

# CHALMERS



## **Attaining important ERP upgrade factors**

A case study of an offshore company

*Master of Science Thesis*

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Gothenburg, Sweden 2010  
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Nordic Master in Maritime Management

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## Abstract

The research examines the underlying reasons for a specific ERP upgrade project. Next, it examines the factors that facilitated the project's success. A case study design was adopted to investigate the ERP upgrade project. Qualitative data collected through seven interviews were coded and analyzed. The findings indicate that the five themes; project management, communication, user involvement, external and internal support are correlated with the project's success. Furthermore, it proposes that there are several different critical success factors in each project phase.

The companies in this study wanted to remain anonymous in order to protect its business interests. The company that conducted the ERP upgrade project has been designated Company X. The company that provided the ERP system has been designated the ERP vendor.

Keywords; ERP, upgrade, project phases, critical success factors



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## Abbreviations

ERP – Enterprise resource planning

BPR – Business process reengineering

IT – Information technology

# 1 Introduction

*This chapter will firstly give a brief statement of what ERP is and then give a short introduction about the background for my research area. Next, statement of the overall problem will be discussed and then the significance will be emphasized.*

## 1.1 What is ERP?

ERP is the contraction for Enterprise Resource Planning. ERP uses ERP software, a large data package, to improve an organizations resource planning, operation and management control. Wallace and Kremzar (2001) defined ERP as a wide set of tools that put equilibrium into supply and demand, giving the option to connect both suppliers and customer together in to the same supply chain. ERP have the potential to streamline different processes and workflows, lower costs, improve efficiency –and productivity level, and provide both better tracking and forecasting. (Olson, 2004; Sandoe et al., 2001; Kalbasi, 2007) ERP software is an integrated information system that intends to serve all departments within an enterprise. It provides a unified database for all business activities. In short, it’s the backbone of the information flow throughout an enterprise.

ERP as such, has spread fast amongst organizations. The latest forecast made by AMR research (2008) sees the global ERP revenue market to grow to a substantially \$ 55.9 Billion in 2012.

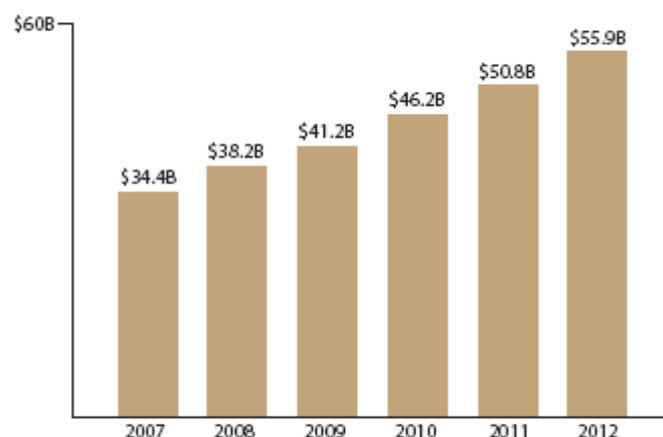


Figure 1.1 – ERP application revenue estimate 2007 – 2012 (AMR research 2008, “The ERP market sizing report”).

ERP is one of the key components in today's information focused business and it's also one of the fastest growing markets in the software industry. In relation to its importance and theoretically influence on an organization, ERP has attracted many researchers throughout the last two decades. (Moon, 2007) Most of the produced research has been about the implementation processes for ERP. However, according to Moon (2007) and Staehr et al. (2002) there is less research available about the post implementation impacts of ERP.

One of the key activities in post implementation stage of an ERP's lifecycle is ERP upgrades. It's important to keep the ERP software up to date with the latest releases and patches, so that you avoid lack of service from the ERP vendor or that the system itself becomes old fashioned. In order to upgrade an ERP software system the organization need to handle all previous customizations, to be compliant with the new version of the ERP software package. Customizations play a major role in ERP software, as it help to close the misfit in between what the organization want and what the ERP vendor can provide.

There are a lot of factors to take into consideration for an organization that have an old and highly customized ERP system, and that are considering to upgrade. Assessing and indentifying the precarious factors is of great importance for the stakeholders of an ERP upgrade project. A case study of a specific project within an offshore drilling company acted as a reliable source.

## **1.2 Background - Company X**

I've had the opportunity to look closer at a company undergoing an ERP upgrade project. The company in question is operating in the offshore segment, specializing in drilling after petroleum deposits and offering tender services. The ERP upgrade project was conducted in close cooperation between Company X and the ERP vendor.

### **1.2.1 A backward glance**

Company X was established in 2005 and is listed on the Oslo stock exchange. The company is presently one of the largest offshore drilling contractors in the world. Company X increased their organization by buying up competitors in the market, and uniformed them into their own company culture and organizational assets. Upon the takeover of one of their competitors, they also acquired an ERP system. Since Company X didn't have an ERP system at that time, they therefore chose to continue with the usage of this ERP system as their own.

Originally the ERP system was designed to handle the operational activities and large share of assets in the North Sea. Due to limited internet and satellite connection from mainland to the offshore rigs operating far at sea, it was required that the ERP system should not be too dependent on 100% live connection to the main servers. Because of this limitation, there was need for a solution that would not require too much data traffic. The ERP vendor in this study then designed a system that could meet the requirements put forward by the company. It was decided that a web based ERP solution would be most fitting, as Web is less dependent of bandwidth and require less data traffic in order to function. The ERP vendor had at that time no standardized web application, as heavy web based software applications was a young and immature technology. Hence, the whole ERP solution was a customization, tailored by the customer's requirements. The ERP system was designated VAM – "Vedlikehold, Anskaffelse og Materialstyring" and went live 2002. It was in operation until it was replaced by the new ERP system during summer 2009. The VAM was customized throughout its lifetime, as new requirements arose during the years.

### **1.2.2 Present**

Where the acquired companies in general were mostly operating in the North Sea territories, Company X has expanded business and is now a global contractor. Company X operates around 40 drilling and tender units, with even more units under construction. They have approximately 7000 employees and have operations concentrated in Northern Europe, South East Asia, West Africa and North and South America. Company X as such, is a Bermuda domiciled company, although the operational headquarter is located in Stavanger - Norway. Other important company locations are found in Houston, Aberdeen and Singapore. Company X operates one of the most advanced and new drilling fleets in the world, and have employees from more than 25 nationalities. During the acquisition process that Company X initiated,

many of the competitor’s employees ventured along and took up key positions in the new company. As such, the company managed to keep crucial competence within its new organization. Company X has as other operators in the petroleum business, felt the ripple effects of the financial crisis that hit 2007. Falling oil prices, income and revenue all over the industry, has left many illiquid companies to put their plans on hold. However, Company X has most of their units on long-term contracts, made before the finance crisis hit. Moreover, many of the buyers are ultra large and well liquid companies like Statoil, Petrobras, Conoco Phillips, BP and EMI. This situation has resulted in a steady and good cash flow, and the company as such is doing very well in the quarterly reports. Company X has recently undergone some organizational changes, resulting in an outsourced standalone “Well Service” unit. Being that VAM was seven years old and specifically designed for another company, Company X initiated the process of upgrading the ERP system. This project was initiated in October 2008 and the ERP system went live in June 2009. Company X revenue in 2009 was US\$ 3,254 billion. (Company X Annual report 2009)

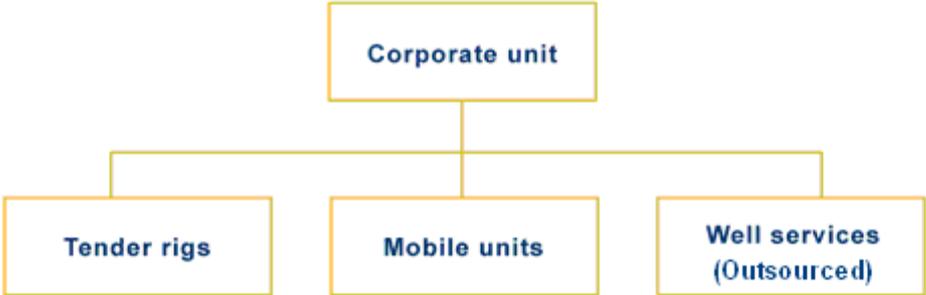


Figure 1.2 – Company X organization chart (2010)

**1.3 Statement of the problem**

Theoretically ERP promise a lot of advantages to an organization. Alas, successful transfer over to a fully integrated ERP solution is far from assured. Previous research shows that close to 70% of ERP implementation fail, in regards to the initial goals set by the steering committee group. (Standish group, 2004) ERP is much about technical challenges, but getting the correlated business issues solved is an even bigger task. (Davenport, 1998; Zhao, 2007) ERP software isn’t only a technical software package, but it come bundled with a version of best business practice from the ERP vendor.

ERP vendors often write their own understanding of how business shall be done, hence resulting in not just the technical challenges of an implementation, but a major challenge about “how to do business”. (Moon, 2007)

Therefore, acquiring a fully implemented ERP solution is more about organizational changes and how to do business, rather than the change in software system from a technical perspective. According to Scott (1999), ERP packages are about people. If the approach is merely technical, it will probably waste a lot of investment due to failure or a “weakened” organization. The Panorama consulting group (2007) point out that many companies tend to think that successful ERP implementation ends after go-live. This is however not the case, and if anything, it’s after go-live that determines if the ERP system “makes or breaks”.

According to AMR research and statistics, ERP upgrade projects cost a significant amount of money. (Swanton, 2004) Company X inherited and chose to continue to use the VAM system as their own, when they bought one of their competitors. What was not satisfactory about the VAM system? What triggered this ERP upgrade project? Mapping the underlying motivations behind this project would help decision makers and CIOs in their question as to why upgrade an existing ERP system. What drove Company X to the point where they decided to actual go forth with an upgrade project?

Fairly much has been written about implementation of ERP software, in organizations spanning from the small to ultra large companies. (Esteves, 2001; Jacks & Bendoly, 2003; Zhao, 2007) However much less has been written about post-implementation issues and general ERP upgrade. What happens after go-live of an ERP system is as crucial as the initial implementation. (Nah et al., 2001) Zhao (2007) state that ERP upgrade is one of the most important activities of a ERPs life cycle and underline that the final impact of ERP in an organization is much less researched. Furthermore he emphasize that understanding the main process after go-live and till the next upgrade will help organizations understand the life cycle of ERP much better.

Every three to five years, a major ERP upgrade is typically needed to keep the system working smoothly. (Zhao, 2007) Although ERP systems have a long life cycle they are unprotected against organizational, technological and communicational changes. Without comprehensive understanding of ERP upgrade concepts and organizational impacts, may

result in huge budget deficit or a prolonged unwanted situation. Now that the ERP upgrade project is finished, what lessons can be learned for Company X and the ERP vendor? What do the involved parties identify as the most important success factors from the ERP upgrade project?

Therefore, this study aims to reason for why Company X initiated this project. Furthermore, it also seeks to identify and assess the most important factors in relation to Company X's ERP upgrade project.

## **1.4 Significance**

There are several reasons for this study. Firstly, an ERP upgrade project cost a substantially amount of investments. The AMR research group state that an "average" upgrade project cost around \$ 9, 2 million dollar for a user group with 5000 users. (Swanton, 2004) Since an ERP system needs to be "maintained" once in a while, to avoid de-support and or obsolescence due to technical age, this upgrade cost will come again. Hence, the ERP upgrade is a lasting cost following along with the usage of the ERP system in organizations. (Zhao, 2007) Thus, assessing the pros and cons for ERP upgrade will benefit the organizations the next time an ERP upgrade is necessary.

Secondly, although substantially amounts of research exist for ERP implementation, there is scarce information about the general ERP upgrade. (Moon, 2007) This may be a result of ERP upgrade being perceived as a lesser or insignificant project compared to ERP implementation. By conducting this research, this paper will help to increase and shed light on the research area.

Thirdly, little have been investigated on what the key areas of importance are in each project phase, when upgrading a highly customized ERP system. Assessing the important issues involved in each ERP upgrade project phase, can benefit both IT- managers and stakeholders, by helping them putting the resources where they are needed the most. This would be greatly beneficial, when decision makers have to consider tradeoffs amongst assorted upgrade activities, helping them to prioritize the correct ones. Due to often limited resources available,

organizations involved in such projects, also have to manage the day to day work or other responsibilities in parallel with the project.

There are great chances to better increase information about serving, education and guidance in relation to ERP upgrade. This study aims to make visible the critical success factors during the mentioned ERP upgrade project and their importance in each ERP upgrade phase.

## **1.5 Limitations**

The ERP system itself is not the primary object in this study, and has therefore not been subject for examination or evaluation to any extent. I have neither taken any consideration if the ERP system provided by the ERP vendor is the best system or not. This study approaches the ERP software and its vendor and buyer, in a pragmatic way. This study doesn't take sensitive "business related" information into account and there have been no interest from the author's side to produce pros or cons of the ERP system or its impact on the addressed company. There has been a great effort to minimize exposure of sensitive data, for all involved parties. Moreover, anonymity has been given to all interviewees and all involved parties, including each company. "Company X" is the offshore drilling company and the "ERP vendor" is the organization behind the ERP system in question.

## 1.6 Disposition

1. Introduction	<ul style="list-style-type: none"><li>• In this chapter I aim to introduce the subject of this case study. A brief statement of the background and a broad approach to the issue is also presented.</li></ul>
2. Review of the Literature	<ul style="list-style-type: none"><li>• This chapter presents the theoretical framework for the subject. The extensive literature review will utterly clarify the research questions.</li></ul>
3. Methodology	<ul style="list-style-type: none"><li>• This chapter aim to explain the methods of procedure.</li></ul>
4. Empirical Findings	<ul style="list-style-type: none"><li>• This chapter seeks to account for the empirical findings, collected from seven in-depth interviews.</li></ul>
5. Qualitative Analysis	<ul style="list-style-type: none"><li>• This chapter seek to connect the empirical findings and theoretical frame of reference.</li></ul>
6. Conclusion	<ul style="list-style-type: none"><li>• In this chapter the main findings and conclusions are presented to give answers to the research questions.</li></ul>
7. Final Discussion and Future Research	<ul style="list-style-type: none"><li>• This chapter list the study's limitations and suggests future research.</li></ul>

## **2 Review of the literature**

*In this chapter, the research background of the subject is presented. To better address ERP, a short presentation of ERP's history and evolution will be presented. Then general ERP and upgrade literature are discussed. Next, Collins (1999) distinctive upgrade phases are presented and then critical success factors are listed as discussed by previous studies. Finally, the research questions are clarified and presented once more.*

### **2.1 ERP – Evolution**

ERP as we know it today is the result of an evolution that started more than 40 years ago. In the 1960s most large production companies designed, developed and implemented “off-the-shelf” business applications to support the production. The earliest versions of MRP (Material requirement planning) supported the creation and maintenance of material data and bill-off-materials, through all products in one or more plants. These “young” software packages were able to process large amounts of “collective” data, although only with simple equations and processing depth. (Klaus, 2000).

The next step in this evolution was the second version of MRP, called MRPII which made entrance in the 1970s. MRPII introduces three extra main features according to Wallace and Kremzar (2001);

1. Sales & Operations Planning
2. Financial interface
3. Simulations

MRPII shifted more towards the technical segment that cover production processes. MRPII packages were even more extended in the 1970s and “new” features like finance, sales & distribution and human resources came into play. (Klaus, 2000) These new features were part of the CIM umbrella (Computer integrated manufacturing), providing a conceptual framework.

ERP in its present stage first saw daylight in the early 1980s. This offspring from MRP and MRPII offered better features for an enterprise-wide and inter-functional integration. ERP connected known business processes like; production, manufacturing, sales, distribution, human resources, project management, accounting & finance, service and maintenance,

inventory management and transportation on to the same platform. The Siemens Company, together with SAP, a German software company, implemented the first enterprise wide ERP system in 1987.

In the late 1990s and early 2000s, the massive growths in internet and IT –technology have introduced add-ons like e-business, e-invoice, customer relationship management, and supply chain management. (Rashid et al., 2002) Figure 2.1 shows the ERP evolution timeline.

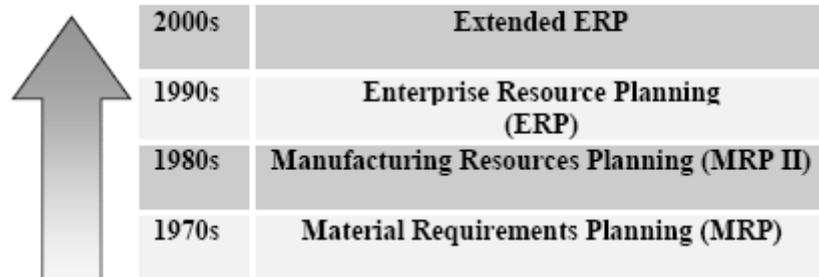


Figure 2.1 – ERP evolution (Rashid et al., 2002)

## **2.2 ERP – General**

ERP seeks to support the “practical” needs of the industry and have become very important in today’s global business operations. (Olson, 2004) However, there are advantages and disadvantage with ERP systems. Some of them are listed below: (Zhao, 2007; Olson, 2004; Trimi et al., 2005)

Advantages or ERP:

- Greater accuracy, one truth.
- Adoption of business practice
- Improved business operations
  - Accounting applications
- Improved understanding across users

Disadvantages of ERP:

- costs for implementation and upgrade
- less flexibility, freedom and creativity
  - Less empowerment due to the concentration within the organization.

- Constrained team-based decision making
- Less openness to business partners
- Unstable vendor environment.
- Bundled with vendors own business interpretation

The amount of research literature has increased substantially in the recent years. Moon (2007) reviewed and classified the latest trends in the ERP literature;

1. Implementation
2. Using of ERP
3. Extension
4. Value
5. Trends and perspectives
6. Education.

Since the failure rate and costs are both high when it comes to ERP implementation; many studies have been focusing on implementation issues as such. Amongst other, issues mentioned are cultural differences (Soh et al., 2000), change management (McAdam and Galloway, 2005), focused stage in implementations process (Verville et al., 2005), case studies (Berect and Habchi, 2005) and critical success factors (Ellie and Madsen, 2005).

Since many companies interpret ERP acquirement as business secrets and hence are reluctant to share information, researchers have had difficulties generating empirical studies. (Botta, 2005) Therefore case studies are good research methods to explore important issues of ERP.

After a successful implementation of ERP software, the attention is drawn to the most effective use of the system. (Moon, 2007) Since considerable resources have been spent on the implementation, most organizations are keen on getting the most out of it. (Brazel, 2005) The best value of ERP is drawn from the effectiveness and efficient usage, and not as much from the “mere” technical aspect of the system. (Martin and Cheung, 2005)

The organization which have successfully implemented ERP systems and are content with the return on investment and level of services provided from it, are now considering the extensions provided by the ERP vendor. (Moon 2007) By extension means applications like e-business, supply chain management, customer and supplier relationship management, e-

invoice, mobile clients etc. (Cardoso, 2004). Huang (2004), Kelle & Akbulut (2005) state that supply chain management is one of the most referred applications.

It has been mentioned that ERP is a costly acquirement, and many have asked the questions of what he real value of ERP is. (Huang and Wang, 2004) What value brings ERP to an organization? How do we measure return on investment? The arrays of values ERP may generate are numerous; benefit for investors, user satisfactions, operational and financial - benefits. (Spathis and Constantinides, 2004) Attaining the actual value can be measured in many ways; asset turnover, return on assets, perception from the market, cost savings, return on investments etc. (Hitt and Wu, 2002; Moon, 2007).

Since ERP as a software tool have evolved much since its childhood in MRP, some research has been about trends and perceptions (Moon, 2007; Chen, 2001; Markus, 2000; Volkoff, 2005). In the next section, ERP maintenance is discussed.

**2.3 ERP – Maintenance**

Less research has been conducted about the maintenance and post-implementation issues. (Moon, 2007) In the ARM report from 2005, depicted below, one can see that maintenance revenue in the ERP market is almost as high as the initial implementation revenue.

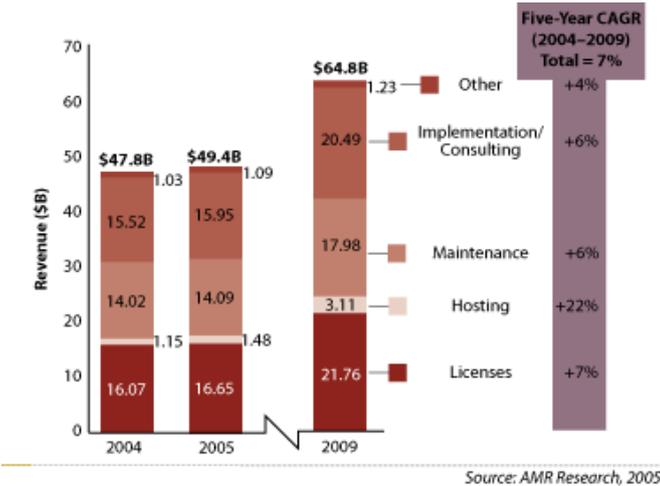


Figure 2.3 – Maintenance revenue 2004-2009. (AMR research, 2005. “The Enterprise Resource Planning Report”)

Maintenance can be divided into three categories;

1. Extensions
2. Modifications
3. Customizations.

Extensions handle “add-ons”, sometimes made by third- party vendors. Modifications in this research refer to changes in the technical programming of the ERP software itself, to fit into the acquiring business environment. Customizations are related to the changes in the functional and business related processes of the ERP software. ERP maintenance is defined as post implementation activities undertaken from the time the system goes live until it is retired from production. ERP maintenance is a lasting cost, if you want to keep the ERP system up to date.

### **2.3.1 ERP – Customization**

As mentioned earlier, implementation of ERP software has often been a headache for the attaining organization. According to Davis (2005) one of the main reasons are customizations. With customizations mean change in the standard core application that most ERP vendors use as a foundation for their software. ERP customization affects the organization in both positive and negative ways. With customization of the ERP software, come increased maintenance costs, increased complexity and less flexibility. Zhao (2007) stated that a company should try to minimize the amount of customizations, although it’s almost impossible to avoid customizations of the ERP package in the long run. ”Pristine un-customized” ERP software solution would not suffice, because of the organizations apprehension of business processes and the ERP vendor’s apprehension of the same business processes. (Babic, 2009) In other words, “your way of my way?”

The massive complexity of ERP software architecture is often underestimated and will require a large amount of effort from the acquiring organization, in the implementation process (Barnes, 1999). Adding even more complexity through customization is challenging. With this in mind, many argue that a standard core version when implementing ERP is the “best way”. (Nah et al., 2003)

Alas, when the desired business processes aren't the same as the offered business processes, the question to customize arises. Davenport (1998) said that "business processes must change or the ERP system has to change, when there are misfit between the organization and the packaged software". Most ERP vendors, having extensive knowledge from different industries businesses processes, write their interpretation of best practice into the ERP software code.

However, most organizations trust more in their own business processes rather than the ERP vendor's, and will ask for customization to best fit their requirements. Light (2001) categorized five ERP customizations;

1. Change functionality
2. Adding functionality
1. Process customization
2. Amending reports
3. New reports

The issues related to ERP customization often continue throughout the lifecycle of the ERP system, as long as it's used and don't end with the implementation. (Zrimssen et al., 2002) Zrimsek et al. (2002) state that each customization will have maintenance and upgrade impacts. As customization are something unique, made with purpose to address a sole issue, most ERP vendors don't assess the implications it might have on the system when changes are done.

We have to keep in mind, that ERP software is extremely complex and that covering all possible issue that may arise when introducing a customization is not possible. To further complex the picture, ERP vendors seldom support customization in future versions of the ERP software.

For example, to be compliant with tax laws and regulations, the accounting software will have to be upgraded once a year. If the company is using a customization within this area, the effects of that upgrade have to be tested against the customizations as well, to secure a smooth business process. (Davis, 2005) Pooling to many customizations into one ERP software might be problematic, especially in relations to increased cost maintenance and support –cost.

Wessel's (2007) tries to describe the level of complexity in customizing ERP systems. These customizations are divided into 4 categories.

- 1) Look & Feel customization
- 2) Reporting customization
- 3) Workflow customization
- 4) Functional customization.

#### 1. Look and Feel customization

Look and Feel customizations are typical user's apprehension of the system. It deals with mostly cosmetic changes, i.e. logos, placing of figures, layout, characters etc.

#### 2. Reporting customizations

System outputs like reports, report templates fall into this ERP customizations category.

#### 3. Workflow customization

Changes made to the automation process among users, where the system is intelligent enough to behave based on work types, predefines standards, users, and the recognition of dynamic processing conditions. (Gartner, 2004)

#### 4. Functional Customization

Functional customizations are changes made to the way a process is designed to function or a module function.

Wessel's matrix depicted below is an overview of both the method and type of customization, along with description, motivation and impact of each suggested customization.

Types of customisation		Customisation method			
		Parameters & Switches	On / Off Selections	External applications	Coding
<b>Look &amp; Feel</b>	Description	Configure screen layout with logos, colours and fields	Selection of fields, menus and business forms to be used (Dashboard options)	Applications that provide a user friendly front end whilst restricting user access to the ERP back end	Screen painters for designing custom screens
	Motivation	Personal preference	System functionality or process should be restricted to a user or group	Essential look & feel options that will determine ERP success	Unique system dashboard and forms required that are not catered for
	Impact	Look & feel can often be personalised without any business impact	Look & feel selections can determine user access to certain functionality	Could be essential business solution as the application governs user access to the ERP	Same impact as external applications; maintenance issues should be considered
<b>Reporting</b>	Description	Configure existing report templates with filter options and field selections	Selection of standard reports to be used within a solution	Reporting applications that bolt onto an existing data source	Scripts are used to extract custom designed reports from a data warehouse
	Motivation	Report information presented in a useful manner	A report does not apply to the business	Application will add value to the business as existing reports are insufficient	Existing reports does not display essential information which a custom report will
	Impact	Report configuration determines how useful the information displayed is	Not having a certain report will result in users maintaining separate calculations	Applications enables custom reports which can be saved as updatable templates	Requires in depth database knowledge and a universal coding style
<b>Workflow</b>	Description	Approval routings and notifications for a specific process	Whether or not a solution, module or process has workflow functionality	Applications that facilitate workflow and provide a user friendly front-end	Custom designed workflow within a solution
	Motivation	The processing sequence must include certain users	A process must be completed in a specific sequence	The existing workflow capabilities are not sufficient	Custom workflow functionality will provide a competitive advantage
	Impact	Workflow governs the users working on a process	Workflow impacts the productivity of a business	Applications could add value to user friendliness and business productivity but adds complexity to the solution	Custom coded workflow could provide synchronisation across supply chains but requires a great amount of maintenance
<b>Functional</b>	Description	Configuration of a process	Selection of modules to be included in a solution	Applications that add some sort of additional functionality	Bespoke software (Custom designed solutions)
	Motivation	Functional configuration will provide a fit with the requirements of the business	The functionality is required by the organisation	The current system does not cater for an essential functionality	Customisation is essential to the organisations and results in a competitive advantage
	Impact	Module configuration determines how a system works. User acceptance often depends on functional configuration	Functionality selection impacts solution scope, acquisition cost and implementation time	Could add considerable value, but might require users to work on multiple fronts which impacts training and focus.	Custom coded functionality could provide a competitive advantage but severely impacts the implementation and upgradability

Table 2.4 – Wessel’s customization method matrix. (2007, iPlan Industrial Engineers.)

## 2.4 ERP – Reasons for upgrading

ERP upgrade is one of the important activities of an ERP’s lifecycle, as it’s a lasting operation, presumptive that the ERP system is meant to be up to date. ERP upgrade primary function is to take advantages of new technologies, bug fixes, patches, improvements, new business strategies and overall update of developing business trends. (Zhao, 2007) However,

even though the above mentioned advantages seem persuasive enough if you're considering an ERP upgrade, it's not a trivial decision. Unlike other small installments like language packages, word –processing software etc, purchasing and implementing an ERP upgrade is a costly and time consuming endeavor.

Ng et al. (1999) reasons that organizations should not upgrade each time a new version is released from the ERP vendor, due to the cost and resources involved. However, if the organization decides that an upgrade would pay off in the future or plan to do it immediately, they still have to consider when the time is right. If the organization upgrade too early, it could miss some of the latest state of the art technology or features. On the other hand, if it waits with the upgrade too long then it would have to face possible user dissatisfaction and a larger budget provision for maintenance of the existing system. As such, Ng et al. (1999) state that gaining the insight of when to upgrade is very important, given the cost associated with ERP upgrade.

Although the ERP code doesn't deteriorate or become worn in relation to its existing services, according to an AMR research survey (2004) near half the upgrades are forced by technology changes and de-support. Amongst the companies in that survey, 45% of them said that they waited with an ERP upgrade until they were backed into a corner. Those 45% divided as such:

- 15% of the upgrades were conducted due to de-support of the old software from the ERP vendor.
- 6% of the respondents triggered the upgrade because of bug fixes and other software patches,
- While 24% were conducted as a result of technology changes. While companies expand or renew their hardware, this often spark an ERP upgrade cycle, as the old ERP software isn't applicable with the new hardware.

According to AMR research (2004) the upgrade cost include near 50% of the software license fee plus 20% of the original implementation cost. This would for instance result in ca. \$9.2 million for a 5,000 –user system. In average each ERP upgrade last eight to nine months effort, with a team equivalent of one full-time employee per 35 business users.

Collins (1999) listed some of the major advantages with ERP upgrade:

- Eligibility for Help Desk Support: After a certain time the ERP vendor stop providing technical support for the old version. Most ERP vendors do this, 12 to 18 months after the new version is released. According to Collins, ERP vendors try to influence purchasing decisions based largely on the extent of service provided to the customer. Alas, the vendor can only give qualified service with if they are expert on the version the customer bought.
- Solutions for Outstanding "Bugs" or Design Weaknesses: The advanced and heavy technical configuration of an ERP system makes it nearly impossible to guarantee it to be 100% perfect and error free after go-live, even with substantially testing and diagnostic tools prior to the deployment. There are so many connections and theoretically vast amount of data integrated in ERP systems, that eliminating all “bugs” is impossible. “The majority of software bugs are resolved and delivered either fix-by-fix or all-at-once as part of the next release version of the ERP package”. Either way, the organizations need to be on the supported version of the ERP software to take advantage of these fixes.
- New, Expanded, or Improved Features. This may be the single most important benefit derived from upgrading the ERP system, as it gives opportunity to harvest the latter functions, features and improvements added to the system after the initial implementation. Organisations are not only buying the ERP system as it exist present, but future enhancement to the product. ERP vendors are constantly improving their product, using time and resources to research new features and better business processes. Customers are neglecting themselves these benefits if they decide not to upgrade.

Ng et al. (2001) state that maintenance and upgrade are inextricably linked together, as the upgrade decision can be postponed by continuing to maintain the old system. Furthermore they define three drivers that influence the decisions for maintenance and upgrade.

- Maintenance support: The ERP system delivered from the ERP vendor is a generic solution, in opposition to the tuned business processes and functional needs of the

customer. In most cases, customization is needed to fill the misfit during the initial implementation. The more customizations that are done to the system during implementation time, the higher the billable maintenance cost will be.

- Availability of a new version upgrade: Organizations typically upgrade to a new ERP version in order to harvest the benefits that come with the new version. Cost is prohibitive when organizations is considering and upgrade of the ERP system.

Upgrade costs are driven by and consist of:

- Software cost
  - Hardware cost
  - User training cost
  - Consultant fees
  - Upgrade implementation cost
- 
- Benefit-Realization: Most organizations implement and re-invest in the ERP system because of the feasible gain that can be achieved through the enterprise systems. Some of the major recognized benefits are:
    - Best business practice
    - Competitive position
    - Globalization
    - Integrated systems
    - Ongoing support from the ERP vendor.

While deploying upgrades cost money for the ERP customer, delaying or postponing new version upgrades will restrain benefit-realization from their systems. This will result in some user opportunity cost to these organizations.

Both Ng et al. (2001) and Collins (1999) point out that the most important reason for upgrading the ERP system is to reap benefits from new features available in the new version upgrade. There are many costs that need to be taken into the equation when considering upgrading, and timing of the project as such is essential. Ng et al. (2001) underline that the three factors; maintenance, upgrade and opportunity –costs should be the main catalysts when deciding to upgrade or not. In the next section, Ng et al. (2001) and Collins (1999) planning and project phases will be discussed.

## 2.5 ERP – Upgrade

Ng. et al (2001) and Collins (1999) has produced a set of key factors that should be highlighted as important in relation to ERP upgrade. These factors will be addressed below.

### 2.5.1 Conceptual upgrade stage model by Ng et al. (2001)

Ng. et al (2001) drafted out a software model relevant for ERP upgrade and as a planning tool. The model is useful as it outlines the main tasks that should be given attention during the software upgrade project as such. See table 2.5 for details.

Stage Number	Upgrade Stages	Description
1	Design an upgrade project methodology	Asses the best method to deploy the ERP upgrade from either previous successful projects or from the ERP vendor. Fine-tune it for internal use and use it as a blueprint or guideline for the rest of the project.
2	Research for upgrade options available	Attain the different pros and cons for each of the available upgrade options. Look especially towards the misfit or interaction between your organizations business needs and what the software can offer.
3	Develop a business case	Identify the important factors that would influence the upgrade project as such. This includes upgrade data, costs, budgeting, and benefits of the upgrade, risks and cost of not pursuing the upgrade project.
4	Make full assessment of modifications in the current version and technical environment	Assess the number of modifications done to the original system, identifying which modifications that is still required and whose should be discarded. Try to link each modification to a business reason.
5	Make full assessment	Identify the new features and functionality to each

	of the new functionality, and technical requirements in each (potential) upgrade option	feasible business module of interest, from both managerial and technical point of view. The scope is to sort out if any of the new features would cover some of the old modifications.
6	Conduct impact analysis between the new upgrade version and the existing version	Analyze the misfit between current system and the new upgrade version to examine the impacts on the organization, in relation to interfaces, server capacity, hardware and reporting capacities etc. This is important step to minimize future costs related to maintenance.
7	Install the new version onto the development system	Install previous patches and fixes. This should be done to ensure that the new system is up to date on all previous modifications and enhancements.
8	Construct the new system	All previous development (reporting capability, interfaces, and modification) overwritten during the new version upgrade will be re-developed or re-applied on the new system to ensure that all competitive business processes remain in the new
9	Conduct a thorough testing of the upgrade system	Verify the accuracy of the system functionality. User acceptance test and verify that the data have been properly converted. The scope is to ensure that the new system is aligned to system requirements.
10	Carry out the trial upgrades	Conduct the trial upgrades to exercise the upgrade process and identify errors or potential problems that would happen during the actual upgrade
11	Conversion (or go live)	Deliver the well-tested system into the production system

Table 2.5 – Upgrade stage model by Ng et al. (2001. “An ERP maintenance model”)

## 2.5.2 Planning the upgrade

When all the pros and cons have been assessed and the decision to upgrade your ERP has been made, then it's time to plan the operation. Collins (1999) point out that even if the initially implementation was not a success, it's still possible to execute an upgrade project seamless. However it requires thorough and comprehensive planning to do so. The plan should, well in advance, cope with all possible aspects. Especially important is the definition of the scope and early identification of feasible issues.

According to Collins (1999) there are four steps that should be followed when approaching the planning process. These steps should be clarified before any involvement with costs, conversion data or estimation of resources is done. The first two bullet points treat with documentation collection of existing application and customizations.

- Firstly: Documentation needs to be collected from the initial ERP implementation. These documents will serve as foundation for the new upgrade and in any chance other customizations. Process trees and support business solution are examples of handy documentation, along with previous specifications for customizations. Collins (1999) emphasizes that confirming the link in between the customizations and the business reason for that particular customization. This would greatly benefit the upgrade process, when it comes to review of the new version of the software. Without knowing the reason for the customization, then is hard to determine if the customization is needed at all. In the worst case, the upgrade will include customizations that are not needed and hence would affect the project in a negative way. A full justification of all business processes and customizations should be conducted at the end of this step.
- Secondly: The next step according to Collins (1999) is to review all the existing data in the current solution, in example server capacity, size, version of the operating system etc. This step involves technical expertise, to assess the state of affairs for the environment.

According to Collins (1999) the next two steps are less dependent on documentation and as such don't rely that much on the initial implementation.

- Thirdly: This is the starting point of reviewing the new release of the software. Attain manuals, a demo version of the new ERP software and test it thoroughly and participate in training courses.
- Fourthly: The last step focuses on the upgrade process itself. Most ERP vendors have much knowledge about upgrading their ERP software and would in most cases be able to supply with a “to do” –list. However, this documentation is written out of a “best practice” –principle and would need some interpretation and analysis.

The outcome should be a work-plan. This work-plan should also consist of target dates, resources available and a check list of tasks to be done. Although this work-plan can project feasible costs and demands, it’s best to consider it as a working document. This is because many variables still exist. Collins (1999) listed some of the major bottlenecks:

- Freezing development for the current release for an extended period of time.
- The length of production downtime, necessary to perform, the actual upgrade
- Scope of modification re-development.
- The time necessary to acquire and install new hardware and software
- The potential inclusion of new features into the application.

The work plan should also include a definition of the project team and should be composed of people with several different responsibilities. Table 2.5.2 display some of the project team members that are commonly part of ERP upgrade projects.

<b>Team Member</b>	<b>Responsibilities</b>
Project Manager	Project planning, tracking, maintaining scope.
Project Technical Manager	Supporting the technical environments.
Database Administrator	Maintaining database, sizing, and administering database security.
Database Server, Network Administrator	Issuing login IDs and passwords, granting read/write and System security and handling.
Application Administrator	Maintaining the application table structures,

	ensuring processes run correctly, and making any necessary changes to the application configuration to resolve any issues.
Upgrade Expert	Running the compare reports, performing migrations, formulating a strategy for the upgrade, and maintaining tracking logs.
Project Module Team Lead	Knowledge of business processes, system modifications, batch interfaces and custom reports.
Project Module Analysts	Analyzing, designing, and reapplying modifications, trouble shooting, and testing.
Technical Analysts	Coding and testing.

Table 2.5.2 – ‘Strategy and Execution of ERP Upgrades – Project members’ Collins (1999)

### 2.5.3 Upgrade project phases – executing the plan

Collins (1999) believes that if a thorough plan exists, your project is ready to conduct the actual upgrade project. As in the planning phase, this part of the upgrade project is also based on phases. There are four phases, all distinctively and following a fixed time line:

- Phase one – Impact analysis and initial upgrade
- Phase two – Solution development
- Phase three – Acceptance/Performance testing
- Phase four – Production conversion

In this study I adopt this model to evaluate the upgrade process:

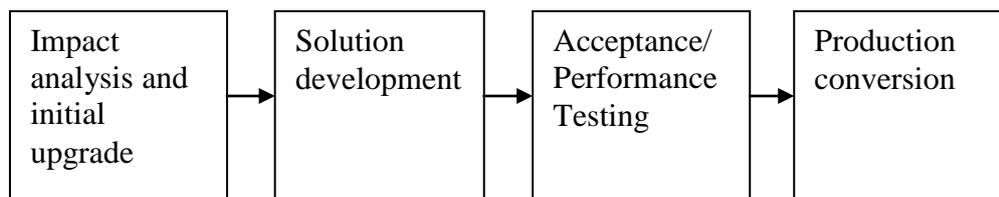


Figure 2.5.3 – ERP upgrade phase’s model. (Collins 1999)

This model is easy to understand, adopt and sees the organizations through different “phases”, distinguishing one step from another. Collins (1999) phases progress as follows:

*Phase one - Impact analysis and initial upgrade*

Before anything else, an impact analysis on all modified interfaces, reports and customizations should be conducted. Settle any divergence by comparing the old configuration processes with the new configuration processes of the new release. Collins (1999) argues that while the impact analysis is being conducted, the initial upgrade may well be executed. Most vendors deliver a method for determine differences between the old vs. the new application. Finally, the process to merge the two versions starts and results in a customized application on the new release. Give attention if the new release has overwritten some of the old customizations.

*Phase Two – Solution development*

It’s important to test all the modifications, especially the one that were overwritten. Business processes should also be tested to validate that the previous merging in phase one was completely and correctively done. This is the core activity of the upgrade, where all modifications/customizations are tested and verified. The heart of the matter is to test and verify the functionality of the application.

*Phase three – Acceptance/Performance testing*

The testing moves on the final stage, whereas using imitated data from the “live” application, to test both performance and punctuality. As this might be interpreted as the same testing conducted in phase two, it’s not. The reason for this is that in phase two, no converted “live” data was used, in opposition to this phase. During this phase, it’s important that no development is being conducted in the production environment. Collins (1999) argues that it’s almost impossible to upgrade a moving target.

It’s not unusual that adopting organizations question the lengthy and extensively testing, but as argued earlier in this study, an upgrade project is a major challenge and should be respected as such. The resulting cost when detecting corrupted data or a malfunction customizations is much higher the farther you get in the delivery process. Do not wait to ascertain errors after the production system has been upgraded!

#### *Phase four – Production Conversion*

By now the old application is ready to be upgraded and users will eventually gain access to the upgraded version, if the deployment goes well. It's necessary to have a controlling organ i.e. support centre or vendor consultants, which coordinate any necessary downtime with the users to make sure that no critical business functions are compromised. Although it's has been thoroughly tested, it's important to make sure that security settings and access rights are ok and that all basic data was converted correctly. These tasks should preferably be assigned to a small group of experienced users, to make sure that all is well.

At the end of this phase, you should theoretically have a fully operating production application on the latest release. The success is however dependant on to what extent the previous phases has been completed.

There are great chances to undertake and successfully go through with an ERP upgrade project, even considering the scope of operations and conceit of resources required. There are some important key success factors in every upgrade:

- If possible try to plan for the first ERP upgrade in the original implementation process.
- As with other major projects, a detailed execution plan should be available prior to starting the upgrade itself.
- In the whole process, follow the same method and structure and make sure that the involved project members are informed of all changes

While Collins (1999) recommendations don't guarantee a successful ERP upgrade, choosing not to follow them would certainly increase the cost and risks in relation to the project as such.

## **2.6 ERP upgrade – Critical success factors**

There is a well established concept for critical success factors in the ERP systems literature (Moon, 2007). This is actually one of the most popular topics when it comes to the concept of ERP implementation. The idea is to address and classify some important factors that affect the success or failure of the ERP implementation. However, as stated by Moon (2007), the majority of "critical success factors" –literature is written for the implementation phases, but

not for post –implementation phases. Based on different literature reviews (Davenport, 2000; Somers et al., 2004; Bhatti, 2005; Zhao, 2007), a list of critical success factors has been proposed that concerns ERP upgrade projects:

### *Business Process Reengineering*

BPR is defined as “fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in critical, contemporary measures of performance such as cost, quality, service and speed” by Hammer et al. (2001) In other words, BPR is about analysing an organizations way of doing business and to make things better. According to Somers et al. (2004) the issue with ERP software package is the potential incompatibility with the upgrading organizations needs and business processes. As such, literature (Somers et al., 2004; Davenport, 1998) argues that the adopting organization needs to change its business processes to fit the ERP software. This indicates that BPR should occur in the early phases of ERP implementation as it would maximize the benefits, and avoid larger “process change” - costs later in the ERPs life cycle. Somers et al. (2004) further state that BPR is less important in the later stages of ERP processes if the technology and routines is properly infused.

### *Business Vision*

Effective project implementations require a set of well established goals and objectives. (Somers et al., 2004) Davenport (2000) also emphasize that knowing what, who and how is very important for an organizations that undergo an ERP project. The business vision should be known for all levels of participants that make up the project team group. Zhao (2007) say that a business vision includes project goals that are in harmony with organizational mission, business objectives and management expectations. In other words, a business vision demands for a well thought through vision of where you want the project to go and end up. The business vision should be clear and important in all stages of the ERP project. (Somers et al., 2004)

### *Change management*

The introduction of ERP and magnitude of change it represents, it’s important to take change management into consideration as such. (Somers et al., 2004) As mentioned earlier, ERP will probably force changes upon the acquiring organization and hence change management is an important tool. According to Zhao (2007), change management in this context can be social and cultural -related change techniques to cope with human relations issues that happen in the

ERP wake. Change management can help the organization to more easily move onto a new platform. In his research, Zhao (2007) argue that half of the ERP projects fail to reap the expected advantages because organizations tend to underestimate the resources involved in change management. Change management is most important in the earlier phases of ERP projects. (Somers et al., 2004).

### *Communication*

Communication is one of the most exacting and difficult tasks in any ERP project. It's considered to be a critical success factors by many authors. (Bhatti, 2005) Communication is imperative for concluding an understanding and acceptance for the ERP implementation project as such. Furthermore, communication is essential when sharing information about results and progress for each project phase between project teams and the organization. Acquiring organizations often create an own communication plan that produce scheduled reports, lessening for instance organizational resistance when it comes to change management. Communication should start at an earliest stage as possible. (Somers et al., 2004) Communication is considered to be important throughout the whole project life cycle. Lack of good communication in the project as such and amongst business reengineering and outside organizational members can at worst halt project progress. (Zhao, 2007)

### *Consultants*

Since ERP systems represents an extreme complex and intricate software solution, internal and external consultant and advisors are often required to handle the installation process. External consultants, sometimes from the ERP vendor itself or from another consulting firm, can provide accurately knowledge about the installation and software. (Bhatti, 2005) Consultants can have good experience in a certain field of industry, detailed knowledge about the application itself or for instance provide an overall expertise advisory service to better utilize the situation. Consultants can be hired to accompany a certain time period or help with different stages of the project, in example: selecting which ERP system to purchase, business process reengineering, customizations, user training and system support. (Zhao, 2007) Consultants may take as much as 30 percent of the overall ERP budget, and is thus a resource one should monitor accurately in reference to how many, where to use them and how long. (Zhao, 2007) According to Somers et al. (2004) and Zhao (2007) consultants are in many cases the single factor that tip an ERP project in favor of success or not, dependant of how good the consultants know the ERP system.

### *Project Champion*

The project champion is often referred as the “champion” of the project. This role is not necessarily the project manager. The project champion should have knowledge of the business processes and technology used, and preferably be a person with extensive authority in order to allocate resources where it’s needed the most. He or she acts as a focal point within the project. This role is important as it account for several key activities and areas of responsibilities. (Zhao, 2007)

### *Project Management*

Project management is also one cardinal part of every ERP project, holder of the planning, controlling and executing authority. As previously stated, ERP projects are large and complex endeavors including human, culture, software, hardware, politics and organizational issue, calling for a strong and committed project management. (Somers et al., 2004) Furthermore, project management must try to manage resistance towards positive change in the old system (Loh et al., 2004) Project management activities span from the beginning of the project to the closure of it and is an essential requisite for ERP project success. (Zhao, 2007)

### *Steering committee*

Identified as one of the most important aspect of every ERP project, because it embodies two very important responsibilities; providing leadership and providing necessary resources. (Zhang et al., 2002) Furthermore, the steering committee is liable in ERP project to comprise an understanding of the boundaries of the project as such, especially capabilities and limitations. (Khaled et al., 2008) A steering committee which doesn’t support the ERP project will greatly jeopardize the outcome of it. According to Zhao (2007) latter research argue that ERP project fails when the steering committee delegate process monitoring and decision at critical crossroads of the project to technical experts.

### *Training & Education*

User training and education are by many researchers considered to be an important factor for ERP project success. (Bhatti, 2005) Training and educating people on all levels to be familiar and comfortable using the ERP system is crucial, as ERP is not necessarily easy to use even with good IT skills. (Khaled et al., 2008) Training is not limited to the ERP system itself, but should also include the new processes and explain the new functions and the intentions behind

them. Lack of proper training and understanding of how ERP application change the business processes seems to be a major reason for many ERP failure projects. (Somers et al., 2004) Although literature widely expresses training and education as one of the most important factors, reality is often different. Executives, project management and steering committee often awfully underestimate the importance of correct training and the associated costs, and by doing so, start with this too late. (Zhao, 2007) The users will not be fully trained before they are actually using the ERP system properly in live production.

#### *User Involvement*

Bhatti (2005) defines user involvement as “psychological state of the individual and is defined as the importance and personal relevance of a system to a user”. It is also defined as the user’s participation in the implementation process. (Zhao, 2007) There are mainly two areas where user involvement is essential: in the phase when the organizations are deciding what kind of ERP system is needed and when implementing or upgrading the ERP system. (Khaled et al. 2008) In relation to the theoretically changes in work processes, ERP represents a “threat” for the users perception of control over their work and responsibilities. Thus is user involvement something that should be prioritized. (Zhao, 2007)

#### *Vendor Support*

ERP may for many companies be a lifelong commitment and thus would require continual investments i.e. new modules and upgrades for added functionality and to better realize their strategic value. Hence, vendor support in the form of i.e. support services, emergency maintenance and special user training is an important post-implementation factor. (Somers et al., 2004)

#### *Customization*

ERP systems are designed upon the ERP vendors own interpretation of “best business” practice, fueled by experience from previous successful or unsuccessful similar projects. The ERP vendor offer a core version in most cases and this solution might not always meet the acquiring organizations requirements and expectations. The decision to reject or accept the core versions “built-in” business processes happen in the early stages of the project. (Somers et al., 2004) Light (2001) described five ERP customizations; 1) Change functionality 2) Adding functionality 3) Process customization 4) amending reports 5) new reports. Somers et al. (2004) refers that successful ERP projects have included little or no customizations at all

and that the opposite situation often has included major customizations. Literature agree that customizations overall has negative effect on the outcome of every ERP project. (Gattiker and Goodhue, 2004; Levin, 1998; Parr and Shanks, 2000).

#### *Partnership*

A partnership between the ERP vendor and the acquiring organization should be interpreted as an important factor. (Zhao, 2007) Literature account that a good relationship in between these two often result in a successful implementation. The interaction between the ERP vendor and the acquiring organization should be of a strategic nature, whereas the ERP vendor increase the others competitiveness and efficiency. (Somers et al., 2004)

#### *Cooperation and Teamwork*

As ERP involves all parties within an organization and cross all functional and departmental boundaries, a cooperative culture is essential. (Somers et al., 2004) Sharing information and pursuing a corporate common goal over personal agenda is imperative, for all parties within organizations hierarchy. Furthermore, ERP potentials can't be reached without teamwork, including coordination of effort and goals across members of the project team. (Zhao, 2007)

#### *Dedicated resources*

Resources needed to finish the task at hand, need to be determined early in the project, to avoid dooming project efforts. Research displays that failure to commit the required people, financial and operational resources has been found to be a problem for ERP implementation. (Somers et al., 2004)

#### *Software development*

The superior architecture of the ERP system should be established before any deployment is done, taking into account the most important aspects of the requirements for the ERP system as such. This strategy would prevent any reconfiguration at later stages during the project. (Loh and Koh, 2004)

#### *Strategy*

The organizations should as with the business vision, have a clear and communicated business strategy and an aligned IT strategy. The magnitudes of ERP implementation require that the organizations focus on how to best serve their customers, employers and goals for the next

three to five years. A balanced and appropriate business strategy will increase the chance for future success. (Zhao, 2007) Since ERP project costs are high, a sound strategy can help to minimize these contingencies.

### *Culture*

Brown (2000) refers to “our collective identity”, where he emphasizes the “ideas, customs, skills, arts and tools” that characterizes a certain group of people in a certain period of time. Successful technological innovations, i.e. ERP systems, require that either the technology be designed to best fit the organization’s present structure and culture or that the organization’s structure and culture be fitted to meet the new technology. (Yusuf et al., 2004) Zhao (2007) argue that one of the reasons for ERP project failures are due to that implementation were adapted to the existing culture style.

### *Performance Management*

Zhao (2007) noted that implementing a new ERP system would change several employees jobs and thus also in how their work is measured. New job descriptions and new performance targets should be developed, making sure that there is a clear link between the employees work, their performance and the reward and recognition they receive. Project management should govern performance management.

### *Data analysis and Conversion*

According to Somers et al. (2004) the effectiveness of ERP systems are dependent on accessibility and exactness of data at the correct time. The handling of data management is important throughout the ERP lifecycle. Corrupt and incorrect data can halt and cause serious issues when following a tight project schedule. (Zhao, 2007) One of the advantages with ERP systems is that they justify data to have one truth, i.e. an account or inventory part will have the same unique value, everywhere in the organization. (Zhao, 2007; Olson, 2004; Trimi et al., 2005) If discrepancies exist, the challenge lies in finding the proper data to load into the system and convert these disparate data into a uniform value or format. Conversion can thus be a resource-demanding process, especially if organizations have been reckless in maintaining correct data.

### 2.6.1 Brief account of critical success factors

Some of the critical success factors mentioned by literature above, have the same intention and purpose and thus a brief simplified account are just:

- Business process reengineering
  - Redesigning of business processes to best fit the organizations needs and to improve business performance. *Business process reengineering* and *customizations* is included in this success factor.
- Business vision
  - The overall business vision and strategy for the ERP project, should act as a beacon for objects and goals to strive for. *Business vision* and *strategy* is part of this success factor.
- Communication
  - Goal-orientated *communication* between all levels of involved parties, including stakeholders, management, top management, users, technicians, consultants etc.
- External support
  - Support provided from external sources outside the organizations. *Consultants*, *vendor support* and *partnership* are part of this success factor.
- Internal support
  - Support provided from within the organizations, i.e. information sharing and technical support. *Cooperation* and *Teamwork* is part of this success factor.
- Organizations culture and change
  - Perceive the demand for change in organizations culture and structure, to ease the introduction of ERP systems. *Change management* and *culture* is part of this success factor.
- Project champion
  - A durable, engaged and determined project champion is best suited to lead the way in the ERP project.
- Project management
  - An enlightened, vigorous and responsible project management is crucial for the outcome of the ERP project as such. Managerial skills to handle the supply and demand for people, materials and equipment in relation to the boundaries of

the project, to meet time schedule and budget control. This success factor includes *data analysis* and *conversion, performance management, project management, dedicated resources, and software development*.

- Steering committee
  - Scope of the ERP project and resources defined, as well as access to resources.
- Training and Education
  - Support users with proper training and education on the new ERP system, new business processes and new job tasks will help them cope with the transition and excel efficiency after go-live.
- User involvement
  - Spark end users to participate and contribute to the project, with the intention to improve understanding of the new ERP systems and limit user and organizations resistance.

Ng. et al (2001) and Collins (1999) defined several reasons for upgrading the ERP system and by using the theory, the first research question is:

- What are the reasons for this ERP upgrade project?

This study aims to identify and assess the most important issues in relation to the ERP upgrade project that Company X conducted and hence:

- What are the major factors associated with Company X's ERP upgrade project?

Eleven major success factors have been identified above in the literature review and by using Collins (1999) upgrade phases; the complementary research questions in this study is:

- What are the major success factors associated with each of the four ERP upgrade phases, in Company X's ERP upgrade project?

### **3 Methodology**

*This chapter presents the research method used in this study. First, qualitative research method is presented, and then qualitative data collection is discussed including settings, participants, measure instruments and data collection procedure.*

#### **3.1 Introduction**

Considering the amount of resources needed to conduct an upgrade of the existing ERP system and the little research available of the subject as such, it's appropriate to increase knowledge about this matter. The offshore drilling company in question recently conducted an ERP upgrade project and yielded much knowledge and experience. This study aims to harvest some of this information and align it against literature theory and by such, try to attain an understanding of critical success factors in ERP upgrade. By assessing the reasons for why this particular IT –project was conducted and understand the critical success factors in each phase of the upgrade project as such, would greatly benefit project and CIO –management in their analysis.

#### **3.2 Research alignment**

One major cited author in method literature, Yin (2003), argues that academic research can have the three main purposes:

- Exploratory studies
  - Exploratory studies are practical if you seek to increase your understanding of an issue. The main goal is to explore situations where the intervention being conducted has no clear set of outcomes. (Yin, 2003) “What is happening; to seek new insight; to ask questions and to assess phenomena in a new light”. Exploratory studies try to define the research question and form hypotheses, and the collection of data occurs before any theories or research questions are generated.

- Descriptive
  - Descriptive studies go somewhat further by trying to describe the characteristics of a phenomenon, but without providing substance and understanding to its underlying cause. (Lekvall & Wahlbin, 2001) A descriptive study is useful when you want to display a case, a process, a situation or an event and the real-life context in which it occurred. (Yin, 2003) This study is also appropriate when the problem is structured, but the intention is not to analyze the connection between causes and symptoms. (Kalbasi, 2007)
  
- Explanatory
  - Explanatory is useful when you want to establish and seek answers to casual relations between variables. (Yin, 2003) As opposed to descriptive studies, explanatory studies provide substance and understanding to its underlying cause. (Lekvall & Wahlbin, 2001) It's useful when the research area has matured. The main goal is to examine the issue in order to explain the relationship between the variables. (Kalbasi, 2007) "Theory is used in order to understand and explain the exact, rather than to produce generalizations". (Ryan et al., 2002)

The purpose of this study was to attain critical success factors for ERP upgrade; a task that given the reasoning above could be conducted with a descriptive alignment. However, this case study draw parallels to previous literature to understand such practices and thus to some extent, also holds characteristics of an explanatory case study.

### ***3.3 Research approach***

Literature recognizes two types of research methods (Dalland, 1997); quantitative or qualitative. We usually distinguish between qualitative and quantitative methods. Quantitative method has the advantage that they aim to shape the information into measurable units, which in turn gives us the ability to make calculations. Quantitative methods are often set up in contrast or contradiction to the qualitative. As mentioned, the quantitative method makes it possible to collect data that can describe the phenomenon by using numbers. There are

methods where the researchers first systematically obtain comparable information on several devices of a certain kind. Then this information is expressed in terms of numbers, and finally analyzed the pattern in the figures. (Dalland, 1997) As where quantitative methods are research dealing with amounts, quantities and anything that is measurable, qualitative methods is not. Qualitative methods deliberate gives up on quantity, in order to better reach in-depth-analysis of the object being studied. (Berg, 2001) The qualitative methods will take a greater extent intended to capture the meaning and experience, that can't be quantified or measured. Common to the two methods courses is that they are trying to contribute to a better understanding of the phenomenon we are researching. Beyond this, they are quite different. (Dalland, 1997)

### **3.4 Research strategy**

Zhao (2007) argue that case studies should be conducted in the future to get deeper understanding of ERP upgrade in different aspects. Given the complexity and abundant factors of ERP in general and that companies are reluctant to communicate about their ERP systems; many researchers adopt a case study design to attain information. According to Yin (1994) only case study method can provide in-depth information of the “dynamic and changing conditions of current IT –systems”. Case study method seeks to gain a rich understanding of the context of research and processes being adopted, and it's a powerful tool to solicit important issues of ERP upgrade.

Although the case study is a form of empirical enquiry, many researchers disdain the strategy. According to Yin (2009) this is because too many times, authors of such studies are too sloppy, producing little rigor case studies. Another argument put forward by Yin (2009) is that they provide little basis for scientific generalization. “How can you generalize from a single case?” is a question often put forward. Yin (2009) advocated the case study design by saying that “case studies, like experiments, are generalizable to theoretical propositions and not to populations or universes”.

### **3.5 Setting**

The research sites were mainly at the offshore drilling company's and ERP vendor's respectively headquarters. The offshore industry is classified as a part of the maritime cluster, defined by the International Maritime Organization. Typical characteristics for the offshore drilling industry are large assets, high pace and dynamic turnarounds to maximize the yield for each drilling rig. Some of the most wanted drilling rigs operating in this business can have a day rate as high as \$500,000 – 600,000.

### **3.6 Participants**

Due to the qualitative research approach of this study, the sampling has been conducted with purposive sample in mind. A purposive sampling imply that individuals and sites have been selected based on certain criteria's that are considered important for the study. (Bui, 2009) All of the participators of the research were strictly voluntary, and all of the involved parties were informed of the purpose and nature of the study. Participants were given full anonymity and all data collected was strictly used to fulfill the requirement of this study. Participants of this study included seven project members from both parties, including the ERP project manager, consultants, a technician and a solution architect from the ERP vendor. Furthermore, participants from Company X's project team including, the project owner and the project champion, were involved in the study. The variety of the participant's background, level of involvement and area of responsibility fit Collins (1999) suggested list of members that should participate in such an ERP upgrade project good. The participants involved in this study have all been working with the given ERP upgrade project as such. They were the actual personnel that carried through the ERP upgrade and best understood both the previous and upgraded ERP system.

### **3.7 Data collection**

According to Yin (2009) a good case study would rely on using several sources for information. In order to acquire information from several sources, qualitative research often tends to use observation and interview as main measure instruments. (Bui, 2009) To obtain

the data for my research I have used my own research-made instruments. Research-made instruments are preferable for my research, since it gives the author the chance to fine-tune the instrument to be more sensitive to what is being studied.

### **3.7.1 Interview**

The first instrument used was semi-structured interviews. The interviews were the primary data source in this research. According to Yin (2003) interviews are the most important sources for case study. Interviews main purpose is to interpret the meaning of central themes in the interviewee interpretation of the situation. The interviewer registers and interprets the meaning of what is being said and the way it is said on. The interview aims to obtain qualitative knowledge, expressed in common language. It does not attempt to quantify. In order that the description should be adequate, it is often necessary to ask supplementary questions. (Dalland, 2007) What characterizes semi-structured interviews is the list of predefined themes and questions that should be covered, although these may vary from interview to interview. This allows the interviewer to leave out some themes and even follow up with other questions that aren't predefined. The nature of this measure instrument strongly calls for a notepad or tape recording. (Sounders et al., 2000) The interviews were taped with a Nokia mobile phone E52, with the participants consent.

The semi-constructed interview questions are listed in the appendix. These questions were tuned and changed to some extent during each interviews and to whom the interviewees were. Furthermore, each participant was sent a short summary of the main theory that this research is based on. Thus, the participants were able to identify and recognize the research topics and questions and at the same time clarify whatever discrepancies. Based on the questions, the interviews have been conducted as a conversation, where I encouraged interviewees to talk freely around the areas I was interested in. During the sessions, I emphasized that each interviewee may express his/her personal opinions and views. Each interview lasted from 30 to 40 minutes.

### **3.7.2 Observation**

The Observation method involve that the researcher observe and records interactions or ideas from the given subject. The observation method gives the researcher the opportunity to participate in, and understand the problem area in a better way. Qualitatively oriented observation is obvious when the phenomena, is to be studied in their natural contexts over time. The goal is to attain more complete information, the most complete picture of what is examined. The approach is open with a low degree of structuring in advance. We are interested in people's subjective experiences and the interaction between them, and we will know the purpose or meaning people have with what they do. (Dalland, 2007) The author has had the opportunity to closely follow the ERP project, from start to end, giving the author's firsthand experience.

### **3.7.3 Written documents**

Another type of measure instrument were also used, namely collection of already collected data. This included collection of documents related to the ERP upgrade provided by the ERP vendor and the offshore drilling company. The goal was to complement the findings from the interviews from the qualitative study. The documents related to the ERP upgrade project acted as secondary data in this research.

### **3.7.4 Validity**

In terms of an instrument, validity is the degree to which it measures what it is intended to measure. It's important to take into account what methods used when conducting measuring: Does the method used measure what it is intended to measure? (Dalland, 2007) Since a research design is supposed to represent a logical set of statements, you should also be able to test and judge the quality of these statements. Yin (2009) argues that there are three tests that can be used to confirm validity:

- Construct validity
- Internal validity

- External validity

Yin (2009) also dispute that internal validity is mainly a concern for explanatory case studies and that external validity deals with the issue of making generalization of the case as such. Since this study is mainly descriptive and don't seek to make generalizations, internal and external validity will not be taken into consideration.

Construct validity seek to identify correct operational measures for the concept that is being studied. (Yin, 2009) Construct validity test includes three main tactics: Use of multiple sources of evidence; Establish chain of evidence; Have key informants review draft case study report. In general, all interviewees had extensive knowledge of the ERP upgrade project as such, both from ERP vendor's perspective and the offshore drilling company's perspective, covering the requirement for multiple sources. Complementary, documents and all sources that have been collected from the initial research question to the final conclusion, have been referenced. Furthermore, the author has taken some principles into account, to utterly provide validity: Questions considered to important, have been forwarded to more than one participant to secure that the information was trustworthy.

### **3.7.5 Reliability**

Reliability means dependability or trustworthiness. It is the degree to which a test consistently measures whatever it measures. Would a later researcher conclude with the same findings, if he/she conducted the same case study all over again? The meaning with reliability is to minimize the errors and biases in a study. (Yin, 2009) Some principles were taken into consideration to ensure increased reliability of the case study: Interviews were booked in advance, to allow the interviewees to take reasonable actions for best outcome. Furthermore, the semi-structured interviews were sent out prior to the interviewees, so that they could prepare the answers. Seeing the author has knowledge to both involved parties, during and after the mentioned ERP upgrade project, he feels that he to some extent, had the ability to attain the accuracy of data in a proper manner.

### **3.8 Qualitative Data Analysis**

The meaning with data analysis is to break down raw data into understandable chunks. This is necessary in order to be able to interpret the data and draw out the major themes and patterns. (Bui, 2009) The data analysis in this study was a continuous process. Secondary data was available from start to end, but the primary data was first collected in the latter period of the study. The analysis has been conducted by balancing chosen theories and empirical data in accordance with the purpose of the study. As such, primary raw data from the interviews and secondary data from the already collected documents were processed and analyzed to the themes of ERP upgrade.

## **4 Empirical findings**

*In this chapter I will present the empirical findings from the qualitative data.*

### **4.1 Introduction**

Company X initiated this project and the goal was to lift the old ERP system to a newer version, provided by the same ERP vendor. ERP systems consist of software that can handle a large variety of work processes i.e. like maintenance, engineering, distribution, finance, production planning, shipping, project, human relation etc. The former ERP system VAM, consisted of the modules maintenance and distribution, and hence the project goal was to upgrade these. The project lasted 9-10 months and as such was completed on forecasted time. The system was delivered on time, to budget and met the requirements for the solution itself. As such, the ERP upgrade project was a success according to contractual goals set in cooperation between Company X and the ERP vendor. The total people involved, spanning from software developers, application consultants and to end users like rig operators and storemen, counted around 80 people. However, only seven to ten people made up the project core team with enough knowledge to answer my research questions, from both Company X and ERP vendor side.

The interviews with the members of the project team yielded five themes, after coding and analyzing of the narrative data. The themes user involvement, project management, external support, internal support and communication are presented in detail. Finally, the major factors associated with each phase of the ERP upgrade project are presented, as rated by the interviewees. The quotations presented come from analysis of the narrative data and already collected documentation.

### **4.2 Reasons for the upgrade project**

The literature review has shown that upgrading an ERP system is an expensive endeavour. I wanted to know the reasons and motivations behind this project as such, and question three and four were used to produce the answers. Question three asked for what were the reasons

for the upgrade of the existing ERP system. The data revealed that there were several important reasons; however one in particular was more important than the others.

#### **4.2.1 Technical Upgrade**

Interviews of the project team members revealed that this ERP upgrade project was first of all a technical upgrade. A technical upgrade is an upgrade that intends to move the ERP system onto the latest technology platform, without implementing new functionality that would change user behaviour or business processes. In other words, the main motivation behind this project was the requirements for a newer ERP system, which could meet the new technical and operational challenges of Company X's business needs without changing their way of doing things. "As is", was a commonly used word to describe the desired new solution in relation to business processes.

Company X, now a global contractor with drilling units all around the world, had other requirements to the ERP system than the VAM was designed to provide. Company X wanted an "offline solution", whereas they weren't to dependant on satellite connection and latency interference when operating far at sea. But before they could utilize this operational feature, they had to upgrade the existing ERP system to the latest version and technological platform.

In situations where a drilling rig is operating in an area with little or no satellite connection, the operations still have to work as normal. But how should the storeman that require new spare parts, be able to send his purchase order to the procurement department located onshore, when there is no connection between his system and the main servers onshore? In order to overcome this issue, Company X said that the ERP system would need to track and memorise all operations and records conducted locally, even without the possibility to send this information to the main servers onshore immediately. So his actions would need to be stored in the system and replicated to the main servers when connection was re-established. As for the storeman, he would not notice anything, since this feature would be handled in the background by the system.

Back to the example, the storeman still needs to forward his request for spare parts to the procurement department located onshore for further handling, but without live connection this action has to be saved until connection is re-established. In other words, Company X wanted

an ERP system that worked even during “offline” from the rest of the organization. This was called a replication solution, and required a newer technological platform than the VAM system could provide. Before Company X could begin with this “offline” solution, they first had to upgrade their existing solution onto the latest technological platform, provided by the ERP vendor. As such, the technical upgrade was a necessity before the Company X could go forth with the replication solution, which would render the satellite connectivity issue not a problem anymore. This “offline” or “replication” –solution would be possible to utilize after the new ERP system had been introduced.

*“VAM couldn’t handle the demand for replicating data when no or little satellite connection existed”.*

#### **4.2.2 Support**

Although the demand for an “offline solution” was the main trigger for this project, several respondents mentioned other motivations that spawned or emerged from this main reason. Support was mentioned the most, as in not being able to support the VAM system. The previous ERP system Company X had before VAM, lost support from its ERP vendor, due to a combination of age and service not being provided. Company X didn’t want to experience the same thing with the VAM system; they therefore sought to initiate the upgrade project before VAM was obsolete or the ERP vendor stopped providing support. Literature has argued that ERP vendors stop providing support for an old version 12-18 months after the next release. (Collins, 1999) However, data revealed that the ERP vendor did in fact support VAM long after the next release, although their experience of VAM was diminishing simply because of its age. The VAM solution was a customization from the beginning, as it was designed from scratch. The technological designs of the VAM system code were not used in the next releases, meaning it required a substantial inside knowledge of how to provide service for it and that the VAM design was one of a kind. It was pointed out that there were fewer and fewer people that knew how to use and support the VAM system, and a proportional increase in cost to keep a sustainable support agreement up to date. This situation was identified as a potential risk for the day to day business for Company X, as they relied on having a competent external support.

*“Fewer and fewer people know how to support VAM”.*

### **4.2.3 Age and Customizations**

The data produced from question three displayed that there were other reasons as well, to why Company X needed a new ERP system. One other factor included the age of the existing system itself. Given the pace in today’s development of information technology, an ERP system that is seven years old, is in fact out of fashion and the old technology were identified as being inadequate for Company X.

Customizations were also mentioned several times during the interviews. VAM, being very customized, required a substantial maintenance cost to keep the system up to date with new patches, fixes and maintenance of user data. The amount of customizations also required a substantial inside knowledge of VAM propelling support costs, so minimizing the number of customization would be a win-win situation.

During observation I had the opportunity to get first hand impression of the former ERP system VAM. These impressions correlated well with the interviewees answers. Observation displayed that the VAM solution diverged in many ways compared to the new version provided by the ERP vendor. First of all, the amount of features that the new version included surpassed VAM in every business aspect, potentially improving Company X possibilities to utilize the ERP system in a better way. Data also revealed that the new version of the ERP system now included features which previously were classified as customization, as standard core functionality. For instance, Company X has large and very expensive assets in their stock, ranging from small electrical equipment to large generators, providing propulsion on their rigs. Much of this equipment is considered dangerous and is therefore under strict rules and regulations. In many cases, certificates are required to serve this equipment. Whereas VAM had a local customization to handle the certificates requirements, the new ERP version had this as standard functionality, meaning there was no need for a customization. This was just one example, but observation of the old ERP system compared to the new revealed several of these differences. Thus, there was less customization done to meet Company X special requirements, since the new ERP system could provide so much more than VAM. Some customizations were done in the new ERP system, but simply to provide the same

special features that VAM provided. Observation had concurred that there was great potential in upgrading from VAM to the new version, although changing the way of doing business was not the goal here.

Question four listed the main theories used as to why upgrade an ERP system, and the interviewees were asked to reason for in which category their arguments belong to. Data revealed that most of the arguments had characteristics that could reason for belonging to the “New, expanded or improved” and “Eligibility for support” –category. “Solution for outstanding bugs or design weaknesses” was not identified by any respondents as important in this upgrade project.

All answers and observation data argued that Company X initiated this ERP upgrade project due to the limitations of the existing system, to handle today’s operational requirements and the risk of support obsolescence. The foremost important motivation was the technical requirement for an “offline solution”, which VAM could not support.

### **4.3 Qualitative themes**

An analysis of the data yielded from the participant’s interview answers, revealed findings within the area of the research questions. The data produced were grouped to correspond with the research question and then categorized for major themes. Five themes emerged as more important than others. Question five was used to produce the data, however some themes are entangled together and some feedback from the interviewees cross several themes. The themes project management, external support, communication, internal support and user involvement stood out from the rest.

#### **4.3.1 Project management**

Project management is the process by which projects are defined, planned, monitored, controlled and carried out, to achieve a desired outcome. Headwords related to project management was brought up seven times by seven interviews. The data from the interviews and collected documents underlined the importance of good project management. However,

project management is a widely used terms, so the interviewees were asked to be more specific. The majority of the respondents mentioned dedicated resources as one of the important project management features. It was pointed out that the project as such, beneficially had dedicated and experienced people from all involved parties, including Company X and the ERP vendor. It was especially important that some of the project members had extensive knowledge to the old ERP system VAM.

*“Very flexible and motivated project members”.*

Planning and control with the dedicated resources was also mentioned several times and is clearly one of the main characteristics of project management. (Zhao, 2007) Project management managed to put to use resources across organizations within the ERP vendor in a good manner when there were peaks in the workload. The review of already collected data did however emphasize that the planning of the ERP upgrade project as such, had room for improvements. Some of the comments were that there should have been a higher intensity earlier in the project, and that this should have been adopted into the project plan. Irrespective of that, the majority pointed out that the planning in general was good and doable.

*“Recognizable planning, which gave a good and fast overview of status and upcoming tasks”.*

Alas, the participants said that in the initial period of the project things weren't running smoothly enough. This was related to the fact that the project itself, was underrated in relation to the work that had to be done in order to reach project goals. It was also mentioned that the project management at that time, didn't manage to apprehend the situation in an acceptable manner. The project review done in the first phase, had assessed the technical and operational scope properly, but failed in realizing how much work that had to be done to reach project goals. Therefore, halfway in the project it was reviewed once more by top management from both Company X and the ERP vendor, and a new project management was introduced. Budgets, scopes and resource demands were re-adjusted for the task at hand, by the new project management. It was unanimous recognized by the interviewees that the project turned to the better after this reiterated project review. Data also revealed that things became more hands-on after new project leaders had been introduced to the project and planning and minutes of meeting increased in quality and frequency. The respondents underlined that the

project would not have met the timeframe in time and required solution design if there hadn't been a reassessment of the upgrade project midway.

*“Project manager skills and commitment during the "second half" of the project ensured project success”*

### **4.3.2 External support**

Since ERP systems are complex, most organizations use ERP vendors or other external professionals to help them with setup, installation and customizations. External support in this matter, relates to the consultants, advisors, solution architects and business analysts that contribute to the project, but are not part of Company X. The external support in this project relates mostly to the people participating from the ERP vendor. According to Somers and Nelson (2004), vendor support is an important factor when it comes to post-implementation stages. Especially when talking about extended technical assistance, emergency maintenance, updates and special user training. Therefore, data from the interviews identified external support as a major contributor to projects success. It was mentioned during the interviews that that ERP vendors understanding of Company X needs and understanding of requirements were of significant importance for the project as such. The ERP vendors understanding of the situation helped the project to properly define the technical and operational scope in the initial phase.

*“Vendor understanding of Company X needs and requirement boosted project process”*

Literature review has pointed out that hiring consultant can consume as much as 30 percent of the overall ERP budget, and as such external support should be monitored carefully so it doesn't excess budget amount. (Bingi et al., 1999) Many of the core team members were external and all the ERP system developers located in Sri Lanka were external. External support can to some extent be tangled with project management, as the experience level of the participant is founded in both success factors.

*“The level of experience within the consultants were more than adequate”*

The software developers located in Sri Lanka was especially identified as crucial by the project team members from the ERP vendor. The interviews said that the good cooperation with this advocacy group was particular important. Sri Lanka managed to keep up with the peaks of software changes that emerged during the project, with a quick turnover and continued development of customizations that needed focus. This vigorously effort was especially visible during the software development phase. The experience level of the external support is of importance for the project as such. If the project is to rely on external support with the wrong level of knowledge or experience, the increased costs would influence the budget. Given that the ERP vendor had delivered the previous ERP system to Company X some years ago, very good relations already existed and it was identified that this was for the better for the project as such.

*“Personal relations between ERP vendor and Company X participants was beneficial”.*

### **4.3.3 Communication**

Communication was pointed out as important by all interviewees. As communication is the process of sharing information, in same way “corporate communication” refers to the communication that is issued by a company, either verbally or written. Expectations and scope must be communicated effectively among stakeholders and throughout all levels of the organizations. (Nah & Delgado 2006) Data revealed that from the beginning to the end, there were frequent project meetings. This helped the project team and all the other external and internal relations to be up to speed on what was going on in the project. The frequency of project meeting also made it possible to issue tasks and overcome issues in plenum. It was appreciated that the project management took advices, in relation to hinder and obstacles, from the rest of the project members into consideration.

Apart from the meetings, telephone conferences and weekly summaries through mail was also maintained. Since Company X had good relations to the people from the ERP vendor and vice versa, there were no constraints in picking up the phone to solve whatever issue at hand. To communicate with the many software developers located in Sri Lanka in a good manner, the project used a team member which spoke Sri Lankan. Although the project language was English, and that all involved parties spoke and understood this, data revealed that it was

beneficial to have some translation of very technical specifications into Sri Lankan. As mentioned in project management, communication was adequate in the first phases of the project, but increased in quality and pace in the latter project period. The boost in communicational quality surely helped the project finish on time.

#### **4.3.4 User Involvement**

User involvement was recognized by several of the interviewees as exceptionally good. Literature (Zhao 2007) argues that in general, ERP represents a “threat” for the user’s perception of control over their work and responsibilities. Thus is user involvement something that should be prioritized, so that the resistance for introducing ERP is minimized. Company X addressed this and flew in several end users from around the world, to participate in the initial phase of the project. The same users were frequently used to test the developed solution later throughout the project. This was recognized as positive for the project itself, that end users were able to participate in the early phases of the project and that they communicated valuable information, which the project team wouldn’t have assessed any other way. With end users present, the solution architects of the project team were also able to assess “how, what and why” –questions regarding their daily work processes. By doing this, the project avoided being caught by surprise later on, if things were wrong from the beginning. As such, overcoming obstacles with the end users in the early stages of the project, the project helped to minimize cost. An error or a flaw discovered later or in the end of a project is much more expensive to handle than addressing it before it becomes a problem. Some of the interviewees identified user involvement as motivation and said that the high level of motivation in the project team ensured the project’s success.

#### **4.3.5 Internal support**

In this project, internal support was mentioned as an important factor for the outcome as such. Internal support involves all kind of support from inside organizations, and includes two other sub groups: teamwork and cooperation. Data revealed that internal communication within Company X was good, and that issues were quickly brought up on the agenda. Company X used a third party vendor to handle the technical aspects of running the ERP systems. This

third party company was tasked to provide servers, technical support and installation of the server's parks that Company X needed to run the new ERP system. This cooperation worked well, and it was underlined that the technical support of the project as such was flawlessly conducted. Although Project champion is not part of internal support, this projects champion was an internal resource within Company X. This person's knowledge of the ERP system helped the project drive forward significantly, and was in many cases considered a stabilizing factor that helped the project to keep on track. A resource of this magnitude, which was highly capable within the ERP system itself and also had extensive knowledge of project management as such, made the internal support essential.

Apart from the five major themes, the respondents rated commitment as an importance for the project. It was mentioned several times that that this project would not have been possible, if the commitment had been very low or not present at all amongst project team members.

#### **4.4 Success factors by each phase**

Each of the interviewees was asked to define important factors in each upgrade phase for this project, amongst the critical success factors that literature listed. Seven respondent's answers were put into table below to give a better overview.

<u>Phase 1: Impact analysis and initial upgrade</u>	<u>Respondents</u>	<u>Percent of respondents</u>
1. Communication	7	100%
2. Project Management	6	86%
3. External support	5	71%
4. Business vision	5	71%
<u>Phase 2: Solution Development</u>	<u>Respondents</u>	<u>Percent of respondents</u>
1. Communication	7	100%
2. Project Management	6	86%
3. External support	6	86%
<u>Phase 3: Acceptance and performance testing</u>	<u>Respondents</u>	<u>Percent of respondents</u>
1. Project Management	7	100%
2. Communication	7	100%

3. Internal support	6	86%
4. External support	6	86%
5. User involvement	6	86%
<u>Phase 4: Production conversion</u>	<u>Respondents</u>	<u>Percent of respondents</u>
1. Project Management	7	100%
2. External support	6	86%
3. Training and Education	6	86%
4. Communication	5	71%
5. Internal support	5	71%

Table 4.4 – Success factors by each phase

The table above contains the factors which gained a score higher than five. The factors that had less than two third or 66% of the respondents marks were discarded, as they didn't represent majority. However, the answers were quite consistent in selection of success factors by phase. Question six where used to produce these answers.

#### 4.4.1 Phase One - Impact analysis and initial upgrade

In the impact analysis and initial upgrade -phase, communication was ranked the single most important factor than contributed for this project success. According to the well cited Nah & Delgado (2006), communication should be open and complete to guarantee honesty. In second place and ranked by six interviewees came project management, and external support and business vision respectively took third and fourth place. Business vision is according to Nah & Delgado (2006) very critical and should specify benefits, resources, costs, risks and a timeline. A joint solution review was held in this phase, with participants from Company X and ERP vendor, where the project team tried to assess the situation. End users and process owners from Company X where flown in from around the world to support the solution review meeting, however user involvement and internal support was only chosen as important by three participants in this phase. Although Company X's initial goal was a mere technical upgrade, secondary goal was to minimize the amount of customizations. In order to achieve this, it's necessary to map what customizations that can be excluded due to a workaround by using the core application. This task is best solved by the external support as they are the ones knowing the new ERP systems possibilities and limitations. Zhao (2007) argue that external

support have a substantially role in ERP upgrade projects. Data revealed that communication acted as glue in this phase, keeping every involved stakeholder up to date on what was going on.

#### **4.4.2 Phase two - Solution development**

In the solution development –phase, communication was ranked the most important factor, closely followed by project management and external support. Second phase is where the solution is developed, and initial testing conducted in a dummy environment. This solution testing was done by the project members from the ERP vendor and as such, external support was identified as important by the interviewees. A substantially part of the work done in this phase, was conducted in Sri Lanka, where all the developers were situated. Good communication to this task force boosted the quality of the product and as such was indentified important, especially by the ERP vendor project team members. Data revealed that according to the ERP vendor’s work methodology “solution development” was not the correct term to use, because this was an upgrade project and not an implementation project. The solution already existed and the ERP vendor said that they used the term “Solution establishment”. The major part of the work done in Sri Lanka was the customizations that needed to be developed, as these customizations was specially designed for the VAM system and wasn’t supported by new ERP system.

#### **4.4.3 Phase three - Acceptance and performance testing**

In the acceptance and performance testing –phase, project management and communication was ranked as the most important by all interviewees. The respondents thought this phase to be very important, as internal support, external support and user involvement was also listed as major factors by six out of seven respondents. According to Nah & Delgado (2006) effective project management is crucial to the success of ERP upgrade. Project management is the executive force and is responsible for carrying out the tasks that need to be conducted to reach project goals. This phase is recognized by final testing of the established solution and literature (Collins 1999) say that in opposition to the testing done in phase two, there is a more accurate test environment in this phase. Data revealed that the ERP vendor work

methodology included making a copy of the live production environment to have the most accurate environment when testing in this phase.

During this phase, Company X initiated several test meetings where participants throughout the organization were able to participate and test the established system. At these meetings, Company X's own super users including the mentioned project champion and project members from the ERP vendor acted as support for the end-users testing the system. When deviations and defects were discovered by the testers, external project members from the ERP vendor noted and reported these issues back to project management. Project management then initiated the proper actions to cope with the immediate issues. As such, internal support, external support and user involvement was subsequently defined as important. At the same time, the ERP vendor halted any ongoing development being deployed into Company X live ERP production environment. This was done because upgrading a "moving target" is almost impossible. (Collins, 1999)

#### **4.4.4 Phase four - Production conversion**

In the production conversion phase, project management was again ranked as the most important factor. Six out of seven said that external support and training and education were important factors. By now, the newly established ERP system should be well tested and ready for conversion into the day to day live production system. This phase is recognized by much technical challenges according to the interviewees, as there are enormous amounts of data that need to be transferred from the old system over to the new system. This task was carried out by the technicians from the ERP vendor and was successfully completed on time. Furthermore five out of seven interviewees said that communication and internal support were crucial factors that secured the project's success. The answers from the interviewees underlined that the communication from project management and in between the internal and external support boosted the quality of the technical deployment.

Several respondents mentioned the value of proper training and education. Company X ran in parallel with the acceptance and performance testing, own internal courses where the goal was to lift the basic knowledge of the new ERP system for their end users. This process continued in the production conversion phase. Literature (Bhatti 2005, Khaled et al 2008) say that

training and education is factor that shouldn't be underrated, as it potentially ensure that rate of successful use of the ERP system after the project upgrade. This phase is in opposition to the other phases, the shortest one.

## 5 Qualitative Discussion

*In this chapter the main reasons behind this upgrade project will be addressed. Next, the themes project management, communication, user involvement, external support and internal support are debated. Lastly, the dominant factors related to each project phase are accounted for.*

ERP systems being the fastest growing branch in IT software industry has attracted much publicity. There are numerous stories of ultra large conglomerate companies being stuck in an ERP implementation quagmire. (Olson, 2004) Hence, with so much assets and resources at stake, much research has been made to ascertain the concealed elements about ERP implementation. Alas, this is not the case for the latter period of ERP's lifecycle, namely ERP upgrade. The offshore drilling Company X initiated autumn 2008 a large IT project, where they sought to replace and change their existing ERP system. This project lasted roughly nine months and came to closure in summer 2009. The purpose of this qualitative study was to identify the motivation behind this costly and time consuming endeavor. The investigation also sought to determine the most important factors in relation to ERP upgrade and project phases, in an attempt to offer further research on the subject.

### **5.1 What are the reasons for this ERP upgrade project?**

For an expanding organization like Company X, from time to time new requirements emerge to cope with different difficulties or limitations. For Company X, such a requirement arose when it was clear that their existing ERP system – VAM - was inadequate to serve their growing amount of drilling rigs. Company X's cash flow is generated by their drilling and tender rigs, and they are as such measured by the extent of service. Many of Company X's rigs are on long term contracts, some yielding a day rate as high as \$500,000-600,000. Needless to say, a downtime in any of these units is a considerable loss in profit as they don't get paid when the rig is inoperative. Hence, Company X strive the utmost to have 100% extent of service. In this manner, Company X want to remove bottlenecks that may mismanage the rate of service provided.

### **5.1.1 Technical upgrade**

According to the interviewees, the main bottleneck in Company X in relation to ERP was the lack of ability to use the existing ERP system when there was no or little connection. As ERP systems, out of the box, require connection to the main server situated onshore, when the drilling rig then loses connection due to geographical position or weather conditions, the main ERP operation and reporting tool is left idle. Should a requirement for a spare part or a maintenance job arise during this idle time, then there would be no means to communicate this in a proper manner through the use of the existing ERP system. Although this is worst case scenario, it was unison identified by the interviewees that a solution for this bottleneck sparked off this project. In this manner, Company X identified VAM as a future bottleneck and as such, initiated the ERP upgrade project in order to take advantage of the technical enhancements the new ERP system could provide.

Given the fact that VAM was 7 years old, core knowledge about this system had built up within Company X, and apart from the fact that VAM didn't have the technical characteristics to support a future offline solution; it's likely to think that the users were satisfied with the day to day business. Otherwise the need for a change in ERP system had emerged before.

### **5.1.2 Support**

When the decision to upgrade first was made, it became clear that there were several other motivations that spawned out from this main trigger. Support being one of them, was mentioned by interviewees as another future bottleneck, given the unique design of the VAM system. We've seen that literature argue for a stop in the support from the ERP vendor, when the system reaches a predefined age after the release of the next version. However, the interviewees said that although there were difficulties upholding a competent level of knowledge, they still provided support service after all these years. The ERP vendor wouldn't have produced this support if it hadn't been profitable; thus the scenario of closing the support agreement for Company X was less lucrative than upholding the extent of service.

One main reason for the continuing support agreement is that Company X, in its expanding embodiment, constituted for a feasible large customer project for the ERP vendor in the future. Another reason is that with ERP systems comes a onetime license fee that every

organization needs to pay for the usage of the system, and a maintenance fee that grant organizations support and maintenance of the system, including customizations. We recall that VAM was a highly customized solution, due to its heavy WEB –based design and as such, generated a steady maintenance income for the ERP vendor.

Thus upholding the support agreement clearly had more benefits than terminating it and we can't fit Company X's case to the theory about de-support after 12 to 18 months. (Collins, 1999) However, it should be noted that some respondents from the ERP vendor said that cost and resources to uphold enough competence level about VAM was increasing, and that it was inevitable not to do anything about the support agreement in the future.

### **5.1.3 Age and Customizations**

Customizations were also mentioned by the interviewees as an area that would benefit from an ERP upgrade. Minimizing the many customizations done in VAM by utilizing more of the core functionality incorporated in the new ERP system, would also lower the maintenance costs. This is because organizations pay a regular maintenance fee in relation to the amount of customizations. Though minimizing the amount of customizations and increase usage of core functionality would mean less maintenance income for the ERP vendor, it would at the same time lower the cost and resources spent to uphold the support agreement. By making the system more standardized, it's likely that this was a win-win situation for both parties.

If we take for ones basis that Company X previous ERP system was out of date in both a technical and operation manner, it's reasonable to say that the upgrade was a result of Company X being backed up into a corner. Company X had the option to continue the existing situation with a well known, but limited ERP system. Or upgrade into the latest version, to reap benefits of the new technology available for the longing "offline" solution. This situation is similar with the survey done by AMR research (2004) whereas almost 50% of the respondent companies said they waited to upgrade until they were backed into a corner.

## ***5.2 What are the major factors associated with Company X's ERP upgrade project?***

### **5.2.1 Project management**

Project management was promptly rated a main influencing factor for this ERP upgrade project's success. We have to remember that even though such a project is prioritized by the top management and steering committee, it's very often run in parallel with the traditionally daily work. This is because, in today's world of free trade and competition, an organization will always strive to increase its margins. Therefore, limiting costs is one of the efficient ways to increase margin of profit. Hence, there is scarcity of labor resources, since employees cost a lot of money and you will normally try to limit your labor costs. This situation also applies for Company X and the ERP vendor in question. In other words, they couldn't afford the luxury of having project team members working solely with the upgrade project.

This is why project management is rated as so important, since the significance of project management comes from its focus on achieving the objective that might be terminated by the concentration of people doing their day to day work instead.

Project management is a set of agreed knowledge rules that allow one to manage and communicate all details, plans, schedules, budgets, people and performance needed to achieving project goals. In other words, project management is important since it applies managerial processes and has its good tools that provide for an opportunity to succeed in achieving our project objectives. Project management is well noted as important in relation to project success. (Kim et al., 2005)

What is interesting to note in this case is that project management was identified by several respondents as "not good enough" in the project's early phase. The criticism was that the project as a whole weren't assessed well from the beginning. The mere technical challenges that had to be done, in order to upgrade from VAM to latest ERP version had indeed been well intercepted in the solution review. But these data had not been transformed properly into the project plan. The amount of time and resources needed to conduct the technical upgrade wasn't correctly ascertained. The progress pace wasn't sufficient and in particular, the

planned amount of work was not in line with the forecasted and communicated agreements. There are multiple reasons for this situation.

Firstly, the competence level of the top project management weren't fit with the task at hand. Company X's top project manager was hired in from a large third party consultant firm, and although more than experienced enough, didn't know much about ERP in the first place. Secondly, top project management in general didn't have the correct information available and thus made the wrong decision on the wrong basis. This was because there hadn't been sufficient situation assessment and the project had been addressed too lightly. A pilot project would have attained the current situation in a better manner, but this was dropped because Company X weren't seeking to improve its business process. Company X wanted the new ERP system to be "as is", like VAM in other words, in relation to its business processes. It was therefore decided that such a pilot project was unnecessary. This "as is" requirement led project management to think that this was a much easier endeavor, than it actually was.

Fortunately, key members in Company X's organization and amongst other, the project champion, saw that the situation needed to be re-assessed midway during the project. In cooperation with the steering committee, the existing project managers were replaced and the project shifted in both pace and quality. It's likely that this action prevented the ERP upgrade project from being one of those failed projects that literature warn us about. (Standish Group, 2004) It's most certainly not enough with dedicated resources, if the managerial qualifications and project's foundation is wrong, as so clearly depicted in this business case.

## **5.2.2 Communication**

Communication was also mentioned as a crucial factor that affected this project's outcome. The presence of communication is obvious; alas it's not elementary that the communication is of such quality that both sender and receiver understand the message being communicated. It's appropriate to link communication to the project's re-assessment action that took place halfway in the project. These influencing factors are very much merged together, but it's fair to say that lack of communication was one of the reasons for the misinterpretation during the project's initiation phase. Although the project had weekly project meetings, even in the initial phase, it later became clear that the minutes of meetings where almost non-existing. A

minute of meeting is a short summary that consist of the most important bullet points from a meeting. The low qualities of these written documentations were later revealed to be an obstacle for the newly introduced top project managers. When they took control of the project helm, they didn't have any records of previous decisions. When top project management, in its accountable and authoritative embodiment, fails to record memorandums, this poses a threat for the project itself.

Similar with project management, the respondents were unison in depicting communication rising to a new level after the project re-assessment. It's likely to do with the characteristics of the top project managers and that they were able to communicate well, but also that communication as a whole had better terms to "flourish". Zhao's work (2007) advocate that communication is present irrespective of in which phase the project is in at the moment.

### **5.2.3 User Involvement**

The literature review defined user involvement in two ways. One definition of user involvement can in short be summed as the importance and personal relevance of a system to a user. (Bhatti, 2005) The other definition was that ERP user's participation in the upgrade processes. (Zhao, 2007) Since this project sought to upgrade "as is", the introduction of the new ERP system is likely to have posed little threat to end users perception of control over their work and responsibilities. No such resistance where detected, neither from the interviewees nor during the observation period. Thus, it's likely to think that the interviewees had in mind the user's involvement in the actual upgrade process. Because of the high level of end users participating throughout the projects lifecycle, it's reasonable to conclude that Company X regarded their employees in a high esteem. This feature was also positively regarded by the external consultant, which held the responsibility to map and collect all valuable information from the end users. This gave a unique chance to ascertain unaffected statements from factory floor, directly to top management.

The first half of the project have been subject for critics in regards for having some managerial flaws, but this weakness wasn't traceable amongst user involvement in any of the project phases. We mentioned that the work scope that had to be done in this project was apprehended correctly, but that this work load was not properly transformed into a realistic

budget and timeframe. For obvious reasons we can ascribe the successful work scope to the positive user involvement spirit and close iteration between end users and the external consultants.

#### **5.2.4 External support**

External consultants have a unique position in an ERP project as they hold the knowledge of pros and cons of the ERP system itself. In other words, they know where the shoe pinches. These qualities make consultants a powerful tool when collaborating with the customer and as such, were ranked an influencing factor on the project's success. The undisputable positive feedbacks received from Company X's participants are mainly a result of the professionalism exercised by the external consultants. However, it shouldn't be forgotten that there already existed established relations between Company X and the ERP vendor. This may potentially have influenced the successful cooperation that took place. Furthermore, many of the external consultants kept on working with Company X after the project ended. As such, the service provided by the external consultants after "go live" may have colored the final interpretation when the interviews took place.

External support also includes other resources like developers, technicians and solution architects. It's interesting that the ERP vendor had the majority of their system developers located in Sri Lanka. Salary costs are much lower in Sri Lanka, but they don't stand back for quality or value in the work they produce. For obvious reasons, communication in between the external consultants and developers might have been an issue, given the time difference and language difficulties. The top ERP vendor management foresight made sure of this issue not being present, by manning an external consultant from Sri Lanka with the project team during the time period. This person's experience and professionalism was also highly appreciated by Company X, leaving communication misunderstandings to a minimum when their requirements were fronted to Sri Lanka for development. Literature mentioned that external consultants represent an expensive cost on the budget (Bingi et al., 1999), but in many cases they are a necessity and this was also emphasized by the interviewees.

### 5.2.5 Internal support

Internal support was somewhat vaguely defined in the literature review, and only included cooperation and teamwork. However, I took the liberty to “tweak” this theme when I conducted the interviews. In general, I told the participant that if external support represented the external resources outside Company X, then internal support would be Company X’s own internal resources. Furthermore, I emphasized that this theme should be a measurement of how important Company X internal resources had been for the project as such. Given this extra definition, internal support was brought up several times during the interviews.

It was the ERP vendor that handled the project in general, with the many external consultant, developers and solution architects included in the loop. But it was Company X, being the customer, who had the final saying in every matter. Considering this fact, the governance of internal resources and the level of cooperation between these in Company X, were important. This brings us over to the project champion which in this case was from Company X.

Irrespective of not being chosen by interviewees as a major success factor, it’s not entirely correct to define a project champion as a “theme”. Nevertheless, I can’t stress enough how important this role and function was for the project. My own observation perceived this role and function, as very beneficial. The reason for this is that the project champion in this case, had extensive knowledge of how the new ERP system worked and its design. In fact, the project champion was the only person within Company X that had such a competence level of the previous and the new ERP system. This might sound like a flaw, that only one person really knew the new ERP system. But this is just how it is, considering that in most cases people are busy doing their daily work and that they have no time, to really learn the new ERP system upfront. As such, Company X actually had an advantage with the project champion being on their “team”. The project champion acted as a focal point and a speaker for all of Company X, when communicating technical details towards the ERP vendor. It’s reasonable to say that given the characteristics of the project champion, the ERP vendor was extra respectable, as they were dealing with a customer as experienced as themselves. The project champion had no issue in rebuking the ERP vendor when it was necessary.

### **5.3 What are the major factors associated with each of the four ERP upgrade phases, in Company X's ERP upgrade project?**

The last objective in this study was to determine the major critical success factors in each project phase during the ERP upgrade. The interviewees were asked to rank which of the 11 success factors, that were listed in the literature review, to be most important in each project phase. A project build consisting of four phases was applied to measure the lifecycle of the ERP upgrade project. The interviews yielded quite consistent answers.

A project has distinctive phases, whereas there is a difference in the work being done in the beginning vs. the end of a project. Therefore it's reasonable to emphasize the difference between i.e. communication's relevance to the project, in phase one vs. phase two. So even though project management was rated highly important in all phases, its project impact is different from phase to phase. Subsequently it's therefore important to address these factors against how the project developed in time.

#### **5.3.1 Phase One – Impact analysis and initial upgrade**

In phase one; communication was ranked the single most important factor influencing the project. The first phase is recognized by the need to assess the situation in general, analysing customizations, reports, business processes and differences between new and old ERP system. In this situation, the key word is information gathering. Every participant, ranging from the external consultant to the top project management is trying to gather as much information as possible, to be map the current situation. This idea of information gathering is the reason communication was ranked the highest factor in this phase. Communication is the “neural system” of the project and without it; no involved parties would work properly.

Observation and interviews reported that the project management had flaws in the first phase and thus it's maybe strange to conclude it as the second most important factor. However, we must not forget that project management is also about governing its resources in a suitable way. And the external consultants did manage to assess the main thing of the work to be done, in the first phase. It was the further possessing of this data that failed, when producing the future project plan. Still, it's somewhat an abnormality that project management was ranked

higher than the external consultants, which from my own observation did a better job than project management in phase one. One reason for this might be that the majority of the interviewees were having the role as external consultants, and out of humbleness didn't rank their role as more important than top project management, in spite of their flaws.

Given the age of the VAM system, it's not necessarily easy to obtain the specifications and the customer requirements for why and what some old customizations were founded on. To complicate the situation even more, sometimes even Company X didn't know why they were doing it like they did. One major reason for this vagueness of Company X's current ERP situation was due to the ERP vendor's bad document management. We know that VAM was utterly customized throughout its years in use, but it was revealed that the ERP vendor had not archived these changes in a good manner throughout the years. Therefore, it was a great challenge to dig up old records and requirement specifications in this phase. By overcoming this hinder, the external consultants were deservingly ranked a major success factors.

Business vision was also mentioned, but since the interviewees were a mixed group of mostly project members, it was only five out of seven who considered it major factor. Had there been more top management or participants from the steering committee, business vision would likely have been rated more important, if we take previous literature (Zhao, 2007) into consideration.

### **5.3.2 Phase Two – Solution development**

Immediately after the solution review had been finished, the findings and approved requirement specifications were sent off to Sri Lanka for development. This phase is very important; because it's required by Company X to approve the findings from phase one, before it's sent off to production. As such, the bulk of the work was conducted outside the typical project arenas like Company X or ERP vendor premises. Communication was again ranked as the most important success factor, influencing the project outcome. It's reasonable to conclude that communication was the main tool to control and govern the resources at Sri Lanka, and to ensure that they progressed according to project plans.

Phase two is recognized by other operations as well, including consecutive testing of the customizations as soon as they arrive from the production environment at Sri Lanka. The testing of the application is in majority done by the external consultant. Company X is not given any access to the testing environment yet, and they are not the ones driving the progress. This would explain that only communication, project management and external consultants were ranked as success factors, since it's mostly ERP vendor operations in this phase.

### **5.3.3 Phase Three – Acceptance and performance testing**

The interviewees rated five success factors influencing the project's success; Project management, communication, internal support, external support and user involvement, in that order of importance. In opposition to phase two, where Company X had a more secluded role, they are very involved in phase three. Phase three is recognized by testing the new application and all customizations developed at Sri Lanka, in a test environment open for Company X's end users. As such, project management had its hands full to govern every resources to adequately test the solution. We have to remember that especially the participants from Company X also had their daily work to look after, in parallel with the ERP upgrade project. Given the highly dynamic business environment in the drilling market and potentially loss of income if a drilling rig is inoperative, Company X would always prioritize the daily operations instead of an ERP project. As such, project management faced a challenge in order to make sure that Company X put enough resources into the final approving of the new ERP system.

By now, the new top project managers had successfully taken control of the budget and the work scope had been reassessed. Therefore, this challenge was managed in an excellent manner and as such, was rated a success by the interviewees. Internal and external support was also rated important, because it's Company X's own internal resources in cooperation with the external consultants, which actually carry out the testing. User involvement is naturally present, as the spirit of the end users assured the successful testing and feedback.

During observation I became aware of the difference in the testing method used by end users vs. external consultants. Whereas the external consultants have a test plan which deliberately

is designed to test a certain predefined scenario, for instance a purchase order for a spare part, the end users often test it in a more natural way. By this I mean that the end users tested their own work processes and their way of doing things in the application. Such testing proved most valuable as several errors and design flaws emerged, which the external consultants never would have discovered with their test plan.

#### **5.3.4 Phase Four – Production conversion**

The fourth phase is almost as intensive as phase three. By now, Company X had approved all extra system extensions, customization and the standard core solution. The respondents ranked the critical success factor in the following order; Project management, external support, training and education, communication and internal support. Again we see that project management is ranked the most important one. As the project is coming to an end, it's sometimes tempting to calm down the project pace. However, project management have to keep the spirit up and continue to use its assigned managerial tools to see the project to its completion.

The main goal in phase four is to deploy and activate the new ERP system. End users will start to use the system and this act can be perceived as the final test of the product. Will it “make or break”? A large amount of communication is running back and forth between the stakeholders. The stakeholder in this matter is first and foremost the customer Company X. To deploy such a large IT –system using a “big bang” –method that suddenly replace the existing system and which end users have known for the last 6-7 years, is a tremendous challenge. Therefore, Company X had initiated many organizational processes to make its own organization fit for the new situation. These processes include amongst others making the organization ready for an operational ERP downtime. As Company X's ERP system is globally integrated, this means that all its departments, spanning from Brazil to Singapore, need to be synchronized when deploying the new ERP package. To manage this operation, asks for a focused and efficient internal support and thus consequently ranked important. If the actual go-live should fail, it would be a major blow for Company X, theoretically having wasted a lot of resources on something that didn't work as intended. Hence, Company X's focus in this critical phase is tiptoe and as such, the ERP vendor should make use of this.

The ERP vendor is also a stakeholder and they would in many cases be the scapegoat if anything should go wrong in this phase. Any errors occurring in the application at this point would either need to be urgently solved if time allows it, or simply be discarded if it affects other important processes. To urgently solve such issues ask for high alerted and flexible external support from the ERP vendor. Consequently, external support was ranked important.

Training and education was mentioned for the first time as a success factor. I reckon this factor to be the most underrated by far. The reason for this is that even though it's nice to have a new "toy", it doesn't help the organization's business if no one knows how to use it. Although Company X asked for a system that was "as is" in relation to its work processes, upgrading to a quite newer system unmistakably introduces new interfaces and menu layouts. And given that the new ERP system could do so much more, it's exceedingly important to have relevant training and education for the end users. Company X reported that they did conduct a variety of classes for educating its users in the new application, although later situations after the go-live revealed that the training was inadequate.

One reason for Company X not revering training and education as high as they should; is probably due to cost. Seeing the project at its end and having spent a lot of money so far, the extra cost for education in the new ERP system is likely to be considered needless. This is because Company X, like many other organizations interprets themselves as more than adequate to be able to train their own users, using internal resources. This might be true, but for Company X's case that goal diminished over time. Literature advocates that the lack of training and education is one significant determinant for ERP failure. (Gupta, 2000; Somers & Nelson, 2004) Company X would most probably not admit to such an allegation, but my own observation of increased user support immediately after go-live, points in the direction that training and education should have been more prioritized.

## **5.4 Summary**

The table below summarizes the different choices of each interviewee in relation to which critical success factor they ranked as most important in each phase.

Critical success factors	Initial analysis	Solution development	Acceptance & Testing	Production conversion	Total for all phases
Business Process reengineering	3	0	1	0	4
Business vision	5	2	1	0	8
Communication	7	7	6	5	25
External support	5	6	6	6	23
Internal support	3	2	7	5	17
Organizations and culture	2	0	1	2	5
Project champion	2	2	2	2	8
Project management	6	6	7	7	26
Steering committee	1	0	2	1	4
Training and Education	1	1	2	6	10
User involvement	3	3	6	4	16
Total points in each phase	38	29	41	38	

Table 5.4 – Summary of interviewees answers.

An overall assessment advocate that phase one – “Initial analysis”, phase three – “Acceptance & Testing” and phase four – “Production conversion” were the most work intensive, as they have clearly more points vs. phase two – “Solution development”. Although not a typical theme and not reflected as by the participants answers, my own observation indicate that the project champion played a very important role. The literature review listed the project champion as an own factor, but in this business case the project champion was part of the internal support and not a standalone theme. Therefore, I believe that if this role hadn’t been part of Company X’s staff, it would have been higher ranked.

## 6 Conclusion

*This chapter will draw conclusions to the analysis performed in the previous chapter.*

This study tried to provide a deeper understanding of ERP upgrade, by looking at an isolated ERP project. Zhao's (2007) work urged future researchers to conduct case studies in order to further shed light on this limited researched area. By a qualitative data collection method, five themes were indentified within Company X's project that had a major significance on the project's outcome. The motivations behind this project were also identified. This study, further sought to clarify that ERP upgrade projects involve distinctive phases and that each phases can have different issues. This chapter presents the answers to the research questions mentioned at the end of chapter two;

1. What are the reasons for this ERP upgrade project?
2. What are the major factors associated with Company X's ERP upgrade project?
3. What are the major success factors associated with each of the four ERP upgrade phases, in Company X's ERP upgrade project?

Company X's expanding business and organizational trend forced this upgrade project. The previous system, VAM, was identified as unsuitable to support future growth. At first glance, imminent reasons like age, support and customizations where identified as triggers for the project. However, a closer look revealed that it was the mere technical limitations of the VAM ERP system that actually triggered the project. Company X's demand for a more advanced technical solution was isolated the only reason for this project. According to data, the project would not have been initiated had VAM supported the "offline" –solution, even though there were numerous other characteristics that urged for an upgrade.

This tells us that Company X assessed VAM with its issues (age, support and customizations) as manageable, and that they first took action when the ERP system was inadequate to support the change in organizational setup. The organizational setup required an "offline solution", in other words not to be dependent on satellite connection at all, which only a new ERP system would support.

Coding and analysis of the narrative data yielded five important themes which influenced the project as such. The themes are quite universal, but nevertheless regarded as mandatory pieces in a typical ERP project. (Zhao, 2007) Project management and communication are much

entangled together and is always present. This project was a joint cooperation between Company X and the ERP vendor, and it was measured very good interactions between the external and internal resources. I believe that this good relationship positively influenced the project when it experienced a relapse in project plan and budget. Hadn't these tight relations existed, it's probable that more decisive actions had to be taken, in order to bring the project back on course.

As such, both parties actually agreed that the project scope misinterpretation was a joint responsibility, since top management from both companies was replaced. I think that this acknowledgment is quite unique and this example emphasizes the importance of good communication on all levels.

The external support provided by the ERP vendor can easily be concluded to have played a major part of this project, and in spite of the issues related to project scope not being well ascertained, Company X was very satisfactory with the effort displayed by the consultants. In this project, the consultants were a necessity.

I reckon the theme user involvement to be an example for the participant's own interpretation of the project's justification and job motivation. Although defined as the end users attitude in the literature review, I like to perceive it as the general spirit of the project as well. This theme is unmistakable one of the reason for why the project reassessment went so well, as it points toward the close relationship of Company X and the ERP vendor.

When told to point out which factors that influenced the project during the distinctive phases, the answers were quite unanimous. Project management, communication and external support were all ranked as influencing factors in each and every project phase. This pattern fits well with the themes that in general were associated with Company X's project. Given that this project was mostly run by the ERP vendor, it accounts for those three key words. Although project management were subject for criticism, the steering committee shouldn't be spared. They are the ones empowering and administrating the whole project frame. Clearly the flaws surfacing in the beginning of the project can be traced back to the steering committee. The absence of points in each phase depicts the project team's comprehension of this factor.

The factors that didn't receive any particular attention are also a kind of answers, to explain Company X's project. Business process reengineering received a very small number and is

likely because Company X wanted the new ERP system to be “as is” like VAM. Therefore, there was no reason to change any business processes. The same goes for organizations and culture, which handle the demand for change in organizations culture and structure, to ease the introduction of ERP systems. This factor is probably more relevant when implementing an ERP system for the first time.

My assessment of the project champion to be important is not reflected in the table, but I think this is because the project champion was not properly defined prior to the interviews. In a retrospective manner I admit that mentioned role was not assigned properly, as the interviewees didn’t recognize the essence of this factor. But my own observation and the already collected data underline the importance of this person’s role in the project. That this person also belonged to Company X might have boosted the factor internal support instead of project champion.

Training and education should have been rated higher earlier in the project in my opinion. Since the project officially ended upon go-live, the consequences of the training and education weren’t assessed. But my own observation advocate that it was not sufficient, as the ERP vendor experienced a peak in user support immediately after go-live. Much of this support was related to the users not using the new ERP properly.

Both Company X and the ERP vendor would have been better off if they had run a pilot project. The extra cost and resources it takes to run a pilot project would have paid off in terms of minimizing the risks. There is a good chance that the project’s reassessment had been avoided, if a preliminary project had conducted. This decision rests at the companies respective steering committees.

In a perfect world, in a perfect project, with a perfect result, all the 11 factors should have had a max score. But we are however governed by the ever present scarcity of resources, and we then choose to prioritize the things we consider the most important. Table 5.4 reflects this in an excellent manner.

## **7 Final Discussion and Future Research**

### **7.1 Limitations**

This study's research area is narrow. I have only looked at an isolated case, which in many ways is very unique and is not easily compared to other situations. Critics have asked why one can generalize from a single case. To generalize, one needs multiple set of experiments, which this case doesn't provide. However, according to Yin (2009) case studies are in fact generalizable to theoretical propositions, but not to populations or universes. The study as such doesn't seek to generalize, but through an extensive literature review a theoretical proposition stand was taken and this has been tested against Company X's project.

My own role in this project might have influenced the interpretation, although the outmost effort has been taken in order to be unbiased. Given the time constraints of the researched subject, with a defined start and end date, it could have been useful to have conducted this research while it was happening and not afterwards. Since it's more than one year after the ERP upgrade project started, some impressions might have been affected, in both companies.

However, I stand by that this case trustworthiness is high. Each qualitative interview has been taped and there are no reasons for why the respondents should camouflage the truth. In fact, as the participants involved in this project was made unanimous, it's more likely that they were sincerely honest as there were no repercussion present.

### **7.2 Future Research**

This study yielded five themes and five critical success factors that highly influenced the project. These findings leave room for improvements and a further advance in this area. For instance, a quantitative study might have been conducted to increase the sample size. A larger sample size would have made it easier to defend a generalizable theory, as to why things were as it was.

Future research should also encompass quantitative surveys that should be sent to other organizations within the Oil & Gas industry. I mentioned earlier in the study that ERP is also about people and not just technical matters, hence future research could even more try to attain the different stakeholder's opinion of ERP upgrade. Furthermore, the researcher should come from external sources and try to be more unbiased.

Another interesting approach would be to conduct surveys within an ERP vendor, given the large amount of empirical data they have, in relation to the numerous implementation and upgrade project's they have conducted.

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## 9 Appendix

Dear Participant

### **Introduction:**

As part of my Master of Science study at Chalmers University of Technology I have sought to assess the important factors concerning ERP upgrades. As main empirical sources of data I have chosen to use the recent ERP upgrade project that Company X conducted, in collaboration with the ERP vendor.

NB! The ERP system itself is not the primary object in this study, and has therefore not been subject for examination or evaluation to any extent. The main goal has been to identify the critical success factors in the mentioned project.

**In the final paper, all involved organizations, people and business -related data will be made anonymous.**

### **Method:**

To collect this information I will use semi-structured interviews, observation and collected existing documents that relates to the ERP project itself.

### **Theory:**

In order for you as participant to better understand the main theories that I have used in this research, I allow myself to list some of them:

I have in this study, based on previous literature, defined four phases for an ERP upgrade project model:

<b>Phases</b>	<b>Characteristics</b>
1. Impact analysis and initial upgrade	Analysis of all modified interfaces, reports and customizations. Compare old configuration processes with the new configuration processes. Finally, the initial upgrade will be executed and result in a

	customized application on the new release.
2. Solution development	Testing of all modifications and verification of the functionality of the application.
3. Acceptance and Performance testing	Final testing of performance and punctuality, with imitated data from the “live” environment, in opposition to the testing in phase two. Stop in development in production environment.
4. Production conversion	Current application is upgraded to the new release and users will have access to live production environment. Necessary to make sure that security issues, access rights and verify that the data was properly converted. At the end of this phase, there should be a fully functioning production application.

I have also based on an extensive literature review, narrowed down eleven success factors that are associated with ERP upgrade:

<b>Critical success factor</b>	<b>Characteristics</b>
Business process reengineering	Redesigning of business processes to best fit the organizations needs and to improve business performance. <b>Business process reengineering</b> and <b>customizations</b> is included in this success factor.
Business vision	The overall business vision and strategy for the ERP project, should act as a beacon for objects and goals to strive for. <b>Business vision</b> and <b>strategy</b> is part of success factor.
Communication	Goal-orientated <b>communication</b> between all levels of involved parties, including

	stakeholders, management, top management, users, technicians, consultants etc.
External support	Support provided from external sources outside the organizations. <b>Consultants, vendor support</b> and <b>partnership</b> is part of this success factor.
Internal support	Support provided from within the organizations, i.e. <b>information sharing</b> and <b>technical support. Cooperation</b> and <b>Teamwork</b> is part of this success factor.
Organizations culture and change	Perceive the demand for change in organizations culture and structure, to ease the introduction of ERP systems. <b>Change management</b> and <b>culture</b> is part of this success factor.
Project champion	A durable, engaged and determined <b>project champion</b> is best suited to lead the way in the ERP project.
Project management	An enlightened, vigorous and responsible <b>project management</b> is crucial for the outcome of the ERP project as such. Managerial skills to handle the supply and demand for people, materials and equipment in relation to the boundaries of the project, to meet time schedule and budget control. This success factor includes <b>data analysis and conversion, performance management, project management, dedicated resources,</b> and <b>software development.</b>
Steering committee	Scope of the ERP project and <b>resources</b> defined, as well as access to resources.
Training and Education	<b>Support</b> users with proper training and education on the new ERP system, new

	business processes and new job tasks will help them cope with the transition and excel efficiency after go-live.
User involvement	Spark end users to participate and contribute to the project, with the intention to improve understanding of the new ERP systems and limit user and organizations resistance.

## INTERVIEW QUESTIONS

Name:

Company:

Location:

Project start date:

Project end date:

Title:

Department:

Role in the project:

How long have you been with the company?

1. When is the first time your organization acquired an ERP system?
2. When is the first time your organization first acquired an ERP system from the ERP vendor in question?
3. What is the reason behind this ERP upgrade project?
  - a. Are there several reasons, and if so, who's the most important?
4. In our research we have defined three categories for the reasons behind upgrading an ERP system. These categories are:

- a. Eligibility for help desk support: Most ERP software vendors stop providing technical support 12 to 18 months after the next version becomes available. Therefore, keeping up with the pace of ERP vendors will guarantee support for the system from vendors.
- b. Solutions for outstanding “bugs” or Design weaknesses. The majority of software bugs are resolved and delivered either fix-by-fix or all-at-once as part of the next release version of the ERP package.
- c. New, expanded or improved features. ERP upgrades provide organizations future enhancement from the vendors to give the organizations better opportunities to catch up the current business development, improve their processes and build more efficient business models with new functions, new features and new processing styles provided in the upgraded ERP versions

In which above categories would you say that the reasons, you have mentioned for the ERP upgrade project, should be listed in?

5. Could you list several key factors influencing the success of the ERP upgrade project?
  - a. Could you give a short comment about the reason for each of those key factors?
6. In this research we have adopted an upgrade model, containing of four phases:
  - a. Phase one – Impact analysis and initial upgrade
  - b. Phase two – Solution development
  - c. Phase three – Acceptance/Performance testing
  - d. Phase four – Production conversion

We have also identified eleven factors that may affect the ERP upgrade project as such. Do you agree with them? If not, why?

Lastly,

Could you list the top three important factors in each upgrade phase that you consider to be most important during that phase, in this project? (Choose amongst the factors listed above)