Critical Success Factors across the ERP life cycle
A study of SMEs in Jönköping County

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Title: Critical Success Factors across the ERP life cycle - An empirical study of SMEs in Jönköping County

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Abstract

Enterprise Resource Planning systems are business systems that are expected to integrate all the business’ processes within organization, and since ERP systems are complex and require extensive changes in the organization, it is crucial that the implementation is successful. However, the implementation of ERP systems is described as both risky and complex projects.

The purpose of this master thesis is to investigate the importance of different critical success factors across the ERP project life cycle within SMEs. Furthermore, we will compare our findings to see if there are differences between larger corporations in the USA and SMEs in the county of Jönköping, Sweden and try to explain the potential differences.

In order to fulfill our purpose, we used a quantitative approach to collect primary data from the SMEs in the county of Jönköping. Our data was thereafter qualitatively analyzed in order to describe our findings.

The conclusions drawn in this thesis is that the following critical success factors are perceived to be most important within the SMEs investigated:

- Infusion stage: Careful selection of package
- Adoption stage: Top management support
- Adaptation stage: Project champion
- Acceptance stage: Project champion
- Routinization stage: Education on new business processes
- Infusion stage: Vendor support.

It was apparent that the critical success factors identified in our research differed from the critical success factors identified for the Fortune 500 companies in the USA. However, we have failed to find any valid and reliable reasons for the differences even though we have discussed possible reasons for them.
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1 Introduction

This introduction chapter will help the reader to better understand the subject researched in this master thesis. The introduction and background sections will describe ERP in a broader sense while the problem will explain why we are going to do our research. The purpose is to pinpoint the research, and demarcation, focus, interested parties as well as a disposition is also presented.

Enterprise resource planning (ERP) systems are a large set of integrated software which provides support for different organizational activities, such as manufacturing, logistics, finance, accounting, sales, marketing, and human resources. The benefits of an ERP system is that it creates synergies between different parts in the organization by sharing data and knowledge, reducing costs, and it gives the management support to improve business processes (Aldawani, 2001).

According to Laugling (1999) ERP systems have been developed to meet the need to plan and manage complex manufacturing processes. In recent years, Laugling continues, the functionality of ERP systems has been broaden as companies want to integrate different units, share services and run global operations. With the ERP systems broad functionality, much of the organization’s legacy systems can be replaced with an ERP system, providing better support for new business structures and strategies. Before the year 2000, ERP systems were also installed to ensure millennium compliant software (Laugling, 1999).

Our, the authors interest of ERP was initiated during the spring of 2005 when we attended a course about ERP systems at Jönköping International Business School. Our interest of the different aspects of ERP was especially focused on the importance of the implementation and we were fascinated by the fact that many businesses did not manage to implement ERP systems due to various reasons.

1.1 Background

According to Prasad, Maneesh and Jayanth (1999), organizations implementing ERP are about to conduct massive changes within the organization; changes that need to be well managed in order to benefit from the ERP solution. Critical success factors, including top management commitment, business process reengineering, integration, and training of users to name a few, must be carefully considered in order to make sure that the implementation is successful (Prasad et al., 1999).

Our study is built on Somers and Nelson’s (2004) study “A taxonomy of players and activities across the ERP project life cycle” which identified the importance of different critical success factors (i.e. players and activities), and was conducted on Fortune 500 companies in the USA. We have chosen the framework of Somers and Nelson (2001) to base our study on, not only because we believe it is a good and solid work, but also because it is claimed to be the most comprehensive work of critical success factors (Hedman, 2003). Our research will focus on SMEs in the county of Jönköping, Sweden.

1.2 Problem

Many academic studies done on critical success factors when implementing ERP systems is focused on large companies, something that maybe was applicable five years ago when ERP systems and other enterprise systems was almost only available for larger corpora-
tions. Today however, there are various systems aimed at smaller companies (Adam & O’Doherty, 2004).

Since SMEs often have more limited resources than larger companies, we believe it is interesting to investigate whether the critical success factors are dependent or independent on the size of the company. Differences that might affect the critical success factors between smaller companies and larger corporation might be that different departments are not as divided in smaller companies as they are in larger companies, which might create conflicts but ease the communication if there are problems in the implementation.

Mabert, Soni and Venkataramanan (2003a) explain that various studies has been done in order to explain how company size impacts different issues, but very little attention has been put on the impact of company size when it comes to ERP systems, something we feel is very interesting.

Somers and Nelson (2004) have divided their critical success factors across the project life cycle into the groups of players and activities, meaning that the term critical success factors refers to both the players and activities throughout the thesis, while the term player only refers to the key players and the term activities only refers to the key activities.

1.3 Purpose

The purpose of this master thesis is to investigate the importance of different critical success factors across the ERP project life cycle within SMEs. Furthermore, we will compare our findings to see if there are differences between larger corporations in the USA and SMEs in the county of Jönköping, Sweden and try to explain the potential differences.

1.4 Demarcation and focus

This master thesis will investigate critical success factors within the ERP project life cycle in SMEs situated in the county of Jönköping, Sweden. The reason why we have chosen to investigate SMEs in the first place is because we feel that the research that has been done previously has been focus on larger enterprises, not on SMEs; a reason for this could be that most of the ERP software that is available on the market is better suited for larger companies, but as Adam and O’Doherty (2004) points out, many ERP vendors are moving in towards SMEs.

Furthermore, since single vendor ERP system is rare within SMEs, our research will expand the definition and more look into the factors when implementing modules of enterprise systems within SMEs (best-of-breed, read more about this in the frame of references). It could be argued that comparing the best-of-breed modules of ERP with single vendor ERP is something that should not be done, especially not in a comparative analysis; however, we believe that many factors during the implementation phases are similar, and problems that occur during single vendor ERP implementations might as well occur during implementation of the best-of-breed modules of an ERP, after all it is still ERP implementations, the definition of ERP in this thesis will be:

**ERP – A business system that somehow eases the business processes within the organization.**

Jönköping as a region is famous for its many small- and medium sized enterprises and was therefore selected as the region where we wanted to conduct our study. Another reason for the selection of the county of Jönköping is the fact that we are attending university in this
region. Furthermore, we have chosen not to focus on any specific ERP system because we do not want to be affected by vendors in our research.

1.5 Interested parties
This thesis on critical success factors of ERP could be interesting for smaller companies planning on implementing an ERP system. It could also be interesting for companies that already have implemented such systems but still are having problems within the organization. Other interested parties are also ERP vendors and other parties who are interested in the implementation of ERP. Furthermore, we believe this thesis can be of interest for the scientific community as a foundation for future research.

1.6 Disposition
To help the reader better understand how the different chapters in this thesis are tied together, a graphical model of the disposition is presented below to visualize this.

![Disposition Diagram]

Figure 1 - Disposition

**Introduction.** Our problem discussion in the beginning of the thesis is formed into the purpose which is going to be the red line throughout this thesis.

**Method.** Our method is describing how we did our research. The method explains how we found reference, collected our empirical findings and how these two parts were put together to form the analysis.

**Frame of references.** Our frame of references is a collection of relevant literature which we have summarized. The frame of references is the basis for the empirical findings.

**Empirical findings.** Our empirical findings are what were collected from our survey.
Analysis. Our analysis is where we will compare our empirical findings with our frame of references. The analysis will form the base for the conclusion.

Conclusion. Our conclusion is where our main findings are presented and conclusions were drawn from our research is presented.

Final discussion. Our final discussion is a review of all of the passed chapters. This is where we will analyze our own efforts.
2 Method

This chapter will discuss and motivate the approach we have decided to use in our research in this master thesis. Description of how data was collected and analyzed will be followed by a part discussion the trustworthiness of this thesis.

2.1 Research method

According to Cantzler (1992) there are two different research methods; quantitative and qualitative methods. Depending on what the researcher is looking for, how much time and resources the researcher has available; the two research methods can be done one by one or combined.

Holme and Solvang (1991) claims that qualitative research is characterized by the proximity the researcher has to the respondent. In qualitative research, the use of small groups; not larger than 30 respondents is used (Cantzler, 1992). Qualitative research is often built upon interviews and open questions. Due to the way data collection is done, the answers can vary and it also requires time and money to collect data this way (Cantzler, 1992).

Cantzler (1992) characterizes quantitative research as a method where a large amount of respondents can be researched and where the data collection is many times done through questionnaires and statistical methods can be applied to the collected data.

Our data was collected through a quantitative research method, mainly because the study which we compared our result with is a quantitative study. Furthermore, a quantitative study is a good way to minimize the subjectivity which otherwise can impact the result of the study (Cantzler, 1992). But it is, according to Cantzler, important to make sure that the subjectivity is not reflected in the questionnaire. Based on the fact that our study is based on another study, there is no possibility for us to use another research method; however, it is fully possible to research the same subject with qualitative method, doing interviews with the companies and try to gain knowledge by this. We have analyzed our empirical findings with a combined qualitative and quantitative research method; this will be described further in the following sub-chapters.

2.2 Data collection

This study is based on a literature study and an empirical investigation. An empirical study is, according to Repstad (1993), an investigation based on data which has been collected through surveys or interviews. Our empirical material was gathered through a survey which was distributed to different SMEs in the county of Jönköping.

2.2.1 Primary data

According to Lundahl and Skärvad (1999), an empirical study is done to collect primary data. Furthermore, Lundahl and Skärvad (1999) suggest that the researcher should select respondents to get access to deviating or typical cases. We chose to collect our primary data through a questionnaire and since our study is based on the study made by Somers and Nelson (2004), our questionnaire was identical with the questionnaire used in 2001, with the exception that ours was translated into Swedish. This was done to ensure that no respondent would misunderstand the questionnaire due to the language. Interested readers
can find the questionnaire in Appendix A. However, an addition to Somers and Nelson’s (2004) questionnaire was done; we added fields for the respondent to fill out their position at the company and in what branch the company was in. This was done to identify the people answering the study but it will not be reviewed in our empirical findings.

According to Saunders, Lewis & Thornhill (2003) the use of questionnaires works best if the questions asked are of a closed character and if the questions cannot be interpreted differently by different persons, this is to achieve as high validity and reliability as possible. Furthermore, a well developed questionnaire makes it easier to interpret and control the data gathered (Saunders et al.).

Somers and Nelson’s (2004) questionnaire was sent with mail to their respondents, and as we base our study on their study, we also used this kind of self administrated questionnaire, with the exception that we made the questionnaire electronic and e-mailed it to our respondents. According to Saunders et al. (2003), self administrated questionnaire is a good way to collect truthfully data from the respondents; the reason for this is that the respondent does not try to please the interviewer, something that can occur when the researcher is doing interviews. We are aware of the problems that Saunders et al. (2003) describes with self administrated questionnaires, for example the fact that it is hard to make sure that the right person answers the questionnaire. According to Saunders et al. (2003), a way to work this through is to use e-mail to make sure the right person gets the questionnaire. However, in our case, we were still unsure whether this would ensure that the right person answered the questionnaire since we only had the email addresses of the companies contact persons. But we put a request in our e-mails informing the recipient to forward the questionnaire to the person who was most into the subject. The questionnaire was built as a website; mainly this was done because it was an easy way to collect the data.

We did not do a pilot test in the traditional context that Cantzler (1992) describes, meaning that questionnaires are not perfect from the start and need to be adjusted before mailed out to the respondents. Cantzler (1992) also means that it is good with a pilot test since it gives the researchers an estimation on how long time the questionnaire takes to finish, and if the respondents experience the questions unclear. In our case, we adopted the questionnaire from Somers and Nelson (2004), which already was piloted on six IT executives in the USA. Therefore, we just piloted our questionnaire to make sure that the Swedish translation was correct and easy to understand. Our pilot was done on persons in our closeness.

According to Punch (2003), a good idea could be to make another pilot test after the first pilot test is done, this time with an enlarged population. The reason for this second pilot test is to try the statistical models intended to use, however, since we based on study on another, we did not feel that this would necessary since we had a good understanding on how to apply the statistical models on our data.

### Secondary data

According to Saunders et al. (2003), it is important to investigate the possibilities to gather secondary data before the researcher decides to go for a primary data gathering. Since we did a replication of the Somers and Nelson (2004) study, there was no way for us to gather the accurate data from secondary sources, however, we searched and found similar studies in Sweden and we have found data that we have used in our frame of references to compare our findings with. The data collected and presented by Somers and Nelson (2004) was also used as secondary data when it came to comparing our data.
### 2.3 Selection of Sample

It would have been very interesting to research the critical success factors of ERP implementations across Sweden, but since we had limited time and other necessary resources, we decided to make our investigation in the county of Jönköping where we attend university. Another reason for the geographic demarcation is that the Jönköping area is well known for its many SMEs. In the spring of 2005, there were 1315 companies with 10 to 250 employees registered in the county of Jönköping (Företagsfakta, 2005-04-26). However, we have not been able to find statistics about how many of these 1315 SMEs that actually use ERP systems, therefore our population is still unknown.

We applied a straightforward approach to collect respondents. Jönköping International Business School has a system of host companies in which students are doing projects in different courses. We selected all the SMEs in the host company database which were situated in the county of Jönköping. Out of these SMEs, about 50 percent was registered with e-mail contact information, which led us to decrease our sample to the companies with e-mail. Within these companies, there were some duplicated e-mail addresses, which can be explained with different offices or branches of a company. We decided to purge the duplicates since we figured that the different offices and branches used the same system. Finally we ended up with 199 SMEs with e-mail contact information in the county of Jönköping. Out of these companies we noticed a limited number of local offices of larger companies, such as banks and multinational consulting firms. We decided to keep these companies in the sample since we felt that we could not find a good way of excluding these kinds of companies. The impact of this decision will be discussed in the final chapter.

Our invitation to participate in the study was sent out to the companies with e-mail on April 20, 2005. The e-mail contained a letter to the recipient which stated the purpose of the study and also a request to forward the letter the person who had most insight in the implementation of the ERP system. The letter can be found in Appendix B. The e-mail also contained a link to the online questionnaire which the respondents had to click to access the questionnaire. If the respondents did not fill out the questionnaire within one working week, a reminder was sent out containing an addition to the previous letter, which requested the respondents to answer the questionnaire in order to make our research as good as possible.

Our sampling method can be compared to what Malhotra (2002) describes as convenience sampling since no detailed qualification was done when selecting the respondents. We could, for example, have used random sampling, but due to the limited resources we believed our sampling method is acceptable and provided us with an accurate sample.

### 2.4 Data analysis

Once we noticed that responses from our survey started coming in, we started to manage the answers by entering the values into a spreadsheet model that we developed to summarize the answers. Each of the answers was entered manually and double checked to minimize errors based on faulty entries. Our spreadsheet model summarized the perceived importance of each factor for each one of the different stages. After that it divided the sums of under each factor with the total number of respondents that had replied to that factor to get the mean value. After this, we divided with the maximum of the Likert scale to get a percentual representation of the perceived importance.
The numbers that was the output of our spreadsheet was in the analysis compared with the numbers of Somers and Nelson’s (2004) to identify differences between their research and ours. When we had identified the differences between our result and Somers and Nelson’s (2004) result, a qualitative approach was used to analyze the factors which could have affected the differences in the results. The qualitative approach allowed us to study the data gathered more in depth. Repstad (1993) argues that a qualitative approach allows the researcher to be flexible in the research and looking for relationships in the area studied. The qualitative approach we chose to use when we analyzed our quantitative data allowed us to modify our problem at the same time as we were gathering data. Finally, the qualitative approach gave us the possibility to describe what we actually saw in the numbers presented and use the literature to find potential reasons for this (Repstad, 1993).

2.5 Trustworthiness

To discuss this research’s trustworthiness, there are four key issues to consider; validity, reliability, generalizability, and objectivity. Each one of these conceptions will be described and discussed further below and will also be reviewed in the final part of this thesis.

2.5.1 Validity

According to Lundahl and Skärvad (1999), inner validity, is achieved if the survey used is measuring what is meant to be measured. Furthermore, Lundahl and Skärvad describe outer validity as reached when the empirical study is coherent with the reality.

Our survey contained relevant questions since they measured what we wanted to find in our research. It was our ambition to have a sample that reflects the reality, and therefore we strived to get results which were coherent with the reality.

2.5.2 Reliability

According to Lundahl and Skärvad (1999), to achieve as high reliability as possible, it is important that the study is conducted in the same way for all respondents. The question of the survey should be designed in the same way and measure the same things (Lundahl & Skärvad). Furthermore, other researchers should, independent of each other, be able to conduct the same research and achieve the same result (Lundahl & Skärvad).

In order to get our study reliable, we described the steps of our research carefully and also attach the survey we used in our research to make it easier for other researchers to conduct the same investigation.

2.5.3 Generalizability

Lundahl and Skärvad (1999) is dividing a study’s generalizability into two segments; statistical and analytical. Statistical generalizability is not generated automatically for the population, but the analytical generalizability can provide information where patterns can be visible and new theories can be created (Lundahl & Skärvad).

Since we have an unknown population, we can not prove that our sample of 199 respondents allows us to generalize to the entire population, but we believe that our sample is big enough to indicate tendencies of the population, although, this might not be totally generalized.
2.5.4 Objectivity

According to Lundahl and Skärvard (1999), a researcher should strive to find facts in an objective and impartial way; the researchers’ values and opinions should not influence the research.

Our theory in this thesis is based on research papers, and we have put an effort in depict the theories in a correct way to make sure that information is not left out or twisted. Our results from the survey were analyzed and the conclusions drawn were based on the analysis and from the collected theory. In order to achieve high objectivity during the analysis, we had to take our extended knowledge within the subject into consideration since it might affect the analysis. Therefore, we have motivated all our thought throughout the analysis and the conclusion.
3 Frame of references

The frame of references discusses relevant theory collected in scientific magazines, books and in some cases the internet. This chapter outlines the frame of references of which the analysis will be formed around. In the final part of our frame of references, we will discuss the theory we intend to use in our analysis.

3.1 Enterprise resource planning

Over the last decades new software packages have been developed. These software packages are named ERP (Enterprise resource planning). ERP derived from the visions of integration of business processes. Two terms that have affected the outcome of ERP are material resource planning (MRP) and manufacturing resource planning (MRPII) (Klaus, Rosemann & Gable, 2000).

MRP is a computerized inventory control and production planning system for generating purchase orders and work orders of materials, components, and sub assemblies. It is a computer-based system designed to handle the ordering and scheduling of dependent demand inventories (Klaus et al., 2000).

MRPII is a method for the effective planning of all resources of a manufacturing company. It is made up of a variety of functions and processes, each linked together: The use of the term MRPII has been dropped in favor of the term ERP in recent years (Klaus et al, 2000).

Even though the term of ERP has been around since the late 1980-s it is not before 1994 that the concept of ERP became evident with SAP R/3 (Muscatello, Small & Chen, 2003). With SAP R/3 the architecture moved towards client/server, where the clients were connected to a single and central database. The fast evolution of new techniques lead to heavy investments by organizations and ERP became the new “standard” (Muscatello et al.).

3.1.1 Single vendor ERP

An ERP system is a module based business system that underpin total integration of organizational processes. Since the ERP system work to integrate functions and processes within organization, it give the implementing enterprise a more holistic view of their organization and their processes (Klaus et al., 2000).

ERP is a business’ transactional backbone and ensures data integrity and best of practice business processes and are used to streamline the flow of information within the enterprise, and in sometimes between different enterprises. Early ERP systems used single database architecture, but since the need for integrating business processes across companies, this architecture have changed somewhat today, and it becomes more and more common with open system architectures, where the systems communicate via different messaging services (Olson, 2004). An ERP system, supported by a strong IT infrastructure and based on clearly defined business rules, forms the core foundation of successfully run business information system. It is also a starting point for forward thinking organizations, organizations that are ready for technological changes; it is this integration that is facilitated by an ERP system. (Al-Mashari, 2002)
There are a lot of different definitions of what an ERP system really is. When Somers and Nelson (2004) executed their survey, ERP systems could be summarize by the characteristics formed by Yen, Chou and Chang in 2002.

1. Client/Server architecture – applications are often spread within the organization.
2. A single database – all applications work with and use the same data which lower the amount of redundancy.
3. Application modules – most of the ERP vendors offer special modules for all areas of business that can be integrated in the system
4. Standardized definitions of data – all business processes use the same definitions.

As visible above, the definition of ERP systems include the use of a single database, something that, according to Olson (2004) and Lundqvist (2003) has changed. Even thought that ERP systems aim to integrate all business processes within an organization this is not always the case. Since ERP systems are based on modules, smaller organizations do not tend implement fully integrated ERP systems, but the modules that are the best-of-breed (Olson, 2004).

### 3.1.2 Best-of-Breed ERP

Best-of-breed is an approach to select and implement the best modules of a system in an enterprise. In this approach, components of custom or standard software packages are integrated (Light, Holland and Wills, 2001). According to Light et al. the objective of this approach is to develop systems that are strongly aligned with the business processes of the implementing company. One of the strengths with this approach is, according to Light et al., that the implementing company has the possibility to choose the most appropriate solution for each process. Furthermore, the best-of-breed approach allows more flexibility which ends up in an easier implementation of the ERP system. Below (Table 1) a table is shown that contains a comparison of best-of-breed and single vendor ERP made by Light et al.

<table>
<thead>
<tr>
<th>Best-of-breed</th>
<th>Single vendor ERP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organization requirements and accommodations determine functionality</td>
<td>The vendor of the ERP system determines functionality</td>
</tr>
<tr>
<td>A context sympathetic approach to BPR is taken</td>
<td>A clean slate approach to BPR is taken</td>
</tr>
<tr>
<td>Good flexibility in process re-design due to a variety in component availability</td>
<td>Limited flexibility in process re-design, as only one business process map is available as a starting point</td>
</tr>
<tr>
<td>Reliance on numerous vendors distributes risk as provision is made to accommodate change</td>
<td>Reliance on one vendor may increase risk</td>
</tr>
<tr>
<td>The IT department may require multiple skills sets due to the presence of applications, and possibly platforms, from different sources</td>
<td>A single skills set is required by the IT department as applications and platforms are common</td>
</tr>
<tr>
<td>Detrimental impact of IT on competitiveness can be dealt with, as individualism is possible through the use of unique combinations of packages and custom components</td>
<td>Single vendor approaches are common and result in common business process maps throughout industries. Distinctive capabilities may be impacted on</td>
</tr>
<tr>
<td>The need for flexibility and competitiveness is acknowledged at the beginning of the implementation. Best in class applications aim to ensure quality</td>
<td>Flexibility and competitiveness may be constrained due to the absence or tardiness of upgrades</td>
</tr>
<tr>
<td>Integration of applications is time consuming and needs to be managed when changes are made to components</td>
<td>Integration of applications is pre-coded into the system and is maintained via upgrades</td>
</tr>
</tbody>
</table>

Professor Anders G. Nilsson with the informatics department at Karlstad University argues that module based ERP is the future and claims that the trend toward such module based
ERP is clearly visible, and welcomed (Lundqvist, 2003). Nilsson means that if a company used modules, it can select the modules that are best within a certain area, even though these modules are developed by different vendors. Nilsson continues and discusses the problems with these best-of-breed solutions, such as the integration between different modules, being problematic since various systems from different vendors need to communicate with each other. Nilsson expresses his belief that in the long run, the vendors will loose importance and that the system integrators will become more important (Lundqvist).

3.1.3 ERP and company size

Mabert et al. (2003a) suggest that the size of an enterprise plays an important role when implementing ERP systems and indicated five key dimensions where the size of the enterprise has an impact (Mabert et al., p. 238):

1. Adoption of ERP systems by large companies is motivated more by strategic needs whereas tactical considerations are more important for smaller companies.

2. Larger companies employ more ERP functionality than small companies.

3. Large companies customize ERP software more while small companies adopt business processes within ERP systems more.

4. Large companies use an incremental implementation approach by phasing in the systems while smaller companies adopt more radical implementation approaches such as implementing the entire system or several major modules at the same time (The Big-Bang or the Mini Big-Bang approach).

5. Large companies report greater benefits in the financial areas, while small companies report more benefits from their ERP implementations in manufacturing and logistics.

The dimensions of Mabert et al. (2003a) mentioned above will not be investigated further, but are described to illustrate some of the differences between smaller and larger companies, something we will focus more on in our analysis.

3.2 Implementation

Implementing ERP system is a complex and time consuming project. Since ERP systems are meant to integrate all business processes it will cause major changes in the organization. ERP implementation often exceeds budget, time schedules, and are fairly risky (Cliffe, 1999).

It is important that the system support all organizational needs and requirements. Another important issue is that the system meets the anticipated expectations (Hong & Kim, 2002). It is also of great importance to have an implementation strategy. The implementation strategy should include technological aspects as well as; budgets, methodologies, time-plans, goals, visions and managerial guidelines (Al-Mashari, Al-Mudimigh & Zairi, 2003).
There are different approaches and strategies than can be used when implementing ERP systems, some of these approaches are listed below:

- The skeleton approach (Bingi, Sharma & Gofla, 1999)
- Complete functionality approach (Holland & Light, 1999)
- Single module approach (Holland & Light, 1999)
- Best practice approach (Bingi et al. 1999)
- Reengineering approach (Bingi et al., 1999)
- Best of Breed approach (Olson, 2004)

Olson (2004) describes a bit more about the approaches mentioned above. According to him, it is most common that companies not implement a complete suite of ERP modules from a vendor; this is mainly because it is very expensive, but also it is because not all companies are in need of all modules. The most idealistic approach of implementation is the best-of-breed approach, which seeks out the best modules from the different vendors and implement these based on what is best for the particular organization.

As mentioned before, implementation of ERP systems is a challenging task for involved parties. The implementation phase is no less important than system research and development (Chin, Wen-Hsiung & Yi-Ming, 2004).

According to Romeo (2001) it takes about 9-12 months for a small company to fully implement a typical ERP system. For mid-size companies the estimated time is 12-14 months and for large enterprises up to three years. Swedish companies have come far concerning implementation of ERP systems. According to Olhager and Selldin (2003) 84% of manufacturing companies in Sweden have or are about to install ERP systems in their organizations.

Managers and implementation specialists often define success of a project with terms like “in time” or “within budget”. Meanwhile, the users have a different view; they focus on the transition from the old to the new system (Markus, Tanis & van Fenema, 2000). From a business view, measurements like inventory reduction and more stable support capabilities could be used.

Implementing an ERP system can often be an expensive and risky venture. According to Cliffe (1999) 65% of management executives believe that ERP systems may hurt their business because of the potential of implementation problems. Organizations may have experience from managing traditional management information systems (MIS) but since ERP invites to new challenges there are new risk factors emerging.

### 3.3 Project Life Cycle Stages

Below we present the different stages in the ERP project life cycle. The stages presented are based on the definitions by Somers and Nelson (2004), but further literature is reviewed and presented in order to review other research. The names used for the different stages will follow Somers and Nelson. We will end this sub-chapter with a discussion of the life cycle stages.
This project life cycle only refers to the life cycle of the project within the implementing organization, and does not discuss the actual development of the ERP system, which is done by an ERP vendor. Since no investigation will be done about ERP vendor development, no further discussion about the development of the ERP system is necessary. However, we are aware of the fact that there are many other models about the ERP project life cycle, and a discussion of Somers and Nelson’s (2004) life cycle will, as mentioned before, be presented in the end of this sub-chapter.

### 3.3.1 Initiation

The first stage in the ERP life cycle is, according to Somers and Nelson (2004) the initiation stage. It is described as the stage where the organization searches and locates the appropriate software for the organization.

Similar to Somers and Nelson’s (2004) initiation phase is parts of the Project Phase Model (PPM) described by Parr and Shanks (2000). The PPM consist of three main phases; planning, project, and enhancement. The planning phase includes, among others, the selection of ERP, which also the initiation phase of Somers and Nelson (2004) includes.

The initiation phase in Al-Mashari et al. (2003) includes two important parts; management and leadership, and visioning and planning. When comparing Al-Mashari et al.’s (2003) “setting-up” phase includes the first two phases in Somers and Nelson (2004), the initiation phase and the adoption phase.

### 3.3.2 Adoption

According to Somers and Nelson (2004) the second stage, the adoption stage is when the organization has reached the decision to invest the necessary resources for the implementation.

Included in the planning phase of the PPM model (Parr & Shanks, 2000) is the assembly of a steering committee, the determination of the project scope, the implementation approach and selection of project manager, and the determination of resources. These activities are similar to the phase of adoption by Somers and Nelson (2004).

Markus and Tanis (2000) life cycle model includes the phase chartering which is characterized as the phase where the “ideas move to dollars”. This phase is where the decision about the project is decided and where the funding is approved.

### 3.3.3 Adaptation

The adaptation stage is when the application package has been installed at the organization and is available for use within the organization. (Somers & Nelson, 2004)

The PPM’s phase (Parr & Shanks, 2000) of the project is seen as an iterative part of the project model, and can be extended to several years. It includes the setup, reengineering, design, configuration and testing, and the installation of the ERP system. The similarity with Somers and Nelson (2004) is that after this phase, the organization has a working ERP system. What differs between the view of Parr and Shanks (2000) and the view of Somers and Nelson (2004) is the fact that Somers and Nelson does not have a phase describing the
configuration and installation of the application within the organization, more about this in
the end discussion (chapter 3.3.7).

Markus and Tanis (2000) include the shakedown phase, which could be described as the
transition between the adaptation phase and the acceptance phase in Somers and Nelson
(2004). It is described as the time between the systems has been implemented in the or-
ganization and when the organization starts to use the system in the everyday work.

3.3.4 Acceptance

According to Somers and Nelson (2004) the organization is in the acceptance stage when
the ERP system is employed by the organizations members.

The implementation stage in Al-Mashari et al. (2003) include steps from Somers and Nel-
son’s (2004) all stages up to the acceptance stage, but it focuses on the configuration (see
more about this in chapter 3.3.7). The main similarity between Somers and Nelson (2004)
and Al-Mashari (2003) is that the latter includes steps such as communication and training,
important issues in order to get the organization to accept the system.

3.3.5 Routinization

The routinization stage is reached when the ERP system no longer is perceived as some-
thing out of the ordinary in the organization. (Somers & Nelson, 2004)

Markus and Tanis (2000) describes their phase “onward and upward” to include the period
while the organization realize the benefits from the system and runs the system on routine
until a new version of the system is released, similar to Somers and Nelson’s (2004) de-
scription of the routinization phase.

3.3.6 Infusion

The last stage of the ERP life cycle is the infusion stage; described as when the IT applica-
tion is used within the organization to its full potential (Somers & Nelson, 2004).

In Al-Mashari et al. (2003), the last phase of the life cycle is the evaluation phase which in-
cludes the evaluation of the system’s performance and the management of the project. Al-
Mashari et al. (2003) argues that measuring and evaluation performance is a very critical
phase for ensuring success for an IT system, especially for ERP systems. Similar to Somers
and Nelson (2004), this last stage is when the system is determined to be an infusion or
not.

3.3.7 Comments about Somers and Nelsons life cycle

When comparing the different stages in Somers and Nelson’s project life cycle (2004) with
other theories about the ERP life cycle, it is apparent that one part describes as important
by other researchers has been left out in Somers and Nelson (2004) description. This part is
what Parr and Shanks (2000) defines as the project phase, including the design, installation,
and configuration of the system. Other researchers has also stressed the importance of the
installation and configuration phase (Grenci & Hull, 2004; Al-Mashari et al., 2003; Mabert,
Soni & Venkataramanan, 2003b; Hong & Kim, 2002; Markus & Tanis, 2000). However,
since our research is based on Somers and Nelson (2004), we will use the phases identified

~ 15 ~
by them and not include the phases of design, installation, and configuration in our research, but we are aware of the fact that the phase of configuration is an important phase.

3.4 Critical success factors across the life cycle

Much research has been done regarding the critical success factors when implementing ERP systems and different frameworks identifying these critical success factors have been developed (Al-Mashari et al., 2003; Davenport, 1996; Hong & Kim, 2002; Parr & Shanks, 2000; Umble, Haft & Umble, 2003; Bancroft, Seip & Sprengel, 1998; Holland & Light, 1999; Nah, Lau & Kuang, 2001; Somers and Nelson, 2001; Skok & Legge, 2002). An overview made by Jonas Hedman (2003) of these critical success factors is found in the table below (Table 2 and Table 3).

Table 2 - Overview of Critical Success Factors (Hedman, 2003, paper 4, p. 7)

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>Enterprise System</td>
<td>Top management support</td>
<td>Organizational fit to Enterprise System</td>
<td>Management support</td>
<td>Top mgmt support</td>
</tr>
<tr>
<td>package selection</td>
<td>Use of only one consulting firm</td>
<td>Process adaptation model</td>
<td>Balanced team</td>
<td>Project team competence</td>
</tr>
<tr>
<td>Management &amp; leadership</td>
<td>Cross functional steering</td>
<td>Organizational resistance</td>
<td>Commitment to change</td>
<td>Interdepartmental cooperation</td>
</tr>
<tr>
<td>Visioning &amp; planning</td>
<td>Cross functional implementation</td>
<td></td>
<td>Best people</td>
<td>Clear goals and objectives</td>
</tr>
<tr>
<td>Project management</td>
<td>Rapid implementation</td>
<td></td>
<td>Empowered decision makers</td>
<td></td>
</tr>
<tr>
<td>Training and Education Communication</td>
<td></td>
<td></td>
<td>Champion</td>
<td>Project Mgmt</td>
</tr>
<tr>
<td>System integration</td>
<td>Inform people about the holistic nature</td>
<td></td>
<td>Vanilla ERP</td>
<td>Interdepartmental communication</td>
</tr>
<tr>
<td>System Testing</td>
<td></td>
<td></td>
<td>Smaller Scope</td>
<td>Mgmt of expectations</td>
</tr>
<tr>
<td>Legacy systems</td>
<td></td>
<td></td>
<td>Definition of Scope and goal</td>
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<tr>
<td>Cultural &amp; structural change</td>
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<tr>
<td>Performance evaluation &amp; management</td>
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</table>

Table 2 - Overview of Critical Success Factors (Hedman, 2003, paper 4, p. 7)
Our research is, as mentioned before, based on Somers and Nelson (2004). Looking at the table above gives us other ideas about critical success factors found by other researchers. However, Hedman (2003) claims that the research made by Somers and Nelson in 2001 (which their research in 2004 is build upon), is the most comprehensive study of critical success factors. This is yet another reason why we have based our research on Somers and Nelson (2004).

Somers and Nelson (2004) describes that each one of the different critical success factors (i.e. key players and actives, P_n and A_n in the figure below) have a different degree of importance in different stages of the ERP life cycle; this is illustrated by the figure below.

![Figure 2 - Players and activities across the ERP project life cycle. (Somers & Nelson, 2004, p. 259)](image-url)
3.4.1 Key players
This section will describe the different key players identified by Somers and Nelson (2004). The key players are people or groups of people that have an impact with the ERP implementation.

3.4.1.1 Top Management support
The support from the top management is important throughout the project life cycle in order to conduct a successful ERP implementation. Somers and Nelson (2004) describe the top management support as the most crucial success factors in ERP projects. Monitoring the progress and providing directions to implementation teams is a critical factor that should be provided by management during the process (Somers & Nelson, 2004).

Top management support is also mentioned by Sumner (1999) and Wee (2000), as one of the most important success factors during the implementation. According to Sumner (1999) it is crucial that the project is aligned with strategic business goals and that it receives approval from the top management. One way to accomplish this is to tie management bonuses to project success (Wee, 2000).

3.4.1.2 Project champion
The role of the project champion is often linked to technological innovations, the project champion should possess skills referred to transformational leadership, facilitation, and marketing. Another critical factor that is crucial for project champion is the acceptance and use of technology during the integration in the organization (Somers & Nelson, 2004).

According to Rosario (2000) the task of the project champion is critical throughout the life cycle. It is important that the one in charge has great business skills, which can give the project a business perspective (Sumner, 1999).

3.4.1.3 Steering committee
The steering committee should include members from the entire organization such as; senior management from different corporate functions, senior project management representatives and future user of the ERP system. The steering committee often takes part in important phases like the selection phase, control of external consultants and monitoring the implementation phase (Somers & Nelson, 2004).

According to Bingi et al. (1999) the work of the steering committee is critical for a successful implementation of an ERP system. The committee is important in the early phases and should also involve the management in the project (Bingi et al.).

3.4.1.4 Implementation consultants
The use of external consultants during the entire life cycle is very common. When hiring external consultants the organization gains outside expertise, and comprehensive knowledge of the different modules available. Other crucial tasks performed by the external consultants are to make a requirement analysis that recommend suitable solutions and also manage the implementation. These are roles carried out latter in the life cycle (Somers & Nelson, 2004).
Most large-scale ERP projects will use external consultants. The consultants have different roles in an ERP project and their knowledge is in many cases an asset to the implementing company (Westrup & Knight, 2000).

3.4.1.5 Project team

The competence, not only technological competence but also business competence, of the project team is crucial for the ERP project’s success. The knowledge of the project team plays a big role when there are areas where other team members lack. The project teams’ knowledge and competence have a significant role in the early stages (Somers & Nelson, 2004).

A cross functional team with the best members of the organization is crucial for success (Rosario, 2000). Sumner (1999) believes in the importance to mix inter-organizational members and external consultants. According to Wee (2000) the team members should focus only on the project and it should be their top priority. Furthermore, Wee (2000) claims that it is important that members are compensated for implementation success. It is also of great importance that members, both internal and external, share information. According to Stefanou (1999) this requires partnership trust.

3.4.1.6 Vendor-customer partnership

The relationship between the software vendor and the implementing organization is of great importance. The relationship should be of strategic nature where the ERP vendor enhancing an organization’s competitiveness and efficiency. These partnerships appear to be a crucial part of the early stages (Somers & Nelson, 2004).

Also Davenport (1998) argues that it is very important that the implementing organization and the vendor have a good partnership. Since the partnership tends to lead to a lifelong relation, strategic values can be obtained.

3.4.1.7 Vendors’ tools

Tools that are used and provided by the ERP vendor are a fundamental enabler for success during the adoption and adaptation phases. Examples of tools are; business process modeling tools, templates industry-specific business practices, bundling of server hardware with ERP software. These tools contribute to both cost and time reduction concerning implementation of the ERP system. These tools are also used to get a bigger understanding of the software and understanding of business processes within the organization (Somers & Nelson, 2004).

According to Holland and Light (1999) vendor tools are important and could for example be used to support customizing business processes without changing existing software code.

3.4.1.8 Vendor support

One importance with ERP systems is that they are often seen as a lifelong commitment. This lifelong relationship requires future investments in modules and upgrades to be able to gain strategic value and business fit. These are good example when it is visible that the vendor support is an important factor in the post-implementation stages (Somers & Nelson, 2004).
It is not often that the implementing organization possesses all knowledge about the system. Therefore it is vital that the ERP vendor support the implementing organization during and after the implementation (Willcocks & Sykes, 2000).

### 3.4.2 Key activities

Below, a summary of Somers and Nelson (2004) key activities will be found. The key activities are, according to Somers and Nelson, activities during the implementation that are of key importance for the success of the implementation.

#### 3.4.2.1 User training and education

In-house training and education to smooth the progress of implementation is vital. Failure to educate users and to understand how enterprise applications change business processes frequently appears to be a problem for many organizations during the ERP implementation. One way of education which has proven successful is computer-based training through the organization’s intranet. Training is a concern in the later phases but can also be seen as an important factor throughout the whole process (Somers & Nelson, 2004).

According to Sumner (2000) it is vital that the organization invests in user training and education. Users need in-house training to learn how the system will change the business processes within the company (Sumner, 2000). Wee (2000) argues that it is important that the user training runs during the whole life cycle, and to ensure support to organizational needs.

#### 3.4.2.2 Management of expectations

One important issue is how user expectations are handled. Management of expectations is important the whole process. Oversold systems often fail to meet user expectations (Somers & Nelson, 2004).

According Hoffer, George and Valacich (1998) a misaligning of expectations is common, organizations tend underestimate the complexity of the implementation. Because of this it is important to manage expectations throughout the lifecycle (Hoffer et al.).

#### 3.4.2.3 Selection of appropriate package

It has shown that the selection phase is one of the most important phases. The selection should be carefully analyzed and the selection should be based on organizational needs and demands. The selection will affect budgets, time-frames, goals and other factors that will affect the whole project. The more thorough this is done the greater are the chances of a successful implementation (Somers & Nelson, 2004).

The people involved in selecting the right ERP package have a lot of parameters to consider, parameters and questions that often are seen as overwhelming (Ptak & Schragenheim, 2000). Choosing the right ERP systems to fulfill all needs of the implementing company is according Callaway (1999) to the most difficult task.

#### 3.4.2.4 Project management

The need for effective management is a fundamental part of every ERP project, from the initiating phase to the final phase. Control and project planning are the main concerns of the project management. ERP projects are huge projects and include issues like hardware,
software, organizational, human and politics and because of this, they tend to be complex, costly, and risky and in order to deal with that a competent project management is crucial (Somers & Nelson, 2004).

The importance of project management is vital in an ERP implementation project. First of all it is important to have a scope (Rosario, 2000). After the scope is defined and limited it is crucial to identify critical paths of the project. Furthermore, it is important that timelines and budget goals are followed to maintain project credibility (Wee, 2000).

3.4.2.5 Customization

Customization is a factor that concerns both budget and success. When minimal customization is used it is often a sign of success and will lead to lower costs, shorter implementation and also inability to use vendor upgrades and support. One thing that affects the customization is the assumptions about business processes that are built into the system. The decision on how to reject or accept these assumptions take place in the early stages of the implementation (Somers & Nelson, 2004).

It is important that organizations are willing to change their business process to fit the software package without having to customize the software. Sumner (1999) claims that all customization should be avoided to reduce the risk of errors.

3.4.2.6 Data analysis and conversion

ERP systems are very dependable on the data that is entered into the system. Accurate data is a necessity and the management of this data is crucial throughout the implementation. Some of the challenges that are faced includes finding the data and convert it to a consistent format before it is entered. When the system is tested by users, feedback is needed to correct corrupt system data. These issues are crucial from initiation through adaptation and moderate important during system acceptance and use (Somers & Nelson, 2004).

3.4.2.7 Business process reengineering

A negative issue with packaged software, such as ERP systems, is the compatibility with the organization’s needs and business processes. Business process reengineering (BPR) is according to the American Society for Quality (2005) defined as:

*The concentration on the improvement of business processes that will deliver outputs that will achieve results meeting the firm’s objectives, priorities and mission.*

BPR is important in the early stages from the initiation through the adaptation phase of the implementation. BPR is not that important when the system is running and it tends to be moderately important in the acceptance stage (Somers & Nelson, 2004).

Sumner (1999) mentions that it is vital to align business processes with the software implementation. Sumner also says that software should be left untouched and not modified as far as possible. It is the business that has to be changed and not the other way around (Holland & Light, 1999). Rosario (2000) supports these facts and says that modifications should be avoided to reduce errors.

3.4.2.8 Defining the architecture

One important issue to consider during the initiation phase is the architecture choice of the ERP system. Other issues in the initiation and adaptation phase, concerns “additional”
software such as data warehousing systems, which many ERP systems already contains (Somers & Nelson, 2004).

According to Wee (2000) it is important that the overall architecture is established before the implementation. Wee (2000) also claims that it is crucial that the architecture is based on the organizational requirements that exist.

3.4.2.9 Dedicating resources

ERP demands a lot of resources. It is important that the resource requirements are clear before the project starts since the dedicated resources affect the project throughout all stages but have a considerable effect in the early stages (Somers & Nelson, 2004).

To be able to fulfill the goals and visions of the implementation it is vital that the required resources are put in. When this fails it often leads to implementation failure (Reel, 1999).

3.4.2.10 Change management

Since ERP systems require considerable changes in the organization it is common with resistance, confusion and errors within the implementing organization. ERP implementations are very dependable on the management and since organizations are resistant the implementation often fails to achieve the expected benefits. Change management activities are important in the early stages and continue throughout adaptation and acceptance phases (Somers & Nelson, 2004).

Other researchers that point out the importance of change management (Rosario, 2000; Roberts & Barrar, 1992). They claim that change management is important from the beginning of the project throughout the entire life cycle. It is important that employees are willing to change and accept new technologies. It is suggested that the management should use the system to show how to achieve organizational goal (Roberts & Barrar, 1992).

3.4.2.11 Establishing clear goals and objectives

Organizational goals and visions are important for all business success. The process of implementing an ERP system must be supported by these goals and visions. Goals and visions outline the direction of the project and need to be understood by all involved parties. Visions and goals have to remain clear throughout all the phases (Somers & Nelson, 2004).

To be able to focus on the benefits of the system it is important that there is a clear plan and a communicated vision. The plan should include aspects like budget-range, timelines, risks and a proposed strategy (Wee, 2000). According to Roberts and Barrar (1992) it is important that the project mission is aligned with the business need. Rosario (2000) states that this plan will make work easier.

3.4.2.12 Education on new business processes

ERP implementation requires large scale changes. Since the implementations often changes the way business is done, education on new business processes is crucial; and once again are visions and goals brought up as a crucial factor. It is important that employees are educated and trained for their tasks, which might change after the implementation of the ERP system. Education should be carried out at the time of BPR and is important during adoption, adaptation and acceptance phases of the project life cycle (Somers & Nelson, 2004).
According to Sumner (1999) it is vital that the organization invests in user training and education. Users need in-house training to learn how the system will change the business processes within the company (Sumner, 1999). Wee (2000) states that it is important that training runs throughout the entire life cycle, and that there are a support organization or help desk to support the organization’s needs after the implementation.

3.4.2.13 Interdepartmental communication

To be able to communicate in the organization throughout the implementation many organizations develop a communication plan. This plan is meant to provide a good information flow to supply necessary data in order to keep users informed about the system’s impact on their responsibilities. Communication is crucial from the initiation to the system acceptance phases, as it helps to minimize the user resistance (Somers & Nelson, 2004).

Effective communication is of great importance to succeed with the ERP implementation. It is important that the goals and expectations are communicated on every level in the organization (Wee, 2000). Sumner (1999) argues that it is important that employees are informed about the scope, objectives, activities and updates in advance to make work more efficient.

3.4.2.14 Interdepartmental cooperation

Since ERP system’s aims to integrate all processes in the organization it is important with interdepartmental cooperation. To manage ERP success, strong coordination of efforts and goals are a necessity. This activity is important from initiation through the acceptance phases according to Somers and Nelson (2004).

ERP is all about integrating business processes within the organization. To be able to manage this it is important that there is cooperation between different departments (Stefanou, 1999).

3.4.3 Comments about the critical success factors

The key players and key activities described in the last pages have, as described in the beginning of this chapter, different degrees of importance under different stages of the project life cycle. During Somers and Nelson’s (2004) literature review, different key players and key activities were ranked on what degree of importance that should be expected. In their research, the expected importance was compared with the importance they observed in their survey.

We have earlier discussed other researchers’ theories about critical success factors, but as Hedman (2003) argues, Somers and Nelson (2004) have the most comprehensive list of critical success factors and we think that Somers and Nelson’s (2004) design of the ranking with the critical success factors gives a surplus compared with other lists of critical success factors we have looked at since it support our thought about different critical success factors having different degree of importance.

3.5 Somers and Nelson’s observed importance

In Somers and Nelson’s (2004) research, the importance of the above described key players and key activities are identified. Below (Table 4), you will find a table that summarizes the importance of the key players and key activities (Xn) during each one of the ERP imple-
mentation stages. Somers and Nelson interpret 0.60 as being high in importance, 0.30 as medium and low importance as 0.10.

Table 4 - Importance of players and activities across ERP life cycle (Somers & Nelson, 2004, p. 265)

<table>
<thead>
<tr>
<th>Players and activities</th>
<th>ERP implementation stages</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Initiation</td>
</tr>
<tr>
<td>X1 Top management</td>
<td>0.64</td>
</tr>
<tr>
<td>X2 Project champion</td>
<td>0.65</td>
</tr>
<tr>
<td>X3 Steering committee</td>
<td>0.83</td>
</tr>
<tr>
<td>X4 Implementation consultants</td>
<td>0.53</td>
</tr>
<tr>
<td>X5 Project team/competence</td>
<td>0.58</td>
</tr>
<tr>
<td>X6 Vendor-customer partnership</td>
<td>0.60</td>
</tr>
<tr>
<td>X7 Use of vendors' customization tools</td>
<td>0.72</td>
</tr>
<tr>
<td>X8 Vendor support</td>
<td>0.78</td>
</tr>
<tr>
<td>X9 User training and education</td>
<td>0.67</td>
</tr>
<tr>
<td>X10 Management of expectations</td>
<td>0.53</td>
</tr>
<tr>
<td>X11 Careful selection of appropriate package</td>
<td>0.73</td>
</tr>
<tr>
<td>X12 Project Management</td>
<td>0.58</td>
</tr>
<tr>
<td>X13 Degree of customization</td>
<td>0.57</td>
</tr>
<tr>
<td>X14 Data analysis and conversion</td>
<td>0.37</td>
</tr>
<tr>
<td>X15 Business process reengineering</td>
<td>0.60</td>
</tr>
<tr>
<td>X16 Defining the architecture choices</td>
<td>0.72</td>
</tr>
<tr>
<td>X17 Dedicated resources</td>
<td>0.57</td>
</tr>
<tr>
<td>X18 Change management</td>
<td>0.66</td>
</tr>
<tr>
<td>X19 Clear goals and objectives</td>
<td>0.71</td>
</tr>
<tr>
<td>X20 Education on new business processes</td>
<td>0.48</td>
</tr>
<tr>
<td>X21 Interdepartmental communication</td>
<td>0.68</td>
</tr>
<tr>
<td>X22 Interdepartmental cooperation</td>
<td>0.53</td>
</tr>
</tbody>
</table>

To give a simplified overview with the ranking of the key players and activities, the tables below (Table 5 and Table 6) shows the key players and key activities sorted in descending order for each one of the six stages in the ERP life cycle.
Table 5 - Observed importance of players and activities by life cycle stages (Somers & Nelson, 2004, p. 267)

<table>
<thead>
<tr>
<th>Initiation</th>
<th>Adoption</th>
<th>Adaptation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use of steering committee</td>
<td>Change management</td>
<td>Change management</td>
</tr>
<tr>
<td>Vendor support</td>
<td>Use of vendors tools</td>
<td>Vendor support</td>
</tr>
<tr>
<td>Careful selection of package</td>
<td>Top management support</td>
<td>Education on new BPR</td>
</tr>
<tr>
<td>Architecture choices</td>
<td>Use of steering committee</td>
<td>Interdepartmental cooperation</td>
</tr>
<tr>
<td>Use of vendors tools</td>
<td>Business process reengineering</td>
<td>Interdepartmental communication</td>
</tr>
<tr>
<td>Clear goals and objectives</td>
<td>Use of steering committee</td>
<td>Change management</td>
</tr>
<tr>
<td>Interdepartmental communication</td>
<td>Clear goals and objectives</td>
<td>Clear goals and objectives</td>
</tr>
<tr>
<td>User training on software</td>
<td>Project management</td>
<td>Use of consultants</td>
</tr>
<tr>
<td>Change management</td>
<td>Interdepartmental cooperation</td>
<td>Project management</td>
</tr>
<tr>
<td>Project champion</td>
<td>Dedicated resources</td>
<td>Project team competence</td>
</tr>
<tr>
<td>Top management support</td>
<td>Data analysis and conversion</td>
<td>Business process reengineering</td>
</tr>
<tr>
<td>Business process reengineering</td>
<td>Project team competence</td>
<td>Data analysis and conversion</td>
</tr>
<tr>
<td>Vendor-customer partnership</td>
<td>Project champion</td>
<td>Project champion</td>
</tr>
<tr>
<td>Project management</td>
<td>Use of consultants</td>
<td>Minimal customization</td>
</tr>
<tr>
<td>Project team competence</td>
<td>User training on software</td>
<td>Top management support</td>
</tr>
<tr>
<td>Minimal customization</td>
<td>Interdepartmental communication</td>
<td>Vendor-customer partnership</td>
</tr>
<tr>
<td>Dedicated resources</td>
<td>Vendor-customer partnership</td>
<td>Use of steering committee</td>
</tr>
<tr>
<td>Interdepartmental cooperation</td>
<td>Education on new BPR</td>
<td>Use of vendors tools</td>
</tr>
<tr>
<td>Use of consultants</td>
<td>Careful selection of package</td>
<td>Dedicated resources</td>
</tr>
<tr>
<td>Management of expectations</td>
<td>Management of expectations</td>
<td>Management of expectations</td>
</tr>
<tr>
<td>Education on new BPR</td>
<td>Minimal customization</td>
<td>Architecture choices</td>
</tr>
<tr>
<td>Data analysis and conversion</td>
<td>Architecture choices</td>
<td>Careful selection of package</td>
</tr>
</tbody>
</table>

It is clearly visible how important different factors are during each of the different stages. In the initiation phase, the use of a steering committee is perceived as having an importance of 0.83, closely followed by vendor support (0.78) and a careful selection of the ERP package (0.73). During the adoption phase, change management is perceived as having an importance of 0.73, with the use of vendor tools (0.72), top management support (0.71), and vendor support (0.71) as other important factors. In the adaptation phase, change management is also perceived as the single most important factor, scoring 0.77. Second is vendor support with a score of 0.68, and after that education on new business processes and interdepartmental cooperation comes, both with a score of 0.65.
Table 6 - Observed importance of players and activities by life cycle stages (Somers & Nelson, 2004, p. 267)

<table>
<thead>
<tr>
<th>Acceptance</th>
<th>Routinization</th>
<th>Infusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use of steering committee</td>
<td>User training on software</td>
<td>Use of consultants</td>
</tr>
<tr>
<td>Interdepartmental cooperation</td>
<td>Interdepartmental cooperation</td>
<td>Interdepartmental cooperation</td>
</tr>
<tr>
<td>Change management</td>
<td>Interdepartmental communication</td>
<td>Interdepartmental communication</td>
</tr>
<tr>
<td>Interdepartmental communication</td>
<td>Top management support</td>
<td>Vendor-customer partnership</td>
</tr>
<tr>
<td>Top management support</td>
<td>Use of steering committee</td>
<td>Top management support</td>
</tr>
<tr>
<td>Education on new BPR</td>
<td>Use of vendors tools</td>
<td>Minimal customization</td>
</tr>
<tr>
<td>Business process reengineering</td>
<td>Project management</td>
<td>Vendor support</td>
</tr>
<tr>
<td>Dedicated resources</td>
<td>Clear goals and objectives</td>
<td>Project champion</td>
</tr>
<tr>
<td>Interdepartmental communication</td>
<td>Vendor support</td>
<td>Project support</td>
</tr>
<tr>
<td>Project management</td>
<td>Project champion</td>
<td>User training on software</td>
</tr>
<tr>
<td>Management of expectations</td>
<td>Change management</td>
<td>Business process reengineering</td>
</tr>
<tr>
<td>User training on software</td>
<td>Vendor-customer partnership</td>
<td>Project team competence</td>
</tr>
<tr>
<td>Project champion</td>
<td>Business process reengineering</td>
<td>Use of vendors tools</td>
</tr>
<tr>
<td>Vendor support</td>
<td>Project team competence</td>
<td>Change management</td>
</tr>
<tr>
<td>Project team competence</td>
<td>Minimal customization</td>
<td>Management of expectations</td>
</tr>
<tr>
<td>Minimal customization</td>
<td>Education on new BPR</td>
<td>Clear goals and objectives</td>
</tr>
<tr>
<td>Vendor-customer partnership</td>
<td>Management of expectations</td>
<td>Use of steering committee</td>
</tr>
<tr>
<td>Use of consultants</td>
<td>Use of consultants</td>
<td>Education on new BPR</td>
</tr>
<tr>
<td>Use of vendors tools</td>
<td>Careful selection of package</td>
<td>Architecture choices</td>
</tr>
<tr>
<td>Architecture choices</td>
<td>Dedicated resources</td>
<td>Dedicated resources</td>
</tr>
<tr>
<td>Data analysis and conversion</td>
<td>Architecture choices</td>
<td>Careful selection of package</td>
</tr>
<tr>
<td>Careful selection of package</td>
<td>Data analysis and conversion</td>
<td>Data analysis and conversion</td>
</tr>
</tbody>
</table>

During the acceptance phase, the use of steering committee is perceived as the most important factor, scoring 0.80. Interdepartmental cooperation (0.67), and change management (0.65) are other important factors. Under the phase of routinization, user training on software scores 0.67 and interdepartmental cooperation and interdepartmental communication both score 0.55. In the infusion stage, the use of consultants is perceived of having an importance of 0.57, and interdepartmental cooperation as having 0.47. Interdepartmental communication is perceived of having an importance of 0.41.

### 3.6 Discussion of the frame of reference

The frame of references has covered many interesting areas concerning the purpose of this thesis. ERP has been described using both a traditional definition and a more contemporary one. We have related ERP issues with the size of organizations in order to make an analysis between larger companies and SMEs. Furthermore, the focus of this frame of references has been on the critical success factors that exist within the ERP project life cycle. Different researchers’ findings have been covered and discussed to be able to give an objective picture of these critical success factors and the stages that they might occur in.

Our analysis will be based on our frame of references, but first we will present our empirical findings, gathered from our survey.
4 Empirical findings

The empirical findings will summarize the data we collected in our empirical study. First, a description of the procedure we worked after will be presented, after this, the results will be presented.

4.1 Procedure

Our survey was sent out to our respondents by e-mail on April 20, 2005. The survey contained a letter describing the purpose of the survey, the reason why the respondent was selected as a respondent, and a unique link to a web-based survey. The result from the survey will be presented below. After slightly more than one week, a reminder was sent out to the respondents that we had not collected answers from; this one containing an addition to the original letter urging the respondents to reply. This reminder was sent out on April 30, 2005. The respondents had to the end of May 6, 2005 to answer the survey.

Totally, we got replies from 54 respondents of the 199 SMEs in our sample, resulting in a response rate of 27.1 percent, which could be compared with Somers and Nelson (2004, p. 263) response rate of 19%. Out of these 27.1 percent we decided to only use those who had answered that they were (1) completed with their implementation the previous year, or (2) the implementation was completed over a year ago. The reason for doing this is because it is only the companies that have passed all stages in the ERP life cycle that can give accurate answers on our questions. We also detected some answers that were not complete, and decided to leave these answers out. Totally, we ended up with 44 correctly answered surveys.

4.2 Result

Below (Table 7), a presentation of the collected result from the survey can be found. These have been put together in the same way as Somers and Nelson (2004) did in their survey.

Each cell in the table below represents a calculation from the answers in the survey. Each of the different factors could have an importance of one to five. The values from the answers were summed up and distributed under the correct phase in the life cycle. This sum was then divided with the total number of answers collected on that separate factor to find the mean, lastly, it was divided by five (which was the maximum of the Likert scale) to get the correct number to compare with Somers and Nelson (2004).
Table 7 - Observed importance of players and activities across ERP life cycle

<table>
<thead>
<tr>
<th>Players and activities</th>
<th>ERP implementation stages</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Initiation</td>
</tr>
<tr>
<td>X1 Top management</td>
<td>Y1</td>
</tr>
<tr>
<td>X2 Project champion</td>
<td>0.42</td>
</tr>
<tr>
<td>X3 Steering committee</td>
<td>0.25</td>
</tr>
<tr>
<td>X4 Implementation consultants</td>
<td>0.13</td>
</tr>
<tr>
<td>X5 Project team/competence</td>
<td>0.24</td>
</tr>
<tr>
<td>X6 Vendor-customer partnership</td>
<td>0.35</td>
</tr>
<tr>
<td>X7 Use of vendors’ customization tools</td>
<td>0.09</td>
</tr>
<tr>
<td>X8 Vendor support</td>
<td>0.20</td>
</tr>
<tr>
<td>X9 User training and education</td>
<td>0.05</td>
</tr>
<tr>
<td>X10 Management of expectations</td>
<td>0.20</td>
</tr>
<tr>
<td>X11 Careful selection of appropriate package</td>
<td>0.52</td>
</tr>
<tr>
<td>X12 Project Management</td>
<td>0.25</td>
</tr>
<tr>
<td>X13 Degree of customization</td>
<td>0.08</td>
</tr>
<tr>
<td>X14 Data analysis and conversion</td>
<td>0.18</td>
</tr>
<tr>
<td>X15 Business process reengineering</td>
<td>0.13</td>
</tr>
<tr>
<td>X16 Defining the architecture choices</td>
<td>0.37</td>
</tr>
<tr>
<td>X17 Dedicated resources</td>
<td>0.21</td>
</tr>
<tr>
<td>X18 Change management</td>
<td>0.14</td>
</tr>
<tr>
<td>X19 Clear goals and objectives</td>
<td>0.44</td>
</tr>
<tr>
<td>X20 Education on new business processes</td>
<td>0.07</td>
</tr>
<tr>
<td>X21 Interdepartmental communication</td>
<td>0.12</td>
</tr>
<tr>
<td>X22 Interdepartmental cooperation</td>
<td>0.10</td>
</tr>
</tbody>
</table>

Based on the table above, a collection of importance sorted in a decreasing order under each of the implementation stages will show what is most important in which stage. This can be found in Table 8 and Table 9.
Based on the tables above, we have summarized the most important findings. Under the phase of initiation, the factor which is perceived to be most important is careful selection of the appropriate package with a value of 0.52. This is followed by clear goals and objectives (0.44) and top management support with a score of 0.42. In the adoption phase, top management support is ranked as 0.55 followed by clear goals and objectives and vendor-customer partnership, both with a perceived importance of 0.46. During the phase of adaptation, the project champion is perceived to have an importance of 0.56, while the project management, dedication of resources and the competence of the project team is ranked as 0.55.
Table 9 - Observed importance of players across life cycle stages (sort in descending order)

<table>
<thead>
<tr>
<th>Acceptance</th>
<th>Routinization</th>
<th>Infusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project champion</td>
<td>0.48 Education on new BPR</td>
<td>0.32 Vendor support</td>
</tr>
<tr>
<td>Project team/competence</td>
<td>0.48 Interdepartmental cooperation</td>
<td>0.30 Vendor-customer partnership</td>
</tr>
<tr>
<td>Project Management</td>
<td>0.45 Vendor support</td>
<td>0.29 Education on new BPR</td>
</tr>
<tr>
<td>User training and education</td>
<td>0.43 Project team/competence</td>
<td>0.27 Interdepartmental cooperation</td>
</tr>
<tr>
<td>Interdepartmental cooperation</td>
<td>0.43 Interdepartmental communication</td>
<td>0.27 Interdepartmental communication</td>
</tr>
<tr>
<td>Interdepartmental communication</td>
<td>0.40 Project champion</td>
<td>0.25 Project champion</td>
</tr>
<tr>
<td>Vendor support</td>
<td>0.38 Project Management</td>
<td>0.24 Project team/competence</td>
</tr>
<tr>
<td>Dedicated resources</td>
<td>0.37 User training and education</td>
<td>0.24 Project Management</td>
</tr>
<tr>
<td>Change management</td>
<td>0.37 Vendor-customer partnership</td>
<td>0.21 Top management support</td>
</tr>
<tr>
<td>Education on new BPR</td>
<td>0.35 Change management</td>
<td>0.20 User training and education</td>
</tr>
<tr>
<td>Vendor-customer partnership</td>
<td>0.34 Dedicated resources</td>
<td>0.20 Change management</td>
</tr>
<tr>
<td>Steering committee</td>
<td>0.33 Business process reengineering</td>
<td>0.17 Business process reengineering</td>
</tr>
<tr>
<td>Clear goals and objectives</td>
<td>0.30 Management of expectations</td>
<td>0.13 Dedicated resources</td>
</tr>
<tr>
<td>Top management support</td>
<td>0.29 Top management support</td>
<td>0.13 Steering committee</td>
</tr>
<tr>
<td>Management of expectations</td>
<td>0.24 Clear goals and objectives</td>
<td>0.12 Clear goals and objectives</td>
</tr>
<tr>
<td>Degree of customization</td>
<td>0.20 Steering committee</td>
<td>0.11 Management of expectations</td>
</tr>
<tr>
<td>Data analysis and conversion</td>
<td>0.19 Implementation consultants</td>
<td>0.09 Implementation consultants</td>
</tr>
<tr>
<td>Business process reengineering</td>
<td>0.19 Degree of customization</td>
<td>0.07 Degree of customization</td>
</tr>
<tr>
<td>Implementation consultants</td>
<td>0.17 Data analysis and conversion</td>
<td>0.07 Defining the architecture choices</td>
</tr>
<tr>
<td>Use of vendors' tools</td>
<td>0.09 Careful selection of package</td>
<td>0.06 Use of vendors' tools</td>
</tr>
<tr>
<td>Careful selection of package</td>
<td>0.07 Defining the architecture choices</td>
<td>0.02 Data analysis and conversion</td>
</tr>
<tr>
<td>Defining the architecture choices</td>
<td>0.07 Use of vendors' tools</td>
<td>0.02 Careful selection of package</td>
</tr>
</tbody>
</table>

In the acceptance phase, the project champion and the competence of the project team is perceived as having highest importance, both with a rank of 0.48. Close to this is the project management which is perceived to have an importance of 0.45. During the routinization phase, education of new business processes is perceived to be of highest importance (0.32). Interdepartmental cooperation is scored as 0.30 and vendor support as 0.29. In the infusion phase, vendor support is perceived to be the factor with highest importance, ranked as 0.26. The partnership between the vendor and the customer is ranked as 0.21 and the education on new business processes as 0.19.
5 Analysis

Our analysis is based upon the main findings in the frame of references and is applied to our empirical findings in order to analyze our findings based on relevant theory.

5.1 Analytical disposition

In the coming subchapters, we will analyze our findings from our study based on the different stages in the implementation life cycle. This is to make our analysis as structured as possible and to help the reader follow our argumentation.

5.2 Analytical discussion

We will first present an overview of our findings compared with the findings of Somers and Nelson (2004). For each factor, our observed value, Somers and Nelson's observed value (marked as S & N), and the difference between the two values will be presented (Table 10).

Table 10 - Comparison of observed importance and Somers and Nelson's (2004) observed importance

<table>
<thead>
<tr>
<th>Players and activities</th>
<th>ERP implementation stages</th>
<th>Initiation</th>
<th>Adoption</th>
<th>Adaptation</th>
<th>Acceptance</th>
<th>Routinization</th>
<th>Infusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>X1 Top management</td>
<td>Observed</td>
<td>0.42</td>
<td>0.55</td>
<td>0.27</td>
<td>0.29</td>
<td>0.13</td>
<td>0.1</td>
</tr>
<tr>
<td></td>
<td>S &amp; N</td>
<td>0.64</td>
<td>0.71</td>
<td>0.58</td>
<td>0.58</td>
<td>0.53</td>
<td>0.39</td>
</tr>
<tr>
<td></td>
<td>Diff</td>
<td>-0.22</td>
<td>-0.16</td>
<td>-0.31</td>
<td>-0.29</td>
<td>-0.4</td>
<td>-0.29</td>
</tr>
<tr>
<td>X2 Project champion</td>
<td>Observed</td>
<td>0.37</td>
<td>0.38</td>
<td>0.56</td>
<td>0.48</td>
<td>0.25</td>
<td>0.16</td>
</tr>
<tr>
<td></td>
<td>S &amp; N</td>
<td>0.65</td>
<td>0.62</td>
<td>0.59</td>
<td>0.46</td>
<td>0.33</td>
<td>0.26</td>
</tr>
<tr>
<td></td>
<td>Diff</td>
<td>-0.28</td>
<td>-0.24</td>
<td>-0.03</td>
<td>0.02</td>
<td>-0.08</td>
<td>-0.1</td>
</tr>
<tr>
<td>X3 Steering committee</td>
<td>Observed</td>
<td>0.25</td>
<td>0.37</td>
<td>0.38</td>
<td>0.33</td>
<td>0.11</td>
<td>0.07</td>
</tr>
<tr>
<td></td>
<td>S &amp; N</td>
<td>0.83</td>
<td>0.68</td>
<td>0.51</td>
<td>0.8</td>
<td>0.41</td>
<td>0.13</td>
</tr>
<tr>
<td></td>
<td>Diff</td>
<td>-0.58</td>
<td>-0.31</td>
<td>-0.13</td>
<td>-0.47</td>
<td>-0.3</td>
<td>-0.06</td>
</tr>
<tr>
<td>X4 Implementation consultants</td>
<td>Observed</td>
<td>0.13</td>
<td>0.25</td>
<td>0.41</td>
<td>0.17</td>
<td>0.09</td>
<td>0.03</td>
</tr>
<tr>
<td></td>
<td>S &amp; N</td>
<td>0.53</td>
<td>0.61</td>
<td>0.61</td>
<td>0.34</td>
<td>0.13</td>
<td>0.57</td>
</tr>
<tr>
<td></td>
<td>Diff</td>
<td>-0.4</td>
<td>-0.36</td>
<td>-0.2</td>
<td>-0.17</td>
<td>-0.04</td>
<td>-0.54</td>
</tr>
<tr>
<td>X5 Project team/competence</td>
<td>Observed</td>
<td>0.24</td>
<td>0.32</td>
<td>0.55</td>
<td>0.48</td>
<td>0.27</td>
<td>0.16</td>
</tr>
<tr>
<td></td>
<td>S &amp; N</td>
<td>0.58</td>
<td>0.63</td>
<td>0.6</td>
<td>0.44</td>
<td>0.25</td>
<td>0.21</td>
</tr>
<tr>
<td></td>
<td>Diff</td>
<td>-0.34</td>
<td>-0.31</td>
<td>-0.05</td>
<td>0.04</td>
<td>0.02</td>
<td>-0.05</td>
</tr>
<tr>
<td>X6 Vendor-customer partnership</td>
<td>Observed</td>
<td>0.35</td>
<td>0.46</td>
<td>0.49</td>
<td>0.34</td>
<td>0.21</td>
<td>0.21</td>
</tr>
<tr>
<td></td>
<td>S &amp; N</td>
<td>0.6</td>
<td>0.59</td>
<td>0.55</td>
<td>0.37</td>
<td>0.28</td>
<td>0.4</td>
</tr>
<tr>
<td></td>
<td>Diff</td>
<td>-0.25</td>
<td>-0.13</td>
<td>-0.06</td>
<td>-0.03</td>
<td>-0.07</td>
<td>-0.19</td>
</tr>
<tr>
<td>X7 Use of vendors' customization tools</td>
<td>Observed</td>
<td>0.09</td>
<td>0.19</td>
<td>0.31</td>
<td>0.09</td>
<td>0.02</td>
<td>0.01</td>
</tr>
<tr>
<td></td>
<td>S &amp; N</td>
<td>0.72</td>
<td>0.72</td>
<td>0.51</td>
<td>0.34</td>
<td>0.4</td>
<td>0.21</td>
</tr>
<tr>
<td></td>
<td>Diff</td>
<td>-0.63</td>
<td>-0.53</td>
<td>-0.2</td>
<td>-0.25</td>
<td>-0.38</td>
<td>-0.2</td>
</tr>
<tr>
<td>X8 Vendor support</td>
<td>Observed</td>
<td>0.2</td>
<td>0.23</td>
<td>0.49</td>
<td>0.38</td>
<td>0.29</td>
<td>0.26</td>
</tr>
<tr>
<td></td>
<td>S &amp; N</td>
<td>0.78</td>
<td>0.71</td>
<td>0.68</td>
<td>0.45</td>
<td>0.35</td>
<td>0.28</td>
</tr>
<tr>
<td></td>
<td>Diff</td>
<td>-0.58</td>
<td>-0.48</td>
<td>-0.19</td>
<td>-0.07</td>
<td>-0.06</td>
<td>-0.02</td>
</tr>
<tr>
<td>X9 User training and education</td>
<td>Observed</td>
<td>0.05</td>
<td>0.05</td>
<td>0.41</td>
<td>0.43</td>
<td>0.24</td>
<td>0.1</td>
</tr>
<tr>
<td></td>
<td>S &amp; N</td>
<td>0.67</td>
<td>0.6</td>
<td>0.63</td>
<td>0.47</td>
<td>0.67</td>
<td>0.22</td>
</tr>
<tr>
<td></td>
<td>Diff</td>
<td>-0.62</td>
<td>-0.55</td>
<td>-0.22</td>
<td>-0.04</td>
<td>-0.43</td>
<td>-0.12</td>
</tr>
</tbody>
</table>
Visible in the table above is that most of our observed values are lower than the observed values of Somers and Nelson (2004). One of the most important reasons for these differences is that Somers and Nelson investigated larger companies, in which it is more common to employ more ERP functionality than smaller companies (Mabert et al., 2003a), resulting in that larger companies is a more homogenous group than our SMEs since they, in most observations, recognized the same critical success factors. Another important aspect is that the investigation of Somers and Nelson (2004) was done in 2001, when it still was very common with single vendor ERP systems. Nowadays, it is more common to imple-
ment more best-of-breed modules (Hedman, 2003), something that most probably have af-

5.2.1 Initiation

Below (Table 11) you will find a presentation of our and Somers and Nelson’s (2004) five
most important factors during the initiation stage of the project life cycle. The factors that
are occurring in both our findings and the findings of Somers and Nelson’s are written in
bold style.

<table>
<thead>
<tr>
<th>Our findings</th>
<th>Somers and Nelson (2004)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Careful selection of package</td>
<td>Use of steering committee</td>
</tr>
<tr>
<td>Clear goals and objectives</td>
<td>Vendor support</td>
</tr>
<tr>
<td>Top management support</td>
<td>Careful selection of package</td>
</tr>
<tr>
<td>Project champion</td>
<td>Architecture choices</td>
</tr>
<tr>
<td>Defining the architecture choices</td>
<td>Use of vendors tools</td>
</tr>
</tbody>
</table>

The only factor that occurs in both our findings and Somers and Nelson’s (2004) findings
is careful selection of package. In our findings, it is ranked as the single most important fac-
tor while it is ranked as the third most important factor in Somers and Nelson. According
to Somers and Nelson, the selection of package is one of the most important issues and af-
ffects budgets, time frames, goals and other important factors that will have an impact on
the whole project. Furthermore, Callaway (1999) argues that the selection of the right pack-
age is the most difficult task during the whole life cycle. Considering that smaller compa-
nies employ less functionality than larger companies (Mabert et al., 2003a), it is more im-
portant for SMEs to find the correct system from the start.

Clear goals and objectives is ranked as the second most important in our research. Accord-
ing to Wee (2000), establishing clear goals and objectives should include aspects as budget-
ing, timing, risks, and strategies. It is also important that the implementation of the system
supports the organization’s overall goal and vision (Somers & Nelson, 2004), and that the
project’s mission is aligned with the business need (Roberts & Barrar, 1992). Since the im-
plementation of ERP in SMEs is driven of more tactical needs, (Mabert et al., 2003a) it is in
SMEs very important to have the goals and objectives clear.

Top management support is ranked as the third most important factor during the initiation
phase. The support of the project by the top management, is according to Sumner (1999)
and Wee (2000) one of the most crucial factors during the implementation.

As visible in the comparison between our findings and the findings of Somers and Nelson
(2004), most of the top factors are different. We believe that the difference in the rankings
has different reasons. To start with, we are confident that the organization’s size matters
much during the implementation process. Mabert et al. (2003a) suggest that the adoption
of ERP by large companies is more motivated by strategic needs while implementation in
smaller companies is more tactical. Furthermore, Mabert et al. (2003a) propose that larger
companies employ more functionality than smaller companies. These two factors can ex-
plain why it is more important in smaller companies to select the appropriate package from
the beginning, and to have the goals and objectivities clear from the start. In larger compa-
nies, the use of a steering committee and support from vendors can help the organization
to develop the strategic advantages with the system. In addition to this, it is interesting to
see that the smaller companies perceive top management support as more important than the larger companies. This must clearly have to do with the fact that the management in most SMEs is closer to the organization than in larger companies.

5.2.2 Adoption

A comparative table of our findings and the findings of Somers and Nelson’s (2004) during the adoption stage of the project life cycle is presented in Table 12 below. The factors that are occurring in both our findings and the findings of Somers and Nelson’s are marked with bold.

Table 12 - Adoption phase

<table>
<thead>
<tr>
<th>Our findings</th>
<th>Somers and Nelson (2004)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top management support</td>
<td>Change management</td>
</tr>
<tr>
<td>Clear goals and objectives</td>
<td>Use of vendors tools</td>
</tr>
<tr>
<td>Vendor-customer partnership</td>
<td><strong>Top management support</strong></td>
</tr>
<tr>
<td>Project Management</td>
<td>Vendor support</td>
</tr>
<tr>
<td>Dedicated resources</td>
<td>Business process reengineering</td>
</tr>
</tbody>
</table>

Top management support is mentioned both by the SMEs and the larger companies as one of the top five factors during the adoption phase. In fact, in our findings, top management support is perceived to be the most important factor, while it is perceived as the third most important factors in Somers and Nelson’s (2004) findings. The top management support is also perceived to be among the top five factors in the previous phase (initiation phase) within the SMEs, something stressing the importance of the top management within the SMEs. As mentioned above, this implies that the top management within the SMEs is closer to the organization.

As the second most important factors during the adoption phase, clear goals and objectives is ranked. We think it is interesting to see that the establishing of clear goals and objectives are ranked high both in the initiation and the adoption phase by our respondents, but is not mentioned by the respondents of Somers and Nelson (2004) as a factor of top importance. As we earlier discussed, smaller companies are more often looking for tactical benefits with their system, while larger companies are trying to achieve strategic benefits. It could be that the goals and objectives are not stated this early in the process within larger companies, something that might be considered strange since the goals are of great importance to be able to have a successful implementation, especially if the company is looking to gain strategic values.

Vendor-customer partnership is ranked as the third most important factor during the adoption phase by our respondents. According to Somers and Nelson (2004), this partnership should be of a strategic nature. Davenport (1998) suggests that the partnership could lead to lifelong strategic values. Somers and Nelson also suggest that this factor is crucial in the early stages, something that our respondents to a certain extent agree with.

Similar with the initiation phase, most of the top five factors differ between the SMEs and the larger American corporations. It is interesting to see that the larger corporations consider change management to be of such high importance since Mabert et al. (2003a) explains that it is more common that larger companies customize the software to fit the organization and not the other way around, however, the changes within the organizations can still be large and requires good change management.
5.2.3 Adaptation

The five most important factors during the adaptation stage during the project life cycle are presented below (Table 13). You will find our and Somers and Nelson’s (2004) factors ordered by importance.

Table 13 - Adaptation phase

<table>
<thead>
<tr>
<th>Our findings</th>
<th>Somers and Nelson (2004)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project champion</td>
<td>Change management</td>
</tr>
<tr>
<td>Project Management</td>
<td>Vendor support</td>
</tr>
<tr>
<td>Dedicated resources</td>
<td>Education on new BPR</td>
</tr>
<tr>
<td>Project team/competence</td>
<td>Interdepartmental cooperation</td>
</tr>
<tr>
<td>Vendor-customer partnership</td>
<td>Interdepartmental communication</td>
</tr>
</tbody>
</table>

None of the factors ranked as having high importance in our findings is ranked as having top importance in Somers and Nelson (2004). This shows a difference between the perceived importance between SMEs and larger companies in the adaptation phase. Our respondents ranked the project champion as the most important factor during this stage of the implementation. The project champion should possess skills connected to transformational leadership (Somers and Nelson, 2004) and help the organization to understand the business perspective of the project (Sumner, 1999). According to Mabert et al. (2003a) the differences between implementation of smaller and larger companies are many, and this could explain the complete differences in the ranking above.

The project management is ranked as the second most important factor during the adaptation process by our respondents. According to Somers and Nelson (2004) the project management is important during all the stages of the project life cycle. Rosario (2000) suggests that the scope is of great importance and Wee (2000) claims the importance of following timelines and budgets. According to Mabert et al. (2003a), smaller companies employ less functionality than larger companies, leading to the possibility for the project management to more efficiently monitor the project. Furthermore, the implementation in smaller companies is more radical than the implementation in larger companies (Mabert et al., 2003a), another factor that influences the importance of the project management.

Our respondents have ranked the dedication of resources as the third most important factor. According to Reel (1999) the lack of dedication of resources can lead to implementation failure. Somers and Nelson (2004) argue that it is important that the resource requirements are clear from the project start. A difference between larger companies and SMEs is that larger companies in general have more resources than the smaller companies, suggesting that it is more important for SMEs to dedicate resources for the implementation.
5.2.4 Acceptance

The five most important factors during the acceptance phase of the project life cycle are presented in the table below (Table 14). To ease the interpretation of the table, the factors occurring in both our finding and the findings of Somers and Nelson is presented with bold style.

Table 14 - Acceptance phase

<table>
<thead>
<tr>
<th>Our findings</th>
<th>Somers and Nelson (2004)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project champion</td>
<td>Use of steering committee</td>
</tr>
<tr>
<td>Project team/competence</td>
<td>Interdepartmental cooperation</td>
</tr>
<tr>
<td>Project Management</td>
<td>Change management</td>
</tr>
<tr>
<td>User training and education</td>
<td>Interdepartmental communication</td>
</tr>
<tr>
<td>Interdepartmental cooperation</td>
<td>Top management support</td>
</tr>
</tbody>
</table>

As visible above, the single factor ranked as top five by both our respondents and the respondents of Somers and Nelson (2004) was interdepartmental cooperation. It was ranked as the fifth most important factor in our survey and second in Somers and Nelson’s research. According to Stefanou (1999) it is important with cooperation between departments since this is the only way to integrate the new business processes throughout the organization. Somers and Nelson (2004) argue that the interdepartmental cooperation is an important factor from the initiation through the acceptance, something that is more visible in the figures from their research than in figures from our survey. Considering that larger companies have more departments and more employees, the activity of interdepartmental cooperation might be ranked higher than in the SMEs. It is more important to focus on cooperation in a larger company since it might not come as natural as in a smaller company.

Ranked as the most important factors during the acceptance phase was the project champion, tightly followed by the competence of the project team and the project management. Obviously, the project functions are perceived as very important, something that differs from what the larger companies perceived as important. As earlier discussed, the implementation of ERP systems within SMEs is often based on single modules and this is an essential difference during the implementation stages. Larger companies, which implement larger solutions, have to put more efforts into the steering committee and the change management since larger changes are about to commence. Furthermore, in SMEs, it is probably more common that the internal project group has more responsibility due to the limited scope of the implementation project.
5.2.5 Routinization

The five most important players and activities during the routinization phase from our survey and the research of Somers and Nelson (2004) are presented below (Table 15). The factors that are ranked as important in both our research and the research of Somers and Nelson (2004) are written in bold in the table below.

Table 15 - Routinization phase

<table>
<thead>
<tr>
<th>Our findings</th>
<th>Somers and Nelson (2004)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Education on new BPR</td>
<td>User training on software</td>
</tr>
<tr>
<td>Interdepartmental cooperation</td>
<td>Interdepartmental communication</td>
</tr>
<tr>
<td>Vendor support</td>
<td>Interdepartmental communication</td>
</tr>
<tr>
<td>Project team/competence</td>
<td>Top management support</td>
</tr>
<tr>
<td>Interdepartmental communication</td>
<td>Use of steering committee</td>
</tr>
</tbody>
</table>

The routinization phase is the first phase in the project life cycle in which two factors are ranked in the top five most important in both our findings and in the findings of Somers and Nelson (2004). Interdepartmental cooperation is ranked second in both the surveys and interdepartmental communication is ranked as number five in our survey and as number three in Somers and Nelson’s investigation. According to Sumner (1999), the communication is important since employees across the organization have to be informed about the scope, objectives, and activities during the implementation ensure that the work is carried out as efficient as possible. Following the discussion in the section above, it is interesting to see that the cooperation and the communication is ranked as top five in both our research and the research of Somers and Nelson (2004). Considering that the routinization phase is where the system no longer perceives as something out of the ordinary, it is possible that the communication and the cooperation between the departments are of great importance in order to gain knowledge from other departments’ experiences with the system.

Education on new business processes is in our survey ranked as the most important factor during the routinization phase. It is interesting to see that SMEs believe this factor is the most important factor, since in general, SMEs implement less features than larger companies, suggesting that less change is done with the business processes (Mabert et al., 2003a). However, Mabert et al. also claims that larger companies customize the system to fit the organization, while smaller companies adopt the business to fit the system, something that our findings points at. Sumner (1999) explains that users need in-house training to understand how the system will change the processes within the organization. Furthermore, Wee (2000) enlightens the importance of having training running throughout the entire life cycle, supporting the organization also after the implementation. Sumner (1999) explains that it is vital that the organization invest time and money in user training during the implementation.

The third most important factor during the routinization phase is perceived to be vendor support. Willcocks and Sykes (2000) explains that the vendor support is vital since it is rare that an implementing organization has all knowledge about the system that is about to be implemented. Somers and Nelson (2004) explain that an ERP system often are seen as lifelong investments and therefore requires good support from the vendor.
5.2.6 Infusion

Below (Table 16) you will find a presentation of our and Somers and Nelson’s (2004) five most important factors during the infusion stage of the project life cycle. The factors that are occurring in both our findings and the findings of Somers and Nelson’s are written in bold style.

Table 16 - Infusion phase

<table>
<thead>
<tr>
<th>Our findings</th>
<th>Somers and Nelson (2004)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vendor support</td>
<td>Use of consultants</td>
</tr>
<tr>
<td>Vendor-customer partnership</td>
<td>Interdepartmental cooperation</td>
</tr>
<tr>
<td>Education on new BPR</td>
<td>Interdepartmental communication</td>
</tr>
<tr>
<td>Interdepartmental cooperation</td>
<td>Vendor-customer partnership</td>
</tr>
<tr>
<td>Interdepartmental communication</td>
<td>Top management support</td>
</tr>
</tbody>
</table>

Similar with the routinization phase of the project life cycle, interdepartmental cooperation and interdepartmental communication are two factors which are ranked within the top five factors in both our findings and the findings of Somers and Nelson (2004). In the infusion stage, the partnership between vendor and customer is also ranked high in both our study and the study of Somers and Nelson; it is ranked as the second most important factor in our research while it is ranked as number four in Somers and Nelson. The partnership between a vendor and its customer is of great importance in all the stages since it might provide both organizations with a lifelong relation (Davenport, 1998). Considering that we are now discussing the infusion stage, it is important that the implementing organization can rely on the vendor so that future implementations already now are analyzed correctly.

Vendor support is ranked as the most important factor during the infusion phase. As explained earlier in the analysis, vendor support is important since the implementing organization rarely has all the knowledge that it takes to use and develop the use of the system (Willcocks & Sykes, 2000). It is apparent that smaller companies rank vendor support higher than larger companies. Since smaller companies at many times have fewer resources than larger companies, the support from vendors seems to be more important for this kind of companies, implying that the SMEs might have a greater confidence with the vendor than larger corporations. Meanwhile, ranked as number one in Somers and Nelson (2004), is the use of consultants suggesting that larger companies turn to the consultants for help while the smaller companies turns directly to the vendor for support.

Education on the new business processes is ranked as the third most important factor during the infusion stage. As discussed earlier, the education of business processes are important in SMEs since it is more common that SMEs change their processes to fit the system than the other way around (Mabert et al., 2003a). But at the same time, Mabert et al. claims that smaller companies implement less functionality, which should influence the amount of new business processes.
6 Conclusions

This section will present the conclusions drawn from the analysis performed in the previous chapter. The conclusion will be presented in the same order as the analysis was in order to have a high level of consistency.

6.1 Conclusions made from the analysis

The purpose of this master thesis is to investigate the importance of different critical success factors across the ERP project life cycle within SMEs. Furthermore, we will compare our findings to see if there are differences between larger corporations in the USA and SMEs in the county of Jönköping, Sweden and try to explain the potential differences.

Our purpose has been fulfilled since we have investigated the importance of the critical success factors across the ERP project life cycle within SMEs in the county of Jönköping, Sweden. Furthermore, we have compared and identified the differences between the companies we have researched and the companies researched in the USA. Finally, in the analysis we have tried to find reasonable explanations for the differences in the critical success factors. The following conclusions can be drawn from our analysis.

The following conclusions can be drawn from our analysis:

- The critical success factors with the highest perceived importance is during the ERP project life cycle the following:
  - Infusion stage: Careful selection of package
  - Adoption stage: Top management support
  - Adaptation stage: Project champion
  - Acceptance stage: Project champion
  - Routinization stage: Education on new business processes
  - Infusion stage: Vendor support

- We observed differences between the perceived importance of players and activities during the ERP project life cycle in SMEs and in the Fortune 500 companies.

- We have failed to show any valid reasons why the differences mentioned above exist. However, we have studied and literature that suggest reasons for these differences, but we believe that this literature is not enough to draw conclusions from.
7 Final discussion

This chapter contains reflections about our own work during this master thesis; you will find method criticism, suggestions for further research, and our acknowledgements.

7.1 Reflections

We have enjoyed working with this master thesis during the spring of 2005. The thesis has increased our knowledge, not only within ERP systems, but also how to conduct academic research. Below, you will find our reflections regarding the method we have used and how we perceive the trustworthiness of this study.

When our findings were compared to the findings of Somers and Nelson (2004) it was apparent that the similarities of the top five important factors occurred in the two first and the two last stages, with increasing similarities towards the final phases, implying that ERP solutions which are used within SMEs, has other critical success factors in the first stages, but is more similar to ERP installations of larger companies in the final stages.

Furthermore, since it is more common nowadays to use best-of-breed solutions, the critical success factors might have changed. We believe there will be a continuous drift towards the use of consultants within SMEs since the system integration between these best-of-breed systems will need competent personnel.

7.1.1 Method criticism

A problem that occurred once our survey was sent out, was that several companies replied to the outgoing e-mail and informed us that their company was not suitable to take the survey since they were part of a larger organization. In some cases the respondent was a local office of an international corporation, in other, the respondent were local branches of large Swedish companies, such as banks and consulting firms. Because of this, our sample contains biases since these companies do not meet the requirements to be an SME. However, we are positive that most of the respondents that answered the survey are actual small and medium enterprises situated in the county of Jönköping. The fact that there were a few larger companies answering the survey should affect our results towards to be more similar to the findings of Somers and Nelson (2004), however, our result differs from the result of Somers and Nelson. Hopefully, this bias has not affected our result to that extent that the result is not valid, although, the result is not as reliable that we would like it to be.

Another problem that we noticed during the collection of the surveys was that some of the respondents submitted a survey that was not completed. In some cases the respondent did just reply to how important certain factors were, and not in what stages these were important. These cases were disqualified by us, and do not affect the result of our research. A way to work around this in future research is to have functions on the internet based survey that does not allow a survey to be saved if not everything is completed.

7.1.2 Trustworthiness of the study

We claim that the trustworthiness of our study is high. We have achieved high inner validity since our survey contained only questions relevant for the investigated subject; furthermore, the outer validity is also high since the investigation has delivered results that we believe are coherent with the reality. In this study, the reliability is very high since we have
used a single questionnaire for all the respondents, and we are convinced that if other re-
searchers use our questionnaire on the same sample, similar result would be apparent.

The generalizability is the one factor in the trustworthiness of the study that we are doubt-
ful about. As described above, our sample contained companies that did not belong to the
category of SMEs; however, since we are positive that most of the answers we received ac-
tually came from SMEs, our research gave us, if not the possibility to generalize, strong in-
dication about the reality of the SMEs. Furthermore, our analytical discussion is clearly de-
scribes and based on literature reviewed in this paper and should increase the analytical
generalizability.

Since our research is build upon research papers from prominent researchers within the
subject, we believe that we have gained as much knowledge possible to be objective in ana-
lyzing the results but we do not believe that our deep knowledge has affected our analysis
in a subjective way.

7.1.3  Suggestions for further research

Our research is focused to the country of Jönköping and also on SMEs in this area. Somers
and Nelson (2004) did their research on a national level in the USA, and focused on the
top 500 companies in the nation. One suggestion for further research is to do our research
on a national level and focus on the public companies.

7.1.4  Acknowledgements

We would like to show our appreciation to the following persons for helping us with this
master thesis.

Mats Apelkrans – For support and tutoring in this master thesis.

Mats Dahlin – For providing contact information to the host companies.

Daniela Mihiaescu – For initiating our interest in ERP.

All the respondents – For letting us know more about our subject.
References


References


Appendix A – Questionnaire

Vad är din position på företaget: ________________________

Inom vilket bransch verkar ni: __________________________

I vilket skede i ert företags implementation av ert affärssystem befinner ni er? (Var vänlig och välj en.)

| Tidigt till mitten av implementationen | Implementationen slutförd förra året |
| I slutfase av implementationen (nästan slutförd) | Implementationen slutförd för över ett år sedan |

Var vänlig och läs dessa sex beskrivningar på IT implementationens faser innan fråga två besvaras.

<table>
<thead>
<tr>
<th>Fas</th>
<th>Beskrivning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initiering</td>
<td>En matchning mellan ett affärssystem och ert företags behov har hittats</td>
</tr>
<tr>
<td>Beslut</td>
<td>Ett beslut har tagits att investera de nödvändiga resurserna för implementation</td>
</tr>
<tr>
<td>Anpassning</td>
<td>Affärssystemet har installerats och finns tillgängligt för användning i organisationen</td>
</tr>
<tr>
<td>Acceptans</td>
<td>Medarbetarna i organisationen börjar använda affärssystemet i det dagliga arbetet</td>
</tr>
<tr>
<td>Rutin</td>
<td>Affärssystemet ses inte längre som något speciellt i företaget</td>
</tr>
<tr>
<td>Tillskott</td>
<td>Affärssystemet används i organisationen till dess fulla potential</td>
</tr>
</tbody>
</table>

1. Hur viktig var följande faktorer för er implementation (Välj ett alternativ)
2. I vilken fas av projektet var denna faktor viktig? (Flera alternativ får väljas)

<table>
<thead>
<tr>
<th>Faktorer</th>
<th>Liten</th>
<th>Medel</th>
<th>Stor</th>
<th>Utan bruk</th>
<th>Avgörande</th>
<th>Vet ej</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avancerad resurser</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>V/E</td>
</tr>
<tr>
<td>Förväntningar</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>V/E</td>
</tr>
<tr>
<td>Förändringar</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>V/E</td>
</tr>
<tr>
<td>Klar mål och objektiv</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>V/E</td>
</tr>
<tr>
<td>Kommunikation mellan avdelningar</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>V/E</td>
</tr>
<tr>
<td>Ledningens support</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>V/E</td>
</tr>
<tr>
<td>Minimal ombyggnation</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>V/E</td>
</tr>
<tr>
<td>Ngorant val av programpaket</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>V/E</td>
</tr>
<tr>
<td>Omstrukturering av affärsprocesser</td>
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<td>V/E</td>
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<td>Partnerskap med säljare</td>
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<td>V/E</td>
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<td>V/E</td>
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<td>Utbildning om nya affärsprocesser</td>
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<td>V/E</td>
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<tr>
<td>Övrigt (var vänlig och ange vad)</td>
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</table>
Hej,

Vi är två studenter som läser på Dataekonomiska programmet vid Internationella Handelshögskolan i Jönköping. Just nu skriver vi vår magisteruppsats inom informatik. Vår uppsats behandlar affärssystem och syftet är att identifiera kritiska framgångsfaktorer under implementationen av dessa system.

Då vi är medvetna om att olika företag använder sig av olika system har vi kommit fram till en övergripande definition på vad vi menar med affärssystem: ett affärssystem är ett system som på ett eller annats sätt underlättar företagets affärsprocesser.

Vår undersökning baseras på cirka 200 små och medelstora företag i Jönköpings län, där den gemensamma nämnaren är att alla har och/eller är fadderföretag till Internationella Handelshögskolan. Resultaten av enkäterna kommer att vi använda för att identifiera de faktorer som är viktiga under implementationen av ett affärssystem.

Då vår undersökning är i behov av Ert svar vore vi ytterst tacksamma om Ni kunde ägna några få minuter att besvara den enkät som vi länkar till nedan. Om Du som mottagare anses att det finns någon person på företaget som är bättre lämpad att svara på enkäten blir vi väldigt glada om Du vidarebefordrar detta e-postmeddelande till den personen och ber denne att svara på enkäten. Självklart kommer Era svar att behandlas med största diskretion.

Er länk: http://www.garland.se/survey/?{Företagskod}

Har Ni några frågor är Ni varmt välkomna att kontakta oss via telefon eller e-post.

Niclas Krantz  0708-257 297   de01krni@ihh.hj.se
Marcus Sköld  0709-321 052   de01skma@ihh.hj.se

Tack på förhand för Er medverkan!

Med vänliga hälsningar,

Niclas Krantz & Marcus Sköld