Making ERP Work
A Logistics Approach to Causes and Effects of ERP Post-Implementation Use

Master Thesis in International Logistics and Supply Chain Management

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Abstract

Problem – Companies are taking into consideration not whether an Enterprise Resource Planning (ERP) system is required, but rather how to establish an effective ERP system. Research on ERP implementation is vast, however fairly little is known about ERP management and post-implementation use. Investigating how ERP systems are managed and used by different users in various companies and sectors adds value to understanding what practices are beneficial and, or detrimental.

Purpose – The purpose of this thesis is to explain how ERP system use in the post-implementation phase affects logistics operations in various enterprises.

Method – The research has been conducted through the method of hermeneutics, enabling the researchers to constructively interpret data from in-depth interviews and documentary secondary data in order to explain what generally goes unnoticed in ERP system use.

Conclusion – Training and business process configuration (also referred to as Business Process Reengineering in ERP implementation) are fundamental drivers to ‘ERP use’ that embodies a wide range of dimensions (i.e. ERP access, understanding of ERP use etc.). All these dimensions, realized in ERP use affect operations either beneficially or detrimentally, externally or internally on a individual, team and, or organizational level.
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List of Abbreviations

BI          Business Intelligence
BOM        Bill of Material
BPR        Business Process Reengineering
CIM        Computer-Integrated Manufacturing
CPFR       Collaborative Planning and Forecasting Replenishment
CRM        Customer Relations Management
ERP        Enterprise Resource Planning
GUI        Graphical User Interface
HR         Human Resources
ICS        Inventory Control System
IO         Information Orientation
IS         Information System
IT         Information Technology
MRP        Material Requirements Planning
MRPII      Manufacturing Resource Planning
SCM        Supply Chain Management
SME        Small and Medium Enterprises
SRM        Supplier Relationship Management
WMS        Warehouse Management Systems
I Introduction

The purpose of the introductory chapter is to provide meaningful preliminary insights in the thesis’ topic. This chapter first discusses relevant background information, ensuing a problem statement and completes with the purpose and research questions of this thesis.

1.1 Background

These days, companies are taking into consideration not whether an Enterprise Resource Planning (ERP) system is required, but rather how to establish an effective ERP system (Yu, 2005). It is estimated that in the past decade about $500 billion was invested in ERP Systems worldwide (Helo, 2008). For 2012 the total market revenue was approximated to be over $50 Billion (Jacobson, Shepherd, D’Aquila, & Carter, 2007). All ERP products that are on the market support logistics processes and operations; this is considered to be part of ERP’s core-functionality (Wieder, Booth, Matolcsy, & Ossimitz, 2006). The cost of an average ERP system, not taking into account company size and number of applications, is roughly $9 million, however there are also cases mentioned where companies spend hundreds of millions on their systems (Behesthi, 2006). These numbers signify the prominent position that ERP systems have in business (Møller, 2005).

ERP systems are enterprise information systems designed to integrate and optimize the business processes and transactions in a corporation. ERP is an industry-driven concept and system, and universally accepted by businesses and industries as a practical solution to achieve an integrated enterprise information system. Furthermore, ERP systems have become vital strategic tools in today’s competitive business environment. ERP systems provide a mechanism for gathering, managing and sharing organizational data across business functions, including the data required to support the integration of logistics operations (Rutnera, Gibsonb, & Williamsc, 2003).

An ERP system facilitates the smooth flow of common functional information and practices across the entire organization. For example, it improves the performance of the supply chain and reduces the cycle times. However, without top management support, having an appropriate business plan and vision, re-engineering business processes, effective project management, user involvement and education and/or training, organizations cannot embrace the full benefits of such complex systems and implementation failure might be at risk (Addo-Tenkorang & Helo, 2011). ERP is essential to Supply Chain Management (SCM), as SCM is the discipline to manage the flow of information, material, and services from raw material suppliers through factories and warehouses to end customers. ERP can support these processes (Hill, 2001). Traditionally, ERP systems endeavor to help user companies in order to achieve seamless data and process integration in their back offices (Kumar & Van Hillegersberg, 2000). At the present time, ERP systems can also act as platforms or backbone systems to link the company’s back office with its front office, by the integration of organizational applications, for example supply chain management and Customer Relations Management (CRM) systems (Kalakota & Robinson, 2000; Pan, Nunes & Peng, 2011).
ERP enlists a multi-module software for managing and controlling a broad set of supply chain activities including product planning, parts purchasing, inventory control and so forth (Swamidass, 2000; Min & Zhou, 2002). Therefore, ERP acts as the central nervous system of an enterprise that manages every transaction involving the acquisition, movement and storage of goods throughout the organization. The main intent of ERP is to increase the velocity of inventory throughout the supply chain along with Warehouse Management Systems (WMS) and Collaborative Planning and Forecasting Replenishment (CPFR). ERP is an important pre-requisite for successful collaboration among supply chain partners. ERP can be considered as a ‘mothersystem’ to all other IT systems as is used in order to integrate all information systems to one, by providing the communication between various systems (Min & Zhou, 2002).

ERP has its origin with the introduction of computers into business in the 1950s and 1960s. Retrospectively, the ancestors of ERP were applications that automated bookkeeping, invoicing and record keeping, such as the Inventory Control System (ICS) and Bill of Material (BOM). In the 1970s Material Requirements Planning (MRP) was developed to forecast the required material more efficiently. This gradually turned into Manufacturing Resource Planning (MRPII). When managers started realizing that profitability and customer satisfaction are objectives that apply to the entire enterprise, they realized that they had to integrate beyond manufacturing, and include other modules like sales and marketing and human resources. In the 1980s, Computer-Integrated Manufacturing (CIM) aimed to automate information systems in enterprise models. This development peaked in the 1990s with the advent of ERP. The key to ERP systems is that it is based on an integrated database and it consists of several modules that support business process specific requirements (Møller, 2005; Klaus, Rosemann & Gable, 2000).

### 1.2 The ERP Market and Tier Packages

Broadly spoken, the ERP market can be addressed by three packages that each in their own way fulfill the needs of companies that differentiate in size and complexity. Each of the so-called ‘Tiers’ in ERP software can be customized to sufficiently support processes and tasks, and hence, allow flexibility to firms with different requirements. Distinguishing ERP software solutions into three tiers is considered a suitable start as it categorizes the variety of ERP software (BPIC, 2013). Tier I packages are the most expensive ERP packages with a complex set of options (i.e. SAP®, Oracle®, Microsoft Dynamics®) and significant abilities to manage multiple companies and multiple plants with international locations. Tier II ERP packages (i.e. Epicor®, Sage®, Infor®) are characterized by addressing application needs of larger companies, however the applications are less complex. Tier III ERP packages (i.e. BAAN®, Exact®, NetSuite®) are designed to have limited complexity and are often designed for vertical industries. They have limited breadth in applications, but often have depth in an application needed by a vertical industry (BPIC, 2013).

Vendors often arose from different disciplines, ranging from manufacturing, operations, to more Information Technology (IT) specialists (Schlichter & Kraemmergaard, 2010). Due to market consolidation and mergers, the current market leaders are known to be SAP® and Oracle®, claiming a majority of market share (Behesthi, 2006). A research report that is
conducted by Panorama Consulting Group (2011) shows that Tier I and Tier II vendors are holding the largest share of the market. The figure 1-1 below shows that the combination of Tier I and Tier II vendors make up 64 percent, while Tier III and others enjoy the remaining 36 percent of the market.

![Vendor Market Share in 2010](image)

Figure 1-1: Vendor Market Share, Source: Panorama Consulting Group, 2011

### 1.3 Problem Statement

In the past decade multiple academics have studied ERP’s status and magnitude. Schlichter and Kreammergaard (2010) conclude that the body of knowledge about ERP systems has reached a maturity stage, and has since started to decline. The majority of research concerns the implementation of ERP (29 percent), followed by studies on management (18 percent) and optimization of ERP (17 percent).

It is interesting to see that research around the topic of optimization of ERP has started to increase over the last couple of years. One argument to this is that ERP systems are considerably more common in today’s business, as a significant number of corporations are now equipped with an IS (Information System) or an ERP system. This is also identified in the following claim:

> As more companies have implemented ERP systems and more is known about the implementation processes (…) more experiences have been gained with the implementation process, different topics such as the importance of using ERP and the assessment of ERP values seem to be becoming of interests to both the researchers, businesses and industrial organizations as they are potential areas for future research (Addo-Tenkorang & Helo, 2011, p.6-7).

It is frequently mentioned that there is a lack of research on how ERP systems’ value can be managed and sustained over time. In this, the value is interpreted as the efficiencies created through ERP system implementation. Now, the very basic aim in logistics is to efficiently and effectively organize the flows in an enterprise; namely the flow of products and services, the flow of information and the flow of finances (Langley, Coyle, Gibson, Novack, & Bardi, 2008). ERP relates to this as it supports these flows in the enterprise.
Due to the huge potential of ERP, it is understandable that authors mark research on how ERP should be managed as a potential area for future researchers. Yet, it is also this vast potential of ERP systems that make it so hard for organizations to comprehend the concept. Evidence indicates that the value of ERP systems is realized across different dimensions at different points in time with as many as 70 percent of the ERP implementations failing to deliver the anticipated benefits (Majed, 2000). Trunick (1999) conducted a survey that revealed that as much as 40 percent of the implemented ERP systems achieved only some of their full efficiencies and 20 percent are scrapped as complete failures (Yu, 2005). According to Escalle, Cotteleer, and Austin (1999) the ERP failure rate may even exceed 50 percent, while Ptak and Schragenheim (1999) noted that 60 to 90 percent of the implemented ERP systems are less effective than expected (Yu, 2005). Even some of the leading multinationals suffered from ineffective ERP systems. Examples are Whirlpool® (Boudette, 1999), Hershey Foods® (Forger, 2000; Weston, 2001), Boeing®, Mobil Europe®, Applied Materials®, Kelloggs® (Chen, 2001), and Nestle® (Worthen, 2002). On the upside, other multinationals have reaped the expected benefits after implementing ERP systems, such as Eastman Kodak® (Stevens, 1997) and Cisco Systems® (Chen, 2001; Yu, 2005).

This evidence shows that ERP is crucial, yet often fraught with challenges, difficulties and problems (Loh & Koh, 2004). It postulates the belief that even if a system is ‘successfully’ implemented, the ‘go-live’ point of the system is not the end of the ERP journey, and that this post-implementation or exploitation stage is where the real challenges will begin and more critical risks may occur (Willis & Willis-Brown, 2002).

Cases show that there are companies with no effective use of the ERP system. Ettlie (1998) estimated that 25 percent of the money invested in ERP is wasted, implying that the effectiveness of implemented ERP systems is less than 75 percent. Revisions by Steve Baldwin, a senior ERP consultant, exhibited that many surveyed companies that had implemented ERP systems discovered that only 50 to 75 percent of the functions of their ERP systems were used to achieve benefits (Caldwell & Stein, 1998). Based on a survey of 117 firms, Betts (2001) reported that 20 percent of the ERP systems are terminated before completion and half of the remaining 80 percent of ERP projects failed to achieve business objectives even a year after the system was completed (Yu, 2005). Hence, the effectiveness of the ERP systems post-implementation becomes a crucial indicator of business success. It is for this reason that today’s companies are concerned not with whether an ERP system is needed, but rather with how to establish an effective ERP system. Investigating how ERP systems are managed and used by different users in various companies and sectors today, could considerably add value to understanding what practices are beneficial and what are detrimental, and aid the question of how ERP systems should be used.

1.4 Purpose of the Paper

The problem statement identifies a lack of knowledge on how ERP systems need to be managed to maximize benefit. Also ERP system has a very direct connection to logistics and supply chain management as it supports logistics flow. The theoretical lens pursued in this thesis will hence focus on how ERP systems ideally affect logistics operations. Reason for this is firstly, because it is in line with the authors’ background, which lies in logistics
and SCM. Secondly, because the literature review explains that ERP holds a significant relation with operations and logistics seeing the important line with Business Process Reengineering (BPR) and seeing that most research is published under the flag of operations (Schlichter & Kraemmergaard, 2010).

Through multiple series of searches and critical evaluation of existing literature a breakthrough was found when the authors hit upon ERP use after implementation as an understudied field to ERP management. Based on the little research that has been done on this topic, the angle of this study was specified. As a result, the purpose of this paper is:

To explain how ERP system use in the post-implementation phase affects logistics operations in various enterprises.

The research purpose seeks to understand how firms knowingly or unknowingly use ERP systems to their benefit or detriment in logistics operations. Understanding this, may contribute to using ERP systems more effectively (optimization) and can add to a best practice in ERP use.

1.5 Research Questions

In order to fulfill the purpose of the paper, the following research questions are generated:

RQ1: What are the dimensions and implications of post-implementation ERP system use to logistics operations?

This question is raised to comprehend what ERP system use entails (i.e. dimensions) and how it pertains to business outcomes (i.e. implications). The question aims to describe a logical framework on how ERP system usage connects to practical implications once a logistics company is operating with an ERP system for a longer time (post-implementation).

RQ2: How are efficiencies that are generally created by ERP systems strengthened or diminished by ERP system use?

This question seeks to explore how ERP system usage can be of contribution or may be detrimental to operations in logistics enterprises. The conclusion to this question could provide a basis for a best-in-practice solution to ERP system use.
2 Frame of Reference

This chapter frames a collective of established theories formed through critical evaluation of existing literature and continuously refined searches. Hence, this section considers a variety of ideas and perspectives on ERP systems and their use. The frame of reference provided the authors with a body of knowledge that is used for reflection throughout the data collection and the data analysis.

2.1 ERP Supports Logistics and Supply Chain Management

Langley et al. (2008) argue that Supply Chain Management (SCM) can be perceived as a pipeline or channel for the efficient and effective flow of products/materials, services, information and financials. In addition, SCM can be viewed as the system of connected networks between the original vendors and the ultimate final consumer. The extended enterprise perspective of SCM represents a logical extension of the logistics concept, providing an opportunity to view the total system of interrelated companies to increase efficiency and effectiveness (Langley et al., 2008). Moreover, Lambert and Stock (1993) have noted that logistics is the process of planning, implementing and controlling the efficient, cost-effective flow, and storage of raw materials, in-process inventory, finished goods, and related information from point-of-origin to point-of-consumption for the purpose of conforming customer requirements. Logistics flows are essentially intertwined with supply chains (Ratliff & Nulty, 1996; Boykin & Martz, 2004).

Each logistics process can be observed as consisting of two distinct substructures: the flow of physical goods and the flow of information, which are essentially related as goods are purchased, ordered and paid for. The decision-makers, or actors linking the flows can be different participants, such as manufacturers, warehouse operators and transportation firms (Lewis & Talalayevsky, 1997). Naturally, these organizations are intensively engaged in operation processes and flows. Therefore this thesis projects its focus on these firms.

SCM entails the material management and information flow in the entire chain. The optimization of business processes across the value-added chain must be supplemented by up-to-date information communication technology in order to optimize enterprise-wide information management (Buck-Emden & Galimow, 1996; Stefanou, 1999). To be effective, logistics processes, such as just-in-time delivery, require effective IT support. Effective coordination of logistics operations is essential to organizational performance. However, for improved coordination to be possible, IT must play a bigger role than simply providing information on existing flows of goods (Lewis & Talalayevsky, 1997). The next part explains how ERP’s role is conceived.

2.2 ERP Systems

As mentioned in the background chapter, ERP systems are standard software packages that integrate modules and processes in an enterprise. The cost of ERP software is relatively small to other costs, such as reengineering costs, support costs, training costs, data conversion costs, the cost of changing the information technology architecture and recurrent costs account for almost 80 to 90 percent (Behesthi, 2006).
ERP systems require substantial time for implementation. The average time required to implement an ERP system could be as high as 21 months, while maximum time could be up to 36 months. During implementation, the ability to align an ERP project with a corporate strategy is key to the success of the projects. On a similar note, it is important to apply best practices, and strengthen the vendor/organizational partnership (Jain, 2008). Amoako-Gyampah (2004) argues that aligning perceptions to ERP implementation of managers and end-users throughout the organization is of paramount importance (i.e. perceived relevance of the technology, satisfaction with the technology, satisfaction of the received training and shared believe). The author also highlights the importance of adequate communication in the implementation phase (Amoako-Gyampah, 2004). These capabilities are essential to the successful implementation of ERP, and without them, it is difficult to anticipate any benefits from the ERP system. Hence, high realization of these capabilities is prerequisite to successful utilization of the ERP system in the post-implementation phase.

Peng and Nunes (2009) pinpoint that enterprises will often come across a wide range of risks when operating, maintaining, and enhancing ERP systems in the post-implementation phase. These risks are spreading further than technical aspects, as they are also localized in diverse operational, management, and strategic thinking areas. The occurrence of undesirable risk events in ERP exploitation may not just affect ERP viability, but may also lead to significant decreases in business efficiency (Peng & Nunes, 2009). The prominence of ERP systems is discussed in its applications, characteristics, and scope discussed in the following paragraphs.

### 2.2.1 ERP Applications

An ERP system is a set of business applications or modules, linking various business units of an organization such as accounting, procurement, manufacturing, and human resources into a tightly integrated single system with a common database and platform for the flow of information across the entire business.

Rizzi and Zamboni (1999) state that ERP systems for modern enterprises have become one of the most effective tools to achieve high efficiency standards. ERP provides the organization with an operational backbone that through a parallel process vision (e.g. access to similar information) allows integration between processes, and ultimately, provides higher traceability. Its direct decision-making features seldom characterize ERP systems. Moreover, the system provides substantial assistance in deriving information that is required. However, the optimal decision is rarely taken independently. In order to achieve an effective improvement of enterprise processes' efficiency, ERP system use has to be combined with submission of ‘ad hoc’ optimization techniques (Rizzi & Zamboni, 1999).

Consequently, the purpose of an ERP system is to enhance the decision making process, whereas this may help identify efficiencies and effectiveness, and so enhancing the company’s competitive position. ERP systems rely on the ability to deliver complete, accurate, reliable, and timely information (Klaus, Rosemann, & Gable, 2000; Behesthi, 2006)
2.2.2 ERP Characteristics

ERP systems can be explained by two specific characteristics that make the software so unique; the ability to integrate the enterprise and its irrefutable impact on business processes. These characteristics define implications for organizations adopting ERP systems (Klaus et al., 2000). Below, the particularities of these characterizes are further discussed.

Enterprise Integration

The ERP system facilitates enterprise integration by separating various business units of an organization in modules, and linking these modules to one integrated database, that continuously updates the information that is entering the system. Although ERP systems are described as standard software packages, there is a high degree in customization available that is essential for effective enterprise integration (Mahashwari, 2007). Yet, customization is costly as it implicates software add-ons or purchasing an additional software package from a different vendor.

Certain levels of customization are required to meet firm’s specific requirements as well as requirements across different industries. It is therefore important that firms investigate to what extent the basic ERP package supports the organization-wide needs for integration. According Klaus et al. (2000) current ERP software can be best described in three different forms: generic, pre-configured and installed.

1. In its most comprehensive form, the software is generic, targets a range of industries, and must be configured before it can be used.
2. Packaged, pre-configured templates have been derived from the comprehensive software. These templates are tailored towards specific industry sectors (e.g. automotive, retail) or companies of a certain size (e.g. SME).
3. For most users, ERP-software presents itself as the operation installation after the generic or pre-configured package has been individualized according to the particular firm’s requirements on site.

A key in enterprise integration for ERP is the consistent Graphical User Interface (GUI) that reaches out across all application areas. ERP systems gather all functionalities of stand-alone applications inside a single standard software, making it compatible with different business processes. Its functions run on a client-server architecture, therewith users perceive the ERP solution as a single application regardless of the module they are working with (Rizzi & Zamboni, 1999). Current ERP solutions are based on a three-tier client-server architecture, in which the database, the applications and the presentation, form three logically independent levels. The single core database is located on a central server machine. This database is connected to the different applications installed and run on so-called ‘clients’ (users’ computers). Clients are networked with the server and needed data are from time to time retrieved from the server database by the applications. Data access is controlled by different admissions levels, reducing error occurrence and granting more reliable data. Furthermore, applications can also be run on clients remotely from the internet, without the need to reinstall programs or data (Rizzi & Zamboni, 1999). The following figure 2-1 shows the integrated architecture of ERP, as purposed by Rizzi and Zamboni (1999).
ERP systems are compatible to multiple industries and companies, yet it remains essential to understand the way individual business processes and enterprise policies are structured and how the business processes are related to one another to achieve effective business integration (Klaus et al., 2000). This is key to Business Process Reengineering (BPR).

**ERP implies Business Process Reengineering**

The adoption of an ERP system is not only seen as an opportunity to discard the legacy system; it also implicates a revision and often redefinition of the work processes, the company culture(s) and company strategy. Herewith ERP has the characteristic of bringing in BPR. BPR means transforming business operations from function based to process based (Subramoniam, Tounsi, & Krishnankutty, 2009). One of the main features of ERP software is to provide business solutions that support the core processes of the business and administrative functionality. However, the ‘plain vanilla’, the most generic form of ERP, has been criticized as it forces companies to adopt certain equally generic business processes imposing companies’ distinctive strategy, organization, and culture (Klaus et al., 2000). Hence, an enterprise system, by its very nature, imposes its own logic on a company’s strategy, organization, and culture. It pushes a company towards full integration even when a certain degree of business-unit segregation may be in its best interest. And it pushes a company towards generic processes, even when customized processes may be a source of competitive advantage (Davenport, 1998).

The role of BPR in implementing ERP is of paramount importance. A custom tailored ERP system can only meet up to 80 percent of the company’s functional requirements, indicating that there exists a gap between company’s requirements and the proposed ERP system abilities. This means that companies have to change established workflows and
reengineer these to suit the ERP package. Companies often consider this a daunting and problematic task. Hence, simultaneously implementing BPR and ERP is the most effective method to implementing ERP (Subramoniam, Tounsi, & Krishnankutty, 2009).

2.2.3 The Scope of ERP

ERP's scope comprises the entire organization and also encompasses inter-organizational activities in the supply chains, both attributing to the complex nature of the system. Marnewick and Labuschange (2005) developed a model that explains the complexity of ERP in an easy to understand format. The model is illustrated in figure 2-2.

The software component is the most visible to users. The software includes different modules, of which the most generic once are:

1. Finance. The financial module is usually the backbone of the ERP system and includes concepts such as accounts receivable and inventory control.
2. Human Resources (HR). HR is an integral part to the ERP system and automates personnel management processes such as payroll, recruitment, and business travel.
3. Supply Chain Management (SCM). ERP systems support SCM in maintaining an oversight of the product, information and financial flows.
4. Supplier Relationship Management (SRM). ERP supports SRM and enables companies and their suppliers to collaborate on strategic sourcing and procurement.
5. Customer Relationship Management (CRM). ERP systems support CRM by storing customer data and processing it to detailed customer information.
6. Business Intelligence (BI). BI refers to the decision supporting tools that are enabled by ERP systems.

ERP integration allows the second component, the process flow, to flow efficiently through the enterprise. A basic process flow diagram is illustrated in Appendix I. The illustration shows how information flows between different modules, highlighting the interdisciplinary functionality (Marnewick & Labuschagne, 2005). Davenport (1998) also illustrates this enterprise-wide scope of ERP systems. He segregates the functionalities in four different disciplines: finances, human resources, sales and marketing, and operations and...
logistics. Table 1 illustrates the operations and logistics functions that ERP systems, in this case SAP® R/3, generally affect (Davenport, 1998).

Table 1: The Scope of an Enterprise System - Operations and Logistics, Adapted by: Davenport (1998)

<table>
<thead>
<tr>
<th>The Scope of an Enterprise System</th>
<th>Operations and Logistics</th>
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<td>Inventory Management</td>
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<td>Purchasing</td>
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<td>Quality Management</td>
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<td>Vendor Evaluation</td>
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The component of change management is especially relevant to the implementation phase and deals with issues such as user attitude, project changes, business process changes, and system changes (Marnewick & Labuschagne, 2005). Rightful implementation is essential to successful utilization of an ERP system. The last component of the ERP model is the customer’s mindset. This refers to the user’s understanding and acceptance towards the ERP system (Marnewick & Labuschagne, 2005). Bagchi, Kanungo and Dasgupta (2003) underline that for any ERP system to be sufficiently exploited, users must buy into the ERP system. Three factors are of important notion:

- User influence. The individual ability to exert the ERP system sufficiently.
- Team influence. Joint commitment is required to make the ERP system work.
- Organizational influence. An appropriate culture that stipulates ERP use.

In addition to this, Jain (2008) provides theory that signifies capabilities that are required to exert ERP value over time. These capabilities are distinct from the capabilities required to create ERP value in the implementation phase and go beyond user involvement and user participation. He indicates the significance of three capabilities: quality of ERP system use, quality of ERP information use and organizational IT capability. In the next paragraph these dimensions will be discussed in greater detail.

### 2.3 ERP Use

Jain’s (2008) findings ground the significance between ERP deployment and the firm’s ability to sufficiently benefit from the ERP system post-implementation. He argues that users’ behavior towards the ERP system influences the value obtained from an organization’s ERP system, especially in the long run. He argues several significant things:
1. To create value from ERP systems during the post-implementation phase an organization needs to either attenuate or amplify variety of doing things to match or exceed the variety exhibited by the ERP system.

2. The first set of capabilities pertains to the successful management of ERP system implementation. The second set of capabilities pertains to exploiting functionalities of the ERP systems during the post-implementation phase. The third set of capabilities includes those required to use the information generated through ERP systems effectively to support business objectives.

3. To exploit ERP functionalities, the organization needs to consider the functionality of the system and the user sophistication.

4. The benefits that ERP systems enable such as increased productivity and cost savings are often achieved in the face of daunting usability problems.

Jain (2008) additionally signifies three distinctive capabilities that enhance ERP value; these are quality of ERP system use, quality of ERP information use and IT capability. His framework is grounded on the logic that it is one thing to create ERP value from implementation, but another to sustain it over time. Hence, these capabilities are especially important to the post-implementation phase.

2.3.1 IT Capability

IT capability refers to the firm’s ability to mobilize and deploy IT-based resources in combination with other resources and capabilities. It also ties into the company’s level of innovation adaptability. It signifies to the firm’s ability to control IT-related costs, deliver the rightful information when needed, and effectively achieve business objectives through IT implementation. IT capability also involves IT governance. The following note by Weill and Ross (2004, p. 3) exemplifies the process of IT governance (cited in Jain, 2008):

*IT governance is not about what specific decisions are made. That is management. Rather, governance is about systematically determining who makes each type of decision (a decision right), who has input to a decision (an input right) and how these people (or groups) are held accountable for their role. Good IT governance draws on corporate governance principles to manage and use IT to achieve corporate performance goals.*

IT capability also refers to the organizations’ ability to acquire, deploy, and leverage IT functionality in combination or co-presence with other resources that shape and support business processes in value adding ways (Pavlou & El Sawy, 2004). Essentially, the IT capability appears at the heart of the organizations’ influence (e.g. organization culture) to encourage ERP use. This connects to a company’s capability to instill and promote appropriate behavior (i.e. integrity, formality, control, transparency, sharing, and pro-activeness). Examples to this are ensuring that information is accurate and not manipulated for personal gain, creating a willingness to share information with others and encouraging employees to look for information (Marchand, Kettinger, & Rollins, 2000).
2.3.2 Quality of ERP System Use

From an IT value perspective, IT capability is necessary, however does not directly contribute to creating ERP efficiencies. Essentially it is not the adoption of a system, nor the managerial capabilities, but appropriate use that causes organizations’ performance to improve (Boudreau, 2003). Boudreau (2003) encapsulates this in the concept of ‘quality of use’, which he describes as the ability to correctly exploit the appropriate capabilities of software in the most relevant circumstances. Firms tend to differ in the way they put their information systems to use (Jain, 2008). On the organizational level, firms influence quality of ERP use by issuing manuals, guidelines, governance, and restrictions. Companies also deal with issues on the more individual level, considering employees that enthusiastically deploy IT systems or that lack the understanding of it. There are ERP users that only achieve limited use and others that exert extended use. Boudreau (2003, pp. 4-5) enlighten this with two relevant examples from their notes (cited in Jain, 2008):

[Limited use] I don’t know how to use half of the functions in this system. I don’t know if they pertain to me or not. I know enough to get what I need to get in there. Most of us use the system like monkeys: we are pushing buttons. We have directions in front of us that say ‘Push this button’, ‘Push that button’ (…) we don’t push other buttons. People are afraid of pushing the wrong buttons (…) they know the buttons to push for their task, but not necessarily what is around.

Or

[Extended use] On a purchase order, if you find that you have to add money, you can’t just go and change the line amount. It’s not going to work; something is going to happen and Disbursements won’t be able to pay it. So, a workaround we have here is to add an additional line to say ‘Increase PO by X amount of dollars!’ just so the dollar amount equals what you need it to equal.

DeLone and McLean (1992) also highlight the dimension of use in their study on information system success by introducing the Information System (IS) success model (Figure 2-3). The model had multiple moderations ever since its first design. In the model, an important distinction is made between the intention of use and the ‘actual’ use (Petter, DeLone, & McLean, 2008). This underlines the idea that there is variability of use that affects the reality of use and the perceived usefulness (DeLone & McLean, 1992; Petter et al., 2008). This distinction is also important for measuring use. For example, research has found a significant difference between self-reported use and actual use (Collopy, 1996; Payton & Brennan, 1999; Petter et al., 2008). Normally, ‘heavy users’ tend to underestimate use, while ‘light users’ tend to overestimate use. This proposes that self-reported usage may be a poor alternate for actual use of a system (Petter et al., 2008). Also frequency of use may not be the ideal way to measure IS use (Doll & Torkzadeh, 1998). It is also said that more use is not always better (Petter et al. 2008). It is therefore suggested to measure use based on the effects of use, rather than by frequency or duration (Petter et al., 2008).
Behavior is a paradigm to the concept of post-implementation IT use and holds its roots moreover in the social studies. Throughout theories such as innovation diffusion theory (analyzing characteristics of adopters of innovators), social learning theory, and the structuration theory it is argued that innovators have an ability to quickly understand and apply complex technical knowledge in their field and can more easily cope with uncertainty, than for instance laggards, who are limited in their capability and confidence to adopt innovation (Bandura, 1977; Giddens, 1979; Rogers, 1983). The social cognitive theory by Bandera (1986) additionally signifies that organizations support and believe in individual capability can significantly strengthen an individual’s ability in operating an ERP system. This is particularly important in the post-implementation phase, whereas this believe can well exhilarate quality of ERP system use (Jain 2008).

Jain (2008) indicates that a lack of knowledge can severely limit the operational benefit of an ERP system. He also signifies that extended use can be ineffective if the organization’s IT capability is insufficient or if the quality of ERP information use, which is further discussed in paragraph 2.3.4, is inadequate in a firm. Hence, high quality of ERP system use is of leading importance to effectively deploy an ERP system as it is expected that comprehensive and full usage of the system capabilities will deliver benefits.

To conclude, a workable definition to quality of ERP system use shelters in Marchand et al. (2000) definition to IT practices. It is a company’s capability to effectively manage IT (i.e. use the ERP systems’ applications and infrastructure to support operations, business processes, innovation and managerial decision-making). This lies in the realm of software, hardware, telecommunications networks and technical expertise, supporting everything from the tasks of lower-skilled workers to the creation of innovative new products and the analysis of market developments and creation of strategy (Marchand et al., 2000).

### 2.3.3 User Satisfaction

A dimension intertwined with use is user satisfaction. According to DeLone and McLean (2003) use precedes user satisfaction in a process sense. In causal sense, a positive experience with the use of a system will lead to greater user satisfaction. They argue that increased user satisfaction will lead to a higher intention to use, which will subsequently affect use.
Different Perceptions

In the ERP literature various researchers discuss the differences of perspectives that exist between different users. Amoako-Gyampah (2004) compares the managerial (user-manager) perspective with that of the end-user (operation employees). His study examines these perceptions in the light of a new ERP system in comparison to the legacy system.

Amoako-Gyampah (2004) identifies a number of gaps between user-managers and end-users in his study on perceptual differences. He concludes that managers are significantly more agreeing to the question of whether the new ERP system is better than the legacy system. Evenly so, the end-users are more doubtful of the new system’s ability to provide accurate, reliable and timely information than the managers.

Another issue is faced in the shared believe with peers and managers regarding the benefits of the ERP system. It appears that user-managers are significantly more positive on the benefits of the system compared to end-users. A reason given is that user-managers have often familiarized themselves with the system far before the implementation, and have hence more understanding of the benefits. Additionally, Amoako-Gyampah (2004) argues that communication and teaching are tools to minimize gaps on shared believes.

More practical differences exist on the perceived personal satisfaction with the technology and the perceived ease of use of the technology. The author reasons that it is important to identify where such differences exist, as it will help managers devise appropriate interventions that minimize end-user anxieties, foster greater cooperation, build trust and consensus in order to achieve sufficient ERP utilization (Amoako-Gyampah, 2004).

2.3.4 Quality of ERP Information Use

Today, a lot of organizations compete over information more than they do over their products. The right information is seen as key to realize an edge over competitors. However, it is not only about gathering the right information, even more important is how well information is used to respond to market opportunities and threats (Jain, 2008).

ERP holds a significant potential to generate highly useful information related to internal processes (e.g. workflows) and so provide opportunity to improve current processes. ERP systems are used to gather data on customer service and quality management. This data enables firms to see customers in their needs and aids to the strategic decision making process (Jain, 2008). Therefore, the primary objective of ERP systems is to integrate processes across an organization and provide better information for control and decision purposes. How managers use the information provided by an ERP system is thus impacting the perceived value of the system (Jain, 2008).

Marchand et al. (2000) also identify the significance of information management practices to IT and describe these practices more specifically as the capability of a company to manage information effectively over its life cycle. This includes sensing, collection, organizing, processing and maintaining information. Skills include identifying and gathering important information about markets, customers, competitors, and suppliers; organizing, linking and analyzing information; and ensuring that people use the best information available.
Acquiring high IT capability, quality of ERP use, and quality of ERP information use are all to constitute to what is in the literature referred to as ‘Information Orientation’ (IO). IO measures a company’s capabilities to effectively manage and use information to achieve superior business performance and to better anticipate to changes in the external environment (Marchand et al., 2000). Despite that an ERP system holds great promise for system integration, these potentials can only be realized when users understand what they can do with the system. Jain (2008) therefore concludes that ERP systems’ value is primarily determined by the quality of ERP system use. The IT capability and the skills relating to ERP information use are argued to have a moderating role to this. Jain (2008) proves that the ‘higher’ the IT capability, the ‘higher’ the quality of ERP system use, and the more a company benefits from its ERP system. In case a firm is lesser concerned with qualities putting ERP information to use, Jain’s (2008) results show that extended use is considered non-effective. In other words, a company would fail to benefit from high-level quality of use if the firm is not able to use ERP information efficiently (Jain, 2008).

Though ERP systems’ value can be perceived in various ways, and is depending on perception and intention, as discussed earlier, the next session will discuss some of the benefits that can be derived and detriments that can be caused by using an ERP system.

### 2.3.5 ERP Benefits and Detriments

Shang and Seddon (2003) offer a framework of benefits that organizations might be able to achieve from using ERP systems (Adam & Sammon, 2004). At operational level benefits can be gained from cost and cycle time reduction as well as in productivity, quality and customer service improvement, as ERP systems automate business processes and enable processes changes. Furthermore, on managerial level ERP systems can provide better resource management, improved decision-making, improved planning as well as performance enhancement, stipulated that the ERP system is used as a centralized database and deploys built-in data analysis capabilities (Shang & Seddon, 2003). Through their large-scale business involvement and internal as well as external integration capabilities, ERP systems assist in achieving strategic benefits such as the support to business growth and alliances, generating product differentiation, enable e-commerce and build external linkages. Moreover, at the IT infrastructure level, ERP systems provide an infrastructure that could support and provide business flexibility for current and future changes as well as increase IT infrastructure capability. Lastly, the integrated information-processing capabilities of ERP systems could affect the creation of common organizational capabilities as they support organizational changes and build upon common visions (Shang & Seddon, 2000).

Organizational benefits, in terms of cost reductions and profits, can be titanic once competitive advantages show from ERP systems use. For example, IBM®’s Storage Systems division reduced the time required to re-price all of its products from 5 days to 5 minutes, the time to ship a replacement part from 22 days to 3 days, and the time to complete a credit check from 20 minutes to 3 seconds. Fujitsu Microelectronics® reduced the cycle time for filling orders from 18 days to a day and a half and cut the time required to close its financial books from 8 days to 4 days (Davenport, 1998).
On the other hand, Rashid, Hossain and Patrick (2002) mention that organizations need to overcome certain problems and disadvantages. One of the most highlighted disadvantages is that ERP systems are time-consuming, due to sensitive issues and internal organizational politics. Moreover, they are expensive, certainly when the business process reengineering cost may be extremely high. The authors also state that ERP systems are complex as they contain many features and modules, which can mislead the user to negative results. Lastly, the authors argue that ERP systems are dependent on its vendors, as some of the ERP systems are requiring occasional expert assistance or maintenance (Rashid et al., 2002).

### 2.4 ERP Post-Implementation

As mentioned earlier, even if a system is ‘successfully’ implemented, the ‘go-live’ point of the system is not the end of the ERP journey, moreover the post-implementation stage is considered the phase where the real challenges will begin and more critical risks may occur (Willis & Willis-Brown, 2002). Many organizations focus only on the completion of an ERP system and value implementation as the final goal instead of a milestone. However, research shows that many ERP systems are discontinued 3 months to a year after they are ‘successfully’ completed (McGinnis & Huang, 2007). It is therefore that ERP systems are subject to continuous improvement. Continued efforts after system start-up will influence the ultimate success of an ERP system (McGinnis & Huang, 2007). Therefore, in the post-implementation phase, ERP system usage plays a critical role for e-business longitudinal success (McGinnis & Huang, 2007). In this stage ERP systems are up and running and significantly involved in organization’s units with more than 1,000 modules and 10,000 software applications (Stevens, 1997). Costs are at a point of three to four million for small firms to over one billion for large firms (Chen, 2001), cumulated over a time span of one up to over four years, depending on the ERP system’s complexity (Weston, 2001; Yu, 2005). Because of this complexity, replacement of an ERP system has become prohibitively expensive. An ERP system is therefore unlikely to be replaced, once it is implemented. In this stage the ERP systems are likely to be leveraged, upgraded, expanded and refined to satisfy new or updated business processes and IS infrastructures (McGinnis & Huang, 2007).

It is stated that only when the post-implementation of ERP succeeds, the entire ERP initiative can be considered successful (Zhu, Li, Wang, & Chen, 2010). The post-implementation success of ERP is a complex concept involving a number of perspectives such as organizational performance and the financial return on investment in ERP (Ifinedo, 2006; Sedera & Gable, 2004). Obtaining profits from ERP systems embodies the post-implementation success of ERP (Al-Mashari, Al-Mudimigh, & Zairi, 2003). At the post-implementation stage, an enterprise is able to conduct business through the ERP system and therein begins to realize the benefits that the system enjoys (Zhu et al., 2010). The ERP system directly affects the operational and managerial processes (Davenport, 1993) and hence, these processes are considered the practices to gain direct benefits from the use of an ERP (Zhu et al., 2010).

Zhu et al. (2010) also argue that operational and managerial benefits are demonstrated through multiple aspects within an organization. Primarily, an ERP system substitutes most routine and repetitive jobs, and simultaneously links various operational units. This results
to that business processes can be streamlined, improving the efficiency of the operation. This leads to operational benefits in terms of productivity improvement, cost reduction, inventory-level reduction, and customer service enhancement (Davenport, 1993; Shang & Seddon, 2003). Additionally, the ERP system can increase the transparency of operational processes by supplying enhanced information. This transparency progresses the coordination and control of the operations, which are indicators to operational benefits (Mooney, Gurbaxani, & Kraemer, 1995; Zhu et al., 2010). If a system is not delivering the desired value, a company should focus on enhancing that value first and then start focusing on capabilities that are required in order to sustain the value (Jain, 2008).

McGinnis and Huang (2007) analyze this sequence, where a company strives to enhance value from the ERP system, from a continuous improvement perspective. They argue that in order to maintain self-sufficient, the organization must capture the intellectual capital (i.e. from third party resources, experts, consultants and software vendors), retain and manage it, and responsibly deploy it as needed. Hence, an important aspect to improving ERP system use is adequate knowledge management. ERP continues improvement can best be considered in a series of augmenting projects, where aggregated knowledge supports retooling and reworking the ERP system’s functionality (McGinnis & Huang, 2007). Figure 2-4 shows this process of interrelating projects, where every time knowledge is stored, generated, distributed and applied by a so called ‘support group’. This support group remains constant across the projects to seize knowledge transferability, stability and sustainability to ERP system employment. This can be an internal platform or an assigned group of people. The support group supervises how knowledge of ERP is transferred through a four-step cycle. Step one, design, entails defining the deliverables and the first acquaintance to the system; this is where tacit knowledge is shared among different parties (e.g. between employees and consultants). Step two involves construction of the system; in this step the tacit knowledge is shared with the rest of the organization and transformed to explicit knowledge. Step three, deployment, acquires project teams to specialize in functional areas and to coordinate the explicit knowledge comprehensively into the organization. Step 4, analysis, represents the internalization quadrant and allows for interpretation of the material gathered during the prior stages. Here augmented knowledge is created which leads to new opportunities and further improvement to the system (McGinnis & Huang, 2007).

Also, within all the steps of continuous improvement there is a constant cycle of externalization, combination, internalization and socialization processes. Applying this perspective to ERP, increases the likelihood that lifecycle of the ERP systems is continuously stimulated and does not fall in decline. The model by McGinnis and Huang (2007) is largely based on theoretical data, however is known to be largely similar to the ValueSAP® approach by SAP®. (McGinnis & Huang, 2007).
Figure 2.4: ERP Continuous Improvement (McGinnis & Huang, 2007)
3 Methodology

This part of the thesis will clarify the research methods that were applied in this study. The research approach, strategy, design, data collection and data analysis techniques will be explained. Furthermore, the creditability will be discussed through its reliability and generalizability.

3.1 Research Approach

The introduction chapter showed that ERP systems are a necessary demand in today’s business environment and generally accepted as enablers to enhance company performance. Nevertheless, statistics show that ERP systems are considerably inefficiently deployed. This prompts to assume that there are certain dimensions and implications to ERP system use that impact the efficiency and effectiveness of a system on the company’s operations (either positively or negatively). It also prompts to believe that in a considerate number of cases such implications are simply accepted over time, whereas users become ‘used to’ the implications. The purpose of this thesis is to explain how ERP systems use in a maturity phase, also referred to as the post-implementation phase, impacts logistics operations in enterprises. Through this purpose, the thesis seeks to illuminate and articulate what generally goes unnoticed in ERP system use, as it is ubiquitous, commonplace and everyday (Packer & Addison, 1989).

Typically, the research purpose holds an exploratory, descriptive and/or explanatory meaning (Saunders, Thornhill, & Lewis, 2009; Bryman & Bell, 2011). The predominant mode that is applied here is explanatory, as the purpose is to shed a refreshing light on a generally accepted, however not always clearly understood phenomenon (Cole & Avison, 2007). In order to explain the misconceived and unnoticed phenomena around ERP system use, this thesis undertaking revolved around cycles of understanding, explaining and interpreting. This is also referred to as hermeneutics and will be further discussed in the research strategy.

Saunders et al. (2009) argue that theory use is commonly made explicit in the presentation of the findings and conclusion, and so answer an important question concerning the design of the research project. As the approach towards theory in this thesis is not so apparent, the authors have decided to elucidate this here; hermeneutics is embedded in the concept of abduction. To quickly grasp the concept of abduction it is useful to compare it to two commonly used modes in carrying out research: deduction and induction. With deduction, conclusions come from premises. For example, all roses have thorns; this is a rose; therefore it has thorns. Induction works in the opposite direction, from cases to general principles. For example, these plants are all roses; they all have thorns; therefore all roses probably have thorns. Abduction is less like these logics. It describes the operation of making a leap to a hypothesis by connecting known patterns to specific hypotheses. For example, all roses have thorns; this plant has thorns; therefore it might be a rose (Dew, 2007). This thesis identified that companies ‘unconsciously’ struggle with ERP, unraveled this notion through cases, and consequently concluded on a plausible general problem.

Abduction never aims to exclude alternative explanations to a phenomenon, yet unfolds the ‘plausibility’ that a phenomenon exists, worthy of further evaluating (Dew, 2007). An empirical event or phenomenon is so related to a rule, which reveals new insights (or sup-
position) about the event or phenomenon. Abduction is the art of continuously ‘suggesting newly’ refined general rules, providing basis for further research of cases that follow or deviate from the rule, which again lead to ‘suggesting’ general rules - in the form of hypotheses or propositions - or ultimately theory (Kirkeby, 1990; Andreewsky & Bourcier, 2000; Kovács & Spens, 2005).

Researchers in the field of logistics have been calling for rigorous orientation toward theory development testing and application, and also criticized logistics research for the lack of it (Mentzer & Kahn, 1995, p. 231). The abductive research approach claims to enhance understanding and to facilitate theory building, which is particularly found useful in profoundly interdisciplinary fields like logistics (Kovács & Spens, 2005).

3.2 Research Strategy - Hermeneutics

The cycle of understanding, explaining and interpreting is pictured in figure 3-1 and illustrates a hermeneutic framework. In short, hermeneutics is a theory of interpreting texts (Dew, 2007). The central idea behind hermeneutics is that the analyst of a text must seek to bring out the meanings of a text from the perspective of its author, entailing attention to the social context within which the text was produced. Its modern advocates see hermeneutics as a strategy that has potential in relation both to texts as documents and to social actions and other non-documentary phenomena (Bryman & Bell, 2011). Hermeneutics holds the ability to investigate evolving behavior by uncovering anomalous words or deeds, what makes this method highly suitable for human-computer investigations, a core topic area for IS researchers (Cole & Avison, 2007).

Through deploying the hermeneutic framework, the authors achieved to meticulously and sequentially strip down theories from existing literature and empirical data (that were gathered through in-depth interviews) to ‘parts’, re-interpreted the theories and re-consolidated the theories to a ‘whole’ in order to ‘better’ understand (Cole & Avison, 2007) how ERP system usage impacts operations in companies.

The crux to hermeneutics is that the task of ‘(causal) explanation’ is undertaken with the reference to the ‘interpretive understanding of social action’, making it broadly interpretive (Bryman & Bell, 2011). Hermeneutics is consequently engaged in two tasks: ascertaining the exact meaning-content of a word or phrase; and defining guidelines to facilitate interpretive explication (Bleicher, 1980; Cole & Avison, 2007).

Despite its potential as a powerful IS and logistics research strategy, hermeneutics is not a particularly popular methodology. The authors note that there is a shortage of formal structures for conducting hermeneutic research and a considerate level of difficulty in understanding and correctly applying its technicalities. Time is advised to learn ‘how to do’ hermeneutic reflection (Cole & Avison, 2007).
3.3 Research Design

By applying hermeneutics, the authors pursued the most reasonable and logical explanation to answer the purpose. Having decided upon hermeneutics as a strategy, Dew (2007) warned that the catch is that ‘we’ all too easily forget that these are only hypotheses. He states: we can see actions, but we have to abduce motivation. And because the incentives for deception are sometimes great, we may make mistakes. We therefore need to exercise caution (Dew, 2007, p. 41). Selecting a correct research design strengthens the reliability, replication and validity of a research project (Bryman & Bell, 2011). Cole and Avison (2007) describe a suitable hermeneutic approach in detail. They explain the six stages of hermeneutics that are also illustrated in the hermeneutic framework for practical research shown in figure 3-1. The authors have used these stages in order to systematically explain the research design of this thesis:

**Stage 1: The Explication of Prejudices**

The first stage of any research process is to establish a research focus and transform masses of data into useful and condensed forms of intelligence, also called data reduction (Miles & Huberman, 1994; Denzin & Lincoln, 1998; Silverman, 1998). In hermeneutics this involves clarifying one’s presuppositions or prejudices. This is to allow the researcher to understand their interpretive lens better prior to data collection and analysis. The presuppositions to this thesis are discussed in the first paragraph of the research approach. They were abducted through introductory literature and partially through literature presented in the frame of reference.

**Stage 2: Formulating Lines of Inquiry**

In this stage the researcher crafts a first line of inquiry that will serve as the reference criterion for the study. More specifically, here ‘parts’ are determined by the researcher to be key elements of the ‘whole’ and are used as themes for discussion in the collection of data during the next stage of active interviews. In this thesis all inquiries throughout the research process were comprehended in a template. A template is essentially a list of codes or cate-
gories that represent themes supposed from the data that have been collected (Saunders, et al., 2009). In this thesis the template was monitored by intensive focus on recurring key words and phrases in literary documents and transcriptions from interviews. The template is illustrated in Appendix II. King (2004) outlines that template analysis offers a dynamic approach to qualitative analysis, whereas categories are predetermined and then amended or added to as data are collected and analyzed (Bryman & Bell, 2011).

**Stage 3: Conducting the Active Interview**

The ‘active interview’ considers the interviewer and interviewee as equal partners in constructing meaning around an interview event (Holstein & Gubrium, 1995). The interview is advised to be highly unstructured where the aim is to delve underneath surface of superficial responses to obtain true meanings that individuals assign to events (Cole & Avison, 2007). In this thesis the authors made use of an interview guide that is attached in Appendix III. The interviews in this research could best be characterized as ‘semi-structured interviews’. The approach that was conducted can be described as ‘non-standardized’ (Saunders et al., 2009). This interview method was selected because the researchers were moved to an extensive list of themes and questions that could potentially be covered in the interest and relevance of the research. The order of questions varied, because it was largely dependant on the flow of the conversation and the themes depicted by the interviewee. Through this method, additional questions could be asked to the respondents, which depended on the matters that were put forward by the respondents.

Additionally the researchers designed a short questionnaire. This is a known technique in hermeneutics, used by inter alia Foster (1994) in order to obtain contrast structures in the interview. This enhances to depict and interpret true meanings that individuals assign to events, and the complexities of their attitudes, behaviors and experiences (Bryman & Bell, 2011; Cole & Avison, 2007)

**Stage 4: Analyzing ‘a Priori’ Codes**

Having collected data through active interviews, the fourth stage of the framework displays the data for the purpose of reflection and reconstruction. Interpretation is structured systematically via the constructed prejudices recorded in the categories (Cole & Avison, 2007). In this thesis pertinent audio-recordings were transcribed by the process of data sampling (Bryman & Bell, 2011) and summarized through selective reading (Cole & Avison, 2007). To produce a thick description (Geertz, 1983) of the phenomena the focus was on the constituent parts rather than on how the elements were connected at first. Central to the analysis of understanding - explaining - interpreting, the authors have constantly cross-referenced the results of the empirical data with conventional conceptions that were sequentially captured in the template. This concept helped maintain the focus of the analysis on the circular presupposition of hermeneutics and to integrate different data sources by treating them as a singular totality (Cole & Avison, 2007). The number of conversational rounds ultimately depended on the degree of variance between the prejudices and the acquired data (Cole & Avison, 2007). The outline of this process is illustrated in figure 3-2 (T stands for Template and FoR stands for Frame of Reference).
Stage 5: Breakdown in Prejudices

According to constructivist hermeneutic thought, ‘we’ attempt to understand new information within the context of what we already know (Cole & Avison, 2007). Reconceptualizing our understanding of the phenomena following breakdown encourages the use of ‘borrowed’ preconceptions or highlight additional sources of literature for review (Cole & Avison, 2007). In this thesis the authors achieved this breakdown by following up on secondary documented literature. Also case companies with different backgrounds participated and perceptions from both user-managers and end-users were explored. Ultimately the researchers constructed so new explanations by attesting partial explanations and developing in-depth understanding to previously taken for granted aspects of the phenomena (Cole & Avison, 2007).

Stage 6: Fusion of Horizons

In the final stage of the framework shared meaning is distilled (Cole & Avison, 2007). The researchers distinguished between partial fusions (conclusions relating to specific themes or issues providing rich descriptions of a ‘part’) and ‘Verstehen’ (an understanding of the complexity of issues as a whole, representing fusions of horizons, constituting of intercategorical links). The framework explicitly acknowledges that interpretation of the data does not stop with the data analysis but is also a part of the presentation and discussion of that data: interpretation also occurs in the rendering of material understandably to others beyond the participants of the proposed study (Cole & Avison, 2007). To assure accuracy and reliability in this phase, the authors first presented the findings to the interviewees to crosscheck interpretive misconceptions on the side of the researchers.
3.4 Data Collection

In this thesis, ‘texts’ as Dew (2007) mentions pertain the documentary secondary data collected from journals and the transcriptions of in-dept interviews with user-managers and end users of logistics companies.

3.4.1 Documentary Secondary Data

The parts on secondary data, comprehending both the introduction and frame of references, were similarly constructed to hermeneutics, using cycles of searches. Beginning with phrases in the line of ‘ERP system use’, articles were evaluated using a selective reading approach. In this approach texts were read several times asking: ‘what statement(s) or phrase(s) seem particularly essential or revealing about the subject’s prejudices and phenomena regarding ERP system use (Cole & Avison, 2007). Multiple databases and search engines where utilized, such as ABI/Inform and Scopus. Using Scopus also allowed the researchers to evaluate the articles on other criteria (e.g. number times an author was cited).

3.4.2 Case Companies and Participant Selection

Yin refers to a case study as an empirical inquiry that investigates a contemporary phenomenon within its real-life context (Yin, 2003, p. 7). Case study research is concerned with the complexity and particular nature of the case in question. The approach is popular and a widely used research design in logistics business research (Bryman & Bell, 2011; Schlichter & Kraemmergaard, 2010). In this thesis both multiply (different) case companies and different staff (typified by user-role) participated and so contributed to different perspectives on the phenomena around ERP system use. Saunders et al., (2009) suggest that a focus on multiple-case studies provides the ability to establish whether the findings of the first case arise in the other cases and, as a consequence, allow to generalize from these findings. Yin (2003) states that analytic conclusions independently arising from more than one case will be more influential than those coming from a single case or experiment. The multiple-case study approach assisted the authors of this thesis to meticulous. The data collection only considered current issues, therewith reflecting a cross-sectional approach (Bryman & Bell, 2011).

Yin’s (2003) second dimension refers to a holistic versus an embedded case study approach. This study targeted both user-managers and end-users of ERP systems. Particular interest went to general managers, IT managers and operators concerned with operations processes. Hence this thesis obtained an embedded approach. Consequently this thesis excludes particular organizational departments such as HR and marketing, as they use ERP differently and therefore may portray different issues.

The selected organizations for this research have their presence in warehousing, distribution and/or manufacturing. All have one common characteristic as they are using an ERP system to plan, organize and execute their logistics operations. Table 2 below lists the companies accordingly to background and includes an overview of the participants and their positions in the company. The authors purposively contacted 22 companies in the categories of warehousing-, transportation-, third party logistics-, and manufacturing com-
panies by means of visiting, calling and emailing. The categories were purposefully chosen because they represent companies that are most typically mentioned in the literature on ERP and logistics. With Bring® Express AB and Bring® Warehousing AB being separate companies, the authors achieved to obtain a total of 7 interviews in 5 different companies. In two companies additional respondents were reached through snowballing.

For reasons of confidentiality, a fictitious name is used for the last interviewed company under research. In the remainder of this report, the company labeled ABI Soft.

Table 2: Selected Organizations and Respondents

<table>
<thead>
<tr>
<th>Company</th>
<th>Company’s Background</th>
<th>Interviewee’s Name</th>
<th>Position</th>
<th>Length</th>
<th>Language</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bring® Warehousing AB</td>
<td>Warehousing</td>
<td>Johan Andersson</td>
<td>Site Manager</td>
<td>52 min.</td>
<td>English</td>
</tr>
<tr>
<td>Bring® Warehousing AB</td>
<td>Warehousing</td>
<td>Mattias Danielsson</td>
<td>Site Manager</td>
<td>45 min.</td>
<td>English</td>
</tr>
<tr>
<td>Bring® Express Service AB</td>
<td>Transportation</td>
<td>Markus Alhult</td>
<td>Dispatcher</td>
<td>77 min.</td>
<td>English</td>
</tr>
<tr>
<td>Aditro® AB</td>
<td>Third Party Logistics</td>
<td>Markus Åman</td>
<td>Administration Manager</td>
<td>70 min.</td>
<td>English</td>
</tr>
<tr>
<td>DuPont®/DuPont Sustainable Solutions®</td>
<td>Manufacturing</td>
<td>Ruud Grande</td>
<td>Site Manager/Consultant</td>
<td>64 min.</td>
<td>Dutch</td>
</tr>
<tr>
<td>DuPont®</td>
<td>Manufacturing</td>
<td>Jaap Mendel</td>
<td>Site Manager</td>
<td>47 min.</td>
<td>Dutch</td>
</tr>
<tr>
<td>ABI Soft</td>
<td>Manufacturing</td>
<td>Kostas Paraskevas</td>
<td>ERP Consultant</td>
<td>51 min.</td>
<td>Greek</td>
</tr>
</tbody>
</table>

3.4.3 Interviews

The primary data collection of this research was done by personal or telephone interviews with the above listed participants. Interviews can contribute to gather relevant valid and reliable data (Saunders et al., 2009). Kvale (1996) argues that the research interview is a specific type of interaction between humans in which knowledge is increased through a dialogue. It is mentioned that the main function in interviewing is to comprehend the meaning of what the respondents state (Kvale, 1996).

Interviews may be highly formalized and structured, utilizing standardized questions for each research participant respondent, or they may be informal and unstructured conversations (Saunders et al., 2009). The term qualitative interview is normally used to capture the different types of interview that are applied in qualitative research where interviews have a tendency to be less structured than in survey research (Bryman & Bell, 2011).

Four interviews were conducted over meetings at the respondents’ locations in order to achieve the most suitable data collection for this study. However, as the researchers are respecting the limited available time of respondents and that some of the respondents were located far away from the researchers’ location, three interviews were conducted over the telephone or using Skype®. All interviews took approximately an hour; the shortest interview lasted 45 minutes and the longest one hour and 17 minutes. The interviews were transcribed as described in the research design. The transcriptions are available upon request.
3.4.4 The Interview Guide and Consulting Experts

The interview guide offered guidance in conducting the interviews. The guide can be found in Appendix III. In order to facilitate data collection, the interview questions that were formulated in line with the research questions, were planned based on theories from the literature review. For content validity an expert in the field assessed the aptness of the questions in the interview guide in relation to presented knowledge. This was done in a discussion format (Carmines & Zeller, 1979). The expert had been working as a consultant for SAP® in China for 5 years. He requested to remain anonymous in this report. As a result, the first part of the interview guide, a small questionnaire, aimed to gain a perspective of how the interviewee regards the ERP system. The guide embodies a mixture of follow-up questions that further explore the participant’s perception of the ERP system and questions that moreover concern the actual use of the ERP system in the organization.

In order to obtain more constructive and precise responses, the researchers also planned interview closed-ended questions encouraging ‘yes’ or ‘no’ answers by the respondents. After such a question the question ‘why?’ the respondent agreed or disagreed was raised.

3.5 Data Analysis

Abductive reasoning emphasizes the search for suitable theories to an empirical observation, which Dubois and Gadde (2002) call ‘theory matching’, or ‘systematic combining’. In this process, data is collected simultaneously to theory building, which implies a learning loop (Taylor, Fisher, & Dufresne, 2002). To facilitate this learning loop the authors have opted that data in this thesis will be analyzed using a combination of techniques. Besides theory matching and systematic combining, the three techniques addressed are explanation building, inductive analysis and template analysis.

Explanation building is considered a deductive-based analytical procedure that involves an attempt to build an explanation while collecting and analyzing data (Yin, 2003; Saunders et al., 2009). This approach is related to explanatory case studies and is designed to test a theoretical proposition. Through explanation building the authors achieved to deduce categories. In the sequence of hermeneutics these categories were modified throughout the cycles, however always inclined by the coded template. By using the template analysis the authors of this thesis exerted an approach suitable to qualitative analysis because categories were predetermined and then amended or added to as new data was collected and analyzed in sequences (King, 2004; Saunders et al., 2009).

The analytic induction technique was applied in the final stage ‘fusion of horizons’, where inter-categorical relationships needed to be established. Johnson (2004, p. 165) defines analytic induction as ‘the intensive examination of a strategically selected number of cases so as to empirically establish the causes of a specific phenomenon’ (cited in Saunders et al., 2009, p.508).

Adopting a wide range of techniques, the analytic process in this study has been a continuous process aiming to explain the phenomenon through continuous assessment and critical reflection (Yin, 2003; Johnson, 2004).
3.6 Credibility of the Research Findings

Credibility is about reducing the possibility of getting the answer wrong (Saunders et al., 2009). Key to credibility in this thesis is the provision and framing of guidelines to abductive reasoning. According Dew (2007) this entails three important characteristics: its plausibility (how well does the evidence hold up the hypothesis or proposal), defeasibility (how well are alternatives explored or is there a strong probability for new explanations) and presumption (in what way is the research framed, what has been included and excluded through prejudices). The thickness of the research design together with the applied methods of data collection and analysis techniques is to ensure internal validity and credibility of the empirical findings. Furthermore the authors have implemented a number of cautions to ensure reliability explained in the below paragraph. Additionally, the authors discuss the generalizability of the findings.

3.6.1 Reliability

Saunders et al. (2009) defines reliability as the extent to which the techniques on data collection and analyzing procedures will yield consistent findings. The researchers are aware that it is impossible to come to exactly the same data when an interview would be repeated. To enhance the likeliness of repetition the authors created a questionnaire plus interview guide with the help of an expert in the field of SAP®. This guide formed the basis for discussion. Moreover, Kumar (2010) argues that some aspects such as the respondent’s mood, the interviewer’s mood and the regression effect of an instrument can affect the reliability of a research instrument. In order to enhance the reliability, both interviewers were present during the first four interviews; the remaining three were conducted in the researchers native languages. Notes were kept and compared after the interviews. Both researchers individually transcribed the first four interviews; subsequently a comparison of interpretations was possible for the first four interviews. Additionally, as hermeneutics is about interpreting text, and it may be assumed that one can best interpret its native language; the last three interviews were done in the mother tongues of the authors. Besides, doing the first four interviews together helped the authors to achieve common ground in conducting interviews. In terms of research ethics, all interviewees were notified about the recording of the interview and offered to remain anonymous. This way the authors are ensuring that the research for this thesis is designed both methodologically sound and morally defensible to all those who are involved (Saunders et al. 2009).

3.6.2 Generalizability

According to Saunders et al. (2009) validity is related to whether the findings are really about what they seem to be about. Saunders et al. (2009) point out that external validity is the degree to which the results from a particular study can be applied to all relevant contexts. A thick research design with its emphasis on a constant developing template in the context of a multiple-case study approach is designed to aid to this. The template was used to sequentially analyze new information gained through interviews using existing knowledge that was reflected in the continuously - through cycles - updated template. Furthermore the evidence of seven different perspectives, encompassing seven interviews.
from both direct-users and manager-users, in 5 companies with different backgrounds covering a complete variety of logistics operations is expected to yield to the generalizability of the findings. The use of secondary data from authentic journals aided the authors of this research to include rigorous data and improve the general validity. Finally, the results were crosschecked with interviewees via PowerPoint™ presentation (Appendix IIII) in order to achieve respondent validation. This was also done to verify that the results account for the all companies that are considered in the report, augmenting the generalizability.

3.6.3 Limitations

The authors of this thesis are aware that there are limitations. Cross-sectional differences in terms of companies’ background could not be made, as this would violate the confidentiality agreement that the authors made with the participant. The authors agreed that that empirical data would not able to trace back to respondents and or the company. By having limited numbers of participants and companies representing each category, it was impossible to denote cross-sectional discrepancies without uncovering the data’s origin. The second limitation entails the line in which the interviews have been conducted. The authors cannot fully guarantee that the line of the conversations could have gone another way if the authors would have started with a different participant. However, the authors remark that based on the principles of hermeneutics, new content has been sequentially cross-checked with earlier obtained data, therefore the results are, but for the last interview, substantially verified by later interviews. The third limitation is that IT develops continuously, consequently perspectives and therewith interpretations of IT may change over time.

To conclude, the fully referenced sources of literature, the transparency to and mixture of the organizations that were targeted for interviews, the use of a semi-structured interview guide, disclosure of the interview guide, availability of interview transcriptions, full disclosure of the template, full disclosure of the presentation that was sent to the participants, disclosure of pattern analysis, the consult from the expert and respondent validations, should all compel to contribute in meeting the criterion of how good a qualitative study is, according to Lincoln and Guba (1985), as cited by Bryman and Bell (2011 p. 43) - that of ‘trustworthiness’. Therewith sustaining the creditability, transferability, dependability and conformability of the thesis and in doing so addressing Dew’s (2007) criteria of plausibility, defeasibility and presumption.
4 Empirical Findings

In accordance with the method, the empirical findings are sequentially and meticulously strapped down to “parts”. This involved a meticulous process of editing or expanding categories to the template, after every interview and, or when additional data was found in articles. As a result of these cycles, below categories were formed and serve as “parts” that will be synthesized to a “whole” in the analysis. As many of the interviews contained overlapping data (that contributed to strengthening the “parts”), and because a display of all data would be incremental and unnecessary, the authors have decided to present summaries to the categories that include general extracts of the interviews. Hence, corresponding categorical theories are ‘matched’.

Table 3: Respondent User types and Abbreviations

<table>
<thead>
<tr>
<th>A/A</th>
<th>Type of User</th>
<th>In Text Abbreviation</th>
<th>Communication Form</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Manager User_1</td>
<td>MU_1</td>
<td>Personal Communication</td>
<td>06 - March - 2013</td>
</tr>
<tr>
<td>2.</td>
<td>Manager User_2</td>
<td>MU_2</td>
<td>Personal Communication</td>
<td>15 - March - 2013</td>
</tr>
<tr>
<td>3.</td>
<td>Manager User_3</td>
<td>MU_3</td>
<td>Telephone Communication</td>
<td>15 - April - 2013</td>
</tr>
<tr>
<td>4.</td>
<td>Manager User_4</td>
<td>MU_4</td>
<td>Telephone Communication</td>
<td>19 - April - 2013</td>
</tr>
<tr>
<td>5.</td>
<td>End User_1</td>
<td>EU_1</td>
<td>Personal Communication</td>
<td>22 - March - 2013</td>
</tr>
<tr>
<td>6.</td>
<td>End User_2</td>
<td>EU_2</td>
<td>Personal Communication</td>
<td>12 - April - 2013</td>
</tr>
<tr>
<td>7.</td>
<td>End User_3</td>
<td>EU_3</td>
<td>Telephone Communication</td>
<td>22 - April - 2013</td>
</tr>
</tbody>
</table>

4.1 The Capacity of ERP

An ERP system is an irreplaceable system for any company these days (EU_1, EU_2, EU_3, MU_3 & MU_4). Yet it should not be forgotten that it is ‘just a tool’ (EU_3). ERP entails a breadth of definitions and even includes excel sheets (MU_4). The conversations with EU_3, MU_4, MU_1 and MU_3, indicate that an ERP system’s mere feature is to support the processes. If they don’t support the processes, and there is a feeling that the system is defining the processes, then the IT system is simply build incorrectly and, or the processes are unclear or have been ill configured (MU_4). The following quote reflects this:

Everything that you as a firm are capable of and able to deliver is possible to automate in an IT system. IT systems only support the processes, if they are not, then you build the IT system incorrectly. After all, the IT systems only do what you require them to do, and this again relates to the setup of the processes. - (MU_4, Telephone Communication, 19-04-2013)

In supporting the operation processes an ERP system requires any company to work according to standards (MU_1, MU_3, MU_4 & EU_3). The manager users all indicate that when they implemented the system, they had to adapt several of their activities. Yet, EU_3 reasons that: when you are buying an ERP package, you are essentially buying the ‘best practices’ of an industry, incorporated in a system. (EU_3, Telephone Communication, 22/04/2013). Another quote says: once you have decided upon a system such as SAP®, you are not going to work with anything else (MU_4, Telephone Communication, 19/04/2013). An ERP system is that big that
changing this software is practically no option (MU_4). One has to modify all applications to operate with an ERP system. For a sizable company coping with considerable resources and operations this process is considered even more impactful. Smaller companies are considered to be more adaptive (MU_3 & MU_4).

The second inference that features ERP systems as business tools is that ERP is used to improve processes through information that can be extracted from the system (all interviews). Hence, precise and correct use of the system and use of information will determine the results (MU_1, MU_2 & MU_4). This connects with the transparency in the configuration of the processes, as shown in the following quote from MU_1:

_The more detailed and the more accurate information you have, the easier it is to make improvements, and to know exactly what is wrong in each process. If you do not have that information, it is hard. Of course you can have an idea about what is wrong in a process, change that and measure the overall time, but if you can measure each part of each process, then you can really improve things._ - (MU_1, Personal Communication, 06/03/2013)

ERP systems are considered systems for information purpose (all users), whereas the modules or connected software are used to manage operations and client management (all users). MU_1, MU_2, MU_3 and MU_4 often mentioned and referred to the financial reporting coming from ERP use. Particularly setting different KPIs were made possible using ERP (all Manager Users). Presentation of financial data is evident (MU_1, MU_2, MU_3 & MU_4)

To describe the importance of an ERP system MU_3 provides an example where the ERP system revealed valuable:

_In the US we had this once that the plant shot down for a six month time period, because of a hurricane that caused floods, causing water damage to the operations systems. In order to deliver to critical clients, the implemented EPR system was able to retrieve accurate information instantly on the whereabouts of products. This is something that with the legacy would have taken months. Now, they were able to construct an emergency plan within a week, which enabled them to continue the delivery to critical clients. This is also when a lot of people appreciated the functionality of the ERP system. So, in this it appears, and especially in unexpected situations, that it can be highly beneficial to have accurate data instantly to your dispense. This is extremely important!_ - (MU_3, Telephone Communication, 15/04/2013)

An ERP is obtained to substitute a company’s legacy system, so when you purchase an ERP you don’t use the legacy system anymore (EU_3 & MU_3, MU_4).

### 4.2 ERP and Logistics Processes

All users address the subject of flows. In general, users specify two big flows; the flow of materials, products and services, flowing upstream and the flow of information including finances, flowing downstream.

An ERP system is considered to substantially organize the flows (MU_4) and is hence applied in and useful to numerous operations and processes. The empirical data covers multiple examples such as the planning of recourses, the provision of raw materials, the regis-
tion of raw materials, utilization and transformation of raw materials, production efforts, raw material's conversion to changed product or end product, monitoring waste, resource planning, monitoring the efficiency of the planning, root cost analysis, trending (EU_3 & MU_3), supply chain operations, personnel administration, finances, stocking of inventory, warehouse planning, taking orders, client management (MU_2 & MU_4), cross-docking, routing, in-time delivery, keeping loading lists, invoicing, loading documents and shipment numbers (EU_1 & EU_2), inbound as well outbound logistics, labeling and other value added services (MU_1).

It is the ERP systems that facilitate the connection between different operations, involving internal business and business-client processes (EU_1, EU_2, MU_3 & MU_4). Examples are inventory to production, production to the human recourse administration (MU_4) and order to distribution (EU_1 & EU_2). There are many different processes that have to be managed here; personnel administration, finances, inventory, planning, taking orders and client management. MU_4 indicates that connecting processes should be addressed using apt language. Examples are made-to-stock (covering production and inventory processes), sales to cash (covering service- and client management and account-receivable processes), requisition-to-pay (covering ordering raw materials and handling imbursement processes), record-to-report (covering entry and extraction of data and information including financial reports). All this is ERP! - (MU_4 Telephone Communication, 19/04/2013)

All users mention that ERP systems are alleged to create transparency in the operations and processes. The following quotes illustrates this:

*It (the ERP system) offers a better perspective of data, such as costs and units converted. So it is especially that transparency that allows you to retrieve certain KPIs and it is easier to find out where waste occurs and improvements can be made.* - (MU_3 Telephone Communication, 15/04/2013)

*The control provided by ERP allows you to better pursue the promises that you make, because it much more transparent.* - (MU_4 Telephone Communication, 19/04/2013)

Through use of an ERP system, processes can be substantially automated (MU_1, MU_3 & MU_4) by creating computerized interfaces that allocate data automatically instead of manually (EU_1 & MU_3). All manager users indicated that where stock reports were manually kept in the system, it was or is noticeable how man-made mistakes cause stock issues and created a significant amount of extra work. MU_1 indicates that they would not want to have the system fully determine for example the schedule on outbound inventory:

*We prefer to do this manually, as this is something that is communicated with the customer offline, because shipments may vary in sort and time, and cutoff times may fluctuate. Besides, as long as customers leave note of shipment before a certain hour, it is ready for shipment the same day.* - (MU_1, Personal Communication, 06/03/2013)

An additional reason for not automating processes is that the services are considered reasonably unsophisticated, therefore monitoring and controlling if the job is done accordingly is not so complex either (MU_1 & EU_1). MU_1 reveals that the lack of computerized control does not feel as a limitation, but would be nice to have. It is argued that the information is not always presented transparently (MU_1, MU_2). MU_2 and EU_2 consider
capturing abundant data and statistics from ERP systems to be not directly necessary because as a third party logistics provider there is no value directly to them in knowing figures and statistics on inventory turnover or cycle time, but underlines that these figures are much more important to their customers and companies internally organizing the logistics.

MU_4 reasons that the decision to what extent one should automate its processes is determined by the promises that companies are willing to make to clients, and consecutively depend on what way the processes and IT systems are equipped to deliver this promise:

We do not guarantee or promise clients that we will deliver in a fixed time frame. This would entail a process where you have to communicate all the way down the supply chain the terms of what each and everyone is required to order and consequently produce (make-to-order). There are businesses that manufacture this way, however we are not doing that, because we have about 150,000 products imposing such complexity that we are simple not able to make that promise. Consequently, our IT system is not enabling this and we are not taking clients that want us to do this. And this is not a matter of IT capacity, this is simply because we cannot do this process-wise. - (MU_4, Telephone Communication, 19/04/2013)

ERP systems allow automating and coordinating processes (MU_1), but human action will always remain requested to put up the processes (EU_1, MU_3 & MU_4). MU_4 signifies this by saying that ERP is not performing the recourse planning in the supply chain in terms of staff, warehousing, transport means and so forth. It can merely assist in planning (EU_3), hence employees will have to enter batches and make estimates on requirements themselves (MU_4). There are possibilities of freezing and automating planning; still companies do also here have to program their own setup and parameters in doing this (MU_4).

Information reliability is enhanced through usage of devices such as bar code scanners (MU_1, MU_3 & EU_2) and PDAs (EU_1). The following quote illustrates this:

Then I can put down information here that the driver sees in his PDA, when I dispatch it to his PDA. And when he picks up the goods, he can scan it, and when he delivers it he takes up a signature in his scanner. Then I can see what time he picked it up and what time he delivered it and so on. The system also gives out warnings for deliveries that seem to run late. - (EU_1 Personal Communication, 22/03/2013)

MU_3 states that it is the use of an ERP system in combination with these devices that helped enormous in controlling volumes and inventory levels and receiving correct information. EU_3 indicates that an ERP system affects logistic processes as it enables to operate with real time data. MU_4 indicates that the data provides information on where they fail to deliver. This way they can effectively do root cost analysis to identify why an incident may have occurred, and improve the process. In doing so they set targets, KPIs, to improve error rates. It should be mentioned that not every incident is taken immediate action upon, but whenever deviations appear of systematic occurrence, then actions are set in motion. ERP systems are so used to improve efficiency (MU_3).

An ERP system like SAP® requires firms to standardize certain work processes (MU_3). This may be experienced to be limiting the level of flexibility, however it is not necessarily
considered wrong (MU_3). One should herein distinguish between business-private processes and standard processes:

Some things are just standard, for example, we all understand that when you produce a product, that product requires a code. And when you have a warehouse, we know that we have to locate products according to codes that we call SKUs. We know that if there are multiple warehouses, these will have different locations, addresses. We know that these warehouses will have inbound and outbound inventory. We standardize invoicing because we know how an invoice should look like, how this should be booked in the accounting program, and we also know that there is a shipment connected to it. And we even know what products require extra attention in delivery. These are all standard processes. (MU_4, Telephone Communication, 19/04/2013)

It is however the management style that an ERP system cannot standardize, this entails business specific processes. An ERP system does for example not know how a firm decides to manage clients and how production or delivery is setup. Such business-specific processes are left open. Whether you would like to stockpile your inventory levels or you want work lean; that is not forced upon the firm by the ERP system and neither is the process of how a firm would like to receive orders (MU_4, Telephone Communication, 19/04/2013). Currently, there is for instance a drive to involve the client proactively in the planning process. So, literally asking customers proactively what they expect to order. This drive is pretty much encouraged through working with ERP (MU_3, Telephone Communication, 15/04/2013).

MU_3 notes that how well an ERP system supports the processes is moreover depending on the processes and the accurately of how well they allow you to depict information from them. It may require extensive investments in equipment to optimize processes to the extent that they communicate and generate accurate and real time data through the ERP system (MU_3 & MU_4).

Working with an ERP system like SAP® requires employees to understand the work processes rather than the clicks of the system. MU_3 and EU_3 express this by saying: we often tend to think in functions or departments, yet the work processes are flowing through the departments. If you do not consider the entire process, it is difficult to trace back an error that appeared elsewhere in the organization. Hence, you miss out on seeing where your weaknesses are; and you are strong as your weakest link (MU_3 Telephone Communication, 15/04/2013). Errors that may will appear system ‘bugs’ often come down to employees’ inability to comprehend the process flow (MU_3 & MU_4). From an example by MU_3 it even appeared that operators might purposefully work around the system to avoid being administrated in the system when they were afraid of sanctions and/or when the control appeared inadequate:

People that were then confronted with the issues coming from these work around, usually work at a different department. As they did not immediately see that from each other, this caused all sorts of problems. - (MU_3 Telephone Communication, 15/04/2013)

When you have constructed your processes well, then you can automate them. And then an ERP system is perfect solution. If you have badly constructed processes – and note well – with this it could be that people just uncoordinatedly happen to do the rightful thing at right time. However, trying to automate these strange and difficult flows will lead to a dispersed and insufficient system. - (MU_4 Telephone Communication, 19/04/2013)
It is through process mapping, using techniques such as flow diagrams and swift lanes, that one can see where responsibilities lie, how administration is done, what the decision points are and where the confirmations are required (MU_4). ERP largely comes down to the control and coordination of the processes (MU_4, EU_1 & EU_3).

4.3 Flexibility

All users argue that the ERP offers a high degree of flexibility. The system is usually adapted to meet with the companies’ business processes (EU_1, EU_2, EU_3, MU_2, MU_3 & MU_4).

MU_1 argues: It is kind of flexible, you don’t need to just one way. You can do things in multiple ways. You don’t have to do things in one particular way and it is easy to change things - (MU_1, Personal Communication, 06/03/2013). He also mentions that the system is not appearing flexible at first, but it becomes more and more flexible once you become familiar with the system.

EU_1 mentions that because planning requires certain agility, the system must be flexible. It has to be flexible in order to make quick adjustments and not be so much time consuming. He also argued that the flexibility of the system provides the ability to meet customer needs and demands.

MU_3 about flexibility:

There is a theorem that you should freeze the planning a week in advance (to optimize the inventory). But this has proven to be difficult for us, it is quite impossible to plan a week ahead. So, it is matter of discipline that is not there. In fact, you are confronted with your own weakness in that sense (...) within the production line, flexibility is not desired; you have to make sure that it is a rigor process. The more rigorous you are the better. - (MU_3 Telephone Communication, 19/04/2013)

Additionally, MU_3 mentions:

I believe that there is causality between the way operations are organized and structured in relation to how easier the system generates desired information (...) A system has a certain programmatic flexibility. In the logistics there is a belief that flexibility is a requirement, but one might question if this flexibility is really required? And the question is then whether it is possible to deliver that flexibility with the current resources in a different way. Because, also here it is so that companies are willing to deliver a service to the lowest cost possible, and then it is essential that a system delivers that support. Because if it doesn’t it may very well turn against you. - (MU_3 Telephone Communication, 15/04/2013)

Flexibility in performances is inclined to it operation setup. MU_4 states:

In the negotiations you may want to offer alternatives or offer extras. This is still possible. However, that flexibility is relying on the operation space that you have in your processes. Then a system can be modified to support this. This flexibility should be defined in the product/service offer (...) a company is able to deliver flexible services, and you are always able to get this in a system, as long as you map and define carefully how your processes work. - (MU_4 Telephone Communication, 19/04/2013)
4.4 IT Capability

You should look at it in this way, when you consider such a company; you can’t simply run such an organization manually! You just need a system and a computer to manage all these business processes. - (MU_1, Personal Communication, 06/03/2013)

Talking about IT capability EU_2 referred to the sites fortune to have two programmers on site that also helped building subsystems, working directly for the headquarter. He also indicated that the site is often used to test new IT systems before implementing it in other offices, mainly due to the presence of the programmers. Also, MU_4 identified IT capability to rest in the IT department ability.

When you look at the staff that is specialized in the system and also help build the system, they are of importance to the IT capability. What they do, they look at the processes from a distance and should know generally what does processes entail (...) these specialized IT employees have to understand these processes and automate them so that someone who is doing the job can enter their orders in the system etc. and do what he or she is required to do (...) in essence it all depends on the IT group’s ability of knowing understanding processes - (MU_4 Telephone Communication, 19/04/2013)

Manager-users moreover refer to the interest that employees take in working with the system. Some are more interested then others and we do encourage that (MU_2), some just don’t have the affinity with IT (MU_3 & MU_4). After instruction, most just do what they have to do (MU_3). Two manager users also indicate that employees have a tendency to not ask questions (MU_3 & MU_2). They might be afraid or ashamed. This is also a bit determined by the culture (MU_3). MU_2 argued: it is about understanding the key functions, from there on you can learn to use the system to its full extent (MU_2 Personal Communication, 15/03/2013).

EU_1 indicated that generally the people on the site are quite young and therefore not so afraid of IT systems. This also determines the spirit. I mean, most people that get a new cell phone these days, they don’t start with reading the manual either! (MU_2 Personal Communication, 15/03/2013)

IT capability is also referred to as in what level a company is willing to rely on IT systems. Two end users here indicated that their firm is not willing to rely on business systems to eagerly (EU_2 & EU_3).

4.5 Understanding ERP Use

The general stance towards ERP system use by all four manager-users is slightly overstated in the following quote by MU_2, but is tending to characterize the general attitude. Similar thoughts are also expressed by end users.

I have not yet taken the time to become completely familiar with the system, but only focused on what I use it for. But it can’t be that hard, as long as you learn the key functions, then you can simply figure it all out. - (MU_2 Personal Communication, 15/03/2013)

Three manager-users signified that it does not seem necessary to know everything of the system (MU_2, MU_3 & MU_4). Employees need to know what they use the system for
(MU_1, MU_2 & MU_3) and routine taught practices; otherwise they will forget them (MU_2).

That not everyone understands the capabilities (MU_2, EU_1 & EU_2) are connected to the interest one holds (MU_2). The ones that are willing to educate themselves more, naturally have a better perspective of the systems capability. EU_3 indicated that it is not needed to understand the system’s capability in full; however it is important to understand how the actions that are preformed have impact to all other functions. It also stated that knowing everything would only be confusing. Employees need to know the right amount of information to perform their job and understand the context of their actions (EU_3). In addition to this MU_4 stated that it is essential that employees know how the processes are designed. MU_3 and MU_4 indicated that this is where employees are trained on. In that training part is about how to use the system accordingly. *They will have to know why they do things, not just that they have to do these* (MU_4 Telephone Communication, 19/04/2013).

Manager-users (MU_1, MU_2, MU_3 & MU_4) indicate that it takes half an hour (MU_2), a few days (MU_3 & MU_4) to get someone started. However it takes quite some time (MU_3 & MU_4), where MU_2 mentions about 2 years for someone to copiously operate with a system. End users talk about one month (EU_3), three months (EU_1) to completely familiarize with the system. EU_2 also speaks of quite some time and argues that it very much depending on the employee.

EU_1 explained how he familiarized himself with the system in the following quote:

*I don’t know if there is manual. I have learned by exploring and discussing issues with colleagues … I learned through experimenting, but as long as I did not press execute it would be fine I knew.* - (EU_1 Personal Communication, 22/03/2013)

EU_1 argued that where one learns and replicates practices from various colleagues, employees start developing individual habits, depending on what one learns from whom. All manager-users and end users agreed upon the fact that not everyone should know everything about ERP systems.

### 4.6 User Satisfaction and ERP

EU_2 mentions that he evaluates the ERP system as following: *The ERP system is very important for us. If it shut down we are completely still. It help us to keep the pace.* (EU_2 Personal Communication, 12/04/2013). He also argues that, besides that ERP is helping the company to be proactive, it is also supporting company’s daily operations as well as the value added services and that it provides sufficient data for the managers. Additionally, MU_2 mentions that he is satisfied with the information flow that the system provides, even though there is still room for improvement. He mentions that the reports that the system generates are highly valuable to the company as well as all efficiencies and the costs that are calculated by the system. Furthermore, MU_3 mentions that there was a lot of information that was not known before the ERP system.
MU_3 also argues that there are according to him no major frustrations caused by the system. However, he mentions that some procedures might cause some frustration due to time that is needed to run certain application in the system. He highlighted:

Managers actually only use it for approvals. So when something of sizeable quantity needs to be ordered, a manager first has to look at his sheet, see what code he has to enter, and then I have to click on that, and I have to check that and maybe then the approval can be send. That is how the management works with it. So in essence they have little affection with the system. - (MU_3 Telephone Communication, 15/04/2013)

According to MU_4, not everything in the system is working perfectly, as there are so many processes and different applications, which they have to communicate together, and there will always be certain losses in this communication. MU_4 also mentions that the system is functioning according to how it is programmed to function. Therefore, if something is wrong, it usually is not because of the system, but due to mismatch or insufficient construction of the processes themselves.

EU_1 mentions that the system is considered user friendly because of the personalized customization of the fields and screens/views. The ERP system that we have is nice in that way. Every colleague has his or her own layout, in the windows they have and so on. (EU_1 Personal Communication, 22/03/2013). However, he argues that, besides that it is very easy to change and correct your actions, sometimes frustrations come from not having a ‘cancel’ button, in case you make a mistake. *When you do a search and you forget to enter a specific time window, the system starts to look back, for instance five years, and as there is no cancel button, you have to wait until the system has finished the search. This is very frustrating.* (EU_1 Personal Communication, 22/03/2013). He also mentions that frustrations can be caused due to the fact that not all employees are using the system in one way. As a consequence information in the system can be projected differently; in this case one needs to double check the data. In addition, MU_1 highlights: *the system could be user-friendly, but currently it isn’t*. In warehousing an ERP system should be a system that ‘is just working’. There is a lot of different type of employees, with different backgrounds and knowledge in IT. So, it must be an easy system. (MU_1, Personal Communication, 06/03/2013). MU_1 mentions that employees are commonly complaining about the system because they are frequently kicked out of the system, and hence have to reboot the system in order to have access again, which is time consuming and can cause distractions. He also argues that employees are often frustrated by the fact that system’s buttons are too small. Employees mistakenly press the wrong button because the system is containing a lot of parameters. However, MU_1 highlights that these issues are not affecting the teamwork.

EU_1 argues that, besides the frustrations that are caused by system’s shut downs, it affects also the perspective of the customer towards your operations. He states:

When you are then talking to customers and they are willing some information from you, and you have to tell them that you don’t have that system open right now and it takes time to open such system. That kind of things might give them the idea that we don’t know what we are doing. - (EU_1 Personal Communication, 22/03/2013)

EU_3 mentions that the ERP can be adapted to organizational and procedural changes. He argues that the critical part is the range of customization as well as not to change other
functions of the system when these changes are applied. You have to be sure that the changes are in line with all other functions and also that the changes should be aligned with forthcoming updates of the system. - (EU_3 Telephone Communication, 22/04/2013)

I would prefer if we could control the system and not the vice versa. I think that the human should be the ‘boss’ (...) because now it is the other way around (...) In our organization it appears that the system is ‘the boss’ and that processes are altered and employees comply to fit and serve the system, however it should be the other way around. - (MU_1, Personal Communication, 06/03/2013)

4.7 Quality of ERP Use

All the case companies work with a number of systems, in which the ERP system is considered to have a rather integrative purpose. Generally, the perspective is that the ERP system is the core system, connecting different modules, also referred to as subsystems, with one another (EU_1, EU_2, EU_3, MU_3 & MU_4). The integration of different systems is done substantially automatically (through computerized interactions called software interfaces) and occasionally manually (human interaction to data transference) (EU_1, EU_2, EU_3, MU_3 & MU_4). However, in one case companies where the integration was done substantially manually, MU_1 and MU_2 indicate that the effective ERP system is not considered to be the core system, but only serves to provide the financial reporting. Here, invoices are manually copy-pasted from the branch’s system to the company’s ERP system, through which the financial department can issue financial reports.

Whereas the ERP systems entail a more integrative purpose, the modules or subsystems to the ERP systems offer more process-specific applications. This is well identified in warehousing activities where a WMS commonly supports the operations (MU_1, MU_2, MU_3 & MU_4). There are various software suppliers that are focusing on these functions, developing ERP compatible software, for instance specializing in certain required language or providing solutions to specific practices (MU_4). Such software packages can then support location - or business -specific processes and connect to ERP software (MU_4).

Distribution activities run on extensive use of subsystems (EU_1 & EU_2). One system can for example coordinate home delivery services, including track-and-trace and SMS information to customers, whereas another system enables route mapping and again another is used for fleet management including cross-docking (EU_1). Ideally all of these systems are integrated (EU_1 & EU_2).

ERP systems generally run the ordering and invoicing activities (MU_1, MU_2, MU_4, EU_1 & EU_2). The way clients order can range from clients having an interlinked ERP system to clients that require a detached system, to clients that only use email systems up to the point where clients only use phone calls (EU_1 & EU_2). It can be costly and/or undesirable to integrate these, but consequently it requires data to be conveyed manually instead (EU_1, EU_2 & MU_4). How dissimilar clients disperse ERP systems is shown in the following quotes from EU_1:

We have a lot of different kind of customers, and they require some different services from us and we have to use their systems too sometimes (...) when customers order they send it to our system from their system
(... regular contracted customers provide us with an IDI file) ... some customers we have a special network connection to ... we cannot manage that system from our own computers ... We have two specific computers for their system that are not integrated in our system. - (EU_1 Personal Communication, 22/03/2013)

The ERP's functionality is also embraced in its connection to databases, which is essential to allow rightful data trending (MU_3) and also enables reducing data and process redundancy illustrated in the following example by EU_1:

*What is so good about - the ERP system, because it is kind of a database too, is that I have access to things like - other offices' - customers, prices and information about their customers, I can see who has done what with an order, and things that you can search if you have a customer that would like to order one thing that he has ordered before. I can search and find it and then use the same guidelines and the same price and I don't have to calculate and do all that kind of things again.* - (EU_1 Personal Communication, 22/03/2013)

In order to extract information, the system is required to know certain sets of data, which have to be entered into the system first. This is called 'master data'. Examples are entering product prices or salaries and wage increases (MU_3 & MU_4).

Master data can be used to connect with other systems, internally and externally. An example is that a bank is informed of a list of employees that need to receive their salary (MU_4). How this is done pertains a decision that the company has to take. According to MU_4 there are companies that outsource these processes. They go to a paycheck company and send them a file with employees and their wages. Hence, in considering ERP utilization, companies are confronted with the decision of outsourcing or not, and secondly deciding upon what system to use (MU_3). According to MU_4 there is no system that offers all the functionality that you as a company may demand.

### 4.8 ERP Use Potential

There is a general perception that the ERP system is *not used* to its full potential. MU_3, MU_4 and EU_1 bring this into perspective by saying that it is subject to the general quest to innovation.

*There is no choice of working with this system, whether the employees would want this or not, they simply have to (…) we have to innovate, otherwise you cannot manage the business, certainly when you look at the number of process orders that we are dealing with nowadays. This has to be dealt with by the employees, we train them on working with the systems, some are better in working with the system, some hate it and others don’t. Yet, this is all irrelevant as it is simply within the job description to work with this.* - (MU_4 Telephone Communication, 19/04/2013)

The empirical data shows that potential gains from using ERP systems are discussed through four means. First, both managers-users and end users talk about aptitude and competence of the employees to operate the system (MU_1, MU_2, MU_3 & EU_1). Secondly there is a general believe that gains will come through integration of existing systems and applications. Thirdly, companies are willing to apply applications more extensively in their operations (EU_3). And fourthly, which is related to the third meaning, is about en-
hancing the technical specifications of modules and subsystems (EU_1 & EU_3). Particularly the last three may request big investments (MU_3). In order to achieve the investments potential, any organization must carefully consider the value of such an investment and subsequent there must be a certain willingness to adapt (all) the processes (MU_3).

In terms of capability and aptitude one of the manager-user (MU_1) stated that: *there are a lot of things the current system is not helping out with. Or perhaps it could, but we don't have enough skills and knowledge about the system.* (MU_1, Personal Communication, 06/03/2013). He understands the will to experiment and also looks for ways to use the system differently, however he indicated rising detriments from employees’ aptitude in experimenting in the following statement:

*The management does not want employees to experimenting with the system. Errors and mistakes occur when people believe that they are pivoting and turning the system the right way, but later we discover that a problem arise from that. When this is a client with a lot of volume, this can go wrong very quickly.* - (MU_1, Personal Communication, 06/03/2013)

Another manager-user (MU_2) expresses the same issue and specifies additional causes:

*I do not think that the overuse of the system is good for the company, as it causes many mistakes. People are thinking that they are doing the right thing but later we realize that was wrong. And if this mistake occurs to a customer that has high volumes, it can cost us a lot. These faults can be caused by the lack of knowledge, and in some occasions, by too much access to the system; what I also miss is some sort of warning system.* - (MU_2 Personal Communication, 15/03/2013)

EU_3 indicates that most users are following the manual and act according to what they learn on their training. In case that they start experimenting with the system, it is because they do not have a clear understanding.

MU_1 flags communication to hold potential to improve ERP use. This can include computer-to-computer interfaces (EU_2), but also computer-to-user and user-to-user interfaces. The following quotes show this.

*Yet, whenever you question me if everything is working perfectly, I have to tell you no. This is because there are so many processes and different applications, which all have to communicate, but there will always be certain losses in this communication. So, that is something where we could improve.* - (MU_4 Telephone Communication, 19/04/2013)

*Maybe it would be good to have some training, because that would force you a little bit to use it in a certain way, because right now it might be a bit frustrating at times, because we don’t use the system the same way. It is then sometimes a bit confusing to interpret the entries of colleagues (...) So, sometimes we have to ask someone else what is meant with a certain entry.* - (EU_1 Personal Communication, 22/03/2013)

The aspect of integrating the systems is considered as very valuable, but not an easy job (MU_3). MU_1 states that there is a lot of manual work that can be avoided when the systems are linked with each other. Plus a system that can provide more specific information can better identify problems when these occur (MU_1). It also enhances the accuracy of information (MU_3)
EU_1 and EU_2 indicate that the system is not being used so much to optimize processes. Although EU_1 indicates that they use information from the system to optimize the processes, he also admitted that:

*Most improvements are discussed and performed by experience rather than data and information generated from the system. Of course we use reports from the system.* - (EU_1 Personal Communication, 22/03/2013)

EU_1 argues that the system is not directly used to optimize the processes. EU_2 implies that the system is not always used in the rightful way. He claims that the system provides basic information but could help cut hours and costs when it would be used to its fullest. Furthermore, EU_3 indicates that the case company does not apply the ERP system in for example strategic planning.

One of the manager-users identifies what seems a clear response to this, in the following quote.

*I believe the system allows more possibilities than so far have been used. The ERP system is not fully exploited. The problem is that it requires recourses to see how you can optimize. And you are not always equipped with such resources. For instance, you can always come up with a smarter method of reporting, trending data and visualizing information to identify potential improvements. That is what you want to focus on. Doing this requires knowledge and resources to induce this from system, and to encrypt this in useful information and reporting.* - (MU_3 Telephone Communication, 15/04/2013)

All manager-users indicate that reporting is now centrally organized. MU_3 denotes that when issuing a certain report, you are one of many that is issuing a request. It then becomes a matter of whether you receive enough attention in your request, if your report is urgent enough, and eventually if report is correctly withdrawn from the system. MU_2 expresses that when information is wrongly presented it can always be fixed through asking the right questions or filing for a new report that presents the information more correctly.

### 4.9 ERP Use Improvement

Questions about what is *actually* done and what could be *hypothetically* done to better the current ERP use were asked.

In two case companies, when an issue would arise from the system, the first one to be called or notified via an online forum was the IT department (MU_2 & EU_1). According to MU_2 there is also a subdivision of the company’s IT department in-house, so it is basically next to them for when the corporate IT department can’t help. In the other case company where a similar setup is maintained, with a separate smaller IT department on site, EU_1 states the following:

*If there are any IT difficulties our intranet offers support. There you enter a case with the problems that you experience. Most of the time you then get a quick response, hereafter you are being helped. Besides that we also have IT guys here, but they always tell us to create a case. I think they have to follow that procedure as well, so that the case is created in the system and that they can see what they have worked on within their system as well.* - (EU_1 Personal Communication, 22/03/2013)
In addition to this, EU_1 also indicates that when a problem is flagged and experienced by many people, then the IT department will fix this for everyone at once. With more individual problems, they fix it only on that specific computer (EU_1). However, the end user continued by stating: *We don’t have the system skills internally. IT support is usually fixing the exact problem that appears, but they don’t look further if this affects other functions.* - (EU_1 Personal Communication, 22/03/2013)

MU_1 replies on this particularity by saying:

*In order to reach the systems full potential, it would really help if IT staff has first worked in operations. The IT department may solve or be asked to solve a small problem at first, but therewith unknowingly create another, if not larger problem.* - (MU_1, Personal Communication, 06/03/2013)

Improvement is few times mentioned in connection to standardizing. This connection is expressed in the following quote from MU_4:

*Without a standard, you don’t know where you stand as a firm, and you are consequently not able to improve. And this is how you grow big.* - (MU_4 Telephone Communication, 19/04/2013)

EU_1 indicates that it would be useful to have some more training to integrate a standard. This would force you a little bit to use it in a certain way, because right now it might be a bit frustrating at times, because we don’t use the system the same way. - (EU_1 Personal Communication, 22/03/2013)

MU_2 comments that they do have a manual, but it is quite complicated, a lot of text and it is thick. In order to have the employees set, all the manager-users and end users indicated that there is some form of education or training that explains the key features relevant to the job.

All manager-users and end users also specify that training and education on how to use the ERP is organized when someone starts working in the company. This training commonly entails a few days (MU_3 & MU_4) up to about a week (MU_2, MU_3 & EU_1). MU_4 mentions:

*Whenever you contract employees, you have to educate and train them on the systems that you have. And if you change a system, you simply have to have them figure out how the new system works. This is often not very difficult, but it yet needs to be done.* - (MU_4 Telephone Communication, 19/04/2013)

EU_1 describes that the training was done through use of a buddy-system. This experience is well explained in the following quote:

*I worked with another person that explained me the system. In the first week I received a lot of guidance this way. And after that you start to work a little bit by yourself and start asking questions like ‘can I do it like this?’ Whenever you start, you don’t see the system being flexible at first, but the longer you work in it, the more possibilities you explore, the more experienced you become and the better you use it.* - (EU_1 Personal Communication, 22/03/2013)

Training could be more, also in the long run, this is specifically remarked by two of the manager-users (MU_2 & MU_3) and one end user (EU_1) but will take up a lot of extra
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time (MU_2) and bring extra costs (MU_3). Also it is hard to construct a general training, because most of the functions that require training are so job-specific (EU_3).

In two case companies the software developer had been approached. MU_1 states that they are expecting some improvements from the developer in the current system. If these improvements are not at satisfactory level, they will consider changing to another system, even if it is costly and scary because you need to adapt again (MU_1).

In two case companies ‘super-users’ form the link between the IT department and the daily operations (EU_1 & EU_2). MU_2 indicated team leaders to have this role. MU_3 remarks that the all employees are well trained through the super-users. It is obvious that this is taken so serious, because when people insert something wrong, it is a hell of a job to correct this. The super-users, who have to correct such mistakes, make sure that accountable workers are using the system in a correct way (MU_3 Telephone Communication, 15/04/2013). EU_3 also indicates that he does not want to have people search for solutions by themselves, but rather have them come directly to him. Often, I assist them online. Quick and adequate response is vital, otherwise they will still try to solve the bug on their own. People need to feel that they are being assisted. - (EU_3 Telephone Communication, 22/04/2013)

MU_4 signifies that training is given on different levels; normal users, key users, super key users and ERP specialists. Training is specified to what a user has to know (MU_4). However, MU_3 explains that they have provided training that show how processes interact. So, in terms of modules, this describes how processes generally interact. This is about how certain processes are constructed, how they link to each other and how databases work (MU_3).

Regarding improvement at more technical nature, MU_4 mentions that:

There are several techniques to check if a system is operating well. One of them is what we call error reporting. This is an application in the system that reports errors. So, whenever information is incorrect or unknown, that this is being reported. A second indicator are running costs of a system; maintenance. With this I mean, you may only pay once for a license, but how many employees do you need to remove patches and bugs? The third element is the ease of use; user friendliness. How perceptive is the system, easy to understand, work with etc.? - (MU_4 Telephone Communication, 19/04/2013)

Whereas one end user and two manager-users indicate that they miss some sort warning system (MU_1, MU_2 & EU_2), an end user and two manager-users where such system is instated, specify this to be efficient and effective to ERP system use (MU_3, MU_4 & EU_3).

In terms of reporting and information, MU_2 reveals that when information is wrongly presented it can always be fixed through asking the right questions or filing for a new report that presents the information more correctly.

4.10 ERP Access

MU_2 perceives too much access to be contributing to man-made errors. As the following quote indicates this is mentioned in combination with a lack of knowledge, or an insuffi-
cient warning system (MU_2). MU_2 and MU_3 also mention a lack of understanding to what the capabilities are and the power of the system is to be significant to access.

Too much access and lack of knowledge are contributing to such errors. Equally so, a warning system is missing to warn users for possible mistakes (...) ERP is a very powerful and very ‘specific’ system. - (MU_2 Personal Communication, 15/03/2013)

All manager-users discuss restricting access as an appropriate precaution to misuse of the system. The following quote addresses restricted access between departments and professions:

Employees only have access to the data that they need. Whenever you need more access we will permit you that access. This means, that if you aren’t a planner, you don’t get access to planning. - (MU_1, Personal Communication, 06/03/2013)

All manager and end users argue that there can be differences in access between levels in the hierarchy. This is shown in the following quotes:

Some measures of controlling behavior have been taken. Team leaders are to know every change and restrictions are being put on other users. - (MU_2 Personal Communication, 15/03/2013)

Only administrators and the team leaders have full access, since people can start focusing on their own habits of using the system and this can cause some problems, as they don’t see the whole picture. - (EU_2 Personal Communication, 12/04/2013)

We use different kinds of access. You have access to the parts that you need. For some more, if you have to change some more advanced things I have to go to my boss and ask him to do it. But I have enough access for what I need to do. - (EU_1 Personal Communication, 22/03/2013)

MU_1 indicates that users sometimes have too many alternative fields to fill out; in the following quote he flags this functional access:

All operators have a lot of access to too many functions within the system and they can perform a lot of operations. I think it could be better to have access only in what they need. They can press hundred buttons, which they don’t know what happens if they press an ‘unknown’ button and they experiment with the system. We need to minimize the access only to needs, because there is too much access. - (MU_1, Personal Communication, 06/03/2013)

Moreover, EU_1 talks about the geographic aspect to access. He states:

All our offices work in the same system, which enables us to access the system from everywhere, including home (...) I have access to things like - other offices’ - customers, prices and information about their customers. (EU_1, Personal Communication, 22/03/2013).

MU_2 argues access to limit his knowledge by saying:

I don’t have complete access to the ERP system, so it is hard to say how much more there is for me to learn. Today we can only use it to get information, we cannot change anything ourselves. - (MU_2 Personal Communication, 15/03/2013)
4.11 Change Management

System changes and updates occur (MU_1, MU_3, MU_4 & EU_1). Changing an entire ERP system is considered highly expensive (MU_1, MU_3 & MU_4) and undesirable, certainly for sizable organizations (MU_4). MU_1 addresses that changing a system entirely is a scary process:

(Today’s software developers) allow doing testing parallel to running the legacy system. These sorts of test environments allow a relatively safe implementation from day one. Of course the actual switch to the other system remains a bit of an unknown factor, as people are involved and used to working with the old system. - (MU_1, Personal Communication, 06/03/2013)

EU_2 indicates how the upper management is working on a project in order to set the ERP system standards to the company standards.

We are planning to integrate a new version of the system, but it’s very difficult at the moment, as you need to transfer all data from the previous system (...) Our system is old, so the developing company is not supported it anymore, as it supports only the new version. - (EU_2 Personal Communication, 12/04/2013)

Equally so, organizations are changing and when few people really understand the potential of the system, this can be considered a weakness (MU_3).

Regarding that matter, MU_3 highlights:

The value of SAP® was already considered low, the number of super-users was reduced over time, because super-users are expensive, since they need specific education and have more responsibility. So when this firm needed to cut down costs, the super-users were let of first or were not replaced when they retired. So, what you see, after several years the organization and the system changed, some employees got promoted, others were led off, but they often don’t get the training required for the new job and the people that worked with system according were not in the organization any longer. People started to become uneducated in using the system with the result that they started to work around the system. So, people start copy pasting certain information from SAP® to a spreadsheet for instance. - (MU_3 Telephone Communication, 15/04/2013)

A similar phenomenon is occurring in data management, where data managers are also often let go, whilst it is so important to have a successor who continues to maintain and clean the database so that data is stored correctly (MU_3). MU_3 also indicated that quite a lot of stress surfaced among the employees, as they felt incapable of using the system. EU_1 mentioned that in case a colleague calls in sick, the colleague is often called to realize information that has been entered in a specific way by him or her.

Additionally, MU_3 point out:

Also, we have in the past changed to more general job descriptions and that is also a mistake, because whenever someone changes their job it is essential that someone knows what the system does in his position, and those trainings are often not given as the employees are supposed to be able to work with the ERP system anyways. - (MU_3 Telephone Communication, 15/04/2013)
This is also experienced by EU_3. He describes that the employees have a general training but not specific to job scenarios and thus, this results in errors and mistakes (EU_3).

Moreover, MU_2 signifies company growth as a reason for not connecting the systems immediately:

*We have expanded very fast and it is because of this that a lot of decisions have not been taken yet. It is unsure of we will be using the same system a year from now. Through the expansion there are now a lot of different systems throughout the company. A decision on what system to continue with must first be taken.*

- (MU_2 Personal Communication, 15/03/2013)
4.12 Overview of the Empirical Findings

Table 4 presents an overview of the empirical findings. Matters and sayings in the categories are summarized.

Table 4 Overview of the Empirical Findings

<table>
<thead>
<tr>
<th>ERP SYSTEM USE Coverage</th>
<th>ERP and Logistics Processes</th>
<th>Flexibility</th>
<th>IT Capability</th>
<th>Understanding ERP Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.1 ERP Capacity</td>
<td>To support operations and processes</td>
<td>ERP supports flow of materials and services</td>
<td>ERP is not flexible at first</td>
<td>Understanding is focused on</td>
</tr>
<tr>
<td></td>
<td>To improve operations and processes</td>
<td>ERP supports flow of information (including finances)</td>
<td>ERP is not experienced flexible after a period of working with the system</td>
<td>it could be used to apply for</td>
</tr>
<tr>
<td></td>
<td>ERP implies various IT systems</td>
<td>ERP connects internal and external processes</td>
<td>ERP is experienced more flexible after a period of working with the system</td>
<td>in the firms willingness to rely on IT.</td>
</tr>
<tr>
<td></td>
<td>ERP implies standardized best practises</td>
<td>ERP creates transparency</td>
<td>ERP flexibility is considered when</td>
<td>With IT capability is often referred to the specialists</td>
</tr>
<tr>
<td></td>
<td>ERP implies process configuration</td>
<td>ERP enables monitoring</td>
<td>meeting customers in their demands</td>
<td>in a firm</td>
</tr>
<tr>
<td></td>
<td>ERP implies process automation</td>
<td>ERP offers automatic coordination between processes</td>
<td>ERP flexibility is mostly experienced in</td>
<td>IT capability can entail</td>
</tr>
<tr>
<td></td>
<td>ERP replaces legacy systems</td>
<td>Data entry can be done manually or by using devices</td>
<td>business-specific processes</td>
<td>employees’ interest in</td>
</tr>
<tr>
<td></td>
<td>Company size is argued to be significant to</td>
<td>Using devices enhances reliability of ERP information</td>
<td>Flexibility is mostly experienced in</td>
<td>working with a system</td>
</tr>
<tr>
<td>ERP implications</td>
<td>ERP is used to improve operations efficiency</td>
<td>ERP leaves business-specific process configuration open</td>
<td>business-specific processes</td>
<td>IT capability can entail</td>
</tr>
<tr>
<td></td>
<td>ERP implies standard-business process configuration</td>
<td>Effective process automation requires clearly and</td>
<td>IT capability can entail</td>
<td>employees’ interest in</td>
</tr>
<tr>
<td></td>
<td>ERP leaves business-specific process configuration open</td>
<td>transparently defined and mapped processes</td>
<td>working with a system</td>
<td>working with a system</td>
</tr>
<tr>
<td></td>
<td>Understanding workprocess is more important than</td>
<td>Understanding the clicks of the system</td>
<td>IT capability connects to</td>
<td>IT capability connects to</td>
</tr>
<tr>
<td></td>
<td>understanding the cicks of the system</td>
<td></td>
<td>company culture</td>
<td>company culture</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>User Satisfaction and ERP</th>
<th>Quality of ERP Use</th>
<th>ERP Use Potential</th>
<th>ERP Use Improvement</th>
<th>ERP Access</th>
</tr>
</thead>
<tbody>
<tr>
<td>Satisfaction from ERP providing information that was previously unknown</td>
<td>ERP systems entail an integrative purpose</td>
<td>The potential is considered subject to the general quest to innovation</td>
<td>IT department solving problems that are reported by case</td>
<td>Too much access contributes to man-made errors</td>
</tr>
<tr>
<td>ERP is valued for its support to day-to-day operations and created efficiencies</td>
<td>Subsystems are more process-specific</td>
<td>Operating a system is an ordinary task</td>
<td>IT capabilities, missing warning, and sayings in the categories are not known</td>
<td>With lack of knowledge, understanding of ERP capabilities, missing warning</td>
</tr>
<tr>
<td>No actual or limited use by manager users</td>
<td>ERP allows subsystems to communicate automatically</td>
<td>Potential through aptitude by training</td>
<td>Solving one problem may inflict another</td>
<td>It is certainly an organizational issue</td>
</tr>
<tr>
<td>No major frustration by manager users</td>
<td>Ideally all systems are integrated and connected</td>
<td>Correct system use</td>
<td>IT capabilities, missing warning, and sayings in the categories are not known</td>
<td>Restricting access to prevent misuse</td>
</tr>
<tr>
<td>Malfunctions are mostly due to insufficient configuration of the processes rather than insufficient configuration of the system</td>
<td>Where systems are not integrated, data has to be conveyed manually</td>
<td>Potential through capability by training skills and knowledge</td>
<td>Learning from colleagues</td>
<td>Learning from colleagues</td>
</tr>
<tr>
<td>ERP can allow end-users to operate the system as they would like</td>
<td>ERP is generally connected to databases</td>
<td>Potential through investing in integration</td>
<td>Through specialized staff or so-called super-users</td>
<td>Different levels of access</td>
</tr>
<tr>
<td>Frustrations from insufficient standardization that cause different data projection among end-users</td>
<td>Storing data allows transparency and data trending</td>
<td>Potential in having IT better support current operations</td>
<td>A warning system</td>
<td>Access should be restricted to what you need</td>
</tr>
<tr>
<td>Frustrations from system downtime</td>
<td>Rightful configuration provides visibility</td>
<td>Potential through investing in new technology</td>
<td>Error reporting</td>
<td>Access to other branches allows transparancy</td>
</tr>
<tr>
<td>Frustrations from frequent updates</td>
<td>Data needs to be entered firsts</td>
<td>Potential in better configuring current IT systems</td>
<td>Considering running cost</td>
<td>Access restrictions limit to extend the knowledge of the ERP system</td>
</tr>
<tr>
<td>Frustrations from work from mistakes</td>
<td>Mastering data entails business specific decisions</td>
<td>Potential gain from improved reporting</td>
<td>Evaluating user-friendliness</td>
<td>It is certainly an organizational issue</td>
</tr>
</tbody>
</table>

1.11 Change Management

- Companies rather not change the ERP system or connected
- Certainly companies of size don’t want to change their systems
- Systems develop over time
- Organizations change over time and need to find ways to nourish
- A growing firm experiences difficulties in setting for one organizational system as it has
5 Empirical Analysis

In this chapter the authors synthesize the ‘parts’ of the empirical data into a ‘whole’. Fusion of different horizons and categories takes place resulting in a complete picture of the phenomena (‘verstehen’) adjoined with partial suppositions. Starting with a discussion of the main findings the chapter follows with contributions and concludes with topics for future research.

5.1 Discussion of the Key Findings

As mentioned earlier in the method, hermeneutics helped the authors pursue the most reasonable and logical explanation to achieve the purpose of the research. As logic and reason imply plausibility, the authors opted to write the analysis as a discussion.

5.1.1 ERP affects Operations Processes

The empirical findings support that ERP systems directly affect operational and managerial processes (Davenport, 1993). In the categories of ‘ERP capacity’ and ‘ERP and logistics processes’ it recurrently shows that ERP influences operations directly as it forces firms to maintain standards and supports operations by its access to transparent real-time data (all users). Indirectly ERP supports process improvement (all users), which is in line with what Davenport (1993) identifies as managerial processes. Additionally this is in accordance with Buck-Emden and Galimow’s (1996), and Stefanou’s (1999) notion of that ERP systems supplement to optimization of logistics processes. ERP systems affect numerous logistics operations and processes, such as planning, monitoring activities, trending, order taking, in-time delivery, finances etc. (MU_1, MU_3, MU_4 & EU_1). In the findings all users indicate that benefits come from reconsidering and streamlining such processes by rightful application of the ERP system. This is in line with literature by Zhu et al. (2010). Secondly, enhanced data transparency facilitated by ERP systems, allows coordination and control of the operations (all users). These are mentioned as indicators to operational benefits according to Mooney et al. (1995) and Zhu et al. (2010). Consistent with the frame of reference, the empirical findings show that users generally indicate ERP to support and organize two distinct flows; the flow of goods, flowing upstream and the flow of information, including finances (MU_4 Telephone Communication, 19/04/2013), flowing downstream (Lewis & Talalayevsky, 1997). Findings in the category of ‘ERP capacity’ pose that rightful ERP use requires apt process configuration in order to facilitate meaningful information. Precise and exact ‘real-time’ data offer the necessary transparency (MU_1, MU_2 & MU_3). Rizzi and Zamboni endorse this (1999) by saying that ERP provides the organization with an operational backbone that, through a parallel process vision (e.g. access to similar information), allows integration between processes, and ultimately, provides higher traceability standards.

5.1.2 Business Process Configuration

Appendix V shows a color-coded picture of the findings that illustrates apparent intercategorical relations to the topic of Business Process Configuration (BPC). BPC ostensibly relates to what is discussed in the frame of reference on Business Process Reengineering (BPR), taken that BPR is about transforming business operations from function based to process
based, and that it implicates revision of work processes, company culture and company strategy aspects (Subramoniam, Tounsi, & Krishnankutty, 2009). Similar notions are expressed throughout various categories. Starting with the category of ‘user satisfaction’ MU_4 argues that malfunctions are to a greater extent caused by insufficient configuration of the processes rather than insufficient configuration of the system. After all, MU_4 argues that ERP systems run according to how they are programmed. This is also supported by Shang and Seddon (2000), who say that at the IT infrastructure level, ERP systems provide an infrastructure that could support and provide business flexibility for current and future processes. Findings in ‘IT capability’ present that all companies have IT specialists and, or an IT department (all users) that assists with programming and malfunctions in the system. Equally so, in the categories of ‘flexibility’ and ‘ERP and logistics processes’ the empirical findings generally indicate that systems are inherently capable of supporting all operational procedures of the companies (all users). Nevertheless, all users voice that the system is not used to its full potential in the category of ‘ERP use potential’. The issue therefore stretches to malfunctions that can be caused from where systems are not integrated and manual transactions are required (EU_1, EU_2, EU_3, MU_3 & MU_4). These malfunctions are argued to cause inaccuracies in the category discussing ‘quality of use’. It is also implied in the frame of reference that effective business integration is subject to business process reengineering (Klaus et al., 2000). In the findings regarding ‘potential of use’, potential can come among others from further integrating the existing system, better applying the system for current operations and investing in new software and hardware such as extra modules and devices (MU_1, MU_2, MU_3, EU_1 & EU_3). It is however noted that this is often costly (MU_3); in line with Mahashwari (2007) notion. Interestingly, it consequently appears that integration ties back to process configuration. This is revealed through the categories of ‘quality of ERP use’, where it says that ideally all systems are integrated and connected (EU_1, EU_2), because ERP allows subsystems to communicate automatically (EU_1, EU_2, EU_3, MU_3 & MU_4); ‘ERP and logistics processes’, where it says that in order to automate processes effectively, processes should first be clearly and transparently defined and mapped (EU_1, EU_3, MU_3 & MU_4). MU_4 argues that where ill configured processes are automated, they cause interface and communication errors and mistakes. Often the system is then blamed first, whilst the root cause shelters in the process configuration (EU_3, MU_3 & MU_4). Hence, the authors of this thesis argue that BPC or as the literature refers to it as BPR, is essential in post-implementation ERP use, even though the researchers have not found literature suggesting this. Notwithstanding that literature often mentions BPR’s significance to implementing ERP systems.

To conclude, it appears that capability and functionality of the system is relying upon how the companies’ processes are configured, and secondarily about how they are automated in the system (EU_1, EU_3, MU_3 & MU4), which is also supported by the literature from Shang and Seddon (2000). A seeming gap between what an ERP system is desired to do with what it actually does may occur from the absence of clearly defined, outlined and mapped processes. In literature business process reengineering (BPR) is mentioned as a technique to change workflows and reengineer these to suit ERP. It is mentioned to be of paramount importance to implementing ERP (Subramoniam et al., 2009). Where errors and mistakes
occur resulting from ERP use, the authors of this thesis suggest that BPR or what is here referred to as BPC is of equal importance to post-implementation ERP use as it is to implementation.

5.1.3 Standard versus Business Specific Processes

To the subject of business-process configuration, the authors signaled that a distinction should be made. In the category on ‘ERP capacity’ it is argued that ERP systems prescribe standard processes (MU_1, MU_3, MU_4 & EU_3) that are commonly also proven best practices (MU_3, EU_3). Indications to this are also verified in literature; Rizzi & Zamboni (1999) state that ERP systems for modern enterprises have become one of the most effective tools to achieve high efficiency standards (…) it is important to apply best practices (Jain, 2008). MU_3 indicates in ‘ERP and logistics processes’ that such forced standardizations may well be experienced as limiting flexibility. MU_1 also denotes that the system is sometimes ‘the boss’ over the organization. In ‘flexibility’ however the general notion seems to be that ERP systems do offer programmatic flexibility (MU_1, MU_3, MU_4 & EU_1).

In ‘ERP and logistics processes’ MU_4 suggests that one should herein distinguish between business-specific (or private) processes and standard-business processes. Standard-business processes are those that have to be performed by every business and preferably in the most efficient and effective way (MU_4). Consequently, these are rather fixed and standardized in an ERP system. The authors suggest that this distinction is relevant to customization (Klaus et al., 2000). Standard-processes may relate to what Klaus et al. (2000) identify as an ERP system in its most generic and, or pre-installed form. The business-specific processes are related to a business strategy, e.g. how a firm decides to approach its clients, or how a company organizes production (MU_3 & MU_4). It seems that the business-specific processes are of subject to ERP customization and the third integration form mentioned by Klaus et al. (2000), where ERP-software is individualized according to the particular firm’s requirements on site. Hence, it is the area of business-specific processes where a high degree of customization is essential to effective enterprise integration (Mahashwari, 2007). In accordance with the literature, Jain (2008) also notes that the ability to align an ERP project with a corporate strategy is key to the success of the projects.

This distinction seems important to the topic of configuration of the processes, but also to the topic of training, as it may imply specific knowledge and understanding.

5.1.4 Training

Patterns between categories in the empirical findings indicate that a significant impact on ERP system use is relying on the users’ training (Appendix V). In the literature it is mentioned that a significant aspect to improving ERP system use is adequate knowledge management (McGinnis and Huang, 2007). In ‘ERP use potential’ all users indicate that training could be more (all users). In ‘ERP use improvement’ and ‘understanding ERP use’ it shows that there is a general spirit of leaning by doing (all users). Additionally, training is commonly introductory and short, focusing only on the features of the system that are generally used (MU_1, MU_2, MU_4, EU_1, EU_2 & EU_3). While understanding the context and capabilities of ERP are indicated to be relevant (MU_3, MU_4, EU_1, EU_3). Consistent
with literature, high realization of communication and training is suggested as a prerequisite to successful utilization of the ERP system in the post-implementation phase (Amoako-Gyampah, 2004).

Thus, the degree of knowledge and insight one has seems to relate to realizing the capabilities of an ERP system. MU_2 and MU_3 both mention that a lack of understanding to the system’s capabilities affects ERP use, because employees fail to see how their actions affect different departments. As a result, errors that only emerge in other departments are difficult to trace back (MU_3). This shows relevant to Bagchi et al.’s (2003) idea on how ERP use affects the individual level and the organizational level. MU_3, MU_4 and EU_3 pinpoint that training should focus on how particular processes interrelate to each other and subsequently on how ERP system use facilitates this, and to think in processes, rather than in functions (EU_3, MU_3 & MU_4). This is advocated by Zhu et al. (2010) notion that ERP links various operational units. The empirical findings henceforth argue that the employee should have notion of how processes relate. This will equip one with knowledge on how to use the ERP system to the business benefit as indicated in the categories of ‘ERP use Potential’ and ‘understanding ERP use’ (MU_1, MU_2, MU_3, MU_4 & EU_1). The significance of training is also argued to value in the long run (MU_2, MU_3 & EU_1). Conflicting arguments are that training is considered time consuming (MU_2) and costly (MU_3), as well as that it is difficult to construct a general training for all users due to specific job functions that require different application, and hence different training (EU_3).

Moreover, in the categories of ‘ERP use potential’, ‘user satisfaction’ and ‘ERP use improvement’ the data reveals that there are often limited or insufficient standards developed in regard to training (EU_1, EU_2, EU_3 & MU_3). Colleagues or employees that were previously holding a certain position often conduct a short introductory training, leaving employees to experimenting with the system (EU_1, EU_2, MU_1 & MU_2). Restricting access is the most common measure to standardizing use (all users), but is also identified to put a restriction on extending knowledge (MU_2). In terms of access, most commonly it is indicated that users just need to know what they should know to do their jobs (MU_1, MU_2, MU_3, MU_4 & EU_3). Literature states that on the organizational level firms influence quality of ERP use by issuing manuals, guidelines, governance, and restrictions (Boudreau, 2003). However, the findings show that manuals are considered thick (MU_2) and employees are sometimes not even aware of its existence (MU_1, EU_1). This lets to belief that there is a variability of use that affects the reality of use and the perceived usefulness (DeLone & McLean, 1992; Petter et al., 2008). EU_1 indicates that he is often unable to understand the presentation of information by colleagues, in case he has to substitute for a colleague. Also MU_3 indicates that when organizations change, whereas people get promoted and others are led off, it is essential to sustain knowledge of ERP use, but that this is often failing. This seems relevant to Bagchi et al.’s (2003) notion of how ERP use is affected at the team level. The authors suggest that insufficient training standards appear to create a gap between how a system is meant to be used and how it is actually used, effecting operations on individual, team and organizational level. Insufficient training and the inherent awareness gap can cause mix-ups in processes, system errors and operational drawbacks. This is supported by MU_1 and MU_2 as they identify that lacking awareness causes mistakes that may lead to discrepancies to customers, leading to high replenishment and
damage costs. Correspondingly, Jain (2008) argues that users’ behavior towards the ERP system influences the value obtained from an organization’s ERP system in the long run. In the category of ‘IT capability’ it appears that primarily this awareness is relying on specialists (so called super-users) (EU_2, EU_3, MU_3 & MU_4) and the IT department (all users). Behavior is also conveyed through organizational culture (EU_1 & MU_3), and varying on the individual stance towards IT (all users).

Furthermore, it appears that insufficient training stimulates employees to experiment with the system inducing overuse (EU_1, EU_2, EU_3, MU_1, MU_2 & MU_3). Equally so, insufficient training provokes employees to be hesitant towards the system, provoking underuse and employees making attempts to work around the system (MU_3, EU_1 & EU_3). Jain (2008) points out that a company will fail to benefit from experimenting in use if it is not able to use ERP information efficiently. Additionally, ‘heavy users’ tend to underestimate use, while ‘light users’ tend to overestimate use and this proposes that, combined with a lack of standardization, self-reported usage may be a poor alternate for actual use of a system (Petter et al., 2008). The authors therefore reckon that the qualities (i.e. quality of ERP use, quality of information use and IT capability) that Jain (2008) uncovers are ostensibly induced by the level of training. Insufficient training seemingly diminishes the desired results from ERP system use. The authors are however not entitled to assert that all experimental or avoiding behavior is detrimental, nor that high levels of training will certain adequate ERP system use.

5.1.5 Proposed Model

The empirical analysis highlights business process configuration and BPR, and training as fundamental topics to ERP system use. The authors of this thesis propose the model presented in figure 5-1 to describe relations between the fundamental factors, ERP use and the consequential effects of ERP system use. McGinnis and Huang (2007) indicated that ERP post-implementation use is as much of the subject of continuous improvement. The authors of this thesis spotted a link between effects and the configuration of business processes. MU_4 for instance argued that where mistakes and errors occur this is likely to be effected by ill configuration of the processes, rather than misconfigurations in the system. On that note, MU_3, MU_4 and EU_3 articulated that it is desirable to train staff ERP in the context to processes rather than in the context of functions. These suppositions inspired the authors to conclude that effects pertain relevant to marking ‘BPR and configuration’ needs, which in turn wheels to ‘training’, which together bring about all categories embodying ‘ERP use’. ERP use then turns sequentially to new ‘effects’.
5.2 Contributions and Implications

Although further research is required, this thesis entails several contributions to subject of ERP system use. The authors of this study imply that this research has several implications to the academic research in the field of ERP, IT and IS. Secondly, the research discovered practical contributions.

5.2.1 Theoretical Contributions to IS Research

The empirical data advocates that an ERP system is difficult to study without considering the entire IT structure of an enterprise. The literature indicates that an ERP system is a set of business applications or modules, linking various business units of an organization into a tightly integrated single system (Rizzi and Zamboni, 1999). From the empirical findings it appears that where integration between systems exist, the ERP system is seen as the “core” system (EU_1, EU_2, EU_3, MU_3 & MU_4). However, indicated by how frequent and rapid the conversations glided off from the actual ERP system towards subjects regarding the more ‘practical’ modules or subsystem, the author suggest that ERP is difficult to de-
pict as a single system. Also phone and email communication apply to ERP (MU_4 & EU_1). The authors of this thesis find that users perceive the ERP solution as a single application regardless of the module or subsystem they are working in (Rizzi & Zamboni, 1999), yet indicate that ERP should be studied in the context of the company’s complete IT and IS system. A more accurate understanding of the links between ERP systems and attached modules and subsystems seems relevant.

This thesis offers insight in the different perspectives of ERP system use between user-managers and end-users. Generally, manager-users spend very little time using the system themselves (MU_1, MU_2, MU_3 & MU_4). End-users often perform the actions, such as reporting, for them (MU_1, MU_2, MU_3 & MU_4). This usage discrepancy may contribute to the different perspectives, involving feelings such as of doubt and inability of understanding the benefits, that user-managers and end-users hold towards the ERP system indicated by Amoako-Gyampah (2004).

The method of hermeneutics proves a powerful tool in unraveling complex behavioral matters that are often anticipated in the area of logistics and IT research (Kovács & Spens, 2005; Cole & Avison, 2007). The authors acknowledge that in this thesis the sequences have not been ample enough to achieve definite conclusions, but the method allows scrutinizing ERP system use in the context of logistics operations in a profound way.

5.2.2 Contributions to Practice

The authors’ suggestion is that best practices of ERP system use are ostensibly concealed in two primary dimensions; on the job training and aptness of business process engineering.

Training enables to develop working standards, through which data and information can be more easily interpret and worked with by others in the organization (EU_1). It enhances apt and purposeful usage of the ERP system (MU_3, MU_4, EU_2) and averts practices of underuse and overuse that are seemingly detrimental to ERP system use (EU_3). This is also noted by Addo-Tenkorang & Helo (2011) as crucial in order to embrace the full benefits of ERP. The authors’ contribution is that it does not only appear crucial in the implementation phase, as argued by Addo-Tenkorang & Helo (2011), but also post-implementation. This theory is in supported by McGinnis and Huang (2007) perception that ERP continues improvement can best be considered in a series of augmenting projects, where aggregated knowledge supports retooling and reworking the ERP system’s functionality.

Business process configuration is the practice of identifying and mapping the steps, decisions and responsibilities in processes (MU_3 & MU_4). Doing this amply allows better understanding of the processes, and is so likely to improve the configuration of the ERP system to the processes that it is meant to support (MU_3 & MU_4). In line with this, the literature indicated that one of the main features, business process reengineering (BPR), involves transforming business operations from function based to process based (Subramoniam, Tounsi, & Krishnankutty, 2009). However, the empirical findings show that companies tend to think in function and departments, rather than in processes (MU_3, EU_3). Throughout the empirical findings it is suggested that ill-configured and unclear processes seemingly lead to misunderstandings and errors in the system, affecting operations (MU_1,
MU_3, MU_4, EU_1, EU_2 & EU_3). The authors in this thesis therefore suggest that BPR is not only evident to implementation, but also to post-implementation ERP use.

A partial supported discovery to this is that companies should distinguish carefully between standard-business processes and business-specific (or private) processes (MU_3, MU_4). ERP systems supply market’s best practices (Jain, 2008) which are concerning the standard-business processes (MU_3, MU_4 & EU_3) and leave business-specific processes to be determined by strategy (MU_3 & MU_4), where correct configuration, integration and customization allow to obtain full benefits of such complex systems and errors to be avoided (Addo-Tenkorang & Helo, 2011).

5.2.3 Limitations and Suggestions for Future Research

Whereas this thesis could not capitalize on sectorial differences between the case companies, because of the confidentiality agreements that were made, it is a suggestion for future research. It must be said that the authors of this thesis have not put much emphasis on sectorial differences, neither in the literature, nor in the empirical data collection. Therefore, there is no substantial evidence that sectorial discrepancies could alter the perspectives that one company holds toward ERP system use, compared to another company from another sector. Yet, as processes differ in nature from one another, it is plausible that ERP system usage is regarded different.

A partial supposition that unveils in ‘ERP capacity’ and ‘change management’ is company size. Size appears relevant to changing the system and how reliant a company is on its ERP system (MU_3, MU_4). It was said that a small company could more easily change its IT systems. In the literature Behesthi (2006) and Klaus et al. (2000) also evoke the relevance of size. A study to what extent size influences ERP use is suggested for future research by the authors. Additionally, finding in the category on ‘change management’ unveil that company growth may well delay decisions on integrating ERP systems organization-wide (MU_3). The authors recommend a longitudinal study that analysis companies and their decisions concerning capitalization and broadening of the ERP systems.

With regards to the analysis and discussion, and the induced ‘verstehen’ of how training and BPR are fundamental to ERP system use, the authors acknowledge that further research is required to support the suppositions (Dew, 2007). A significant limitation to the study has been the element of time. In the past five months the authors have invested significant time in the literature review and managed to conduct seven interviews. Nevertheless, the authors recommend that future researchers should continue where this thesis leaves off and seek inducing evidence of how meticulous training and BPR can be benefitting ERP system use.
6 Conclusion

In this chapter the authors will summarize the outcome of the analysis and answer the purpose and the research questions of this thesis.

The purpose of this thesis was to explain how ERP system use in the post-implementation phase affects operations in logistics enterprises. Throughout the frame of reference, literature already indicated that ERP system use considers various qualities. Previous research illustrated various models that indicated how qualities, i.e. IT capability, quality of ERP system use, quality of information use, ERP system capacity and user satisfaction, contributed to ERP system usage and have a certain detrimental or beneficial impact on individual level, team level and/or organizational level. Through the empirical data the authors inductively added new qualities that were argued to affect operations in logistics operations; i.e. understanding ERP use, the custom-ability of the ERP system to support processes, individual access to ERP system use, opportunity to change ERP systems and potential versus what is done on improving in regard to ERP use. Hence, with identifying these dimensions and implications the first research question was achieved: What are the dimensions and implications of post-implementation ERP system use to operation processes?

In answering the second research question: how are efficiencies that are generally created by ERP systems strengthened or diminished by ERP system use? The research identified two fundamental elements in training and business process reengineering. It is argued by the authors of this thesis that these elements are driving the gap between how ERP systems are intentioned versus how they are actually used. The greater the gap, i.e. the lesser sufficient the training and the lesser meticulous the business process reengineering, the more detrimental the ERP system use and the lesser effective and efficient an ERP system is. And vice versa; the smaller the gap, i.e. the more sufficient the training and the more meticulous the BPR, the more beneficial the ERP system use and the more efficient and effective an ERP system is.
List of References


Worthen, B. (2002). Nestle’s ERP Odyssey: Nestle USA’s costly and protracted struggle with its SAP project is a cautionary tale for any company Internet on an enterprise-wide implementation. *CIO, 15*(15), 1-5.


Appendices

Appendix I
Appendix II

Research Template

Key Categorizing

1. The Importance of ERP as a Business Tool
2. ERP as an Utility System – Functionality – Actual use – Intention of use
3. ERP Evaluation
4. ERP and Logistics Processes
5. Flexibility
6. Requirements
7. ERP Use Potential
8. ERP Use Improvement
9. ERP Access
10. General Knowledge of the ERP System
11. Change Management
12. IT Capability

List of Key Words:

- Logistics Processes
  - Transparency
  - Effectiveness
  - Efficiency
  - Efforts
  - Improvement
  - Setbacks
  - Issues
- IT Capability
- Use Quality
  - Overuse
  - Underuse
- System
  - API - Connectivity
- Information Quality
- Benefits
- Disadvantages
- Post-Implementation
- Improvement
- Needs
- Support
- People Involved
- Governance (Access)
- Flexibility
Appendix

Appendix III

Name:
Position:
Company:
ERP system name:

Months/years since ERP implementation:

1. Where on the scale would you position the level of IT capability of your firm?

2. Where would you position yourself on a scale in rating your capability to use the system?

3. On the scale below, how would you rate the information from the ERP system?

4. Which of the pictures below does best explain your view of ERP?
Appendix

Interview Guide

1. What do you use the system for?
2. How necessary do you believe that the ERP system is?
3. How does the ERP system support the organization’s/department’s needs?
4. Do you think you use the system to its full potential? Please explain.
5. Are there any other functions that you could use the ERP system for, other than you are doing now?
6. Do you believe that the software is flexible to your requirements? Why/why not?
7. Do you think the system is user friendly? Why/why not?
8. What do you do/who do you contact when there are questions regarding the program?
9. What happens after reporting the questions?
10. How do you adapt the system to organizational or procedural changes? Is this easy?
11. (After all these years of working with the system) Would you say that you modify processes to the system or the system to processes?
12. How do you think that ERP system affects the
   a. Planning
   b. Controlling
   c. In-process inventory
   d. Order Cycle time
   e. Optimization of processes
   f. Just in Time (JIT) delivery
   g. Transparency
   h. Flexibility
13. What are your experiences in working with ERP?
14. How do these issues frustrate the company, the staff or the teamwork?
15. Do you still work with applications of the legacy system? How does that work? Is data well conveyed to the current system?
16. What is the average time to familiarize yourself with such a program?
17. Does this count for everyone in the firm?
18. Do you believe that everyone in the firm understands the capabilities of the ERP system?
19. How do you support correct use of the ERP system? How do you empower people to work with the software?
20. How do you believe this connects with the staff’s attitude of working with system?
21. Do you believe everyone should know everything about the system? Or differently put do you hold the belief that the more you know the better?
22. Do you feel the system is a powerful tool to your organization?

Thank you very much for your time and consideration
Appendix IV

Effects of ERP Post-Implementation Use: A Logistics Approach

Dolf Grande
Nikolaos Chatzidakis

Introduction

First of all, once again, thank you for your participation in our research.

Research is done to unravel interesting insights in a reliable and valid manner. This presentation offers a short outline of what we have done and what we discovered. To ensure the validity and reliability of the results we like you to comment on our findings by answering two simple questions:

- Do these results make sense to you?
- Do you agree with the results?
What we did

The research has been conducted through the method of hermeneutics, which is about interpreting text and meaning of actions.

Very briefly, this method entailed that when we did an interview we would transcribe the interview, interpret the interview, come up with certain ideas and verify these in the next interview; hereafter we would again transcribe the interview, interpret the interview, hold it against the earlier ideas, verify suppositions, come up with new ideas and advance in verifying these in the next interview. This is done in sequences what is called the “hermeneutics cycle”. This causes interviews to become more focused and suppositions more valid.

After all the interviews we took all the data from the transcribed interviews again and distinguished eleven distinct topics that had been touched upon throughout the interviews. Such topics were ERP Access and ERP process support. The analysis involved scrutinizing patterns between the different topics.

From this investigation we deduced the following results. Please mark that this is a very time-intensive method, and because our research was compelled to seven interviews, these results are new suppositions, to be further validated in future research.

What we found (1)

In short, the research determined the following:

- There are two fundamental elements to ERP system use:
  - Business Process (Re-)Engineering: Before an ERP system and any connected system can be purposefully used, the business processes should be configured clearly and meticulously. Only then processes can be rightfully automated in an ERP system. Whenever this is done correctly the ERP system can be used to its intent.
  - Training: Training on ERP system use should be more standardized and, or more continuous. From the findings it was often argued that more training could help employees to use the system in a more in sync and understandable way, and achieve better team and organization effort. Also, it could help employees overcome misunderstanding (avoidance) or overviewing (experimenting) the system. These aspects are experienced rather detrimental then advantageous to ERP system use.
What we found (2)

Other partially supported findings are:

- In terms of configuration, a firm should distinguish between standard business processes, which are standardly delivered with the system and business-specific processes (i.e., business strategy, client-approach), which have to be designed and configured by the vendor.

- There is a difference in perspective to the effect of ERP system use between User-Managers and End-users, whereas managers often only indirectly use the system for information only and end-users more see the malfunctions.

- Company size and growth effect decisions on ERP system use, in terms of what system to use and how to expand or improve the system.
### Appendix V

#### ERP SYSTEM USE Coverage

<table>
<thead>
<tr>
<th>4.1 ERP Capacity</th>
<th>4.2 ERP and Logistics Processes</th>
<th>4.3 Flexibility</th>
<th>4.4 IT Capability</th>
<th>4.5 Understanding ERP Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>- To support operations and processes</td>
<td>- ERP supports flow of materials and services</td>
<td>- ERP is flexible and adaptive to processes</td>
<td>- IT is obligatory</td>
<td>- Understanding is focused on</td>
</tr>
<tr>
<td>- To improve operations and processes</td>
<td>- ERP supports flow of information (including finances)</td>
<td>- ERP is not experienced flexible at first</td>
<td>- IT capability is said to rest in the firms</td>
<td>what one has to apply it for</td>
</tr>
<tr>
<td>- ERP implies various IT systems</td>
<td>- ERP connects internal and external processes</td>
<td>- ERP is experienced more flexible after a period of working with the system</td>
<td>willingness to rely on IT.</td>
<td>Not everyone does nor</td>
</tr>
<tr>
<td>- ERP implies standardization best practises</td>
<td>- ERP offers transparency</td>
<td>- ERP flexibility is considered when</td>
<td>With IT capability is</td>
<td>should know everything</td>
</tr>
<tr>
<td>- ERP implies process configuration</td>
<td>- ERP enables monitoring</td>
<td>meeting customers in their demands</td>
<td>often referred to the</td>
<td>Understanding ERP in</td>
</tr>
<tr>
<td>- ERP implies process automation</td>
<td>- ERP offers automatic coordination between processes</td>
<td>- Flexibility is mostly experienced in</td>
<td>specialists in a firm</td>
<td>its context is considered</td>
</tr>
<tr>
<td>- ERP replaces legacy systems</td>
<td>- Data entry can be done manually or by using devices</td>
<td>business-specific processes</td>
<td>IT capability can entail</td>
<td>relevant</td>
</tr>
<tr>
<td>- Company size is argued to be significant to ERP implications</td>
<td>- Using devices enhances reliability of ERP information</td>
<td></td>
<td>employees' interest in</td>
<td>Commonly an introductory</td>
</tr>
<tr>
<td></td>
<td>- ERP systems are used to improve operations efficiency</td>
<td></td>
<td>working with a system</td>
<td>training is provided</td>
</tr>
<tr>
<td></td>
<td>- ERP implies standard-business process configuration</td>
<td></td>
<td>IT capability can entail</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- ERP leaves business-specific process configuration open</td>
<td></td>
<td>fear of working with a system</td>
<td>There is general spirit of</td>
</tr>
<tr>
<td></td>
<td>- Effective process automation requires clearly and</td>
<td></td>
<td>IT capability connects to company culture</td>
<td>learning by doing</td>
</tr>
<tr>
<td></td>
<td>transparently defined and mapped processes</td>
<td></td>
<td></td>
<td>It takes considerable time to</td>
</tr>
<tr>
<td></td>
<td>- Understanding workprocesses is more important than</td>
<td></td>
<td></td>
<td>learn operating the system</td>
</tr>
<tr>
<td></td>
<td>understanding the clicks of the system</td>
<td></td>
<td></td>
<td>copiously</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4.6 User Satisfaction and ERP</th>
<th>4.7 Quality of ERP Use</th>
<th>4.8 ERP Use Potential</th>
<th>4.9 ERP Use Improvement</th>
<th>4.10 ERP Access</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Satisfaction from ERP providing information that was previously unknown</td>
<td>- Companies use various modules and subsystems to ERP</td>
<td>- ERP is not used to its full potential</td>
<td>- IT department solving problems that are reported by case</td>
<td>Too much access contributes to man-made errors</td>
</tr>
<tr>
<td>- ERP is valued for its support to day-to-day operations and created efficiencies</td>
<td>- ERP systems have an integrative purpose</td>
<td>- The potential is considered subject to the general quest to innovation</td>
<td>- With lack of knowledge, understanding of ERP capabilities, missing warning</td>
<td>- With IT capability is</td>
</tr>
<tr>
<td>- No actual or limited use by manager users</td>
<td>- Subsystems are more process-specific</td>
<td>- Operating a system is an ordinary task</td>
<td>- Restricting access to prevent misuse</td>
<td>often referred to the</td>
</tr>
<tr>
<td>- No major frustration by manager users</td>
<td>- ERP allows subsystems to communicate automatically</td>
<td>- Potential through aptitude by training correct system use</td>
<td>- Different levels of access</td>
<td>specialists in a firm</td>
</tr>
<tr>
<td></td>
<td>- Ideally all systems are integrated and connected</td>
<td>- Potential through capability by training skills and knowledge</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Where systems are not integrated, data has to be conveyed manually</td>
<td>- Potential through investing in integration</td>
<td>- Potential in having IT better support current operations</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- The companies use different subsystems to support different processes and to provide alternatives to reach customers</td>
<td>Potential in it better support current operations</td>
<td>- Potential through investing in new technology</td>
<td></td>
</tr>
<tr>
<td>- ERP is generally considered user-friendly</td>
<td>- ERP is generally connected to databases</td>
<td>- Potential in better configuring current IT systems</td>
<td>- Potential gain from improved reporting</td>
<td></td>
</tr>
<tr>
<td>- ERP can allow end-users to operate the system as they would like</td>
<td>- Storing data allows transparency and data trending</td>
<td>- An ERP integrates the way it is programmed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Frustrations from insufficient standardization that cause different data projection among end-users</td>
<td>- Rightful configuration provides visibility</td>
<td>- Communication occurs between user-and-computer interfaces and computer-to-computer interfaces</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Frustrations from system downtime</td>
<td>- Data needs to be entered first</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Frustrations from frequent updates</td>
<td>- Mastering data involves business specific process decisions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Frustrations from rework from mistakes</td>
<td>- An ERP functions the way it is programmed</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 4.11 Change Management

- Companies rather not change the ERP system or
- Certainly companies of size don’t want to change their systems develop over time
- Organizations change over time
- And need to find ways
- A growing firm experiences difficulties in settling for one organizational system