findings after analysis,** this is the last phase and begins when a set of fully refined and worked-out themes are in place. The final write-up of thematic analysis is that of telling a story of your data that is convincing to the reader and shows the validity of the analysis. The analysis shall provide a logical, concise, coherent, interesting and non-repetitive story about the data throughout the themes. The write-up must provide clear and sufficient evidence of the themes within the transcribed data using enough data to demonstrate the prevalence of the theme argues Braun and Clarke (2006). The coding was very helpful to get the data set and transcripts organized. When the themes have been formulated, it was easy to find the correlating text and context using the codes as links.
3.7 Anticipated threats

When doing research, there is always a risk that few or none of the selected participants want to take part in your study. The study was given management support to mitigate that and it made it easier to get commitment and time from the participants. There was also a risk that participants say what they think is expected and not their mind and belief. To cater for this, the interview data have been treated with confidentiality.

3.8 Reliability, validity and researcher’s role

Reliability regards the accuracy of research methods and techniques used in research argues Mason (2002). Reliability in this thesis will be ensured by means of using fair and objective interviews that were recorded. Seale and Silverman (1997) advocate the benefit of recording interviews objectively and comprehensibly to get higher rigor and validity in the details of the transcribed data. The gathered data was then subject of transcription and thematic analysis. Leung (2015) argues that researchers constantly must verify the accuracy of data when extracted from the original sources using comparison. The thematical analysis uses an iterative approach and a two-stage review process of the themes against the coded data and whole data set to ensure that data is analyzed carefully and accurately. Validity in this thesis has been met by choice of several data collection methods and by triangulating subjects. By collecting data from a range of individuals using multiple methods increase the robustness of results argues Kaplan and Maxwell (1994). The sample was selected by purposeful sampling to ensure a mix of subjects that represent the three (3) roles in the project team.

My role as researcher and background that I have worked with all of the participants in the project team could in fact bias the analysis and results. I have taken precautions not to be in power relationships and been careful not influence their meanings and answers. Kaplan and Maxwell (1994) advocate that researchers recognize that their personal knowledge and experiences influence their choice of evaluation questions, data and interpretation in a positive way. Sutton and Austin (2015) argue that qualitative work requires a reflexive approach throughout the whole research process to providing context and understanding for readers. The researcher should not ignore or avoid their own biases, but instead, reflect upon and articulate their position, perspectives, worldview and biases so that readers know the filters through which interview questions were asked, data were collected and analyzed. Bias and subjectivity are not negative but unavoidable. They should be articulated up-front in a clear and coherent manner for the reader (Sutton and Austin, 2015). The interviews, analysis and interpretation benefits by my own knowledge and experience in the topic to better understand the questions, codes, themes and context. I also believe that my background created trust, opened doors and formed a good relationship with all participants where I could ask the right follow-up questions to discuss and reveal a deeper understanding.

3.9 Ethical considerations

All responses from interviews have been kept confidential. Gathered data will sometimes contain names mentioned by the respondent that point at one specific person. In order to cater for that and respect privacy of the respondents, any finding of that kind was erased. Participation will be voluntary, and the participants can withdraw at any time.

The Swedish Research Council (2017) states that it is always a good research practice to inform those that the research applies to that they are subject of research and that they will be asked to give their written consent. This was done by creating an informed consent form (Appendix B) that was sent together with the invite to the selected participants. The informed
The informed consent form has adopted below elements that acknowledges protection of human rights and integrity (Creswell, 2014, p.134).

- Information about the researcher and contact information
- Information about the purpose of the study
- Identification of the benefits for participating
- Identification of the level and type of participant involvement
- Notation of risks to the participant
- Guarantee of confidentiality to the participant
- Assurance that the participant can withdraw at any time
- Provision of names of persons to contact if questions arise

The informed consent form promises confidentiality and no personal data is collected in this research to ensure privacy of the participants. The informed consent form had two purposes here, first to give permission to the researcher to use gathered data and to record the interview if approved. Second, it did provide information to the participant about the researcher, the research topic, the research process, who that will have access to the data and that participation in the study is voluntary. The informed consent form gave also the participants option to approve YES/NO if the interview can be recorded. The recorded interview has many benefits, it will allow the researcher to focus more on the interview without slow distracting note-taking. It will also minimize the risk of misunderstanding and misquotation. The informed consent form was signed in two copies at the beginning of the interview. One copy for the participant and the other copy for the researcher. The research as a whole was conducted in accordance with below general rules for Good Research Practice (Swedish Research Council, 2017, p.10).

- Tell the truth about your research
- Consciously review and report the basic premises of your studies
- Openly account for your methods and results
- Openly account for your commercial interests and other associations
- Not make unauthorized use of the research results of others
- Keep your research organized, for example through documentation and filing
- Strive to conduct your research without doing harm to people or the environment
- Be fair in your judgement of others’ research
4 Empirical findings

This chapter begins by presenting the empirical findings from the thematical analysis that was conducted on the collected data set from the interviews and card sorting sessions described in chapter 3. This chapter begins by presenting each of the themes in detail together with examples of empirical data from the interviews and card sorting that serves as proof of the analysis correctness. The chapter ends with a summary of the thematic analysis process.

It was the purpose of the thematic analysis to identify the participant's perception of CSFs to provide the necessary information needed to answer the research questions stated in Chapter 1. The thematic analysis resulted in four (4) main concepts that relate to the research questions. These concepts are; Reasons for upgrade, Definition of success, Perceived CSFs and Lessons learned. Within each of the concepts, there are a number of identified themes as shown in Table 4. Each theme has underpinning codes that served as links towards the transcribed data and completed data set. For convenience the participants have been given short names in tables as IT staff (I3, I5, I7), Managers (M1, M4, M6, M8) and Consultants (C2, C9, C10).

Table 4 - Concepts and themes used in the analysis

<table>
<thead>
<tr>
<th>Concept</th>
<th>Data collection method</th>
<th>Theme</th>
<th># of Codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reasons for upgrade</td>
<td>Interview</td>
<td>Support</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Platform</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Features</td>
<td>1</td>
</tr>
<tr>
<td>Definition of success</td>
<td>Interview</td>
<td>Operation</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Project KPIs</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Quality</td>
<td>1</td>
</tr>
<tr>
<td>Perceived CSFs</td>
<td>Interview + Card sorting</td>
<td>Organization</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Technology</td>
<td>6</td>
</tr>
<tr>
<td>Lessons learned</td>
<td>Interview</td>
<td>Data</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Development</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Key resources</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Planning</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Project management</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Readiness</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sum</td>
<td>56</td>
</tr>
</tbody>
</table>

4.1 Reasons for upgrade

One of the first question during the interview was: What were the main reasons for the ERP upgrade? The reason for the question was to get a deeper understanding of why the company wanted to upgrade the ERP system in the first place. Three different themes could be identified during the thematic analysis of the respondent’s answers; Support, Platform and Features. The identified codes for Reasons for upgrade can be seen in Table 5.
Table 5 - Codes and themes for concept Reasons for upgrade

<table>
<thead>
<tr>
<th>Reasons for upgrade</th>
<th>I3</th>
<th>I5</th>
<th>I7</th>
<th>M1</th>
<th>M4</th>
<th>M6</th>
<th>M8</th>
<th>C2</th>
<th>C9</th>
<th>C10</th>
<th>SUM</th>
<th>Theme</th>
</tr>
</thead>
<tbody>
<tr>
<td>NEW New features needed</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td>7</td>
<td>Features</td>
</tr>
<tr>
<td>PLM Become less platform dependent</td>
<td>1</td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>Platform</td>
</tr>
<tr>
<td>END End of support of current ERP system</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td>10</td>
<td>Support</td>
</tr>
<tr>
<td>OSX OS level not supported by ERP system</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>6</td>
<td>Support</td>
</tr>
</tbody>
</table>

4.1.1 Support

This theme regarded the support of the ERP system and was mentioned as the main reason for upgrade by all ten (10) respondents. Support means that the company can get advanced help, report bugs and obtain code fixes for known issues from the ERP system vendor. Vendors often keep roadmaps of the different versions where dates of extended support and end of support of the ERP system and underpinning operating systems is stated. This theme had two codes that are related. First the ERP system support but also the support for the operating system on the platform was near the end of support. A platform in this context is the hardware with servers and databases where the ERP system is running. The old ERP system didn't support newer versions of the operating systems on the platform.

Manager 1 said: “The main reason for the ERP upgrade was to have a supported version of the ERP system and the underlying platform. It’s very critical to have support in this type of industry and that’s why this was priority one for doing the upgrade”.

All participants gave similar answers regarding the Support theme that the main cause for the upgrade was due to technical reasons to get a fully supported version of the ERP system that also supported a more modern platform.

4.1.2 Platform

The old ERP system had been in use since 1999 and over the years an extensive platform dependency was built up. Platform dependency refers to specific functions that are closely tied to the operating system and hardware features. High platform dependency means that it is hard to move to another platform if desired. In the old ERP system, the label printing, for example, was developed using programming languages that required hard to find specialist to change and maintain. This reason for the upgrade was pointed out by one (1) participant.

Consultant 10 explained: “One reason for the upgrade was to get less platform dependent, remove those jobs and applications that are tightly coupled to the platform. For example, to remove all label programs that used RPG and CL code by replacing them with a new label printing software outside the platform. This was also one of the main achievements and benefits of the ERP upgrade”.

Consultant 10 explained further that RPG (Report Program Generator) and CL (Control Language) are proprietary programming and command languages mainly used on IBM enterprise servers.

4.1.3 Features

The new ERP system offered a great number of new features such as; improved usability, web interface, enhanced integration possibilities and Business Intelligence (BI) tools for making inquiries on ERP data for ad-hoc and operational reporting, those could replace old queries
and SQL scripts. Seven (7) of the participants highlighted the need for new features that were available in the new version of the ERP system to enhance user experience and enable business opportunities.

Consultant 2 said: “New features were needed and required by business, for example web services and new web-based user interface”.

Consultant 2 explained that a web service is a type of integration that supports interoperable machine-to-machine interaction over a network. Modern ERP systems often have web service capabilities as they are considered more secure than for example direct database access. The web service uses the built-in logic, validation and security in the ERP system.

### 4.2 Definition of success

This concept regards what is considered as a successful ERP project. The question that I asked during the interview was: How would you from your perspective define “success” in the context of the ERP upgrade? The respondent’s answers could be divided into three themes; Operation, Project KPIs and Quality. The identified codes for Definition of success can be seen in Table 6.

<table>
<thead>
<tr>
<th>Definition of success</th>
<th>I2</th>
<th>I5</th>
<th>I7</th>
<th>M1</th>
<th>M4</th>
<th>M6</th>
<th>M8</th>
<th>C2</th>
<th>C9</th>
<th>C10</th>
<th>SUM</th>
<th>Theme</th>
</tr>
</thead>
<tbody>
<tr>
<td>BUS Operational system without major issues</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5</td>
<td>Operation</td>
</tr>
<tr>
<td>NBL No business value lost, no harm to customers</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td>5</td>
<td>Operation</td>
</tr>
<tr>
<td>SMO Smooth go-live, clear implementation plan</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>Operation</td>
</tr>
<tr>
<td>HYP Good hyper-care after go-live</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>Operation</td>
</tr>
<tr>
<td>NOR Normal operation after a few month</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>Operation</td>
</tr>
<tr>
<td>SUP Key resources was trained to support after go-live</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>Operation</td>
</tr>
<tr>
<td>BUD Project was kept within budget</td>
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<td>1</td>
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<td></td>
<td></td>
<td></td>
<td>6</td>
<td>Project KPIs</td>
</tr>
<tr>
<td>TIP Project timeplan was kept</td>
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<td>1</td>
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<td></td>
<td>6</td>
<td>Project KPIs</td>
</tr>
<tr>
<td>SCO Project scope was kept</td>
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<td>1</td>
<td></td>
<td>1</td>
<td>Project KPIs</td>
</tr>
<tr>
<td>QAL Focus on system quality</td>
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<td>1</td>
<td>1</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>4</td>
<td>Quality</td>
</tr>
</tbody>
</table>

### 4.2.1 Operation

This theme regards the definition of success in relation to the operation of the ERP system and the business impact after go-live. The participants explained that the go-live is the most critical part of an ERP upgrade, then you know if the quality, setup and performance are good enough and up to standards. In the industry of distribution of pharmaceuticals to pharmacies, there are little to no room for critical incidents in the ERP system. A failure will affect the pharmacies in a matter of hours. In this deregulated age many pharmacies place more customer orders instead of larger re-stock orders meaning that they often have very small stocks in the pharmacy. They are therefore much more sensitive and dependent on a reliable and timely supply chain.

IT staff 5 explained that: “It was a big surprise for me, that everything worked that good directly after go-live, no major issues with the whole systems. Just a few small interruptions that were fixed in a couple of hours, not affecting pharmacies”.
Manager 8 continued on the same line: “To go-live without major incidents and revert back to normal operation within a month or two. That the business processes are kept and no harm comes to our customers”.

IT staff 7 said: “There was a very good plan for the ERP implementation with hyper care after go-live”.

The participants explained that hyper care was a limited period directly after go-live with extra high support, all experts were allocated and stood by on high alert, ready to quickly solve any issues in the ERP system. Due to the low number of incidents and successful go-live the hyper care was ramped down already after a week for both countries.

4.2.2 Project KPIs
This theme is covering the classic KPI's in projects; budget, time, scope and quality. The budget and time were regarded as a success by six (6) of the ten (10) participants. One (1) participant regarded the maintained scope in the ERP upgrade as a success. The respondents explained that for the ERP upgrade project it was a main focus on quality followed by time, scope and budget, in that order.

Manager 4 responded: “We had quality first and then within time, scope and budget. We kept all basically”.

Manager 8 added: “To me success is to be able to keep the project within budget, give or take 10%”.

4.2.3 Quality
Four (4) of the participants regarded the system quality as a separate definition of a successful ERP upgrade.

Manager 1 explained that: “Several of the executive managers remembered the old ERP implementation back in 1999, that project was really tuff with many issues related to poor quality, it was almost a failure. That lesson led to that this ERP upgrade got high attention and was prioritized with focus on the overall quality of the system”.

4.3 Perceived CSFs
The concept Perceived CSFs is derived from data gathered during both interviews and card sorting. The participants were asked prior to the interviews to start thinking of CSFs and which three they thought contributed the most to the successful ERP upgrade project. During the card sorting exercise, they were asked to select ten (10) of the twenty-four (24) identified CSFs from the literature review in Chapter 2. The ten (10) CSFs was to be sorted by importance with regards to the ERP upgrade project. This approach led to a deep understanding of the perceived CSFs by interpreting the respondent's interview answers together with the ranking of the sorted cards. The Perceived CSFs concept has two themes; Organization and Technology. The identified codes for Perceived CSFs during the interviews can be seen in Table 7.
Table 7 - Codes and themes for concept Critical Success Factors (interviews)

<table>
<thead>
<tr>
<th>Critical Success Factors</th>
<th>I3</th>
<th>I5</th>
<th>I7</th>
<th>M1</th>
<th>M4</th>
<th>M6</th>
<th>M8</th>
<th>C2</th>
<th>C9</th>
<th>C10</th>
<th>SUM</th>
<th>Theme</th>
</tr>
</thead>
<tbody>
<tr>
<td>SSV</td>
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<td>1</td>
<td>9</td>
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<td>TBB</td>
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<td>Organization</td>
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<td>PRM</td>
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<td>5</td>
<td>Organization</td>
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<td>TMC</td>
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<td>4</td>
<td>Organization</td>
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<td>2</td>
<td>Organization</td>
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<td>1</td>
<td>Organization</td>
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<td>1</td>
<td>Organization</td>
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<tr>
<td>TST</td>
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<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>7</td>
<td>Technology</td>
</tr>
</tbody>
</table>

4.3.1 Organization
The theme organization is by far the largest theme with eighteen (18) codes. This theme covers the organizational structure and composition of skills and resources in the project team together with project management, management support, strategies, scope, timeframe and relationship with consultants and vendors. The project management and the skills and competencies in project team were highlighted as CSFs by many participants.

Manager 1 responded: “Use of external project manager was a key success, because we didn’t have that type of competence in the company”.

Consultant 10 answered: “Project structure, broke up the work in workstream, right skills leading each of those, with the right attention, responsible for deliveries of the workstreams”.

IT staff 7 said: “Very good competence in the project team, members were almost too committed”.

Manager 4 explained: “We brought in external knowledge into the project teams in both countries, the project management was developed during the project”.

Consultant 2 continued further: “The project structure and project management with several sub-projects and workstreams, also made it easier to divide development between local and offshore resources (mainly developers in India) according to the assessment that was done prior to the project. Clear scope of each workstream, what they should deliver, often conducting proof of concepts”.

What do you mean by proof of concept? Consultant 2 explained that proof of concept is a realization of functionality or idea in order to demonstrate its feasibility before a decision is taken to adopt and use it. The management support and commitment were another CSF that was regarded as important by several participants. The project was treated number one in both Finland and Sweden, not competing with other projects about key resources. The project team had sufficient mandate to make decisions without the need for escalation to top management. The participants explained that each workstream lead could make many decisions related to the own workstream. Bigger decisions like those affecting several workstreams or the entire project could be raised to the project steering group for rapid decisions.
Manager 1 said: “There were a great support and commitment from top-management right from the start of the project”.

Manager 6 highlighted: “Prioritization and support from management, it was totally number one project, no questions that resources should be shared to other projects”.

The clear project scope was a CSF that was mentioned by several participants. The fact that it was an As-Is upgrade thus keeping changes to a minimum was a contributing CSF to the successful outcome of the ERP upgrade.

Manager 1 answered: “That the scope was very clear and the fact that it was an As-Is upgrade with a main focus on quality and not to harm business”.

Consultant 2 and Manager 8 had the same view and explained: “The scope of ERP project was clear, it was based on functions, each function shall work As-Is with the regards to the business processes, they should remain the same”.

The selection of skilled consultants and the relationship was another highly rated CSF by several participants. The usage of consultants that already knows the business and company was considered important.

IT staff 5 and Consultant 9 answered: “Good experienced consultants that were familiar with the company”.

Manager 4 highlighted further: “The supporting network was in place, consultants and vendors were familiar with our business”.

The timeframe for the implementation was another CSF that was perceived as important by many participants.

Consultant 10 said: “We had a realistic time plans of 18 months, not 6-8 month as normal in this type of technical upgrades, the longer time plan was due to high complexity”.

4.3.2 Technology
This theme regards the technical side of the ERP project with data conversion, testing and infrastructure. The testing was the single most mentioned CSF, all ten (10) participants had this as an important CSF. The testing approach and especially usage of dry runs was regarded a CSF by the participants during the interviews.

IT staff 5 pointed out: “That we did an As-Is upgrade, we didn’t change too much. The data conversion was easier as we didn’t have to re-map any data. Just change some data types to fit the new database schema”.

Consultant 9 followed with: “Lot of effort in testing, using a holistic testing approach, covering flaws in quality at an early stage”.

Manager 4 answered: “We did run dry runs three times per country, six in total, we found issues that were tweaked each time to be prepared for go-live. There was a learning curve during data conversion, took long time first dry-run almost 50 hours, for each dry run it was improved down to around 20 hours making it possible to do go-live during a weekend”.

30
IT staff 7 said: “The testing was done with good quality, mainly the dry runs were a major success factor, the only part where all warehouse systems could be tested, both countries could learn from each other’s dress rehearsals to get it perfect before go-live”.

The second data collection method was card sorting. The total results from the card sorting exercise are summarized, sorted and presented in Table 8. For convenience the participants have been given short names in tables as IT staff (I3, I5, I7), Managers (M1, M4, M6, M8) and Consultants (C2, C9, C10).

**Table 8 - Card sorting results for IT staff, Managers and Consultants**

<table>
<thead>
<tr>
<th>Rank</th>
<th>CSF</th>
<th>IT staff</th>
<th>Managers</th>
<th>Consultants</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>I3</td>
<td>I5</td>
<td>I7</td>
</tr>
<tr>
<td>1</td>
<td>Top management commitment and support</td>
<td>10</td>
<td>10</td>
<td>8</td>
</tr>
<tr>
<td>2</td>
<td>Software analysis, testing and acceptance control</td>
<td>2 5 9</td>
<td>9 5 7</td>
<td>3 7 5</td>
</tr>
<tr>
<td>3</td>
<td>Project team leadership, empowered decision makers</td>
<td>6 9 5</td>
<td>3 9 8</td>
<td>9 5 6</td>
</tr>
<tr>
<td>4</td>
<td>Project management</td>
<td>10 10</td>
<td>6 9</td>
<td>2 5 9</td>
</tr>
<tr>
<td>5</td>
<td>Strategy planning, scope and vision</td>
<td>9 7</td>
<td>3 10 7</td>
<td>9 5 9</td>
</tr>
<tr>
<td>6</td>
<td>Involvement of end-users and stakeholders</td>
<td>8 7 3</td>
<td>4 1</td>
<td>6 7</td>
</tr>
<tr>
<td>7</td>
<td>Data conversion and integrity</td>
<td>3 3 8 7 6 5</td>
<td>3 5</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Consultant selection and relationship</td>
<td>2 2 2</td>
<td>3 8 3</td>
<td>6 5</td>
</tr>
<tr>
<td>9</td>
<td>Balanced team</td>
<td>4 6 4</td>
<td>8 7 4 1</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Project team: the best and brightest</td>
<td>5</td>
<td>6 10 8</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Implementation strategy and timeframe</td>
<td>8 2 6 3 7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Communication plan</td>
<td>8</td>
<td>5 1 2</td>
<td>4</td>
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<tr>
<td>13</td>
<td>IT infrastructure</td>
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<td>4 1</td>
<td>4</td>
</tr>
<tr>
<td>14</td>
<td>Software maintenance</td>
<td>4 6 1</td>
<td>1</td>
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</tr>
<tr>
<td>15</td>
<td>Business case</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>16</td>
<td>Business process re-engineering and configuration</td>
<td>7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Training, education and job redesign</td>
<td>1</td>
<td>2 2</td>
<td>5</td>
</tr>
<tr>
<td>18</td>
<td>Change management programme</td>
<td>4</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>19</td>
<td>Managing cultural change</td>
<td></td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>20</td>
<td>Post-implementation evaluation</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>21</td>
<td>Project champion</td>
<td>1</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>22</td>
<td>ERP vendor support</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>Level of customization</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>Selection of ERP</td>
<td></td>
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</tr>
</tbody>
</table>
4.4 Lessons learned

This concept covers the themes and codes that relate to what could have been done better. The question in the interviews was; From your perspective, if you were to do a similar ERP upgrade project once more, are there things that you would have done differently to make the outcome even more successful? In this concept there were six (6) themes identified; Data, Development, Key resources, Planning, Project management and Readiness. The identified codes for Lessons learned can be seen in Table 9.

Table 9 - Codes and themes for concept Lessons learned

<table>
<thead>
<tr>
<th>Lessons learned</th>
<th>I3</th>
<th>I5</th>
<th>I7</th>
<th>M1</th>
<th>M4</th>
<th>M6</th>
<th>M8</th>
<th>C2</th>
<th>C9</th>
<th>C10</th>
<th>SUM</th>
<th>Theme</th>
</tr>
</thead>
<tbody>
<tr>
<td>CON Better conversion without NULL values in converted tables</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>Data</td>
</tr>
<tr>
<td>BTD Create better test data, not converted</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>Data</td>
</tr>
<tr>
<td>BUG More attention to bug backlog</td>
<td>1</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>Development</td>
</tr>
<tr>
<td>DEV Better consistency in development, similar had different implementation</td>
<td>1</td>
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<td>1</td>
<td>Development</td>
</tr>
<tr>
<td>TOB More to-be functionality during project</td>
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<td></td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>Development</td>
</tr>
<tr>
<td>KEY Key resources involved in too many workstreams</td>
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<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>Key resources</td>
</tr>
<tr>
<td>EDU Train new resources during the project, knowledge transfer from key resources</td>
<td>1</td>
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<td></td>
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<td></td>
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<td></td>
<td></td>
<td>1</td>
<td>Key resources</td>
</tr>
<tr>
<td>BET Better preparations before project start, pre-projects, PoC, hardware and licenses</td>
<td>1</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td>1</td>
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</tr>
<tr>
<td>APX Undersetimation of effort for new features</td>
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<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
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<td>Planning</td>
</tr>
<tr>
<td>PLN More planning before development starts, design review</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>Planning</td>
</tr>
<tr>
<td>PRO Less project model, too much admin for this size of project</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Project mgmt</td>
</tr>
<tr>
<td>ORG Project organization, look at this organization and not so much on best practise</td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
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<td></td>
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<td></td>
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<td>Project mgmt</td>
</tr>
<tr>
<td>COP Closer cooperation between workstreams from day one</td>
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<td>1</td>
<td>Project mgmt</td>
</tr>
<tr>
<td>NON Project tried to get too many changes in, an upgrade shall just be an upgrade</td>
<td></td>
<td>1</td>
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<td>Project mgmt</td>
</tr>
<tr>
<td>PBA Processed based approach</td>
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<td></td>
<td>1</td>
<td>Project mgmt</td>
</tr>
<tr>
<td>GOV More training for smoother transition to support teams</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>Readiness</td>
</tr>
<tr>
<td>ICH Improved changed management after go-live</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>Readiness</td>
</tr>
<tr>
<td>NFE New features directly after go-live</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td>Readiness</td>
</tr>
</tbody>
</table>

4.4.1 Data

The Data theme relates to the overall data quality and integrity in the new ERP system. The tables in the new version of the ERP system had been changed by the vendor, new fields added. After conversion some fields in tables where new and not populated with data. The data used during testing were also old converted data that gave some issues during the tests.

IT staff 3 said: “Conversion could have been done better, lots of NULL values in converted tables”.
IT staff 3 continued: “We should take time and create better test data, add your own test data in the ERP and not use old converted data. Then you also test how the ERP system creates the data”.

4.4.2 Development
This theme regards the development and retrofit that was done during the ERP upgrade. There were lots of development done in parallel giving diversity in design and solutions. Also, the issue backlog was not given proper attention, those minor bugs were not corrected and ended up in a large backlog that should have been corrected during the project and not after go-live.

Manager 6 stated that: “Better coordination in the development area, more planning on the technical side before development start to avoid different solution”.

IT staff 7 highlighted that: “More focus on bug backlog and the small details at the end of the project”.

4.4.3 Key resources
The key resources theme regards those limited highly skilled team members, mainly internal experts at the company with many years of experience with the old ERP system and business processes. The key resources often have a long history within the company working in different positions in business before becoming a valuable asset to the IT department. As in many projects, the key resources quickly became a bottleneck. Key resources were shared in several workstreams making it hard to allocated needed time. As a result, the key resources had a hard time making it work because they had too much on their table.

IT staff 7 answered: “The key resources were allocated in too many workstreams, maybe it would have been a good time to involve new resources from IT or business”.

Consultant 9 said: “What I’m thinking about is to avoid getting too reliant on key resources. That is, for example, to let a new resource go with a key resource throughout the project in order to learn what the key resource can do. In the upgrade, we were constantly planning around key resources when they were on the critical path all the time, not good”.

4.4.4 Planning
The planning theme regards preparations, hardware and license ordering, estimates and other planning activities, many were done during the project causing delays and stealing time and effort. There were even things that took too much time to implement during the ERP project that they were put on hold. The participants explained that the scheduler workstream was much bigger effort than expected, the first estimate was a few months to set up all needed jobs, that workstream took in fact eight (8) months to get the new scheduler operational for Finland and Sweden.

Manager 8 answered: “Better preparation before project start. Pre-project, order new hardware and licenses, more proof of concepts done before and not during the project, some things were also scoped out”.

IT staff 5 said: “We clearly underestimated effort of implementing the new scheduler, took much more time. More effort in real resource need and planning, the people doing things should be involved in time estimates”.

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4.4.5 Project management

The project management theme had five (5) codes and was one of the most cited during the interviews. Five (5) participants had lessons learned that was compiled into this theme. Many relate to the project model and planning used and how the project was organized in the beginning. The scope statement, meaning the detailed requirements for the ERP upgrade project was not finalized when the project started, giving uncertainty in what workstreams should deliver. Several participants had the same shared view that it was too much administration and status reporting instead of producing documents of real value, such as system documentation and test documentation.

Consultant 2 pointed out: “Less project model, the one used was too big with massive amounts of administrative tasks”.

Manager 8 said further: “Too much effort in project documentation, all documentation should bring value, not only status reporting on a high level and be used. Clear scope early in the project, scope statement was done during the project, should have been done before”.

Manager 8 continued to explain: “Use a different project organization, too much looking at best practice, not enough attention to how it looks and fits at this organization”.

IT staff 3 responded: “At the beginning of the project we were using a function-based approach during testing, each function like purchasing, sales and warehouse was tested individually, after a proposal from the experts a more process-based approach to testing was adopted, allowing more cooperation between testers and workstreams”.

IT staff 7 highlighted: “More attention on system documentation and test scripts, that was not done in the best way, this is one of the benefits during ERP projects that the processes and test cases gets documented”.

4.4.6 Readiness

The theme regarding readiness includes ERP governance, training and transition to support organization after go-live. Many of the participants argued that this could have been done better by involving the support organization early in the ERP upgrade project. This was not done properly, and the new ERP systems were handed over without sufficient training of those that should support the new system after go-live. The theme also regards the change management right after go-live, processes how to handle changes in the new ERP system was not fully in place causing unnecessary delays in development.

Manager 1 stated: “Invest time in more training and planning for the transition to support organization”.

IT staff 5 continued: “The support process could be improved, it is still not perfect, no proper handover to operations was done. They should be involved already in the project as they are key stakeholders”.

Manager 4 answered: “Add more changes right after go-live, but we were not prepared in a lean way, it took a long time before we could focus on new changes. The governance should be in a better state”.
4.5 Summary
This master thesis interpreted how the project members at the pharmaceutical distribution company perceived the CSFs that they thought led to the successful ERP upgrade. It also interpreted the reasons for ERP upgrade at the company, the definition of success and the lessons learned after the ERP project to get the full picture of the project. To achieve this, the empirical data from ten (10) respondents from the project team was subject to a thematic analysis. The outcome of the analysis resulted in four (4) concepts and fourteen (14) themes that were presented in detail together with examples from the empirical data to support the reliability and existence. The meaning and implications of the results in the themes and concepts will be discussed in next chapter.
5 Discussion

This chapter constitutes a discussion about the empirical findings and thematic analysis in previous chapter. The chapter is divided in four (4) subsections representing the concepts where each of the four (4) central research questions and the findings that answers them are discussed in detail.

The result of the analysis conducted in the previous chapter is here summarized in four tables where each table represents one research question. The first research question is presented in Table 10.

Table 10 - Research question 1

<table>
<thead>
<tr>
<th>RQ1</th>
<th>Which were the main reasons for the ERP system upgrade at the pharmaceutical distribution company?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>End of support in ERP system and platform</td>
</tr>
<tr>
<td>2</td>
<td>New features needed by business</td>
</tr>
<tr>
<td>3</td>
<td>Reduce platform dependency</td>
</tr>
</tbody>
</table>

The first research question was aimed to get background information about what the reasons were for the ERP upgrade at the pharmaceutical distribution company. During the analysis of the reasons for ERP upgrade, it was clear that all participants were well aware of the aim and reasons expressed by the company. The old ERP system was long overdue, and support was according to IT staff already expired. Also, the system didn't support an upgrade of the operating system on the platform or a newer platform. Together these two reasons formed the number one (1) reason for upgrade. The old ERP system also used old technology with thin clients in a Citrix environment. The new ERP system was using a web-based user interface that offers better maintainability and increased user experience. The new user interface offers same functionality and more, but some training was needed for users to learn to know where to find functions and new features.

The last reason is also technical and involves platform dependency. The old ERP system had many solutions using the functionality on an operating system level. Those were developed back in early 2000 when that was the technology of choice. During the ERP upgrade, there was a which to also reduce the dependency by use of new inquiry tools and by lifting out the job scheduler and label printing solution from the platform. Olson and Zhao (2007) argue that ERP systems upgrades are mainly driven by the intention to take advantage of new technology and business strategies to keep up with the latest business development trends. The reasons for ERP systems upgrades are often triggered by technology changes, forced by de-support and new functionality. Statistics show that 55% of the upgrades are triggered by a need for new functionality, consolidation or expansion of systems. 24% were triggered by technology platform changes. 15% of the upgrades were forced by the end of support of the current version of ERP system to avoid vendor support termination. The remaining 6% was triggered by bug fixes, or legal changes argues Olson and Zhao (2007). These reasons correspond well with the pharmaceutical distribution company and above identified main reasons stated by the participants.
The second research question is presented in Table 11.

Table 11 - Research question 2

<table>
<thead>
<tr>
<th>RQ2</th>
<th>How do project members define “success” in the context of the ERP system upgrade at the pharmaceutical distribution company?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Operation, functional and stable system after go-live with minimal impact on business</td>
</tr>
<tr>
<td>2</td>
<td>Project KPIs, budget, scope and timeframe is kept</td>
</tr>
<tr>
<td>3</td>
<td>Quality, refers to the overall system quality, especially the retrofitted objects</td>
</tr>
</tbody>
</table>

The second research question was asked to get information about how the different participants regarded the definition of success, and specifically what success meant for them in context of the successful ERP upgrade project. The main definition of success was according to the participants the theme called Operation with focus on running the new version of the ERP system. What stands out is that the system operation without major issues that affect business and customers. Operation theme can be directly linked to number (5) in Markus, et al. (2000) definitions of success; the smooth running of business operations with success for customers, suppliers and investors. This also gets support by Magnusson and Olsson (2005) that claims that the main definition of success in ERP projects is related to not cause a loss in production or harming the business.

The second most important success definition according to the participants in the project team is during the analysis found to be the theme Project KPIs. That is not surprising as those often are carefully measured with constant focus and reported throughout projects as part of project management. The Project KPIs are covering several of the definitions of success stated by Markus, et al. (2000), namely (2) financial success, (3) success according to the users and managers, (4) strategic success and (5) smooth running of business operations.

The last theme is Quality and was by many participants in focus during the ERP upgrade remembering the old implementation back in 1999. This theme will relate to (1) technical success, (3) success according to the users and managers, (4) strategic success and (5) smooth running. It's interesting to see that the definitions of success stated by Markus, et al. (2000) often works in combinations, it's only the Operations theme that was covered one to one. But it would be possible to add both (1) technical success and (3) success according to the users and managers to this theme as those are contributing or are a result of the smooth operation of the new ERP system.
The third research question is presented in Table 12, the rank from the literature review is added as a reference.

**Table 12 - Research question 3**

<table>
<thead>
<tr>
<th>RQ3</th>
<th>Rank in literature review</th>
<th>Which are the main CSFs perceived by project members after the ERP system upgrade at the pharmaceutical distribution company?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>Top management commitment and support Organization</td>
</tr>
<tr>
<td>2</td>
<td>22</td>
<td>Software analysis, testing and acceptance control Technology</td>
</tr>
<tr>
<td>3</td>
<td>16</td>
<td>Project team leadership, empowered decision Organization</td>
</tr>
<tr>
<td>4</td>
<td>3</td>
<td>Project management Organization</td>
</tr>
<tr>
<td>5</td>
<td>7</td>
<td>Strategy planning, scope and vision Organization</td>
</tr>
<tr>
<td>6</td>
<td>21</td>
<td>Involvement of end-users and stakeholders Organization</td>
</tr>
<tr>
<td>7</td>
<td>17</td>
<td>Data conversion and integrity Technology</td>
</tr>
<tr>
<td>8</td>
<td>10</td>
<td>Consultant selection and relationship Organization</td>
</tr>
<tr>
<td>9</td>
<td>11</td>
<td>Balanced team Organization</td>
</tr>
<tr>
<td>10</td>
<td>6</td>
<td>Project team: the best and brightest Organization</td>
</tr>
</tbody>
</table>

The third research question was the main question for this thesis and aimed to identify what the CSFs perceived by project team members were. Data for this question was collected by both interviews and card sorting. The interview responses served the purpose of gather indeep background and thoughts. The initial question about perceived CSFs didn't reveal any new CSF that was not already covered by the 24 CSFs identified during the literature review. If that had been the case, a new card would have been created for that CSF. The card sorting was the second data collection method that captured the reasoning and sorting of the perceived CSFs during the ERP upgrade project. I have chosen only to discuss the top ten (10) CSFs, the complete list of all 24 CSFs is found in Chapter 4 and Table 8.

CSF number one (1) was *Top management commitment and support* got high scores by many participants, four (4) participants gave this CSF the highest score of ten (10). The CSF was regarded as important by eight (8) of ten (10) participants. The ERP project had a very good commitment and support by top management throughout the entire project. The ERP upgrade was considered a priority one project by top management and that made the allocation of key resources much easier without the need to compete with other projects. This was also the findings in the literature review, the CSF got top scores in six (6) of the seven (7) reviewed articles. Finney and Corbett (2007) argue that Top management commitment and support is one of the two most widely cited CSFs. The CSF is empirically proven that a strong committed leadership and the top management is essential to the success of any ERP project.

CSF number two (2) was *Software analysis, testing and acceptance control* and was the only CSF that was selected by all ten (10) participants. This CSF is also the major difference when compared with findings in the literature review were it only got mediocre results and ended up in place twenty-two (22). The reason for the high scores in the analysis is mainly due to the heavily regulated industry of pharmaceuticals were testing has a special focus and attention as
the ERP system is validated. The *dry run* testing approach is included in this CSF and that can explain the high scores as this was the main success factor and maybe the main contributor to the high quality of the upgrade implementation and smooth go-live.

The company uses several types of testing in different environments and for different purposes. For example, unit tests were developer make basic testing of new code. IT testing were designers and IT staff tests new or changed solutions. Once tested successfully the package is deployed for user acceptance testing by business and finally deployment to production environment. Each testing step must be conducted and approved before it can be moved to next environment. The company tests in four levels together with integration testing and performance testing were processes are stressed to see that they can handle the non-functional requirements set by the business. Example of non-functional requirements could be that the ERP system must be able to handle a minimum of X number of order lines per hour or that a label shall be printed X seconds after pressing a print button in the ERP system.

The approach with dry run testing was explained as a kind of dress rehearsal of the go-live scenario. The new ERP system was installed on own platform making it possible to switch between old ERP system and new ERP system. The aim of the dry run is to verify that data conversion and needed activities during go-live will be ready in time and to test warehouse systems with the new ERP system. The dry run was performed during weekends, six times in total, three for Finland and three for Sweden. The dry run results were shared each time and had benefits to both countries in finetuning and tweaking the data conversion and go-live activities.

**Steps in the dry run (high level):**

1. Dry run execution begins
2. Shut down production in old ERP system
3. Copy data from old ERP system new ERP system
4. Perform data conversion in new ERP system
5. Testing of new ERP system using converted data with production warehouse systems
6. Perform roll-back to old ERP system and verify that it works
7. Old ERP system is operational, and production is started
8. Dry run execution completed

*Warehouse systems* are external systems that are connected via integrations to the ERP system, for example, hand scanners, conveyor belts, tote systems, forklifts, pallet automation, picking robots and picking stations. Many of these warehouse systems are one of a kind and only possible to test directly in production explained several participants. Leyh (2014) advocates that testing and simulation exercises for the different parts and functions and the whole system have to be performed in the final stages of the ERP implementation process. The testing and validation are necessary to verify that the system works according to the business requirements and processes from a technical perspective.

CSF number three (3) that were identified during the analysis was *Project team leadership, empowered decision makers*. This CSF also stands out compared to earlier research, it was ranked sixteen (16) in the literature review. Finney and Corbett (2007) argue that the project team must be empowered to make necessary decisions quickly not to introduce unnecessary
delays in the implementation. This was working fine during the ERP upgrade project at the company by means of a project steering board with sufficient mandate to make decisions.

CSF number four (4) was the Project management. The company used an external program manager and several external project managers because the company didn't have that competence. The project organization is very important in these types of project. The main deliveries in the project were divided into several workstreams. Each workstream had a clear scope of what they should deliver. The workstream leads acted as project managers for their respective workstream with reporting responsibilities towards the program manager. The project organization was not perfect in the beginning but was developed during the project to allow and support good communication and fast decisions.

Dezdar and Sulaiman (2009) advocate the importance of an effective project management keeping track of project scope, work time schedule, schedule and plan, project cost and project management of consultants and supplier. Leyh (2014) argues further that project management involves planning stages, allocation of responsibilities, definitions of milestones, this enables timely decisions and that such decisions are made by the right project members. Project management is a continuous process with a focus on the important aspects of the ERP project and ensures that schedules and timelines are met.

CSF number five (5) was the Strategy planning, scope and vision. The scope of the ERP upgrade was very clear. It was limited to a technical As-Is upgrade with a focus on quality. It was based on function and that each function should work As-Is with regards to the business processes. Dezdar and Sulaiman (2009) and Ahmad, Haleem and Syed (2012) argues the importance of a clear scope, goals, objectives and desired outcomes.

CSF number six (6) was identified as the Involvement of end-users and stakeholders. The project team also included users and business process owners and experts. The users together with the business process owners and experts where involved in the different testing phases to ensure that functionality was kept As-Is in each function and module of the ERP system. The quality department was also a stakeholder that was involved during the entire project and were responsible for the validation of the system. Magnusson and Olsson (2005) argue that by involving users as early as possible in the project there is much to gain in the form of knowledge transfer and that the user's level of competence is raised enough to enable the ERP system to be used properly after the implementation. To achieve this, you seek to create an atmosphere in which the user feels involved in the development, configuration and testing of the ERP system, thus gaining a sense of ownership from the user's side. If the users feel that it is their ERP system, then the likelihood is greater that they will accept the ERP system at the time of implementation.

CSF number seven (7) was the Data conversion and integrity. This step is critical in any ERP project when you convert your current data to the new system. Not only the mapping and conversion of data to the new formats but mainly the needed time to do the conversion. The database in the old ERP system was massive, containing thousands of tables filled with old data, some tables have never been archived or purged since 1999. Chaushi, Chaushi and Dika (2016) argue the importance of data quality during conversion. There is a need for the business to create a data analysis plan for quality control, data cleansing and data accuracy. The first step in the data conversion strategy was to remove obsolete data in the old system, e.g. housekeeping. All data that can be removed in beforehand is good to keep the data size down to make the data conversion faster. The data conversion is tested several times to
finetune and tweak the scenario to get the duration of time down so that it's possible to complete over a weekend during go-live. After the data conversion is completed, it's important to verify the data integrity and data quality. This is done by running several reports and SQL scripts that check for example orders head compared with order lines to identify any orphan records or other inconsistency in the converted data. Beynon-Davies (2013) explains that data integrity is to ensure that data stored in an ERP system remains an accurate reflection of the activity system it describes.

CSF number eight (8) was the Consultant selection and relationship that relates to the importance of careful selection of consultants and the relationship. The majority of the consultants in the project team had worked for the company for many years and was familiar with the old ERP system and the business. All consultants had proven experience in different areas, for example, functional design, project management, coordination, development, quality assurance, test management, system configuration and enterprise architecture. The consultants and their consulting companies were trusted partners to the company doing the ERP upgrade. Ahmad, Haleem and Syed (2012) argue should be assessed by software knowledge, business understanding and soft skills. The consultants did possess valuable knowledge about the standard functionality of the new version of the ERP system and best practices in how to use the new version and how to setup the new environment and platform to achieve best possible advantage and performance. Valuable knowledge transfer was made between consultants and internal project members through workshops and training sessions. Finney and Corbett (2007) advocate that efforts should be made during the ERP project to take the opportunity for knowledge transfer from the consultants to the own organization to decrease the dependency.

CSF number nine (9) was the Balanced team that concerns the project team and the mix of people. The competence in the project team was very high. Several members had many years of experience and deep knowledge about the business processes at the company. Internal team members were from many different departments and functions in the organization. Many of the external consultants were already familiar with the company since many years and had been working in several similar ERP projects in the past. Other consultants were not that familiar with the company but did bring in fresh ideas and knowledge that the company didn't possess. Finney and Corbett (2007) argue the importance of a project team that spans over the whole organization with a good balance of business and IT skills. Ahmad, Haleem and Syed (2012) argues in a similar way that members in the project team should not only be technologically competent but also have very good knowledge about the company and the business processes and requirements.

CSF number ten (10) was the Project team: the best and brightest that concerns the skills, motivation and competence of members of the project team. The project team was indeed compiled using the best key resources available at the company in both Finland and Sweden, along with experienced international consultants with deep knowledge of project management, ERP system upgrades and implementations. Take the selected participants for this research as a good example, they had an average of over 18 years of experience working within IT and had been involved in over three (3) similar ERP projects each. Finney and Corbett (2007) claim the criticality of a solid core project team that is comprised of the best and brightest individuals with a proven reputation at the company.

It was also interesting to compare the different perspectives between the IT staff, Managers and Consultants. Not too much should be drawn on this as a project team always will be a mix
of roles and perspectives. The card sorting results by looking at the three different perspectives separately is shown in Table 13, Table 14 and Table 15. Each table is sorted by SUM of scores. If two CSFs have the same SUM, it is sorted by the occurrence and the highest individual score. All three perspectives had similar CSFs, five (5) of the ten (10) CSFs were common within all three perspectives, it’s only the ranking that differs. The individual results also show that many CSFs that are closely related to the participant’s own role is regarded as essential and got high scores.

The IT staff perceived that the Project team leadership, Project management and Involvement of end-users was contributing the most to the successful ERP upgrade. The Managers regarded the Top management support, Testing and Balanced team as main contributing CSFs. The Consultants considered the Project team best and brightest, Top management support and Consultant selection (no surprise there) as the main contributing CSFs. Also, interesting to see what they didn’t raked as important, for example, Managers didn’t score Involvement of end-users and stakeholders as top ten (10). The Consultants didn’t regard Balanced team in their top ten (10).

Table 13 - Top ten CSFs perceived by IT staff

<table>
<thead>
<tr>
<th>Rank</th>
<th>CSF</th>
<th>I3</th>
<th>I5</th>
<th>I7</th>
<th>SUM</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Project team leadership, empowered decision makers</td>
<td>6</td>
<td>9</td>
<td>5</td>
<td>20</td>
</tr>
<tr>
<td>2</td>
<td>Project management</td>
<td>10</td>
<td>10</td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>3</td>
<td>Involvement of end-users and stakeholders</td>
<td>8</td>
<td>7</td>
<td>3</td>
<td>18</td>
</tr>
<tr>
<td>4</td>
<td>Software analysis, testing and acceptance control</td>
<td>2</td>
<td>5</td>
<td>9</td>
<td>16</td>
</tr>
<tr>
<td>5</td>
<td>Strategy planning, scope and vision</td>
<td>9</td>
<td>7</td>
<td></td>
<td>16</td>
</tr>
<tr>
<td>6</td>
<td>Data conversion and integrity</td>
<td>3</td>
<td>3</td>
<td>8</td>
<td>14</td>
</tr>
<tr>
<td>7</td>
<td>Balanced team</td>
<td>4</td>
<td>6</td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>8</td>
<td>Software maintenance</td>
<td>4</td>
<td>6</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Top management commitment and support</td>
<td>10</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Communication plan</td>
<td>8</td>
<td>8</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 14 - Top ten CSFs perceived by Managers

<table>
<thead>
<tr>
<th>Rank</th>
<th>CSF</th>
<th>M1</th>
<th>M4</th>
<th>M6</th>
<th>M8</th>
<th>SUM</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Top management commitment and support</td>
<td>10</td>
<td>10</td>
<td>8</td>
<td>6</td>
<td>34</td>
</tr>
<tr>
<td>2</td>
<td>Software analysis, testing and acceptance control</td>
<td>9</td>
<td>5</td>
<td>5</td>
<td>7</td>
<td>26</td>
</tr>
<tr>
<td>4</td>
<td>Balanced team</td>
<td>4</td>
<td>8</td>
<td>7</td>
<td>4</td>
<td>23</td>
</tr>
<tr>
<td>3</td>
<td>Strategy planning, scope and vision</td>
<td>3</td>
<td>10</td>
<td>10</td>
<td></td>
<td>23</td>
</tr>
<tr>
<td>5</td>
<td>Project team leadership, empowered decision makers</td>
<td>3</td>
<td>9</td>
<td>9</td>
<td>21</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Implementation strategy and timeframe</td>
<td>8</td>
<td>2</td>
<td>6</td>
<td>3</td>
<td>19</td>
</tr>
<tr>
<td>7</td>
<td>Data conversion and integrity</td>
<td>7</td>
<td>6</td>
<td></td>
<td>5</td>
<td>18</td>
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<td>8</td>
<td>Project management</td>
<td>6</td>
<td></td>
<td>9</td>
<td></td>
<td>15</td>
</tr>
<tr>
<td>9</td>
<td>Consultant selection and relationship</td>
<td>2</td>
<td>3</td>
<td>8</td>
<td></td>
<td>13</td>
</tr>
<tr>
<td>10</td>
<td>Communication plan</td>
<td>5</td>
<td>1</td>
<td>2</td>
<td></td>
<td>8</td>
</tr>
</tbody>
</table>
As suggested by Esteves and Pastor-Collado (2000) and Remus (2007) the CSFs can be seen as multidimensional by adding the strategical and tactical perspectives to the organizational and technological themes. In Table 16 the unified critical success factors model shows the four dimensions of the ten (10) CSFs identified during the ERP upgrade project. Esteves and Pastor-Collado (2000) argue that organizational CSFs are considered to be more important than technological CSFs. The cross-functional nature and large budget of a typical ERP project, the extent of top management support is often considered to be the most important factor. This is supported by the findings of this research, eight (8) CSFs is related to organizational perspective and only two (2) is within technological perspective. No technological/strategical CSFs was perceived and selected by the participants, typical CSFs in this quadrant would be Selection of ERP and Level of customization.

Table 15 - Top ten CSFs perceived by Consultants

<table>
<thead>
<tr>
<th>Rank</th>
<th>CSF</th>
<th>C2</th>
<th>C9</th>
<th>C10</th>
<th>SUM</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Project team: the best and brightest</td>
<td>6</td>
<td>10</td>
<td>8</td>
<td>24</td>
</tr>
<tr>
<td>2</td>
<td>Top management commitment and support</td>
<td>4</td>
<td>9</td>
<td>10</td>
<td>23</td>
</tr>
<tr>
<td>3</td>
<td>Consultant selection and relationship</td>
<td>8</td>
<td>3</td>
<td>6</td>
<td>17</td>
</tr>
<tr>
<td>4</td>
<td>Project management</td>
<td>2</td>
<td>5</td>
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<td>9</td>
<td>Strategy planning, scope and vision</td>
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<td>Implementation strategy and timeframe</td>
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<td>3</td>
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<td>3</td>
<td>Project team leadership, empowered decision makers</td>
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<td>Balanced team</td>
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</tbody>
</table>

But what about those CSFs that got low scores < 10 and zeros (0) by the participants? Several of the CSFs were not applicable to this ERP upgrade. For example, the Business process re-engineering and configuration was not needed as it was an As-Is upgrade, this CSF relates more to new implementations were the functions and processes at the company will change due to the new ERP system and business rules. The Post-implementation evaluation is an important task but is done after the go-live and not a CSF related to the immediate success but more towards the complete life cycle of the ERP system.

*Project champion* was not used in this ERP project. As it was an ERP upgrade with As-Is functionality the resistance at the company was very low or non-existent. The CSF called
Level of customization was not really applicable as it was an As-Is upgrade, all modifications should be retrofitted into the new objects anyway. Had it been a new implementation of a different ERP system the Level of customization would have played a more central role. Same for Selection of ERP the selection was not an option as the decision already was taken to stay with same ERP system and just upgrade the version. The ERP vendor support was not selected by the participants mainly due to that the vendor was only involved in the license management, the support of the ERP system was handled by other support partners not directly tied to the ERP vendor.

The fourth and final research question is presented in Table 17. The six (6) themes identified in the analysis is presented randomly.

Table 17 - Research question 4

<table>
<thead>
<tr>
<th>RQ3</th>
<th>Which were the lessons learned after the successful ERP system upgrade at the pharmaceutical distribution company?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Data, more attention to data quality in converted tables, the creation of test data</td>
</tr>
<tr>
<td>2</td>
<td>Development, higher quality and consistency, design review before development</td>
</tr>
<tr>
<td>3</td>
<td>Key resources, allocation, knowledge transfer, training of new resources</td>
</tr>
<tr>
<td>4</td>
<td>Planning, preparations, proof of concept, hardware and license ordering</td>
</tr>
<tr>
<td>5</td>
<td>Project management, less admin, better fit of project model to adopting company</td>
</tr>
<tr>
<td>6</td>
<td>Readiness, change management process and handover to operations</td>
</tr>
</tbody>
</table>

The fourth research question was aimed to answer what could have been done better in this ERP upgrade project to make it even more successful. This question resulted in six (6) themes and was one of the most discussed among the participants. Despite the fact that this ERP upgrade was considered a success, there is always room for improvements. Some things could have been done differently to have been better prepared to result in less effort, less stress, higher quality and long-term benefit for the pharmaceutical distribution company.

The data quality that was not as good as expected, many new table fields got NULL values during the conversion. The term NULL is often used in database tables to indicate missing or unknown values. NULL isn't a specific value but more an indicator. The NULL values can cause issues during inquiry and when jobs run on old data. Another data-related lesson learned was that testers used old converted data in their tests, causing issues that developers had to investigate for bugs that were found related to data quality. Rule of thumb should be to always create your own test data in the ERP system if possible, then the creation process and data quality are also verified, and the tests bring more value in that way.

The upgrade of the ERP system resulted in that a large number of objects had to be developed. The development was done in parallel by different developers resulted in a diversity of solutions for similar functions. This could have been avoided by better coordination and design reviews before the actual development starts. In the final stages of the ERP project focus shifted towards timeline and go-live, resulting in that many non-critical bugs were put in a backlog for correction later. Several participants pointed out that those bugs should have been corrected within the project instead of after the project. Because after
the project there was lots of new development requested by business queueing up, it’s hard to prioritize bug fixing towards business initiatives.

The key resources in this ERP project were allocated in many workstreams causing a lot of planning work and stress. The company should take the opportunity to train and introduce new resources before and during the project. An ERP project is an excellent opportunity to go beside a key resource and learn the trade by doing. During the project, these new resources would become skilled and valuable assets for the project and a long-term benefit for the company.

Planning and preparations could have been done better in several areas. Needed hardware, mainly servers and related licenses should be ordered and made operational and available before the ERP project starts. During the ERP project, several hardware orders and license negotiations were done during the project causing frustrating delays in workstreams. Proof of concepts should also have been done before project start. Many workstreams had to conduct proof of concepts and verify feasibility during the project taking up valuable time and effort before the real implementation work could start. This approach caused delays in several workstreams and also that some new features had to be scoped out due to lack of time.

There were several lessons learned related to project management. One good example is that the project organization were looking too much on best practices and not how it looks and fits at this organization. This resulted in lack of communication between workstreams in the beginning. The project model was also too detailed and generated a large amount of administrative work and documentation that didn't bring any real value. The scope statement, the documentation with the requirements for the entire ERP systems upgrade was not ready at project start causing delays and uncertainty about what the different workstreams should deliver. The projects testing approach should have been processed based from the beginning. At the beginning of the project, the testers were only focused on testing separate functions causing glitches when entire process flows were tested. Later in the project, a more holistic testing approach was adopted.

More attention should have been given to transition to operations. The operations are stakeholders and should have been part of the project from the beginning to get training and be able to acquire knowledge about the new system. This would have made the handover much smoother. After go-live, it was some uncertainty in operations regarding how to support the new ERP system. Some platform dependency was reduced during the project, for example by moving job scheduler to own service. It was not clear for operations how to handle incidents and service requests that spanned over several services. In the readiness theme, there is also the change management process. The new ERP system introduced a new way of building and deploying code releases throughout the different environments. This process was not entirely in place after the go-live causing some issues and delays in development.
6 Conclusion

In this last chapter, the research study at the pharmaceutical distribution company is summarized by first presenting its findings and conclusions per objective followed by some general recommendations. After that my personal reflections and challenges regarding the overall process of the research and thesis writing is discussed. Followed by contribution of the research study. The chapter ends by presenting implication for future research.

6.1 Conclusions

The central aim of this research study was to identify the main CSFs that contributed to the successful ERP upgrade at the pharmaceutical distribution company in Finland and Sweden. The research study focused on the members of the ERP project team through a qualitative interpretive approach. The participants belong to three main roles in the project team; IT staff, Managers and Consultants. The data collection and analysis were done by interpreting interviews and card sorting results from the participants. Three additional research questions were added about reasons for the upgrade, definitions of success and lessons learned to get the whole picture.

Research question 1
Which were the main reasons for the ERP system upgrade at the pharmaceutical distribution company?

Summary of findings
The company was running a 15-year-old unsupported version of the ERP system. The main reason for doing the ERP upgrade was to get a supported version as well as a supported hardware platform. The second reason was that the new version offered several new features and functionalities requested by the business. The third reason was to get less platform dependent by moving out some closely tied solutions to the operating system, for example; label printing, reporting, queries and job scheduler to new solutions separated from the ERP platform.

Conclusion
The first two reasons for upgrade found at the pharmaceutical distribution company; end of support and need for new functionality are both described in the theory and literature as the main triggers for ERP upgrades. The third reason to remove platform dependency might be very company specific due to how solutions were solved in the past at the company and the fact that the old ERP system had been used for over 15-years in the same type of platform. I believe that it's not uncommon that companies rely on this type of dependency to a specific platform and operating system. An ERP project is an excellent opportunity to remove platform dependency in old solutions and replace with more modern solutions to get increased functionality, usability and support.

Research question 2
How do project members define “success” in the context of the ERP system upgrade at the pharmaceutical distribution company?
Summary of findings
The main areas of success were identified; first and foremost, was the operational part with regards to a functional and stable system after go-live with minimal impact on business and harm to customers. Then the traditional project KPIs; to keep the budget, to keep the scope and to be able to keep the timeframe together with a high systems quality was described as definitions of success after the successful ERP upgrade.

Conclusion
The findings match the identified success definitions in previous research presented in theory and literature review.

Research question 3
Which are the main CSFs perceived by project members after the ERP system upgrade at the pharmaceutical distribution company?

Summary of findings
The identified perceived CSFs were; (1) Top management commitment and support, (2) Software analysis, testing and acceptance control, (3) Project team leadership, empowered decision makers, (4) Project management, (5) Strategy planning, scope and vision, (6) Involvement of end-users and stakeholders, (7) Data conversion and integrity, (8) Consultant selection and relationship, (9) Balanced team and (10) Project team: the best and brightest.

Conclusion
There were several CSFs that the participants regarded top ten (10) that was found ranked low in the theory. For example, the second CSF Software analysis, testing and acceptance control, that regards testing approach in general and the dry runs. The Involvement of end-users and stakeholders was another low ranked CSF in the literature that got high marks by the participants. This research empirically shows that these CSFs are considered major success factors for the company in the pharmaceutical distribution industry. No new CSFs were identified that was not already present in the 24 CSFs from the literature review.

Research question 4
Which were the lessons learned after the successful ERP system upgrade at the pharmaceutical distribution company?

Summary of findings
Even though the ERP upgrade was considered a success, there were several areas identified for improvements. The overall data quality after conversion should have been given more attention. The testers were using old converted data in tests causing issues that were mistaken for bugs when they were related to data quality. Always create new fresh test data if possible. The development quality could be improved, by use of design reviews and coordination before development starts to get better consistency in solutions. The key resources at the company was a bottleneck, and new resources should have been introduced to be trained by key resources before or during the project. Planning and preparations should have been done before project start, for example, hardware ordering and installation of servers, proof of concepts and license negotiations. Many participants had opinions about the project management, one common area of improvement was to adapt the project organization and model to the company instead of looking too much at best practice. The administrative work
should be kept to a minimum in the workstreams, all documentation and reporting should have a valid purpose and value. The last area of improvement was the readiness, stakeholders from operation were not included in the project team, resulting in confusion and uncertainty of how to support the new ERP version after go-live. The readiness also concerns the change management process and release management. Those processes were not entirely in place after go-live causing unnecessary delays in development for the countries. The readiness is essential but often hard to get attention, resources, and commitment to that as the primary focus is on the actual ERP upgrade.

Conclusion
The different lessons learned are important as they also can be seen as CSFs that should have been given more attention during the ERP upgrade. The identified areas can often be mapped to one or more CSF(s). Data quality issues relate directly to CSF Data conversion and integrity. CSF Project management covers the other lessons learned regarding design reviews, key resources, planning, project organization, project model and readiness. The lessons learned can be used as input and guidance during next ERP project at the company as they are empirically proven areas for extra attention and improvements.

6.2 General recommendations
The main findings of this research study can be used as recommendation for upcoming ERP projects at the company. They can be summarized as:

- Ensure top management commitment and support, it is the key to getting right focus and attention for the initiative.
- Testing, use a holistic approach, test the processes end-to-end and not only the separate functions, create new fresh test data in the new ERP system, perform several dry runs to dress rehearse and finetune the go-live activities, conversion timings and testing of integrations to warehouse systems.
- Project team, use external help in areas where the company lacks competence, use members with right skills, have the right mix of resources and with sufficient empowerment to make decisions, including operations at an early stage to enable a good transition and handover of the ERP system support before go-live.
- Project management, take the opportunity to train new resources by use of knowledge transfer from key resources and consultants, strive for a good fit of project model and project organization to the company, keep administrative work to a minimum, create only documentation that adds value and will be used in future, review design before development starts to get better consistency in solutions.
- Create a clear scope, what’s in scope and what’s out of scope, prepare and plan as much as possible before ERP project start, for example, hardware ordering, license negotiations, and conduct needed proof of concepts in beforehand, make realistic time estimates by including the resources who will do the task.
- Use experienced and trusted consultants that are familiar with the business and company.
- Pay careful attention to data quality during conversion, if it’s not done right and corrected during the project it will probably remain in bad shape for years to come.
6.3 Personal Reflections

Conducting this thesis provided me with an excellent academic experience. It has given me the opportunity to undertake a large research project. This has been achieved through a learning process with help and support from supervisors, classmates and professors. I have developed a structured approach to data collection, interpreting, and analysis of qualitative data to reach meaningful conclusions. It also forced me to exercise and strengthen my project management skills to keep the time plan with several deadlines, seminars and milestones to finally be able to submit my thesis on time. I have enjoyed this journey of research to see the development of a research proposal to final master thesis dissertation. With my background in ERP systems development, it was quite easy to understand the phenomenon of interest, the participants and the settings at the company. However, it was also proven to be difficult to distance me and take on the role of the researcher in the beginning. When transcribing the recorded data after the first interview, I could hear myself talking too much and getting too involved in the reasoning and discussion. The mistake was immediately corrected, and in the following nine (9) interviews I held a much lower profile and let the participants speak their mind, and I just kept the conversation going and asked follow-up questions. The research project and thesis writing helped to improve my academic proficiency, as well as enhancing my information management and organizing skills that will be of great benefit to me in my future professional career.

6.4 Contributions

This study collected CSFs identified in earlier scientific research and compared those with the perceived CSFs after the successful ERP system upgrade project at a pharmaceutical distribution company. This was achieved by analysis of collected primary data from the IT staff, Managers and Consultants in the project team. The findings discovered in this study will contribute to the research in the area of CSF analysis within ERP systems projects by looking at the industry of pharmaceutical distribution. The findings will also provide valuable guidelines in forms of CSFs and lessons learned together with some general recommendations for upcoming ERP system projects at the pharmaceutical distribution company.

6.5 Future Research

At this point, I would like to propose some topics for future research by other researchers based on my conducted research study results. CSF analysis as a phenomenon is a very interesting research field that can be applied in all kinds of projects not only with regards to ERP. One topic could be to identify new possible areas where CSFs analysis could be adopted. I also believe that more research should be conducted covering more perspectives and industries to gain a better understanding of which factors that influence success and failure in ERP projects. One of the main findings of this research study was the CSF Software analysis, testing and acceptance control that was ranked as number two (2) and the only CSF selected by all participants. Why is testing CSF not regarded higher during ERP projects? This could be investigated and researched upon in more detail as the testing is directly related to systems quality and in turn, is linked to the main success definition of a stable system with minimum harm to customers.
7 References


Appendices

Appendix A - Interview guide

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<th>Focus area</th>
<th>Interview</th>
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<tr>
<td>Introduction</td>
<td>I’m doing this interview to learn about what CSFs that contributed to the successful ERP upgrade at the company. We shall begin with some mandatory paperwork.</td>
</tr>
</tbody>
</table>
| Informed Consent Form | I want you to read through the Informed Consent Form. It describes my research, your rights, and privacy. It also has my contact information if there are any questions afterwards.  
Do you mind if I record the interview? This will allow me to focus more on the interview without distracting note-taking. It will also minimize the risk of misunderstanding and misquotation.  
We should both sign this in two copies, one for you and one for me as the researcher.  
REMINDER - Start recording if approved |
| Background         | How long have you worked within IT?  
Was this your first ERP project? (upgrade/implementation)  
What were the main reasons for the ERP upgrade? |
| Perceived CSFs     | Which three CSFs do you think contributed most to the successful ERP upgrade?  
Can you explain why you chose these three CSFs?  
How would you sort these three CSFs by criticality? |
| Success            | How would you from your perspective define “success” in the context of the ERP upgrade?  
Do you think there is more than one measurement of success?  
If yes, please explain? |
| Sorting of CSFs    | Now we will move into the structured part of the interview. During my literature review, I have identified 24 unique CSFs. I have made cards of the CSFs that are scrambled.  
Let's walk through the 24 CSFs, I describe what they stand for, and we discuss the meaning of each so that it's clear.  
I would like you to select those top 10 CSFs that you believe played a critical role in the successful outcome of the ERP upgrade project.  
Please sort those 10 CSFs that you selected by importance, most important first. Please explain why?  
REMINDER - Take a picture of the sorted CSFs, note which CSFs and the sort order. |
| Lessons learned    | From your perspective, if you were to do a similar ERP upgrade project once more, are there things that you would have done differently to make the outcome even more successful? |
| Ending             | That was all, do you have any questions or something else that you would like to add? If not, I would like to thank you for participating in the interview and my research. |
Appendix B - Informed consent form

Informed consent form

Title of the Research: Successful ERP system upgrade; What lays behind the critical success factors and how are they perceived by different project members?

Researcher: Christian Svärd, Master Programme in Informatics, Linnaeus University
Email: csvfr06@student.lnu.se
Phone: +46(0)733 677687

Purpose of the research: This research will be a study of critical success factors during a successful ERP system upgrade. The aim is to identify the critical success factors by examining if there are differences in how project members with different roles perceive what was important for their successful ERP system upgrade project.

Description of the research process: Participants will be invited to participate in an interview conducted by the researcher. The interview will be audio recorded (if agreed). The interview recordings will be transcribed and used in the master thesis. The critical success factors identified during the interview will be analyzed and compared to scientific literature base on the subject.

The benefits of the research: Participants will have a chance to provide their insight and constructive view on the critical success factors during the ERP system upgrade project. The results of the study will give input to further research and give valuable guidelines for the company in future ERP system upgrades and new implementations.

Risk and discomfort: Personal information referred to in the interview will not be used or mentioned in the master thesis to ensure privacy.

Participant’s rights: The participation in this research is voluntary, meaning that you may withdraw at any time without any obligation of justifying it. All data from interviews will be kept confidential.

Access to data: The gathered data will be accessible by the researcher and University professor/supervisor without any personal information of participants being correlated to the data. The data will be used strictly for this thesis.

Consent: I understand and agree with the above statements and that my participation is voluntary. I understand that I can withdraw at any time until the research study is published. I consent to participate in the research study, and I allow you to use the information that I will provide in your master thesis.

I agree to audio record our interview: YES NO

Date and place of interview: ________________________________

Participant's name and signature: ________________________________

Researcher's name and signature: ________________________________