ERASMUS UNIVERSITEIT ROTTERDAM
ERASMUS SCHOOL OF ECONOMICS

Accounting, Auditing and Control

Corporate governance and ERP implementation success in the large U.S. companies

Author: Shanna Cai

Student number: 343956

Supervisor: Drs. T.P.M. Welten

Co-reader: Dr. P.Y.E. Leung

Date: 10-09-2016

Abstract

This paper examines the association between corporate governance levels and the success of ERP implementation of U.S. based large companies. The success of ERP implementation is very important for large firms due to the extent of their investment. The corporate governance attributes, which this study focuses on, are organizational governance, IT governance and project governance. Survey is conducted by senior managers from large companies in the U.S. The sample used in this study includes 169 U.S. companies. User satisfaction is used as proxy for ERP implementation success. Using Partial Least Squares Structural Equation Modeling (PLS-SEM), the empirical results show that, organizational governance is positively and significantly correlated with the success of ERP implementation, while IT governance and project governance are not critical to achieve the success. This indicates that the model is not able to support the association, since only organizational governance is significant. Furthermore, the type of industry has also a positive and significant influence on ERP implementation success.

Key words: Corporate governance constructs, Enterprise Resource Planning (ERP), ERP implementation success, internal control, the U.S.

Preface

This thesis is elaborated and completed by myself as fulfillment to pursue my Master degree in Accounting, Auditing and Control at Erasmus University in Rotterdam. My interest in finally choosing ERP system as my thesis subject was actually initiated during my study of the course Enterprise Information System. To study this course and understand the IT world was a big challenge for me just as completing this thesis. Fortunately, with lot of efforts, I finally went through the course study and now complete the writing of this thesis. Apparently, the success of completing the study of my Master Program at Erasmus University is attributed to the careful and patient guidance of the lecturers. It would be impossible without their help and guidance.

When looking back, I feel fortunate that I decided to join the Erasmus University and selected the major of Accounting, Auditing and Control. What I learned during my study will surely be very helpful for my future career and life. For this, I would firstly, give my heartful appreciation to my university which gives me years of intellectual education as well as colorful memories as a student. Secondly, I would like to give applause to my family who always encourages me and support my work. My special thanks goes to my husband. He helped me not only by the way of providing useful advices, but also helping me to raise my self-confidence with motivation talks especially when I was in difficult situations. He also helped me to monitor the progress during different phases of writing this thesis, which contributes to my successful completion of this essay today. Lastly, but surely not the least, I am grateful for my research supervisor Drs. Welten and co-reader Dr. Leung who both played key roles and gave priceless suggestions and guidance throughout the this thesis project.

Contents

1. Introduction

1.1 Introduction to the Enterprise Resource Planning systems

The current global business environment is characterized by rapid growth, global competition and shorter product life cycle. In order for the enterprise to gain or maintain competitive benefits, efficient and optimal utilization of company resources becomes very important. For instance, tasks like utilization of resources, marketing, after sales service system, customer filing, transportation arrangement, dealer management, finance management and human resource management, may rise every day and need to be solved at both the senior management level and executive management level. The existing system was out-of-date and incapable of handling ever increasing information. The limited resources are squandered on keeping up the maintenance of old system rather than investing on development of new system (Pressman, 1997). In the meantime, most U.S. companies began to realize the importance of implementing a brand new information system into their core business process.

One of the solutions for these problems that many organizations are facing is Enterprise resource planning (ERP) systems. This ERP system is offered by SAP, Oracle, Microsoft, Infor etc. The vendors promise that ERP would help companies increase their efficiency, achieve transparency, tighten internal control, and enhance collaboration between departments. The basic feature of this system is to interconnect automation, information and business processes from different modules by using a central database to store data from all different modules or applications. An ERP system is a process based system and is developed from information technology and systematic management thinking. It is a management system tool applicable for staff, management, decision makers and as well as stakeholders (Kumar and Hillegersberg, 2000).

The United States where this study is focused on, occupies the biggest ERP market and is the primary sales target of ERP system (Huang and Palvia, 2001). Analysis reports also have shown that about 75 percent of U.S. manufacturing companies have implemented, or are thinking of implementing an ERP system (Mabert et al., 2000). In addition, more survey results have shown that, 67 percent of 500 mid- to and large-size companies had adopted Enterprise Resource Planning systems (Sirkisoon and Shepherd 2002; Liang,

2007). The existence of ERP system is at every corner of our daily work and life. For instance, the grocery stores will use ERP system to analyze your shopping list to calculate the expiry and "best buy" dates (IJpelaar, 2007). Another example is that the ERP system is also widely used in cruise vacation companies. Their ERP system will facilitate you with easy online check-in, airport transport arrangement, luggage to stateroom services and so much more (Giachetti et al., 2013). Therefore the influence of ERP system has been spread all over our daily life, whether you notice it or not.

In the era of information, ERP system can significantly improve the transparency and efficiency, due to the fact that ERP system generates considerably lot of useful information, for both internal and external users, which makes a great contribution to the understanding of business operations.

Besides ERP, another method to generate organizational knowledge and enhance the information transparency is the control of corporate governance (CG). The major task of CG is to generate, accumulate, transfer, and protect firm specific knowledge (Grant, 1996; Teece et al., 1997; Kogut and Zander, 1996; Spender, 1996; Foss and Foss, 2000; Grandori and Kogut, 2002). Effective CG ensures that management will not engage in behavior which could be harmful to stakeholders, since their conduct can be and will be scrutinized. Thus, not only the ERP implementation is important, enhancing the corporate governance will also assist an organization to improve the information transparency.

Although ERP implementation brings a lot of benefits, not all implementation plans are equally successful. Several studies have showed that implementation have yielded more failures than success in large organizations (organizations having more than thousand employees). According to Martin (1998), about 90 percent of ERP implementations are late or over budget and ERP implementation success rate is only about 33%. There are a lot of reasons for failing, but most of the time is that they don't have efficient governance. Leaders provide oversight and controls so that the technology program aligns with the interests of all departments and makes them cooperate. However, organizational control can become institutionalized over time, and thus difficult to be changed (Drazin and Van de Ven, 1985). This means that good corporate governance could negatively influence the success of ERP implementation. Fitz-Gerald and Carroll (2003) divide the whole CG

concept into three levels: organizational governance, IT governance and project governance and they use their matrix as a framework for the investigation of whether and how CG levels will contribute to the ERP implementation success.

The size of the firms is an important provision for the companies to decide whether an ERP system is needed or not. In order to determine the categorization of firms, the same approach as Trelevan et al. (2004) and Van Everdingen et al. (2004) will be followed. As elaborated in their research, the number of employees is used to determine the size of the firms. Firms which have more than 1000 employees are classified as "large", and the counter entities are nominated as "small/medium". The division between "medium" and "small" is of no importance for this study, therefore disregarded.

An ERP implementation in a large company requires tens to hundreds of thousands of dollars and takes normally one to three years to finish the project. An ERP failure means a waste of enormous sums of money or destroying the competitive advantage of the firm (Davenport, 1998). Therefore, there is an urgent need to investigate the enterprise precondition, implementation resource input and the role of governance that would lead to the implementation success. This study aims to seek an understanding of these factors by analyzing the following elements of CG: organizational governance, IT governance and project governance. It can be believed that companies that successfully have implemented ERP will show patterns of corporate governance that are different from companies that failed to implement ERP.

1.2 Research question

In this thesis, it will be examined the association between CG attributes and ERP. More specifically, the aim of this thesis is to study the impact of organizational governance, IT governance and project governance on the success of ERP of U.S. large companies. Consequently, the main research question is:

"How the levels of corporate governance contribute to the success of Enterprise Resource Planning (ERP) systems implementation in the U.S. large companies?"

In order to answer the main research question, the following sub-questions have been constructed:

1. What is the theoretical concept of this research?
2. What have been found in the previous literature on this topic?
3. Which hypotheses can be formulated based on the finding of previous literature?
4. How will the research be designed?
5. What are the analysis and the results?
6. What is the conclusion of this research?

1.3 Motivation

ERP and corporate governance are very common topics in the financial accounting research. Since ERP systems have been considered as one of the most important innovations in IT in this decade (Al-Mashari, 2003). The reason of focusing on ERP systems is not only because of its large-scale nature, but also due to the very high level occurrence of failure. In order to support the organizations to plan and execute their ERP projects more successfully, Karimi et al. (2007) have pointed out the necessity of better understanding the role of critical success factor (CSF) in the ERP implementation. In addition, because ERP is process-oriented, rather than function-oriented, and ERP requires rapid organizational changes (Volkoff, 1999; Hammer and Stanton, 1999). Successful ERP implementation must be supported by every level of practitioner in the organization. Only few academics have been focused on the association between corporate governance pattern and ERP success, but their research have been conducted in a qualitative manner by doing literature review or have focused on single case studies where the external validity is very low (Ang et al., 1995; Bingi et al., 1999; Cox and Clark, 1984; Holland and Light, 1999; Mandal and Gunasekaran, 2002; Motwani et al.,

2002; Sum et al., 1997; Wilson et al., 1994; Yusuf et al., 2004). Thus, the results of these studies cannot be generalized to all contexts.

Furthermore, a lot of factors that positively influence the success of ERP implementation are identified and ranged from low to critical in prior studies (Dezdar and Sulaiman, 2009; Al-Mashari et al., 2003; Bingi et al., 1999; Somers and Nelson, 2004; Finney and Corbett, 2007). These factors include business plans, project management, cultural influences, business process redesign, top management support, project team composition, ERP vendor quality and fit between ERP and organization. However, previous studies are quite fragmented. They have provided understanding of some of these elements on ERP success, but no empiric studies exist in the literature in which all levels of corporate governance with respect to ERP success have been discussed.

Empirical studies focusing on how CG levels will contribute to the ERP implementation success are rare. The aim of this study is to bridge this gap, by considering different levels of corporate governance and success of ERP implementation of large companies. In addition, this study will also help the management to understand different levels of CG and their role in the success of ERP implementation.

This study will focus on the U.S. market. Because even ERP systems have their roots in Germany, organizations in North America have used these software programs for ages and still continued to invest in advanced systems. Simply speaking, they have more experiences with ERP (Huang and Palvia, 2001). Nowadays, The USA is still the dominant ERP market and represents 66 percent of revenues for the major vendors.

1.4 Methodology

The sample used in this study consists 169 U.S. companies. Survey is conducted to collect the data. Questionnaires are sent to senior managers who are involved in the implementation process from large companies in the U.S. As prior literature, user satisfaction is used as proxy for ERP implementation success. Top management support and commitment to change are used as measurements of organizational governance, adequate IT infrastructure and risk assignment as measurements of IT governance, sound project management and best people best team as measurements of project governance.

Furthermore, two control variables are added into the model, they are: industry type and working experience of the manager. Partial Least Squares Structural Equation Modeling (PLS-SEM) is used to analyze the data.

1.5 Finding of this thesis

The results of the study show that organizational governance is the only governance aspect which is positively and significantly correlated to the success of ERP implementation. However, IT governance and project governance are not critical to achieve the success. Additional, industry type is also a determinant of ERP implementation success.

1.6 Limitation

This study has several limitations. First of all, this study focuses on the U.S. large enterprises. The results may be not suitable for other settings. Secondly, regarding the used proxy of ERP implementation success, the possibility of an intervening variable such as perceived user satisfaction exists. Finally, besides the influence from the company's side, implementation success can be affected by other factors, such as unsuitable ERP program, or other social and political aspects.

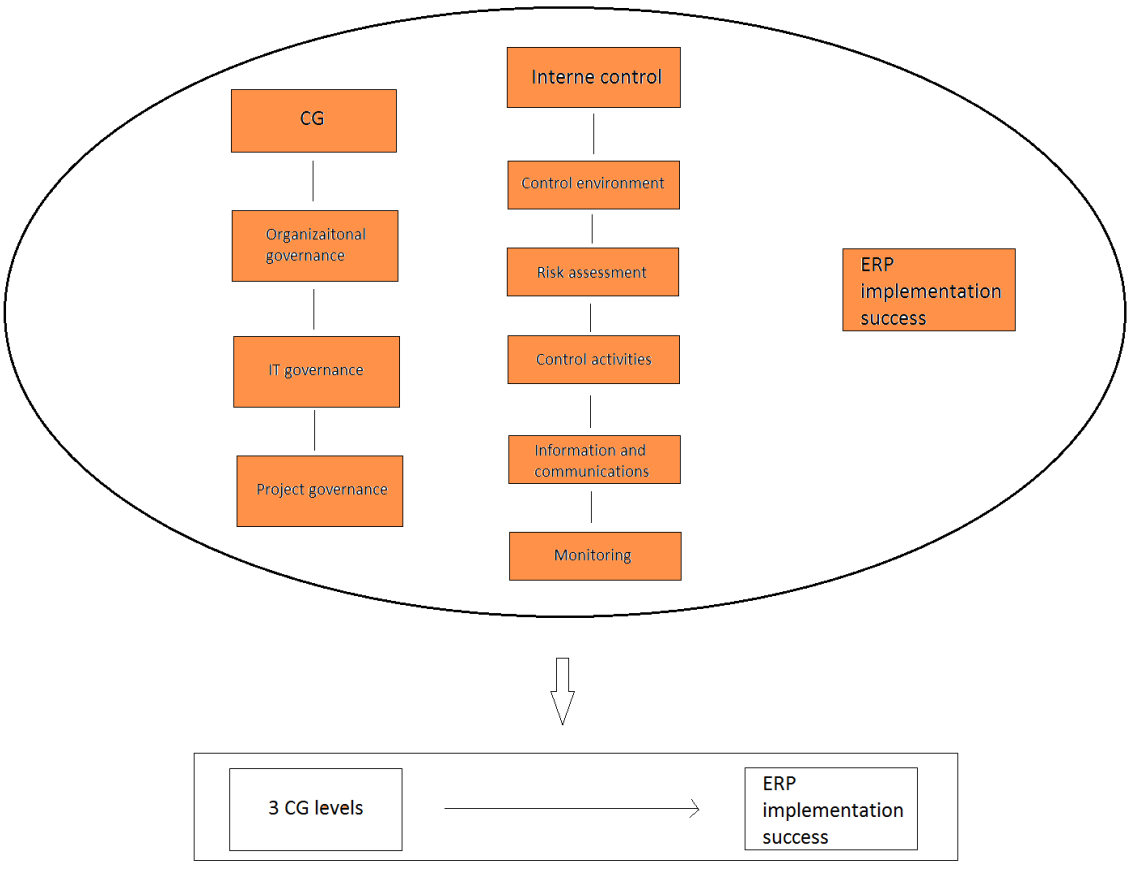
1.7 Structure

This study is divided into 9 chapters. Chapter 2 presents a theoretical overview of ERP, ERP implementation, implementation success, CG, CG levels, underlying association between ERP success and CG. Chapter 3 provides a review of prior literature. Based on theories and previous literature, the research hypotheses are developed in chapter 4. The research design is presented in chapter 5, while the empirical results is analyzed and discussed in chapter 6. Finally, the conclusion, limitations and recommendations are presented in chapter 7.

2. Theoretical overview

2.1 Introduction

In this chapter, the literature review is presented and the first sub-question is answered. Theoretical foundation of ERP and its implementation process is provided in 2.2. In section 2.3 the measurement of implementation success is discussed. Then the corporate governance structure in the U.S. is defined in 2.4. Section 2.5 will focus on internal control. After that, the association between ERP and CG is described in 2.6. The theoretical framework is summarized in 2.7.



2.2.1 Enterprise Resource Planning (ERP) systems

Literately, Enterprise Resource Planning system means a system, by which a company makes plans for its assets. Enterprise-wide tasks are integrated, such as sales and order management, purchasing, warehouse management, financial and managerial accounting, and human resource management (Kumar and Hillegersberg, 2000). An ERP system is a

technology infrastructure that helps an organization with integrating information from all departments with vendor and customers. ERP replaces old systems of each department, collects information from different programs, and transforms them into a single central database. ERP system allows automation and integration of information and business processes from different modules, advances the flow of information across diverse business units, and eliminates the geographical boundaries by using advanced technologies and management thinking. By entering new data into one place, all related information is automatically updated (Davenport, 1998). It connects all internal units together to help management to achieve more governance of the business.

Because ERP systems provide uniformed data and process integration, Gattiker (2005) believes that it will better fit by manufacturing companies. During the process of system development, ERP gradually evolve itself into more customized system to match the existing organizational processes. Nowadays, ERP can support every organization across functions, across industries and across countries.

ERP targets numerous industries in two ways. Firstly, the core function or solution of ERP can be applied to different industries, for instance the manufacturing and retailing functions. It can generate pre-formatted documents like quotes, automatically deliver notes and invoices or easily set up HR-related rules (e.g. payroll). Secondly, the ERP system is flexible to be customized to meet individual enterprise needs. Most ERP solutions are based on common programming platforms which normally incorporate web services and developer tools to facilitate further upgrading or customization of the existing system.

Also, ERP is designed for companies that operate internationally, intercontinental or even globally. The mandatory functions of ERP include services like multiple language interface, various currency evaluation, different taxation rules and it can collectively manage factories in different regions as well. The ERP system is able to meet the requirements of different regions or countries in the field of finance, tax, environment, logistics and etc.

Increasing transparency within the enterprise will reduce the risk of people working in their own interest, and consequently will lead the entire company towards a common goal. This is the main feature and function of ERP systems. With the aids of ERP system, the accessibility of information and coordination between the various departments of the firm can be considerably improved. Accurate information, by using ERP systems, are also made available in a real-time environment, giving it a transaction-oriented characteristic (Davenport, 2000).

ERP brings a lot of benefits to the enterprise. Quantifiable benefits are: 1) reduction of labor costs. Since ERP eliminates manual, inefficient tasks and repeat work. The time saved by this way will lead to a decrease in staff numbers or a reduction in paid overtime (Shang and Seddon, 2002). 2) Additional revenue. As better planning program is applied, chance of missed orders due to non-availability is lowered (Markus and Tanis, 2000). 3) Improved profit margin. ERP supports efficient information report, helps an organization to identify and focus efforts on profitable products (Bendoly et al., 2009). 4) Reduced inventory. ERP makes accurate forecast, this leads to the right stock availability at the right time (Rikhardsson and Krcmmergaard, 2006). Advantages which are not quantifiable are: better integration between internal units (Alsene, 2007), timely and reliable report (Spathis and Constantinides, 2004).

On the other side, there is a significantly high cost involved with ERP systems. Besides the software package itself, investments in hardware, internet installation, staff training programs, software testing, process redesign, hiring consultant and maintaining programs should also be taken into account. Interesting finding by larger firms is that although ERP implementation cost more money due to the greater range of adoption related services. A comparison of revenues shows that there are economies of scale working in the favor of the larger firms (Mabert et al. 2000).

2.2.2 The revolution of ERP

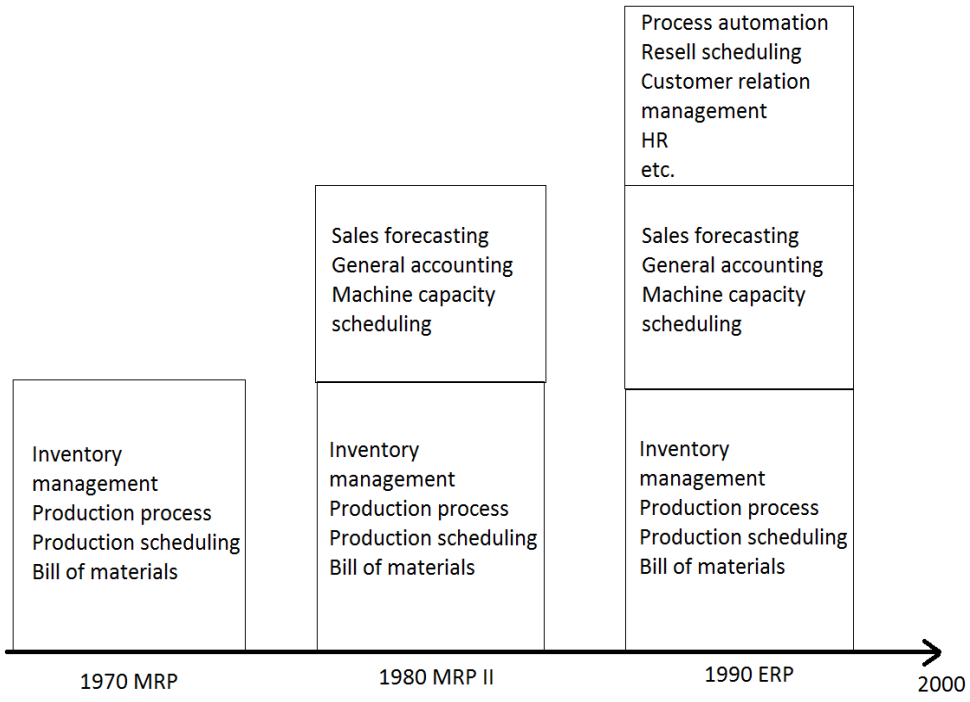
ERP systems can be traced back to Materials Requirement Planning (MRP) systems from 1970s and Manufacturing Resource Planning (MRP II). The initial aim of these systems was facilitating companies to plan all resources necessary for manufacturing. MRP was the first software package that enabled inventory management, processing of mass data,

calculating of material needed. Past data are used to calculate future requirements. Demand-based planning and consumption-based planning were therefore typically parts of MRP.

In 1980s, MRP was extended with new functionality, such as tong-term sales forecasting, general accounting, and capacity management. Though the initial aim of MRP II was making the planning more efficient, organizations quickly realized that profitability and customer satisfaction are more important than manufacturing and sales (Klaus et Al., 2000). Technical function development must be integrated into production process improvement. The concept of a totally integrated organizational solution is now called ERP.

Russell and Taylor (1995) define ERP as updated version of MRP II. ERP was developed into a new generation of integrated management information system. It firstly appeared in the beginning of the 1990s. In comparison with MRP and MRP II, ERP has relational data-base management, graphical user interface and client-server architecture. ERP was initially targeted at manufacturing companies, with the increasing functionality, ERP can be used across any institutions (Koch et al., 1999). It broadens the functionality of the MRP system with the core competitiveness in supply chain management. Figure 1 shows the ERP revolution process.

FIGURE 1: Revolution of ERP (Zuo and Kuang, 2001)



2.2.3 ERP implementation

Ram et al. (2013) described ERP implementation as "an organizational effort directed towards the installation and diffusion of an ERP system within a user community." Literately, ERP implementation is realized by means of physical computer integration using operational skills. But to make the ERP implementation successful, this transformation should comprise a technical and a managerial migration path. Rather than an effort of software installation, it is a complex program in IT innovation and organizational change management (Markus and Tanis, 2000).

Khanna and Arneja (2012) introduced five strategies to roll out ERP systems. They are: 1) Big Bang; 2) Phased; 3) Parallel; 4) Process Line and 5) Hybrid. Based on the organizational structure, the complexity of the business, economic issues, strategic partners, time constraints and geographical locations (Markus and Tanis, 2000), the appropriate manner should be used. The Big Bang approach is the extreme one, where multiple modules of an ERP system across the entire company are simultaneously installed. This approach requires a lot of resources to support the installation. Furthermore, good planning and preparation before the implementation is very important.

The second way is phased transition, where one system component is installed at a time. It should be operated and observed before moving on to implementation of the next element. This is the most commonly used approach (Khanna and Arneja, 2012). Because by reducing the range of transition, adoption will be constantly evaluated, the risk of installation failure for the whole company is therefore declined.

Under parallel transition, both the existing system and ERP will run at the same time, users learn the new system while working with the existing one. Comparison of both old and new systems can be made, but huge amount of money is required as keeping both systems running.

The fourth approach is process line strategy. This strategy breaks the implementation to handle similar product lines. The transaction from existing system to ERP program has been settled per product line. When the transformation of the first product line is successfully completed, more complicated product lines could be handled.

The last approach is hybrid transition strategy, which is the combination of any of aforementioned strategies. Most large companies are preferred hybrid strategy since they are distributed across multiple business environments. This approach allows company flexibly chooses the appropriate ones in adaption to the specific needs of the situation.

ERP system implementation steps out of the boundary of traditional corporate management thinking and optimizes the enterprise resources from the perspective of supply chain system. It combines the modern information technology and advanced management thinking, which are the operational mode for modern business. It meets the requirements of ambitious enterprise for optimizing corporate resources.

2.3 ERP implementation success measurement

ERP system is at a completely different level compared to traditional IT systems, due to its complexity and diversity. Therefore a more particular measurement scheme needs to be adapted to subjectively evaluate the success of those systems.

2.3.1 Evaluation features

2.3.1.1 Complexity

As mentioned in the last section, ERP implementation is an adaptation between the system and user environment. Successful ERP implementation must be managed as perfect match between software installation and current business environment. Its complexity and the extent of impact on the enterprise is much greater than any single-functioned information system. There are tactical benefits that companies right after the completion of the implementation can record, however, strategically benefits appear after two to three years (Hunton et al., 2003). There is a significant time-lag. Therefore, advantages generated by successful ERP implementation are difficult to quantify.

2.3.1.2 Subjective nature

As people sometimes say "position determines your thought". The definition of one system being successful is purely depends on the perspective of different user groups. The software implementer thinks it is 'successful' when the program is running without problem and is completed within budget and on time. While the managers only consider the system as successful when the key performance indicators have be significantly enhanced. Thus, the results of the end product depend on the people who evaluate the implementation.

2.3.2.1 Target

The reason why an organization implements ERP differs from each other. Some enterprises tend to fix the management issues by using ERP. Other companies desire to enhance their competitive advantage. However ERP implementation can also be mandated by top management or even government. In voluntary situations, system usage can be a measure of system success. In other situations, perceptual measures of satisfaction may be appropriate (Doll and Torkzaden, 1988). User satisfaction is the extent to which users believe the IS available to meet the desired information requirements (Ives et al., 1983).

2.3.2 The evaluation criteria of implementation of ERP

In order to evaluate the results of the ERP more subjectively, systematically, accurately and efficiently, a few criteria need to be established as following:

2.3.2.1 Comprehensiveness

ERP system is implemented to all departments within the entire corporate. The success of ERP implementation should not only be limited to the valuation of the system itself, but also should be applied to the quality of the information and satisfaction of the end users. Therefore the evaluation system must be comprehensive across the entire corporate.

2.3.2.2 Emphasis on key points

A too much detailed evaluation consumes a lot of unnecessary time and resource. And sometimes the actual valuable information can be even covered up by useless ones. Therefore filtering out the less important criteria and targeting the most useful and relevant criteria is the key analysis to evaluate the success of ERP. The key criteria should be emphasized in order to underline their significance in the evaluation system.

2.3.2.3 Accuracy

The contents of the evaluation criteria need to be defined as specific as possible to prevent the ambiguity of literature interpretation, which may further have impact on the accuracy of the evaluation results.

2.3.2.4 Quantifiable

The evaluation criteria should be practically operable and achievable. For instance, the corresponding results should be able to be extracted from the surveys or analyzed from statistical data. In another word, defining a criterion which cannot be evaluated and demonstrated is meaningless.

2.4 Corporate governance structure

2.4.1 Definition

A very general definition is provided within the Cadbury Report issued: "CG is the system by which companies are directed and controlled. The board of directors is responsible for the governance of their companies. The shareholders' role in governance is to appoint the directors and auditors and to satisfy themselves that an appropriate governance structure is in place" (Cadbury, 1992). Cadbury has enormous impact on following studies. CG is defined as the construction decided together by board of directors, shareholders, top management and other stakeholders, which involves the objectives of assuring accountability and improving performance (Dunlop, 1998;

Sternberg, 1998; Tricker, 1994). Gillan and Starks (1998) define CG as a control instrument for operations in a company.

Two types of corporate governance are distinguished: internal and external corporate governance. It is called internal corporate governance, when the monitor-process is taken place within the firm, namely by the board of directors, management incentives, capital structure, by law and a number of internal control systems (Gillan, 2006). CG's tasks are: guiding enterprise strategic, planning and controlling projects and human resource, and is delegated to project managers (project governance), which responsible for IT (IT governance) and senior executives (organizational governance). External governance refers to control from the outside of the firm, such as laws, regulations, market competition and private sources of external oversight. This research focuses on the internal governance, concentrates on the question of whether internal control represents a means to enhance ERP implementation success.

2.4.2 Governance levels

2.4.2.1 Organizational governance

Organizational governance includes two key groups: the board of directors and executive managers. The board of directors ensures that company runs on behalf of the shareholders' interest (Vives, 2000). Executive managers are employed by directors, and are responsible for achieving the targets, performing operations and responding to stakeholders' needs (Shattock, 2001).

Top management support is originated from the leadership at executive level, which could be senior executives, board of directors, (vice-) presidents and senior managers. They are the people who can control and oversee the entire organization (Ewusi- Mensah, 1997; Jurison, 1999; Parr and Shanks, 1999; Sauer, 1999; Standish, 1999). According to prior researchers, this term refers to self-participation, direction, authority and resources for all departments in the enterprise that provided by the management (Davenport, 1998; Nandhakumar et al., 2005). In another word, top managers should take the interests of all other stakeholders and architect the ERP software design in a way that project output is valuable to everybody.

Moreover, a process change-oriented implementation requires companies to have suitable structure, tools and types of information needs. Even the most customized ERP system has its own logic concepts and technical terminologies (Kassem and Schult, 2008). Therefore, commitment to change by all members of the enterprise is needed.

2.4.2.2 IT governance

IT governance 'is an integral part of enterprise governance and consists of the leadership and organizational structures and processes that ensure that the organization's IT sustains and extends the organization's strategy and objectives' (Sallé, 2004). IT governance cannot be seen as a discipline on its own. IT related decisions are made to achieve the organizational goals. The risks that are associated with such decisions, especially decisions that will bring changes to the organization should be mitigated. This can be realized by setting standards, possessing adequate IT infrastructure, empowering these people decision making capability and assigning risk responsibility. According to Lee and Lee (2004) an adequate IT infrastructure refers to high skilled IT experts and IT program which is aligned with the business needs and priorities. Another important element within the IT governance is assigning accountability for technical risks. Accountability implies an obligation to accept the responsibility.

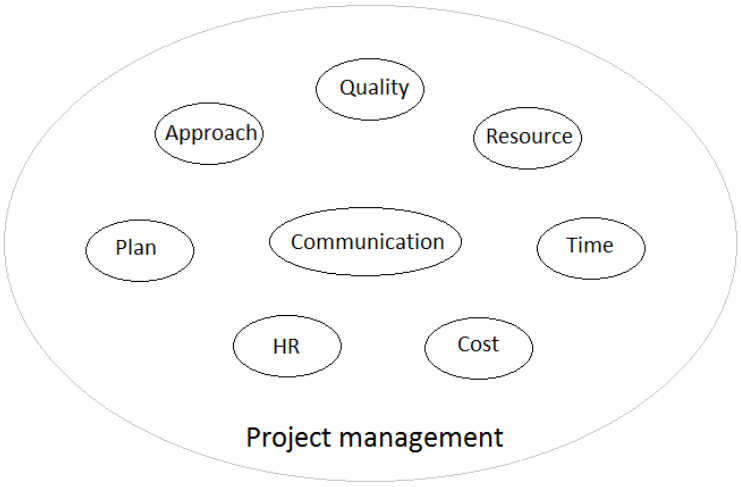
2.4.2.3 Project governance

According to a CIO magazine survey, managing an IT project that improves the business is the biggest IS concern as reported (Schneider, 2000). Project governance is the framework, which ensures project to deliver the value which is expected from the investors. Crucial activities of project governance include employing sound project management techniques and controls, setting realistic budget, creating balanced team and engaging best people full-time. McLeod and Smith (1996) emphasize hereby the necessities of coordination and the purpose of achieving change. Moreover, completing an IT project on time and within budget is also a significant feature of good project governance.

ERP implementation projects may involve problems such as implementation plans, appropriate approach, system quality, resources available, an extremely long implementation process, budget over running, or a personnel related change management

issue. Poor management, an inexperienced project leader, and infrequent or ineffective communication within the team will cause implementation problems, particularly in large entities. Communication is considered as the crucial part of sound project management (Weston, 2001), including the communication level between the project manager and his project team, additionally, the communication with the project sponsor and top management.

FIGURE 2: project management areas



2.5 Internal control system

In 1992, the committee of Sponsoring Organizations (COSO) of the National Commission on fraudulent financial reporting has presented the COSO Report. In this report, internal control is as followed: in order to achieve the operational effectiveness and efficiency, reliability of the financial information and compliance with laws and regulations, a process that the board of directors, management and other staff members need to follow. The internal control concept has been for the first time developed into a three dimensional framework model. COSO report represents a milestone in the study of internal control.

The COSO Framework stipulates five interrelated components of internal control:

1) Control environment: it is the fundamental of other components, and it provides the organizational discipline and structure. Control environment includes:

integrity, ethical values, competence of the staff etc.

2) Risk assessment includes: setting objectives, identifying and analyzing the relevant risks and finally dealing the risk associated operating changes.
3) Control activities are procedures which will help the management to ensure that necessary actions are taken to mitigate the identified risks and to achieve the organizational goal. Authorizations, verifications, reconciliations, reviews and separate of duties are the examples.
4) Information and communications: all business related information should be timely, accurately and completely captured and communicated within the enterprise. That makes running and controlling the business possible. Downward communication, as well as across and upward communication is needed. Everybody must receive a clear message from top management about control responsibilities. In the internal control system, both the individual roles and activities and their influences on others must be understood. Effective communication with external parties is also crucial.
5) Monitoring. A process to evaluate the internal control mechanism. This involves ongoing monitoring and separate evaluations. Figure 2 shows the COSO Framework.

FIGURE 3: COSO Framework

A lot of researchers have studied the association between internal control and corporate governance. They found that effective internal control positively associated with good corporate governance (Mensah et al., 2003; Pratolo, 2007 and Nilia and Viviyanti, 2008). This association can be explained by the fact that internal control is a part of management control process and both of these two mechanisms will lead the enterprise towards its goals. Effective internal control ensures good CG.

Since control objectives basically covers the entire business operations, another positive association can be found between ERP and internal control. Because of the successful implementation of ERP, the control environment is changed. The organizational structure becomes more flat, efficiency is increased, risks are more timely and accurate analyzed, control method becomes more flexible, manual examination system could be replace by more effectively software programs and offers more monitoring solutions, and the top management comes closer to the operations. Therefore, ERP can be used by the management to generate information, enhance the communication and realize the control.

2.6 Interaction of ERP and CG

Figure 3 summarizes how ERP, internal control and CG interact with each other. It is discussed that both good corporate governance and ERP success is positively associated with effective internal control. It can be believed that there is a positive association between ERP and CG.

ERP-IC: Technology affects "the ways in which organizational members must interact with one another to accomplish routine tasks" (Deetz et al., 2000). ERP is a process-oriented software package, and ERP brings disruptive changes to the entire enterprise (Volkoff, 1999; Hammer and Stanton, 1999). Such process may involve difficult, probably unique, technical and managerial choices and challenges (Markus et al., 2000) and calls for adequate internal control structure of the system. Concerning the impact of ERP at the same time, Chand et al. (2005) indicate in their research that timeliness and availability of information are improved and internal controls are tightened because of the ERP implementation. ERP implementation success and internal control is interconnected with each other. Based on the COSO model, this relationship can be explained.

ERP-control environment: control environment is the foundation of all other control elements. ERP changes the internal control structure by making it flatter and reducing control levels. ERP brings the decision maker closer to the practitioners. ERP enhances the accessibility of information, and at the same time, permits data access just to the authorized people.

ERP-risk assessment: The traditional closed operating environment and risk control method are replaced by ERP. The ERP application provides companies a better view of associated risks, risks impact and risk responses. Also, it allows companies to make the analysis more timely and accurately.

ERP-control activities: ERP allowing company to go beyond the limitation of internal control will not just rely on the manual approval. Well-designed software package will also assist the enterprise to achieve the control objectives.

ERP-information and communication: ERP enhances information flow in real-time throughout the entire enterprise and connects various departments. A relatively open information system is an open channel of communication, through which staff can easily communicate with managers. Meanwhile, the staff gets a clearer picture of the internal control system and his own responsibilities.

ERP-monitoring: ERP combines human control and computer control, provides management a real-time monitoring tool and allows accurate analyzing for quicker and better business decisions.

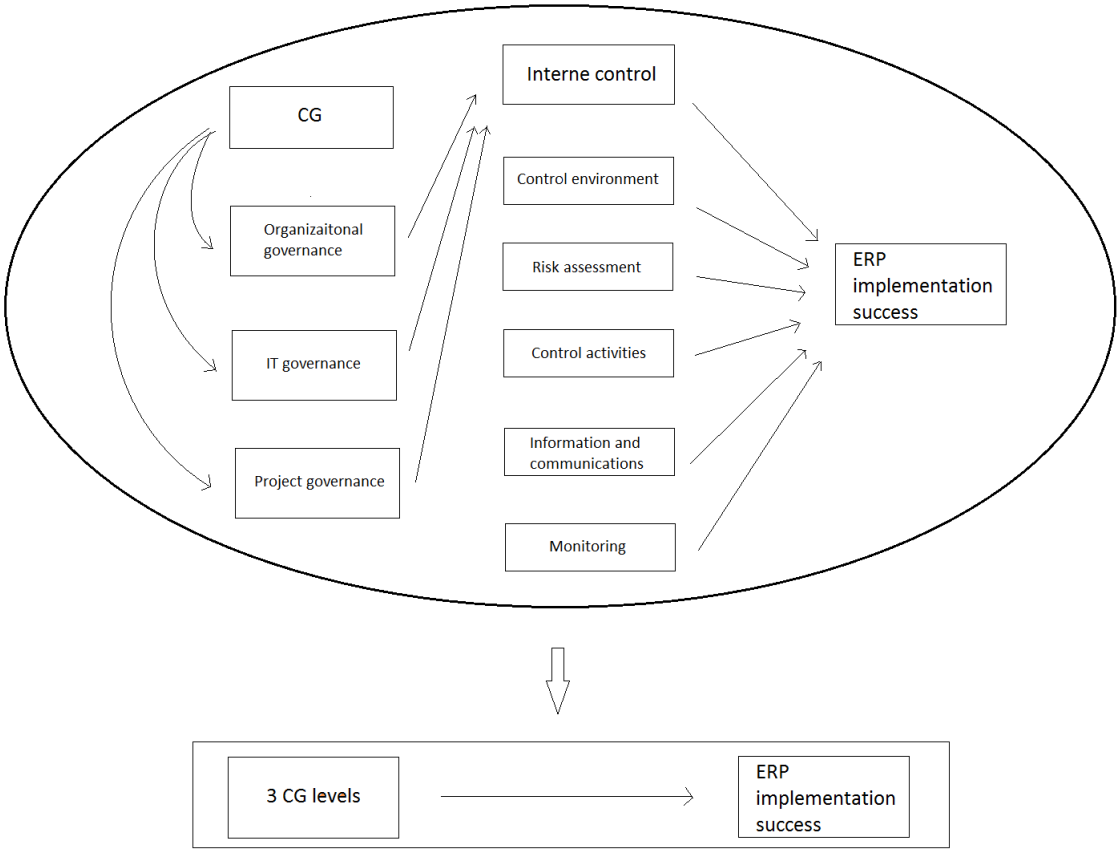
IC-organizational governance: The top managers set the "tone at the top", influence the control consciousness of other people and set operating style. In a large company, the chief executive officer supports the ERP implementation by being a participant and effectively allocating the resources, will affect the control environment positively. Moreover, the massive enterprise changes involved with ERP implementation could bring confusion. In order to prevent this, Spike and Lesser (1995) indicate that communication is a tool to help people realize and understand the changes. Subsequently, communication is a key contributor to widespread understanding ERP and cooperation (Kraemmerand et al. 2003). Since communication could minimize user resistance, Lippitt (1997) notes that

communication can also increase commitment to change. Moreover, implementing an effective change management strategy will help the enterprise to identify the risks at the beginning and have enough time to be prepared. According to the COSO model, effective communication enhances the internal control.

IC- IT governance: as aforementioned, IT governance ensures that there is an adequate IT capability to support current and future operations. Moreover, there is an assigning of responsibilities and risks. Organization's IT sustains and extends the organizational goals. Both of IT governance and internal control will contribute to achieve the organizational objectives. Therefore, it is expected that IT governance is positively associated with internal control.

IC-project governance: Establishing a sound project management makes the control structure more clear, allocates the best people in a balanced team, strengthens the control system and monitors activities.

FIGURE 4: Summary theoretical framework



In summary, ERP implementation brings changes to the elements of the internal control framework, enhances the internal communication efficiency and opens new opportunities for enterprises.

2.7 Summary

This chapter provides an overview of the theoretical framework, namely the ERP systems, ERP implementation and its success, CG concept, IC framework, how is ERP associated with CG. The next chapter provides a literature review of prior research about the relationship between CG and ERP.

3. Literature review

3.1 Introduction

This chapter will focus on the second sub question. A review of the prior literature about ERP and CG is performed in section 3.2. Then, a more specific view on the CG levels is given in section 3.3, by examining research on organizational governance. A summary of prior research is provided in appendix A.

3.2 ERP implementation success and corporate governance

The corporate existence is determined by how many resources that the enterprise may possess. Any enterprise or organization only contains limited resources. The resources include people, finance, assets, information, knowledge, time and etc. The resources are limited therefore valuable. And the corporate performance is determined by how well the valuable enterprise resources can be optimal used, which is the core objective of deploying ERP system (Zhang and Wang, 2010).

The key stage of ERP system is during its implementation phase, where the ERP system turns from concept into reality. The implementation of ERP system is a complete business transformation. Most failures are due to the organization, social or even political reasons rather than technical and software caused reasons (Willcocks and Margetts, 1994). The corporate congenital factors, for instance personnel quality, management infrastructure, and corporate performance, will have great impacts on the decision whether the ERP system should be deployed by the corporate. Furthermore, these conditions will consistently have effects during the implementation of the ERP system, and finally determines the end results of ERP projects (Chen, 2001). Among all the factors, the most important factor is the personnel. The personnel include top management, managers, and employees (end users).

Top management, which contains the board of directors and key shareholders, is the decision maker for the implementation of ERP system. Therefore their awareness of the importance and usefulness of information technology is the critical factor for the decision making on ERP related subjects. Over the last years, especially in the years when ERP systems are widely populated, many literatures have increasingly emphasized the risks

and critical success factors for ERP implementation on top management support and the existence of a project champion (Ewusi-Mensah, 1997; Jurison, 1999; Parr and Shanks, 1999; Sauer, 1999; Schmidt et al., 2001; Standish, 1999; Sumner, 1999). According to a survey (Umble, 2001), the lack of leadership and commitment from top management is indicated as a major reason for ERP implementation failure by 73% of respondents. As the end users, employees' knowledge, skills and trainings at ERP or IT related subjects also have a positive influence on the successful ERP implementation project (Muscatello, 2002). By analyzing the ERP system failures of many enterprises, the problems mostly occur in the management infrastructure, and it is represented by a few key aspects like business procedure, organization, culture, data process and corporate regulations (Ash and Burn, 2003; Al-Mashari et al, 2000; Xu, et al, 2002).

In addition, ERP system by itself will not provide company competitive advantage (Clemons, 1998). ERP is not a cure for all problems in the corporate management infrastructure. Instead rescuing an enterprise from crisis, the implementation of ERP systems actually needs a relatively stable corporate environment. The provisions of corporate environment for a successful ERP implementation requires: commitment by the senior executives (organizational governance), or board of directors good IT infrastructure and support of experienced IT technicians (IT governance) and clear strategic direction, good planning and controlling projects and people, delegation to responsible and experienced project leaders (management governance). The role of various governance levels in ERP system implementation is examined, analyzed and evaluated in the rest of this thesis.

3.3 ERP implementation success and different governance levels

In this section, a more specific view on each corporate governance level is given. The influences of each governance level: organizational governance, IT governance and project governance will be discussed.

3.3.1 Organizational governance

Organizational strategies for promoting ERP implementation success include: top management support, change strategy development and deployment, change management techniques, project management, organizational structure and resources, managerial style

and ideology, communication and coordination, and IS function characteristics (Al-Mashari and Zairi, 2000; Gable and Stewart, 1999; Sarker and Sarker, 2000). Among them, the most essential factor in an ERP implementation success is top management support and commitment (Sarker and Lee, 2003).

3.3.1.1 Top management support

Various literature has explained the critical role of top management support in a successful ERP implementation project. The reasons of the importance of top management support can be summarized in following aspects:

- Strong leadership, a clearly view of the business mission and vision, and on the other side, what business issue the ERP system will address (Krupp, 1998; Latamore, 1999; Schragenheim, 2000; Travis, 1999).
- Top management self-involvement and commitment to enterprise integration (Holland and Light, 1999, Sarker and Lee 2003);
- Giving high priority to the project within the organization (Shanks et al., 2000);
- Arranging and allocating necessary valuable corporate resources at executive level, which contains: analyzing the retire operation processes, strategic input, promoting the benefits of a successful ERP project to entire corporate (Parr and Shanks, 1999), and undisguised point of authority for the project and project team (Pinto, 2000).
- Consent of culture, political and structural change which may be required by ERP system implementation project (Sumner, 1999).
- Tolerance to any glitches that might be encountered (Motwani et al., 2002).

The support of top management should be spontaneous rather than passively required. Davenport (1998) has posited that "if the development of an enterprise system is not carefully controlled by management, management may soon find itself under the control of the system". In addition, the support and commitment should not only be limited to initiation and facilitation phase, but should be expanded to the entire process of ERP implementation (Al-Mashari et al., 2003).

3.3.1.2 Commitment to change

Carr (1993) defines commitment to change as organizational change management, which include all human, social, and cultural related techniques. Previous research found that regardless how companies have concentrated exclusively on the technical part, absence of the change management elements will lead the implementation into a failure. (Bancroft et al., 1998; Stefanou, 1999) also suggested that for the successful ERP implementation, the required organizational change is crucial. Cooke and Peterson (1998) show evidence that organizational change has to be managed during the whole implementation process and should be considered as the key areas in the ERP implementation. Somers and Nelson (2001) and Al-Mashari et al. (2003) argue that commitment to change is a critical success factor for the implementation. These findings show that commitment to change can have a huge influence on the process.

3.3.2 IT governance

3.3.2.1 Adequate infrastructure

IT infrastructure contains several aspects which significantly influence the adoption of IT system, for instance system formalization, technology competence and support for technology (Oliveira and Martins, 2011). Like any other IT software program, these important factors are also applicable for ERP implementation. Formalization of ERP requirements is very useful to reduce the risk and uniform the subsequent application development during ERP implementation (Talukdar et al., 2016). According to Davis et al. (2009), joint IT technology competence is a critical factor for the user satisfaction of an ERP system. Supramaniam and Kuppusamy, 2011) come to the same conclusion and argue that IT infrastructure can be expressed by its maturity in terms of resources and assets (Supramaniam and Kuppusamy, 2011). One of the key resources for a successful and effective ERP implementation is IT human capital (Oliveira and Martins, 2011). IT human capital contains in-house IT expertise (Ifinedo, 2011; Nour and Mouakket, 2011) as well as end user IT knowledge (Upadhyay et al., 2011).

3.3.2.2 Assign responsibility

Like any other IT project management, in order to accomplish the required tasks during the implementation of ERP system, clear obligations and responsibilities should be precisely defined and deliberately allocated (Rosario, 2000; Ewusi-Mensah, 1997).

The study of Ehie and Madsen (2005) is one of few empirical studies on the user satisfaction of ERP implementation. This paper discusses the factors that are critical to the implementation success in small, medium and large sized companies. However, they find that IT infrastructure and human resource development are not significantly correlated with ERP implementation. Because of the fact that the director should not just focus on choosing the IT infrastructure, since the ERP implementation is a business solution and not a software installation.

3.3.3 Project governance

Many papers have been conducted to study the project risks and critical success factors at project governance level for large-scale software implementation projects, which are considered as valuable reference for EPR implementation projects. The most significant factors that influence the ERP success are summarized as:

- Well defined project scope and clear and reasonable goals (Parr and Shanks, 1999; Jurison, 1999). A detailed project scope should be defined and agreed (Holland et al., 1999) and the project goals should be limited in order to prevent budget exceeding (Laughlin, 1999).

- Project management should understand the complexity of ERP system implementation and initiate the necessary project planning and control at early stage (Umble and Umble, 2002). It includes the definition of project scope and project goals (Holland et al., 1999).

- Use sound project management practice (Willcocks and Griffiths, 1994), which includes a well described project methodology (Lyytinen and Hirschheim, 1987), small milestones (Standish, 1999) and close tracking of project progress (Laughlin, 1999), realistic schedule (Jurison, 1999), clear roles and responsibilities at project organization level (Sumner, 1999) and project monitoring with attention (Keil, 1998).

To be able to successfully implement the system, an elaborated project plan should be worked out, in which, project management, implementation methodology and other important project aspects need to be clearly defined and incorporated. According to Bingi et al. (1999), the main causes of ERP implementation failure are 1) lack of understanding of the project and 2) lack of guidance and leadership to the team members of the project.

- Appointing a capable and suitable project manager can significantly reduce the risk of the success of ERP implementation (Kim et al., 2005). A suitable project manager is deemed as a person who possesses relevant experiences (Wiegers, 1998) and authority and accountability for the project (Parr and Shanks, 1999).

- The best member with applicable domain experiences in the enterprise should be included into the ERP team (Bingi et al., 1999; Buckhout et al., 1999; Falkowski et al., 1998; Rosario, 2000; Shanks et al., 2000). The ERP team should be balanced (Holland et al., 1999; Shanks et al., 2000; Sumner, 1999). According to Parr and Shanks (2000) a balanced team refers to a right mix of technical experts, external consultants and end users who have sufficient understanding of business processes. So that internal ERP team can develop technical skills for design and implementation.

3.4 Summary

This chapter talks through the ration behind the association between ERP and CG, and the second sub-question is answered. Various authors have found different sets of critical success factors (which are representatives for each level of governance) affecting ERP implementation. The frequently studied factors in previous research are: top management support, commitment to change, adequate infrastructure, assign responsibilities, balanced team people full time and sound project management. In the next chapter the hypotheses are developed.

TABLE 1: Summary literature review

CG level	Attribute	Ahtuor(s) / Year	Objecte of research	Sample	Dependent variable	Independent variables/ outcome	Methedology
OG	TMS	Clemons, 1998	ERP success and critical success factor (CSF)	One medium-sized manufacturing firm operating in the U.S. and Canada	Reduced lead times	Top management support(+)* Best people(+)* User involvement(+)* Consultants(+)* Clear goals(+)*	Case Study
OG	TMS	Ehie and Madsen, 1998	ERP success and CSF	36 responses out of 200 targeted companies in the U.S. (18%)	User satisfaction level (5)	Project management principles(+)* Feasibility/evaluation of ERP project(+)* Process re-engineering(+)* Top management support(+)* Cost/budget(+)* Consulting services(+)* IT infrastructure Human resource development	Interview; Questionnaire; Multiple regression analysis
OG	TMS	Mabert, Soni and Venkataraman an, 2003	ERP success and CSF	75 useful responses out of 270 targeted companies in the U.S. (28%)	Implementation on-time and on/ under-budget	Upfront planning(+)* Education programs(+)* Technology infrastructure(+)* Modifications(-)* Regularly communication (-)* Implementation management effort	Questionnaire; Multiple regression analysis
OG/PG	TMS/SPM	Motwani, Subramanian and Gopalakrishna	ERP success and CSF	4 companies (pharmaceutical , footwear, energy, automobile)	Improved efficiency	Cautious, evolutionary, bureaucratic implementation process(+)* Careful change management(+)* Network relationships(+)* Cultural readiness(+)*	Case study, interview with executives

OG/ITG/PG	TMS/SPM/AI/BTBP	Nah, Zuckweiler and Lau, 2003	ERP success and CSF	54 useful responses out of Fortune 1000 firms (5,4%)	Success perceived by CIO's (not specified which part)	Top management support(+)* Project champion(+)* ERP teamwork and composition(+)* Project management(+)* Change management program and culture(+)* Appropriate business and IT legacy systems BPR and minimum customization	Questionnaire to CIO's; Multiple regression analysis
OG/PG	TMS/CTC/BTBP	Parr, Shanks and Darke, 1999	ERP success and CSF	42 ERP implementation large projects in Australia and the U.S.	User satisfaction	Management support(+)* Champion(+)* Balanced team(+)* Commitment to change(+)* Minimal customization(+)* Empowered decision makers(+)* Best people full-time(+)* Smaller scope(+)* Deliverable dates(+)* Definition of scope and goals(+)* Availability of skilled staff Project management Understanding of corporate culture Process change completion Communication Multi-skilled project manager Appropriate training	Interviews with 10 senior members

OG/PG	TMS/BTBP	Sarker and Lee, 2003	ERP success and CSF	Interviews with several stakeholders between 1996-2000	Statements or indications from different stakeholders through actions	Top management support(+)* Commitment to change(+)* BPR(+)* Newer ERP versions(+)* Best people, best team(+)*	Case study, interview, pattern matching
OG/PG	TMS/SPM	Somers and Nelson, 2004	ERP success and CSF each phase	133 usable responses out of Fortune 500 firms and randomly 200 ERP implemented firms. (19%)	Successful management of user expectations	Minimal customization(+)* Top management support(+)* Interdepartmental cooperation(+)* Interdepartmental communication(+)* Use of a steering committee(+)* Partnership with vendor(-)* Clear goals and objectives	Questionnaire to a senior level IS executive, 5-point Likert scale; Multiple regression analysis
OG	TMS	Sumner, 1999	ERP success and CSF	7 companies: Monsanto; Anheuser Busch; Sigma Chemical; Boeing Company; Edward Jones Company; Ralston Purina Company; Emerson Electric Company.	On time and within budget, reliable, maintainable, and meet the goals and requirements of user	ERP teamwork and composition(+)*, Top management support(+)* Change management and culture(+)* BPR and minimum customization(+)* Effective communication(+)* Project management(+)* Monitoring and evaluation of performance(+)* Project champion(+)*	7 Case study

OG	TMS/BT BP/SPM	Umble et. al, 2003	ERP success and CSF	Case study of Huck International, Inc.	Cost of ownership minus quantifiable benefits	Clear understanding of strategic goals (+)* Commitment by top management(+)* Excellent project management(+)* Organizational change management(+)* A great implementation team(+)* Data accuracy(+)* Extensive education and training(+)* Focused performance measures(+)* Multi-site issues(+)*	Case study
ITG	OA	Ewusi-Mensah, 1997	Factors contribute to the cancellation of IS projects.	Data from studies of abandoned projects	Stopped with the IS	Project team composition(-)* Project management and control(-)* Technical know-how(-)* Technology base or infrastructure(-)* Senior management involvement(-)*	Content analysis
PG	SPM	Ram, Corkindale and Wu, 2013	ERP success and CSF	217 usable responses out of 2002 targeted large to medium sized Australian companies	Improved organizational performance	Project management(+)* Training and education(+)* System integration(+) BPR(+)	Questionnaire to senior managers; Multiple regression analysis

PG	SPM	Somers and Nelson, 2004	Strategy and integration mechanisms on enterprise system value	287 usable responses from 1250 IS executives from manufacturing companies with > 500 million annual revenues, >500 employees in the U.S.	Fit management's expectations of the system's value	Project management(+)* Change management(+)* Balanced team(+)* Project cost planning and management(+)* IT infrastructure(+)*	Questionnaire to first five IS executive; Multiple regression analysis
PG	SPM	Ramirez and Garcia, 2005	ERP success and CSF	72 usable responses out of 195 targeted large companies that use ERP in Chile	System quality; Information quality; Service quality; Net benefits	IT Strategic planning(+) Executive Commitment(+) Project Management(+) IT skills(+)* Business Processes Skills(+) ERP Training(+)* Learning(+) Change Readiness(+)	Questionnaire, PLS-SEM
*: significant/ be seen as most critical factors by the authors, +/-: Sign of the association							

4. Hypotheses development

4.1 Introduction

Based on the discussion presented in the last chapter, the research model is developed in which three levels of CG and their interaction with ERP implementation success are hypothesized. Each relationship along with associated hypothesis will be discussed in this chapter.

4.2 ERP implementation success and corporate governance attributes

Although effective corporate governance is essential for the success of ERP implementation, however, there are several reasons that CG causes the negatively influence on the ERP success. Drazin and Van de Ven (1985) indicate that effective internal direction may become institutionalized and routinized over time, therefore to be difficult to change. This could lead to confusion of even failure of ERP implementation when the internal coordination is in conflict with the working of ERP.

One of the examples is NASA, which has a reputation of holding good and mature corporate governance. After the ERP system has been implemented at the American aerospace institute for almost one year, the organizational institutional logics were still conflicting between different organizational actors which results into a loss of coupling (Berente and Yoo, 2012). By evaluating the pros and cons, the final effects of corporate governance on the ERP implementation success can still not be simply concluded positive or negative. Therefore,

H0: Better governance would not necessarily lead to a more successful ERP implementation.

4.2.1 Organizational governance

As aforementioned, ERP implementation is not just installation of a software program. It involves the change of the whole operating process, understanding the business, applying mission and vision of the company into the design of ERP. Leader's support and vision of change is hereby very important. Top managers are able to oversee the whole enterprise and make proper allocation of resources.

According to the COSO model, top management support plays an important role in stabilizing the control environment, enterprise integration, identifying opportunities and risk in the environment, utilization of resources and communication. Effective organizational control enlarges the chance of ERP success. Poor organizational governance will cause inefficient resource allocation and less emphasized change management, which adds more chances for the failure of ERP system implementation. ERP implementation in such organizations may be more successful when the top management determines the ERP development direction, pays more attention to the changes and utilizes proper change management strategies.

The majority of the prior studies have proved that support from the top management level is essential to the success of an ERP implementation, because they have the authority and control over the entire company (Ewusi-Mensah, 1997; Parr and Shanks, 1999; Standish, 1999; Sumner, 1999; Sarker and Lee, 2003). Commitment to change is related to how the overall success of an ERP adoption (Nah et al., 2003; Parr et al, 1999, Sarker and Lee, 2003; Sumner, 1999; Umble et al., 2003, Somers and Nelson, 2004). Therefore, it is expected that in case of large U.S. firms, support from the top management increase the likelihood of ERP implementation success. Therefore, it is expected that:

H1: organizational governance is ***positively*** associated with the success of ERP implementation.

4.3.2 IT governance

The IT infrastructure is related to the overall implementation success, since ERP application is an IT-based accounting program. ERP system is very complex, therefore it is logical to assume when the executor who lacks appropriate technical skills, will not be able to support the implementation (Davenport, 2000; Oliveira and Martins, 2011). Accordingly, lacks of sufficient IT equipment form also obstacles to the implementation success. Willcocks and Sykes (2000) emphasize the importance of the impact of high valued IT department on the ERP success. A clear assignment of accountability for technical risks attributes to effective supervision and monitoring activities and prevents unclear responsibilities, hence improved internal control positively associated with corporate governance. Studies have shown that companies with effective IT governance

are better at managing risks (Calder, 2005). According to COSO model, the more the risks are in control, the more effective the IC will be, and therefore the higher chance of ERP implementation success. This is also confirmed by prior research (Ewusi-Mensah, 1997). Projects should not be approved until the level of technology infrastructure is adequate. Thus, it is hypothesized:

H2: IT governance is ***positively*** associated with the extent of ERP implementation.

4.3.3 Project governance

A successful ERP implementation depends on appropriate project management techniques and controls (Ewusi-Mensah, 1997; Phelan and Frey, 2001; Wiegers, 1998; Bingi et al., 1999). The implementation process must be carefully carried out by a team of competent people. A team should incorporate an experienced project manager (Standish, 1999), capable and full time members (Sumner, 1999) and a balanced team consisting technical and business experts (Parr and Shank, 2000).Since proper project ensures all important implementation objectives are clearly defined, communicated and included in the project plan (Scott and Vessey, 2002). This is also confirmed by the literature. According to the COSO model, team member with more communication is expected to be more effective in internal control and accordingly results in better corporate governance. Therefore, it is hypothesized:

H3: project governance is ***positively*** associated with the extent of ERP implementation.

4.8 ERP success measurements

ERP Systems are organizational-wide implemented system, so it is very difficult to measure the performance. Several measurements available for evaluating the performance of the ERP system will be discussed in this section.

Although it may be more convenient and straightforward to measure implementation success in monetary terms, by benefits minus costs. But most of the time this traditional success measurement has its limitations, due to the difficulty of quantifying intangible costs and long-term benefits. (DeLone and McLean, 1992; Jacobs and Bendoly, 2003; Kennerley and Neely, 2002). Therefore, surrogates are used.

Some researchers have discussed the impact of ERP implementation based on metrics calculation evaluating the financial performance indicator, such as ROI and ROA. (Poston and Grabski, 2001; Hunton et al., 2003; Nicolaou, 2004). MIS academic researchers tend to dodge this success measurement (except in laboratory studies). The reason is, because it is very complicated to isolate the effect of the implemented IS from other affects which also influence the outcome.

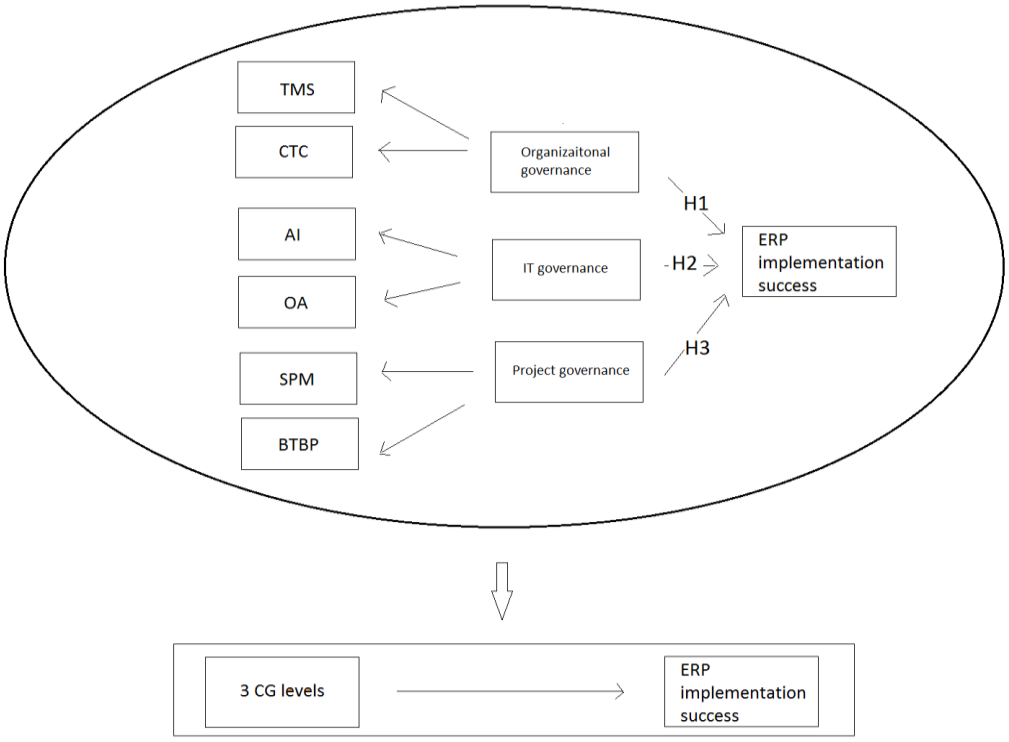
An objective measurement for an IT project's outcomes is often a difficult task. Delone and McLean (1992) have reviewed 180 empirical studies and developed a success model including six categories of information system success: system quality, information quality, usage, user satisfaction, individual impact, and organizational impact. Not all dimensions are assessed at the same time. Some researchers just looked at one of these elements. Ang et al. (1995) and Yusuf et al. (2004) use system acceptance and usage as surrogate of ERP implementation success. While Delone and McLean success model also has its downsides. When ERP system is compulsory, the measurements of system quality, information quality, and usage become than nonessential. Because whether the system's quality is good or bad, and whether it provides useful information or not, that ERP system should be used. Individual impact and organizational impact are also difficult to conclude from an objective perspective. The empirical results have proven that the system quality, information quality, and perceived benefits have a significant and positive effect on user satisfaction (US). Same as good performance, US is caused by the extent to which top managers believe that information needs are met due to IS implementation (Ives et al., 1983; Dezdar and Ainin, 2011). Thus, user attitude is considered as a good surrogate measure of IS success (Seddon and Kiew, 1994; Saarinen, 1996; McHaney et al., 2002; Bendoly and Jacobs, 2004). In this study, US on ERP systems will be used as the measurement for ERP implementation success.

4.9 Summary

In this chapter, sub-question three is answered and six hypotheses are designed. Figure 5 presents a summary of the hypotheses. Based on the COSO model and prior research, all three governance levels can be assumed to be positively associated with ERP implementation success. The measurements of implementation success are discussed in

section 4.8. In the next chapter, an explanation on how this research will be conducted will be presented.

FIGURE 5: Summary of hypotheses



5. Research design

5.1 Introduction

In this chapter, the research design will be presented, whereby sub question four will be answered. Structural equation model, research operation and variable definitions of this research will be discussed in section 5.2. Data collection will be presented in section 5.3. 5.4 continuous with the predictive validity framework (Libby boxes). Finally, section 5.5 provides a summary of this chapter.

5.2 Research method

5.2.1 PLS-SEM

In this research, measurement of ERP implementation success includes both observable variables and latent variables. While social science research questionnaire survey cannot reflect the actual situation completely, in other words, you have to work with a certain amount of error. First generation multivariate methods, like multiple regressions will unable to deal with these. Therefore, this study will use Structural Equation Model (SEM) to perform empirical analysis. SEM belongs to the second generation multivariate methods (Fornell, 1984; Chin, 1998) and allows simultaneous analysis of all the variables in the model instead of separate analysis. In addition, measurement error is not aggregated in a residual error term. Partial least squares (PLS) is an SEM component based software program. PLS-SEM operates much like a multiple regression analysis (Hair et al., 2011). PLS-SEM is suitable in such cases: abnormal data, complex model, small sample sizes and formatively measured constructs (Chin,1998). It is less sensitive to measure errors in the observed variables and multi-collinear problems (Fornell and Bookstein, 1982). Therefore, PLS-SEM has been chosen to make the evaluation more accurately and precisely. The model is imported in SmartPLS 3 for analyzing process.

5.2.2 Structural equation model

Based on prior studies, two equation models will be carried out to examine the association between the dependent variable, user satisfaction (ERP-US) and the independent variables that measure different governance levels. In order to assess the robustness of the results, the regression model without control variables (model 1) and

the regression model with control variables (model 2) will be compared, to see whether the results have changed after including the control variables.

1. $ERP\text{-}US_i = \beta_1 TMS + \beta_2 CTC + \beta_3 AI + \beta_4 OA + \beta_5 SPM + \beta_6 BTBP + \varepsilon$
2. $ERP\text{-}US_i = \beta_1 TMS + \beta_2 CTC + \beta_3 AI + \beta_4 OA + \beta_5 SPM + \beta_6 BTBP + \beta_7 TYPE + \beta_8 EXP + \varepsilon$

5.2.3 Variable definitions

5.2.3.1 Endogenous latent variable

In the context of SEM, variables whose variances are explained by one or more variables in the model are endogenous variable. This term is similar to the dependent variable in the context of linear regression. Since the ERP implementation success is a concept which is not directly measurable. The proxy which is used for this concept is the US. Therefore, ERP implementation is the latent endogenous variable and US is its measure. As mentioned in the last chapter, there a lot of long –term benefits, which are not directly reflected in the profit and loss account. Measurements such as: benefits minus costs or other financial performance indicators are thus not accurate. Prior researchers have indicated that US is the most comprehensive measurement, because it is associated with system quality, information quality and perceived benefits. It reflects how well ERP system's performance is and whether the information needs are met. US is presented in this study using five point Likert scale.

5.2.3.2 Exogenous variable

Exogenous variables are variables whose variance is not to explain by one or more variables in the model. These are similar to the independent variables in the context of linear regression. Consistent with previous literature, it is believed that the success of ERP implementation depends on three parts of corporate governance, which are commonly used by prior studies. They are organizational governance, IT governance and project governance. Organizational governance is measured by top management support and commitment to change. IT governance is measured by adequate infrastructure, accountability of technical risks. Finally, project governance is measured by sound project management and best people, best team. All six independent variables are presented using five point Likert scale.

5.2.3.3 Control variables

In addition to the independent variables, two control variables are added into the model. These control variables are correlated with the dependent variable, but not the primary interests of this study and therefore not included in the model as independent variables. They will be part of the residual term. To keep independent variables in the model exogenous, items that could be correlated with dependent and independent variables such as working experience with ERP and type of industry are included in the model. These variables are also used by other researchers (Wu and Wang, 2006; Wang et. al, 2004; Chien et. al, 2007). Table 2 contains a summary of all used items.

TABLE 2: Used items

Abbrevi-ation	**Constructs**	**Observable variable (measurement)**	**Measurement**
US-ERP	Successful ERP implementation	Users are satisfied with implemented ERP systems.	Five-point Likert-type scale measuring user satisfaction
TMS	Organizational Governance	Top management support	Five-point Likert-type scale measuring the adequateness of top management support including self-involvement and resources allocation management
CTC	Organizational Governance	Commitment to organizational change	Five-point Likert-type scale measuring the adequateness of commitment to change including communication and change management
AI	IT Governance	Adequate Infrastructure	Five-point Likert-type scale measuring the adequateness of IT infrastructure including IT hardware, software and IT experts
OA	IT Governance	Assign accountability for technical risks	Five-point Likert-type scale measuring the adequateness of accountability assignment
SPM	Project Governance	Employ sound project management techniques and controls	Five-point Likert-type scale measuring the adequateness of project management including clearly defined goals and scope
BTBP	Project Governance	Balanced team and best people full time	Five-point Likert-type scale measuring the adequateness of team composition including the correct mix of project manager, internal analysts and external consultants
TYPE	Control variable	Industry type	Open question: Indication type of industry
EXP	Control variable	Working experience	Open question: Indication how many year of experience in ERP
ε	Residual term		
This table contains all elements which are used in the model.			

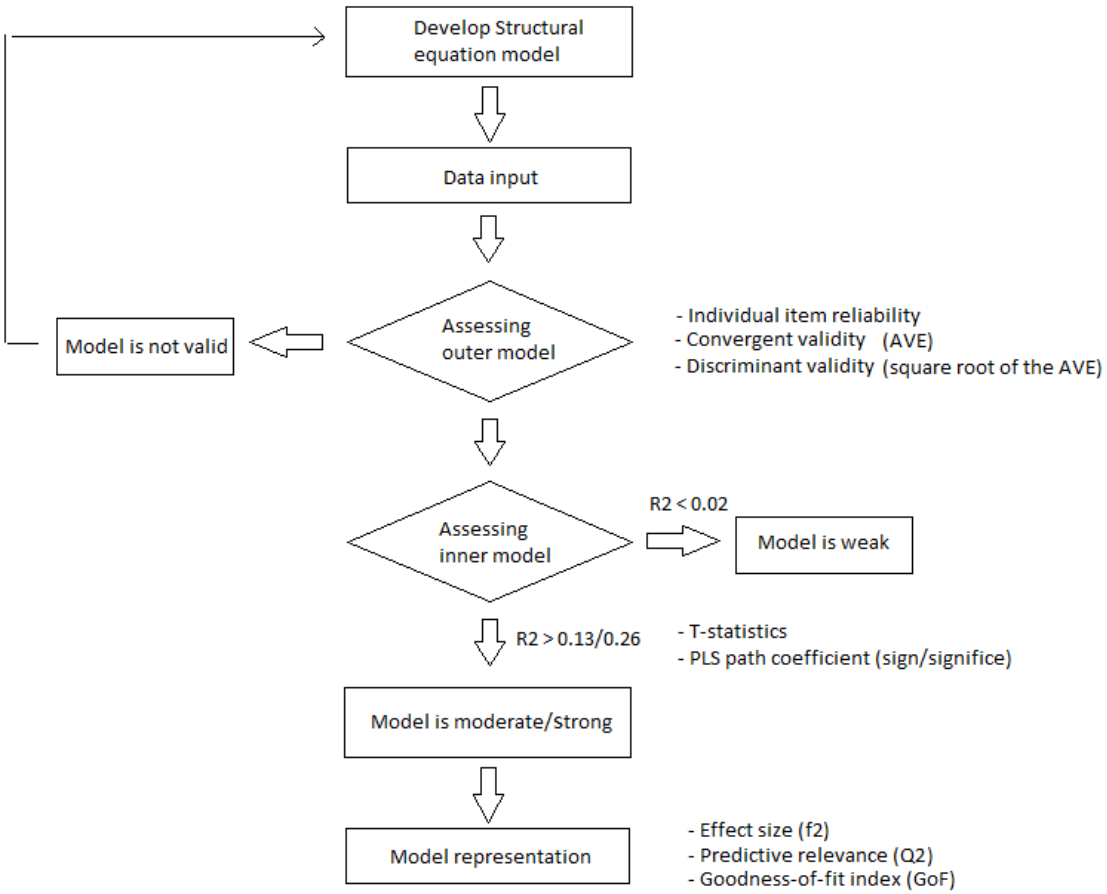
5.2.3 Research operationalization

To assess the user's perception of ERP success and the degree to which corporate governance has been established, a survey questionnaire (see Appendix 1) is developed. In comparison to case study and content analysis, this approach provides more content validity and comparability. Furthermore, to facilitate the reliability of the results and ensure that all respondents have sufficient experience with ERP, respondents are asked at first place to indicate the type of ERP and the extent to which they have used ERP systems. The research approach is consistent with prior literature (Calisir and Calisir, 2004; Nah et al., 2003; Ram et al., 2013).

Two types of constructs are distinguished. Reflective constructs are observable measurements that are influenced by underlying latent constructs (MacCallum and Browne, 1993). Conversely, formative construct works the other way around: changes in the formative element cause changes in the latent construct (Jarvis et al., 2003). In this study, reflective constructs are used. One example could be that IT governance (latent variable) affects the level of IT infrastructure (directly measureable variable), but the increasing in IT infrastructure will not cause improvement of IT control. Reflective constructs are commonly used throughout the IS literature for concepts such as perceived ease of use, perceived usefulness, and satisfaction (MacCallum and Browne, 1993).

PLS path model allows the examination for both the links between observable measurements and constructs (i.e., loadings) and the links between different constructs (i.e., path coefficients). PLS analysing procedure consists two stages: the outer model or the measurement model, and the inner model or the structural model. The outer model assesses how reliable are observable variables in measuring latent variables. Several indexes will be calculated to measure the model reliability. They are convergent validity (AVE), discriminant validity (square root of AVE) and composite reliability (CR). The inner model assesses the relationship between latent variables, (Ringle et al., 2010). Several indexes are important here: extent of effect of three constructs on ERP-US (R^2), path coefficient values, effect size (f^2), prediction capability (Q^2) and finally the goodness-of-fit index. PLS-SEM technique follows a systematic subsequent analyzing procedure as described in Figure 6.

FIGURE 6: Analysis procedure



5.3 Data collection method

The data needed for this research will be data on corporate governance attributes and data on US of implemented ERP. In compliance with the objectives and philosophy elaborated in this thesis, a survey is used to collect the required data and demonstrate the hypotheses. The questionnaire was made via the online survey tool Monkey Survey (www.surveymonkey.com). This survey tool is very convenient to use, e-mail invitations along with the link to the survey can be easily created and sent out. The questionnaire was designed in English. Large U.S. organizations that have implemented an ERP system are chosen as the population from which to collect data. The sample frame for this study was obtained by purchasing the contact details from Global Software Leads. This company is focus on delivering qualified ERP user lists. The received database contains company name, address, sales figures, and senior executives' verified contact details. A

hard-copy together with separate prepaid envelopes and a web-based questionnaire is mailed personally to the senior managers, since prior research show that this group knows detailed information about implementation experience and system's outcome (Gable et al., 2003; Wu et al, 2003; Johnston and Carrico, 1988; Rockness and Zmud, 1989). Therefore they are considered as the most suitable informant regarding the ERP success. Considering the low response rate and speed as indicated in prior research, in order to gather a generous amount of responses, the Survey Monkey Audience service is applied. This is a paid services and it costs 983 euro in total. Survey Monkey has access to people/companies who are ready to complete the survey. The surveys are sent through their system based on my specific criteria, and responses will be manually collected by them.

Since the data generated from the survey are self-collected, common method survey bias should be considered. The dataset was examined for potential bias in terms of non-response by means of comparing the characteristics of early and late participants. The results of the comparison show that there is not much difference in terms of general characteristic and model variables, which means that non-response does not result in any survey bias.

Furthermore, the survey bias can be reduced by using an appropriate questionnaire's design, in which a triangular structure is embedded (Jick, 1979). The questionnaire has a triangulated multiple choice format which can be divided into following sections: 1) Demographic, in order to better understand the responder and his background; 2) business and management, in order to clarify the benefits of ERP bring to the business as well as to collect data with regard to the management problems; 3) technical, in order to comprehend, analyze and conclude the problems of the companies after the ERP systems go online. Hence, the research issues can be considered from different perspectives as it was proposed by Denzin (1978). According to (Jick 1979), "the effectiveness of triangulation rests on the premise that the weaknesses in each single method will be compensated by the counter-balancing strengths of another."

5.4 Libby boxes

Libby boxes operationalize the immeasurable conceptual items of the study (Libby, 1981). Libby boxes contain a conceptual and operational level. This thesis investigates the association between CG and ERP implementation success. Because both of the concepts are not directly measurable, therefore proxies are used. Libby boxes simplify the thoughts processes and assist with setting the research design.

FIGURE 7: Predictive validity framework (Libby boxes)

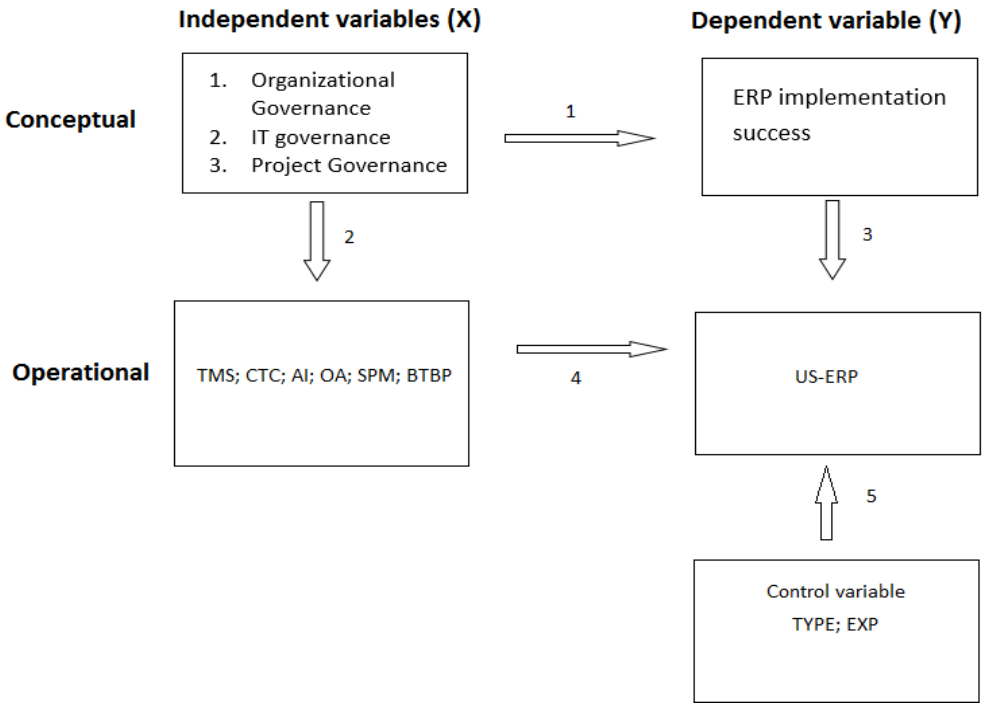


Figure 7 contains four boxes and four links. The first link in the framework is the conceptual link and reflects the hypothesized correlation between CG and ERP implementation success and leads to the theoretical part of the study. The second and third link reflects the measurements of CG and ERP success. Link four reflects the relation between the operationalized variables. Lastly, link five reflects the effect of control variables on the ERP success. Controls variables which are used in this study are: industry type and senior manager experience. These variables are used for endogeneity problem.

External validity refers to the extent to which the sample results can be generalized to settings other than those studied (Smith, 2011). Link 1 represents to the external validity of this study. Instead of content study of case study, this research use real world data, but the size of response sample is relatively small compared to other studies which use data that randomly selected from the database. Furthermore because this study focuses on the U.S companies, the findings of this study may not be generalized to other setting outside the U.S. **Internal validity** refers to the degree of causality of independent variable and dependent variable. Link 4 represents to the external validity of this study. **Construct validity** is the degree of how well a measurement captures the underlying abstract concept. This can be extracted from link 2 and 3. It is believed that the construct validity of this study is quite high, because operationalized variables are widely used in prior research.

5.5 Conclusion

This chapter presents the research design of this thesis and answers sub-question four. A survey questionnaire is used to collect the data about the relation between CG constructs and ERP success. After collecting data, SmartPLS 3.0 will be used to test the level of association. Lastly, a predictive validity framework is described. The internal validity, external validity and construct validity are explained based here on. In the next chapter the empirical result and analysis of the study are presented.

6. Empirical results and analysis

6.1 Introduction

This chapter provides the empirical part of the research and sub question five will be answered. Findings of different tests and analysis about the impact of different governance levels on ERP implementation success will be discussed. Section 6.2 presents the descriptive statics in order to get an overall picture of the collected data. The outer model is assessed in section 6.3, the inner model 1 (without control variables) is assessed in section 6.4, and model including the control variables is evaluated in 6.5. After that, additional assessment for the model quality is provided in 6.6. Lastly, a summary of this chapter is given in 6.7.

6.2 Descriptive statistics

Descriptive statistics is undertaken to determine the characteristics of the data that is generated through survey responses. 2115 companies are invited by email to participate in the survey. The survey yielded a set of 388 respondents, with 707 undelivered emails due to invalid email-address and 218 incomplete responses. The net response rate is 14.2 percent after excluding invalid responses [169/ (2115-707-218) =14.2%], which is in line with other comparable studies. In total 169 usable questionnaires are received. The summarized features of responses are described in table 3. The respondents' industries are divided into 10 sectors. The most commonly used ERP system is SAP (59%), the respondents have on average 10.7 years' experience with ERP and most of them (58%) use ERP every day, which means that they possess sufficient knowledge about ERP.

TABLE 3: Demographic analysis

	Frequency	**Percent**	**Cumulative**
Type of industry			
Manufacturing	27	16%	16%
Technology	26	16%	32%
Professional Services	26	16%	47%
Healthcare	16	10%	57%
Non-profit	16	10%	66%
Consumer	16	10%	76%
Finance	14	8%	84%
Energy & Utilities	11	7%	90%

Government	10	6%	96%
Education	6	4%	100%
Transportation	0	0%	100%
Materials	0	0%	100%
Type of ERP system			
SAP	100	59%	59%
Oracle	26	15%	75%
Movex	14	8%	83%
PeopleSoft	10	6%	89%
Infor	4	2%	91%
Others	15	9%	100%
Use frequency			
Several times a day	50	29%	29%
About once a day	49	29%	58%
2 or 3 times a week	49	29%	87%
About once a week	22	13%	100%

TABLE 4: Descriptive statistics

Variable	Mean	Std.	N
ERP-US	3.64	0.927	169
TMS	3.67	1.064	169
CTC	3.57	1.182	169
AI	3.74	1.264	169
OA	3.63	1.160	169
SPM	3.64	1.199	169
BTBP	3.62	1.077	169
TYPE	see table 3	n/a	169
EXP	10.7	6.795	169

Table 4 provides descriptive statistics of the sample and an overview of the average of all used variables in the model. The average of dependent and independent variable is ranged between 3.57 and 3.74, which means that the overall satisfaction level locates between neutral and satisfied. The standard deviation of the ERP related working experience is very high. It indicates that there are a lot of dispersion in the data surrounding the mean.

6.3 Assessment of outer model

After describing the general impression of the data, the quality of the model has to be tested. Assessment of outer model refers to the examination of how well the observable measurements (questions in the survey) load on the underlying constructs. The model is

validated by convergent validity (Hulland, 1999) and discriminant validity (Gefen et al., 2000).

6.3.1 Convergent validity of constructs

It is the extent to which the items assumed to measure the latent construct actually measures one and the same construct and not measures another construct (Fornell and Larcker, 1981; Hulland, 1999). This can be assessed by calculating individual item reliability, composite reliability (CR) value and the average variance extracted (AVE) value.

6.3.1.1 Individual item reliability

Individual item reliability refers to the extent to how well the measurements of the latent variables are representative to the construct. In PLS, it is assessed by examining the standardized factor loadings of the measures with their construct. Since loadings implies correlations, when items with loadings of less than a certain boundary means the error variance is more than shared variance between the construct and its measure (Carmines and Zeller, 1979). In general, items with loadings of less than 0.4 (Hulland, 1999) or 0.5 (Chin, 1998) should be dropped. Researchers such as Carmines and Zeller (1979) work with higher standards. They accept items with loadings of 0.7 or more. This implies that more than 70 percent of the variance in the collected data (i.e., survey response) is due to the construct. As we see in table 5, loadings of all observable measures are higher than 90 percent, which means that they add a lot of explanatory power to the model and have a strong link with the construct. Loadings of two control variables are a little bit lower, but the explanatory power is still sufficient.

TABLE 5: Standardized factor loadings

Measurement items	Mean	st.dev.	Standardised factor loadings with p-valus					p-values
			ERP success	IT Governance	Organizational Governance	Project Governance	control variable	
IT infrastructure	0.9283	0.0202		0.9287				<0.001
Risk assignment	0.9646	0.0076		0.9635				<0.001
balanced team	0.9385	0.0117				0.9361		<0.001
project management	0.9091	0.0281				0.9121		<0.001
commitment to change	0.9714	0.0053			0.9716			<0.001
management support	0.9654	0.0096			0.9668			<0.001
user satisfication	1	0	1					>0.05
working experience	0.4327	0.4484					0.5483	>0.05
industry type	0.7251	0.3314					0.842	<0.001

* Besides working experience (a control variable), standardized factor loadings of all measurements are significant at $p < 0.001$.

6.3.1.2 Convergent validity

When several indicators are used for an individual construct, not only individual measurement item reliability should be taken into account, but convergent validity also should be approved. In other words, reliable measurements would generate high consistency in response to questions and measure the one and same construct which they supposed to be. Reliability is estimated using three indicators: Cronbach's Alpha, Composite Reliability (CR) and Average Variance Extracted (AVE). Cronbach's Alpha is calculated in SPSS and in this thesis, but it will be not determined because this measurement tends to underestimate the internal consistency in PLS. Composite Reliability (CR) measure has the same purpose as Cronbach's Alpha but is preferred over Cronbach's Alpha and used to assess how well a construct is measured by its assigned measures (Henseler et al., 2009). The recommended benchmark for exploratory research is 0.60 to 0.70 and 0.70 to 0.90 for more advanced stages of research (Nunnally and Bernstein, 1994). The CR values of the constructs in this study are ranged between 0.66 and 0.96 (see table 6).

Other measurement is Average Variance Extracted (AVE). This indicator is used to test the amount of variance that a construct captures from its measurement relative to the amount of variance due to measurement errors. The recommended benchmark here is 0.5 (Chin,1998; Fornell and Larcker, 1981). In this research, all AVE values are higher than

0.5. It means that more than 50 percent of measurement variance is caused by latent variables.

TABLE 6: Convergent validity and discriminant validity

Constructs/latent variabes	No.of items	AVE	CR	Corrlations(square root of AVES)				
				ERP success	IT Governance	Organizational Governance	Project Governance	control variable
ERP success	1	1	1	**1**				
IT Governance	2	0.8954	0.9448	0.5421	**0.9463**			
Organizational Governance	2	0.9394	0.9687	0.7195	0.7681	**0.9692**		
Project Governance	2	0.8541	0.9213	0.5022	0.7837	0.6994	**0.9242**	
control variable	2	0.5048	0.6612	-0.1558	-0.0348	-0.0426	-0.031	**0.7105**

* AVE = average variance extracted
CR = composite reliability
The diagonal elements are the square root of average variance extracted (AVE)

After assessing the individual item reliability, CR and AVE value, it could be concluded that all the constructs demonstrate adequate convergent validity.

6.3.2 Discriminant validity

Discriminant validity refers to the degree to which a given construct is different from other constructs in the model (Hulland, 1999). The recommended criterion is that the AVE value of each construct should be higher than the squared correlations with other constructs (Fornell and Larcker, 1981; Chin, 1998). Consequently, the square root of AVE value of each construct on itself should be higher than correlations with other constructs. This can be illustrated in a correlation matrix (see table 6) which includes the correlations between different constructs. For adequate discriminant validity, the diagonal elements should be greater than the other elements in the corresponding rows and columns. In this case, this condition is satisfied. All constructs possess adequate discriminant validity.

After assessing convergent and discriminant validity, it could be concluded that the research model of this research is valid.

6.4 Assessment of inner model 1 (without control variable)

After evaluating the outer model, two steps should be undertaken to determine the hypothesized correlations within the inner model. The following assessments are crucial:

Coefficient of determination (R^2) and path co-efficient (β) (Hulland, 1999).

R^2 of the dependent latent variable ERP implementation success represents the model's predictive accuracy (Hair et al., 2014). Chin (1998) describes with 0.67, 0.33, and 0.25 as substantial, moderate and weak predictive accuracy, respectively. In this research, R^2 indicates that three independent constructs: organizational, IT and project governance account for 51.8 percent (Figure 8-1) variance in ERP-US, therefore the results are supportive of the research model.

The path coefficients show the strengths of hypothesized associations between constructs (Chin, 1998). This value is ranged between +1 and -1. When the coefficient is closer to +1, the correlation tends to be significantly positive. However, whether the correlation is statistically significant depends on the t-statistics value, which comes from PLS algorithm. By using Bootstrapping within SmartPLS software significance of path coefficient is assessed. t>1.65 means significant impacts at 0.1 level, t>1.96 means significant impacts at 0.05 level. The path coefficient of 2.57 means significant impacts at 0.001 level. In this study, the 1.96 threshold is applicable. Correlations with t-statistic greater than 1.96 are considered as significant. As obtained from table 7-1, the association between OG and ERP-US is significant at 0.001 level and positive, which means that when organizational governance is improved with 1 point, the ERP user satisfaction will improve with 0.7359 point. IG is negative but not significant and PG is positive but also not significant.

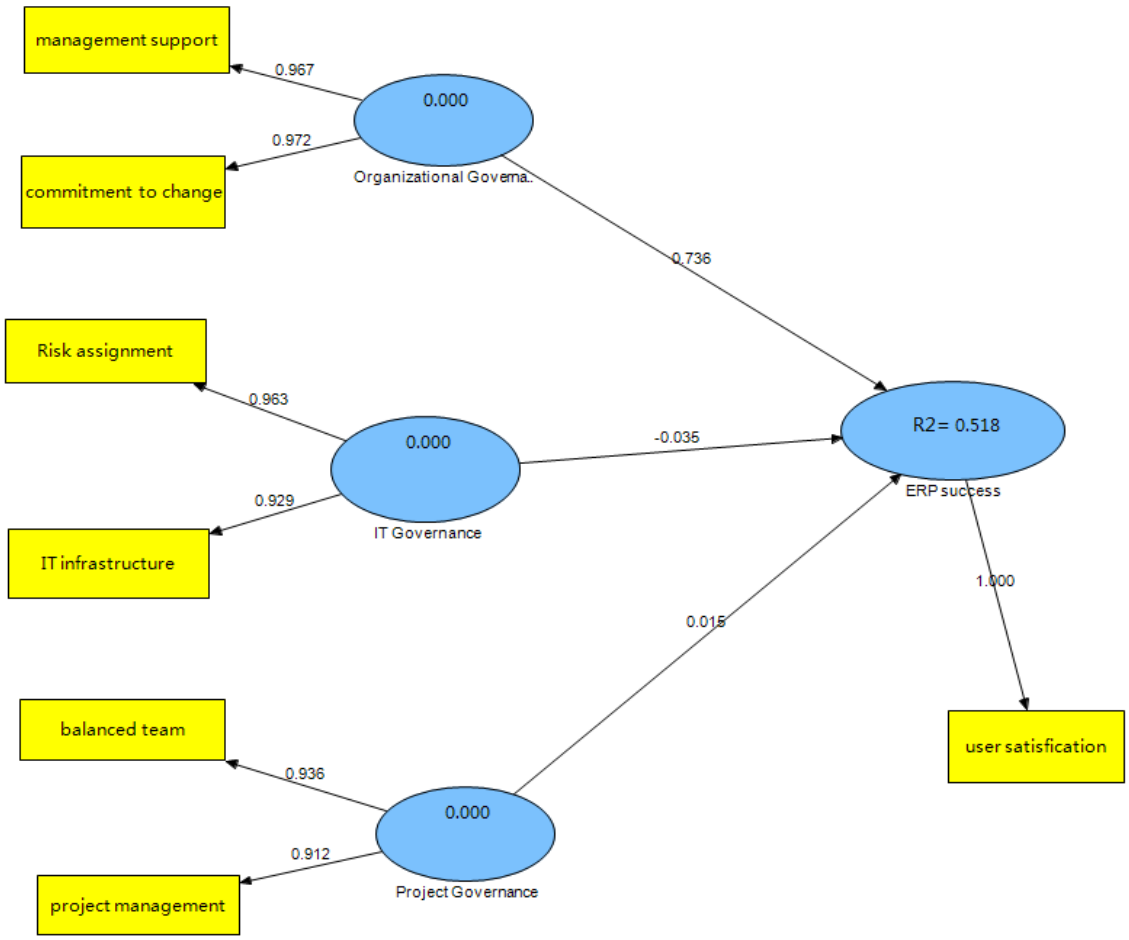
TABLE 7-1: Structural path in the model (excl. control variable)

Structural paths in the model	**Sign**	**PLS path co-efficient**	**t-statistic**	**P-value**
H1: Organizational Governance	+	0.7359	7.3232	significant
H2: IT Governance	-	-0.0347	0.2582	not significant
H3: Project Governance	+	0.0147	0.1054	not significant
Management support <- Organizational Governance	+	0.9668	32.3555	significant
Commitment to change <- Organizational Governance	+	0.9716	27.0946	significant

IT infrastructure <- IT Governance	+	0.9287	17.8976	significant
Risk assignment <- IT Governance	+	0.9635	19.9399	significant
Project management <- Project Governance	+	0.9121	15.9441	significant
Balanced team <- Project Governance	+	0.9361	14.5122	significant

* Hypothesis supported: H1 at $p < 0.001$
Hypotheses rejected: H2 , H3

FIGURE 8-1: SmartPLS 3.0 results for the main effects model (excl. control variable)



6.5 Assessment of inner model 2 (with control variable)

Model 2 has a high R^2 of 0.534 (Figure 8-2), which means that 53.4 percent of variance of ERP-US is explained by four constructs. By adding the control variables the strengths of correlations between constructs is increased with 1.6 percent. The results are still supportive of the research model.

As we see in table 7-2, organizational governance (β=0.731, $p<0.001$) still has a positive and significant impact on ERP-US. Contrary to the hypotheses, the other two governance

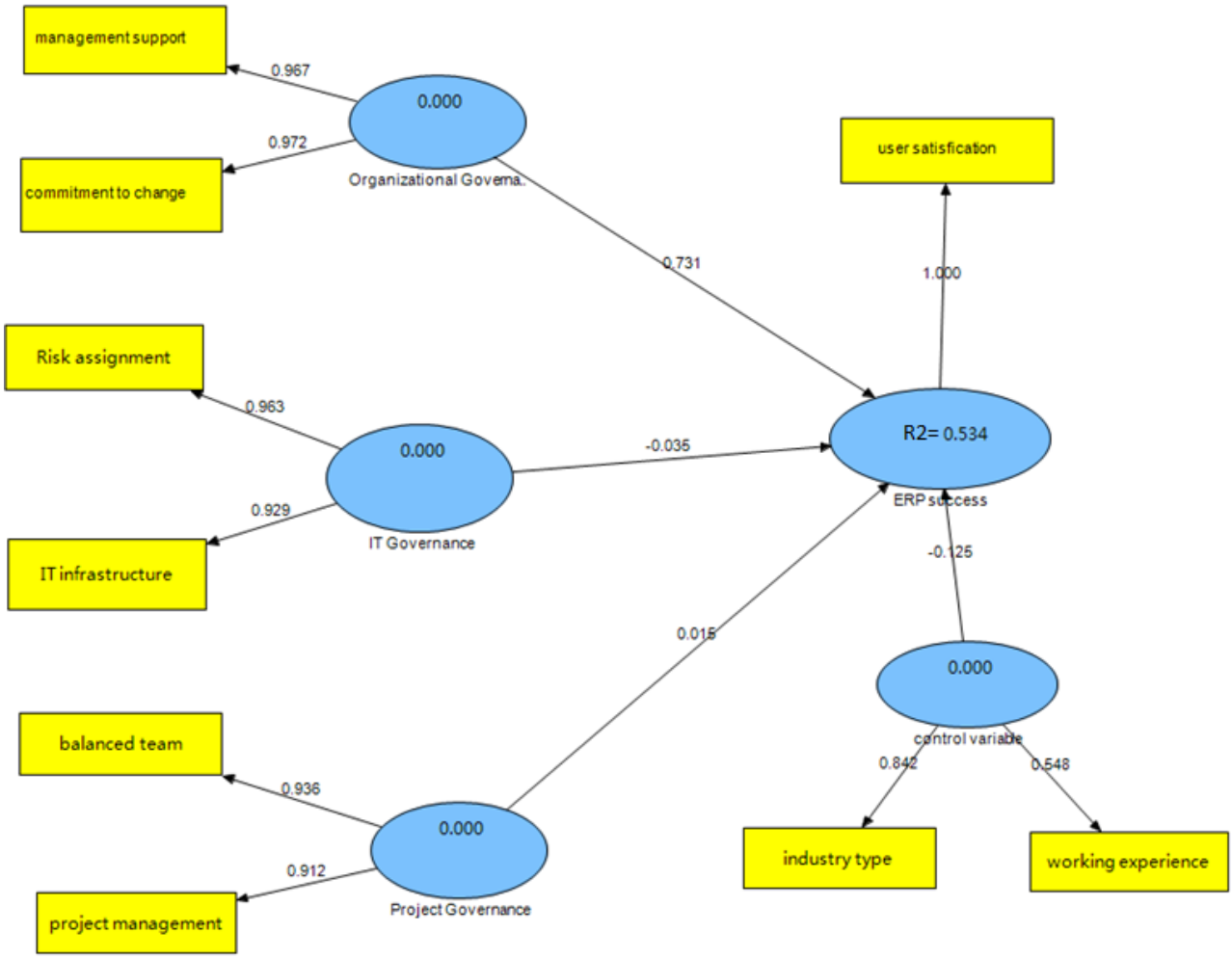
levels have no significantly influence on ERP-US. Interesting here is that the coefficient of PG becomes negative due to incorporating the control variables. From this fact we can conclude that this construct is not robust. It is thus not surprising that PG is insignificant. In addition, we observe a negative and significant correlation between control variable and ERP-US (β=-0.1254, $p<0.05$). When we take a closer look to the control variable construct, we see that not the working experience of the manager, but the industry type plays an important role, industry type is namely significantly associated with control variable. This is in line with prior research (Wu and Wang, 2006), but differently than the research of (Wang et al., 2005) where industry type has no significant influence on project outcomes, but managers' experience well. An possible explanation is the different proxy for ERP success is used. In their study, the project team performance is used to measure the project overall performance during ERP implementation. Appendix B shows the codes of industry types which are used in the analysis. A negative coefficient implies the higher ERP-US, the lower industry code. With other words, industries with codes closer to 1 have higher chance of ERP-US. These industries are non-profit, technology, energy and utilities and transportation.

TABLE 7-2: Structural path in the model (incl. control variable)

Structural paths in the model	**Sign**	**PLS path co-efficient**	**t-statistic**	**P-value**
H1: Organizational Governance -> ERP success	+	0.731	7.0996	significant
H2: IT Governance -> ERP success	-	-0.0354	0.2581	not significant
H3: Project Governance -> ERP success	-	0.0147	0.1106	not significant
Control variable -> ERP success	-	-0.1254	1.773	significant
Management support <- Organizational Governance	+	0.9668	100.2582	significant
Commitment to change <- Organizational Governance	+	0.9716	183.7915	significant
IT infrastructure <- IT Governance	+	0.9287	45.9818	significant
Risk assignment <- IT Governance	+	0.9635	126.6869	significant
Project management <- Project Governance	+	0.9121	32.467	significant
Balanced team <- Project Governance	+	0.9361	79.8099	significant
Industry type <- control variable	+	0.842	2.5406	significant
Working experience <- control variable	+	0.5483	1.2227	not significant

* Hypothesis supported: H1 at p < 0.001
Hypotheses rejected: H2 , H3

FIGURE 8-2: SmartPLS 3.0 results for the main effects model (incl. control variable)



6.6 Further Assessment of the model quality

Four estimations have been carried out to further assess the quality of the model. They are effect size (f^2), predictive relevance (Q^2) and Goodness-of-fit index (GoF).

Effect size of the dependent construct ERP-US is examined by Cohen's f^2. The calculation of f^2 is based on the change in Coefficient of determination (R^2) when a specific construct is removed from the model. 0.02, 0.15, and 0.35 represent small, medium, and large effects, respectively (Cohen, 1988). The f^2 value of ERP-US 0.4417 (see table 8) demonstrates that exogenous latent variables strongly contribute to explaining the endogenous construct.

The Q^2 is the parameter for evaluating the model's predictive capability. The predominant measure is Stone-Geisser's Q^2 (Stone, 1974; Geisser, 1975). The underlying idea is that a part of the data has been omitted, by using the analysis model within PLS. The omitted part is predicted by means of the calculated indicators. The smaller the difference between predicted and actual values the greater the Q^2 and thus the higher predictive accuracy. The Q^2 value of this study is 0.4214 which is greater than zero, which indicates that the research model provides qualified prediction (Henseler et al.,2009).

Goodness-of Fit (GoF) index refers to the mean of the average commonality and average R^2 for endogenous construct (Tenenhause et al., 2005). It reflects the overall prediction power of the model. The determined criteria are $GoF_{small} = 0.10$, $GoF_{medium} = 0.25$ and $GoF_{large} = 0.36$ (Akter et al., 2011). The GoF value is calculated as follows:

$$GoF = \sqrt{\overline{AVE} \times \overline{R^2}}$$

$$GoF = \sqrt{0.798*0.534} = 0.653$$

This study obtains a GoF of 0.653, which is greater than the 0.36 criterion for large prediction power.

TABLE 8: further assessment structural model

Dependent variable	**f^2**	**Q^2**	**GoF**
ERP-US	0.4417	0.4214	
Model			0.653

* f^2 values of 0.02, 0.15, and 0.35 signify small, medium and large effects, respectively (Cohen, 1988).
Q^2 value greater than zero indicates that observed value is well constructed and that model has predictive power (Henseler et al., 2009).
GoF values of 0.10, 0.25, and 0.36 indicates small, medium, large value, respectively (Akter et al., 2011)

6.7 Summary

This chapter provides the empirical results of the study. 169 usable responses are collected. First of all, the descriptive statistics is provided in order to get a general impression of the date. Next, the measurement model is assessed by means of convergent and discriminant validity. Table 6 indicates that internal consistency is sufficient and constructs are different from each other. This means that the measurement model is valid. After assessing the outer model, the inner model has been evaluated. Figure 8 shows that

the coefficient of determination 53.4 percent is and the research model is strong. Furthermore, the PLS path coefficient with sign and significance is provided in table 7. Finally, several additional assessments are applied in 6.6 for the quality of the model. Table 8 indicates that the model has a strong predictive power and that exogenous variables have a large effect on the endogenous variables. In the next chapter, the findings will be discussed per hypothesis.

7. Conclusion and Limitations

7.1 Introduction

In the last chapter, the empirical results are discussed. This chapter provides a summary of the research, three hypotheses will be discussed and answers to sub question six as well as to the main research question will be presented. Finally, this study ends with its limitations and recommendations.

7.2 Summary and conclusion

This study focuses on the association between ERP implementation success and corporate governance levels of U.S. large firms. This is unique in the literature, because most of prior researchers have just identified loss critical success factors to the ERP success, but they did not investigate the situation as a whole by using real world data. The main purpose of this research is to conduct a detailed empirical investigation of the role of different controls for ERP implementation success.

To answer this question, six sub questions and three hypotheses are formulated. First, theoretical concepts of ERP systems, ERP implementation success measurements, and corporate governance structure are described. Internal control system, which could explain a possible connection between ERP success and CG is discussed. This theory explains why an enterprise with tide internal control –better control environment, lower control risks, better control mechanisms, more efficient communication and monitoring tools- would have higher chance of ERP success (sub question one).

There is a lot of prior studies conducted in other countries or with other size of firms regarding this association (sub question two). In this study, three CG levels are used, they are organizational governance, IT governance and project governance.

Based on the theories and previous literature, three hypotheses are formulated (sub question three). The prediction is that all of them are positively associated with ERP implementation success in the U.S. large companies.

Before the analyzing, the research design is described (sub question four). EPR implementation success is measured by user satisfaction, organizational governance is measured by top management support and commitment to change, IT governance is

measured by adequate infrastructure and risk assignment, project governance is measured by sound project management and best people best team. These items are quantified using five point Likert scales. Two control variables: working experience of manager and industry type are added into the model. The associations are tested with PLS-SEM.

In total, I have received 169 usable responses to do the research (sub question five). The measurement model is assessed to ensure the validity of the model, next, two models are tested (one excludes the control variables and the other on includes). As we conclude from the empirical results, organizational governance is in both models positively associated with ERP implementation success. However, in contrast with the prediction, the other two governance levels have in both models no significant influence on ERP implementation success.

Hypotheses	**Accepted / Rejected**
H1: organizational governance is ***positively*** associated with the success of ERP implementation.	Accepted
H2: IT governance is ***positively*** associated with the extent of ERP implementation.	Rejected
H3: project governance is ***positively*** associated with the extent of ERP implementation.	Rejected

Back to the research question:

"How the levels of corporate governance contribute to the success of Enterprise Resource Planning (ERP) systems implementation in the U.S. large companies?"

This study provides two important finding to this question. 1) organizational governance plays an important role in the ERP implementation success. IT governance and project governance are not statistically significant associated whit ERP success. 2) Based on the results, there is no sufficient evidence to support the association between corporate governance levels and the success of ERP implementation the in U.S. large companies. For the reason that only one of the three governance levels is statistically significant.

ERP system is not the "Holy Grail". No matter how powerful and useful it is, it is just a tool after all. The only thing matters in the end to enhance the core competence is still the enterprise and its staff. In this information generation, those corporations, which could

make the best use of the digitalized tools like ERP and utilize them with its people and its corporate governance, will find them very difficult to be not outstanding.

7.3 Limitation and recommendations

There are a few limitations of this study. First, this study focuses on the association between corporate governance levels and ERP implementation success in the U.S. large enterprises. However, besides the influence from the company's side, implementation success can be affected by other factors, such as unsuitable ERP program, or the vendor is failed to deliver the system on time and within budget etc. Secondly, the results of this study may not be applicable to companies from other countries or smaller sized companies. Regarding the research method, user satisfaction has been chosen as proxy of ERP implementation success, however, the possibility of an intervening variable such as perceived user satisfaction exists (Bradley and Lee, 2007). Finally, the social and political aspects are not taken into account.

For on this topic, in order to provide more helpful guide to practitioners who seek for implementing ERP in their companies, further research can look at other countries or other types of enterprises, e.g. small and middle sized companies. Moreover, this study just focuses on the implementation stage. It will be interesting that the research model also includes other stages to help further understanding of this topic.

Appendix A: Survey questionnaire

Corporate governance during the Enterprise resource planning (ERP) implementation

Welcome to the ERP-corporate governance survey and thank you for agreeing to take part in this. In order to get a better understanding of the association between ERP and corporate governance and finish my master thesis, I will be gaining your opinions. This survey should only take 4-5 minutes to complete. Be assured that all answers you provide will be kept in the strictest confidentiality and only be used for academic purposes.

1. Do you use an Enterprise Resource Planning (ERP) system in your office?

- ○ Yes, then please continue with Q2 on the next page.
- ○ No

Next

2. What industry does your company belong to?

3. How long have you been using the ERP system?

4. Which type of ERP system are you woking with (eg. SAP/MOVEX)?

5. How often do you use the system?

- ○ About once a week
- ○ 2 or 3 times a week
- ○ About once a day
- ○ Several times a day

6. Within your organization, how satisfied are you with the implemented ERP systems

Very unsatisfied	Unsatisfied	Neutral	Satisfeid	Very satisfied	N/A
					○

7. How would you rate the top management support level for ERP. This includes self-involvement and resouces allocation management. | TMS

Very unsatisfied	Unsatisfied	Neutral	Satisfied	Very satisfied	N/A
					○

8. How would you rate the commitment to organizational change and associated change management strategies? This includes comprehensive communication to provide information, assist in the change management process and manage expectations. | CTC

Very unsatisfied	Unsatisfied	Neutral	Satisfied	Very satisfied	N/A
👍	👍	👍	👍	👍	○

9. How would you rate the adequateness of IT infrastructure? This includes IT hardware, software and human capital. | AI

Very unsatisfied	Unsatisfied	Neutral	Satisfied	Very satisfied	N/A
👍	👍	👍	👍	👍	○

10. How would you rate the level of accountability assignment for technical risks? | OA

Very unsatisfied	Unsatisfied	Neutral	Satisfied	Very satisfied	N/A
👍	👍	👍	👍	👍	○

11. How would you rate the performance of project management? This includes an approved project plan, clearly defined and understood goals and Definition of smaller scope.| SPM

Very unsatisfied	Unsatisfied	Neutral	Satisfied	Very satisfied	N/A
👍	👍	👍	👍	👍	○

12. How well was the team structure? Did your institution build a balanced team and allocate best people full-time? This includes an experienced project manager, sufficient full-time business analysts and the correct skill mix to support the implementation. | BTBP

Very unsatisfied	Unsatisfied	Neutral	Satisfied	Very satisfied	N/A
👍	👍	👍	👍	👍	○

Appendix B: Code of industry used in this study

1	Non-profit
2	Technology
3	Energy & Utilities
4	Transportation
5	Materials
6	Consumer
7	Finance
8	Education
9	Government
10	Professional Services
11	Manufacturing

References

- Ang, J.S.K., Sum, C-C. and Chung, W-F. (1995). “Critical success factors in implementing MRP and government assistant: a Singapore context”, Information & Management, Vol. 29, 63-70.

- Al-Mashari, M. and Zairi, M. (2000). “Supply-chain re-engineering using enterprise resource planning (ERP) systems: an analysis of a SAP R/3 implementation case”, International Journal of Physical Distribution & Logistics Management, Vol. 30 No. 3/4, 296-313.

- Al-Mashari, M. (2003). Enterprise resource planning (ERP) systems: a Research agenda, Industrial Management and Data Systems, Vol. 103 No. 3, 22-27.

- Alsene, E. (2007). ERP systems and the coordination of the enterprise. Business Process Management Journal 13, 417–432.

- Ash, C. and Burn, J. (2003). A strategic framework for the management of ERP enabled E-business change, European Journal of Operational Research 146 (2) 374.

- Bancroft, N., Seip, H. and Sprengel, A. (1998). Implementing SAP R/3: How to introduce a large system into a large organization. Greenwich, CT: Manning.

- Bendoly, E., Rosenzweig, E.D. and Stratman, J.K. (2009). The efficient use of enterprise information for strategic advantage: a data envelopment analysis. Journal of Operations Management 27, 310–323.

- Berente, N. and Yoo, Y. (2012). Institutional contradictions and loose coupling: postimplementation of NASA's enterprise information system. Inf. Syst. Res. 23 (2), 376–396 (593,597).

- Bingi, P., Sharma, M.K. and Godla, J.K. (1999). Critical issues affecting an ERP implementation, Information Systems Management 16 (Summer (3)), 7–14.

- Bradley, J. and Lee, C.C. (2007).ERP training and user satisfaction: a case study. International Journal of Enterprise Information Systems, 33–50.

- Buckhout, S., Frey E. and Nemec, J. (1999). Making ERP succeed: Turning fear into promise. IEEE Engineering Management Review 19, 116–123.

- Cadbury, A. (1992). Report of the Committee on the Financial Aspects of Corporate Governance, Section 3.4.

- Calder, A. (2005). IT Governance: Guidelines for directors, London: IT Governance Publishing.

- Calisir, F. and Calisir, F. (2004). 'The relation of interface usability characteristics, perceived usefulness, and perceived ease of use to end-user satisfaction with Enterprise Resource Planning (ERP) systems', Computers in Human Behavior, Vol. 20, No. 4, 505–515.

- Carr, D. (1993). Managing for effective business process redesign. Cost Management, 16–21.

- Chand, D., Hachey, G., Hunton, J., Owhoso, V., & Vasudevan, S. (2005). A balanced scorecard based framework for assessing the strategic impacts of ERP systems. Computers in Industry, 56(6), 558–572.

- Carmines, E. G. and Zeller, R. A. (1979). Reliability and validity assessment. Newbury Park, CA: Sage. Caudron, S. 66–74.

- Chen, Q. (2001). "Supply chain management and ERP systems (article in Chinese)". Enterprise management Beijing, 204-209.

- Chien, S.W. and Tsaur, S.M. (2007), "Investigating the success of ERP systems: case studies in three Taiwanese high-tech industries", Computers in Industry, Vol. 58, 783-93.

- Chin, W. W. (1998). The partial least squares approach to structural equation modelling. In G. A. Marcoulides (Ed.), Modern Methods for Business Research. Erlbaum, Mahwah, NJ, 295–336

- Clemons, C. (1998). Successful implementation of an enterprise system: a case study, in: Proceedings of the Fourth Americas Conference on Information Systems, 109–110.

- Cohen, J. (1988). Statistical power analysis for the behavioral sciences. 2nd edition.

- Cox, J.F. and Clark, S.J. (1984). Problems in implementing and operating a manufacturing resource planning information system. Journal of Management Information Systems 1, 81–101.

- Cooke, D. and Peterson, W. (1998). SAP implementation: Strategies and results (Research Rep. No. 1217–98–RR). New York: The Conference Board.

- Cotteleer, M. J., and Bendoly, E. (2006). "Order Lead-Time Improvement Following Enterprise-IT Implementation: An Empirical Study," MIS Quarterly (30:3), 643-660.

- Davenport, T.H. (1998). "Putting the enterprise into the enterprise system", Harvard Business Review, July/August, 121-31.

- Davenport, T. H. (2000). Mission critical: Realizing the promise of Enterprise Systems, Harvard Business School Press.

- DeLone, W. H. and McLean, E. R. (1992) Information Systems Success: The Quest for the Dependent Variable, Information Systems Research, 3 (1), 60-95.

- Deetz, S. A., Tracy, S. J. and Simpson, J.L. (2000). Leading Organizations Through Transition. Thousand Oaks, London, New Delhi, Sage Publications, Inc.

- Dezdar, S. and Sulaiman, A. (2009). "Successful enterprise resource planning implementation: taxonomy of critical factors", Industrial Management & Data Systems, Vol. 109, 1037-1052.

- Dezdar, S. and Ainin, S. (2011). "Critical success factors for ERP implementation: Insights from a middle-eastern country." Middle-East Journal of Scientific Research, vol. 10, no. 6, 798-808.

- Doll, W.T. and Torkzaden, G. (1988). "The measurement of end-user computing satisfaction", MIS Quarterly, Vol. 12 No. 2, 259-71.

- Drazin, R. and Van de Ven, H. (1985). Alternative forms of fit in contingency theory. Adm. Sci. 514–539.

- Dunlop, A. (1998). "Corporate Governance and Control", London: CIMA Publishing.

- Ehie, I., and Madsen, M. (2005). "Identifying critical issues in enterprise resource planning (ERP) implementation", Computers in Industry, (56), 545-557.

- Eisenhardt, Kathleen M. (1989). Agency Theory: An Assessment and Review. Academy of Management Review 14 (1), 57-74.

- Ewusi-Mensah, K. (1997). Critical issues in abandoned information systems development projects, Communications of ACM 40(9), 74-80.

- Falkowski, G., Pedigo, P., Smith, B. and Swanson, D. (1998). A recipe for ERP success. Beyond Computing, 44–45.

- Fama, E., & Jensen, M. (1983). Separation of ownership and control. Journal of Law and Economics, 26, 301–326.

- Finney, S. and Corbett, M. (2007). "ERP implementation: a compilation and analysis of critical success factors", Business Process Management Journal, Vol. 13 No. 3, 329-347.

- Fitz-Gerald, L. and Carroll, J. (2004). "The role of governance in ERP system implementation", The Communications of the ACM, Vol. 15 No. 4, 72-83.

- Fornell, C. and Bookstein, F.L. (1982). Two structural equation models: LISREL and PLS applied to consumer exit-voice theory. Journal of Marketing Research 19(4), 440–452.

- Foss, K. and Foss, N.J. (2000). 'Competence and Governance Perspective: How Much Do They Differ? And How Does it Matter', Governance, and Entrepreneurship, Oxford University Press, 55-79.

- Gable G. and Stewart G. (1999). "SAP R/3 Implementation Issues for Small to Medium Enterprises". Americas Conference on Information Systems AMCIS, Milwaukee, USA.

- Gable, G., Sedera, D. and Chan, T. (2003), "Enterprise systems success: a measurement model", Proceedings of the 24th International Conference on Information Systems, Seattle, WA.

- Gattiker, T. F., & Goodhue, D. L. (2005). What happens after ERP implementation: understanding the impact of interdependence and differentiation on plant-level outcomes. MIS Quarterly, 559-585.

- Gefen, D., Straub, D. W. and Boudreau, M. C. (2000). Structural equation modelling and regression: Guidelines for research practice. Communications of the Association for Information Systems, 4(5), 1–78.

- Giachetti, R.E., Damodaran, P., Mestry, S. and Prada, C. (2013), "Optimization-based decision support system for crew scheduling in the cruise industry", Computers & Industrial Engineering, Vol. 64 No. 1, 500-510.

- Gillan, S.L. and Starks, L. T. (1998). "A survey of shareholder activism: motivation and empirical evidence", Contemporary Finance Digest, Vol. 2, 10–34.

- Gillan, S. L. (2006). Recent developments in corporate governance: an overview. Journal of Corporate Finance. Vol. 12, 381-402.

- Grandori, A. and Kogut, B. (2004). 'Dialogue on Organization and Knowledge', Organization Science 13(3), 224-231.

- Grant, R. M. (1996). Toward a knowledge-based theory of the firm. Strategic Management Journal, 17(Winter Special Issue), 109-122.

- Habib, A. (2004). Governance through ownership, A synthesis of research on causes andconsequences of corporate ownership structure and some evidences from Bangladesh. Dhaka University Journal of Business Studies, XXV (1), 107-129.

- Hair, J. F., Ringle, C. M. and Sarstedt, M. (2011). PLS-SEM: Indeed a Silver Bullet. Journal of Marketing Theory and Practice, 19(2), 139–151.

- Hammer, M. and Stanton, S. (1999). How processes enterprise really work, Harvard Business Review, November-December, 108-118.

- Henseler, J., Ringle, C.M. and Sinkovics, R.R. (2009). The Use of Partial Least Squares Path Modeling in International Marketing, in R.R. Sinkovics and P.N. Ghauri (eds.) Advances in International Marketing: New challenges to international marketing,277–320.

- Holland, C. and Light, B. (1999). A framework for understanding success and failure in Enterprise Resource Planning System Implementation. 7th European Conference on Information Systems, Copenhagen.

- Huang, Z. and Palvia, P. (2001). ERP implementation issues in advanced and developing countries, Business Process Management 7, 276–284.

- Hulland, J. (1999). Use of partial least squares (PLS) in strategic management research: a review of four recent studies. Strategic Management Journal, 20, 195–204.

- Hunton, J.E., Lippincott, B., and Reck, J.L. (2003). Enterprise resource planning systems: Comparing firm performance of adopters and non-adopters. International Journal of Accounting Information Systems, 4 (3), 165-184.

- Ifinedo, P. (2011), "Internal IT knowledge and expertise as antecedents of ERP system effectiveness: an empirical investigation", Journal of Organizational Computing and Electronic Commerce, Vol. 21 No. 1, 1-23.

- IJpelaar, R. (2007). Een herontwerp van de ordercyclus voor de uitlevering van verse snijbloemen. Eindrapport bij Jumbo Supermarkten.

- Ives, B., Olson, M.H. and Baroudi, J.J. (1983). "The measurement of user information satisfaction", Communications of the ACM, Vol. 26 No. 10, 785-93.

- Jacobs, F.R. and Bendoly, E. (2003), "Enterprise resource planning: developments and directions for operations management research", European Journal of Operational Research, Vol. 146, 233-40.

- Jarvis, C. B., MacKenzie, S. B., and Podsakoff, P. M. (2003). "A Critical Review of Construct Indicators and Measurement Model Misspecification in Marketing and Consumer Research," Journal of Consumer Research (30), 199-218.

- Jensen, M. and Meckling, W. (1976). Theory of the firm: managerial behavior, agency costs and ownership structure. Journal of Financial Economics 3, 305–360.

- Johnston, H.R. and Carrico, S.R. (1988). Developing capabilities to use information strategically, MIS Quarterly 12 (1), 37–48.

- Jurison, J. (1999). Software Project Management: The Manager's View, Communications of the Association for Information Systems 2: 29.

- Karimi, J., Somers, T.M. and Bhattacherjee, A. (2007). The impact of ERP implementation on business process outcomes: a factor-based study. Journal of Management Information Systems 24, 101–134.

- Kassem, G. and Schult, R. (2008). "ERP Self-Adaptive customizing," Information and Communication Technologies: From Theory to Applications, 2008. ICTTA 2008. 3rd International Conference on, 1-5.

- Keil, M. and Cule, P. (1998). A framework for identifying software project risks, Communications of ACM 41(11), 76-83.

- Khanna, K. and Arneja, G. P. (2012). Choosing an appropriate ERP implementation strategy. Journal of Engineering, 2(3), 478-483.

- Kim, S. S., Malhotra, N. K. and Narasimhan, S. (2005). "Two Competing Perspectives on Automatic Use: A Theoretical and Empirical Comparison," Information Systems Research (16:4), 418-432.

- Klaus, H., Rosemann, M. and Gable, G.G. (2000). What is ERP? Information Systems Frontiers 2, 141–162.

- Kraemmerand, P. Moller, C. and Boer, H. (2003). ERP implementation: an integrated process of radical change and continuous learning, Production Planning & Control 14, 338–348.

- Koch, C., Slater, D. and Baatz, E. (1999). The ABCs of ERP. CIO Magazine ERP research Center.

- Kogut, B. and Zander, U. (1996). 'What Firms Do? Coordination, Identity, and Learning', Organization Science 7: 502-518.

- Krupp, J. (1998). Transition to ERP implementation, APICS–The Performance Advantage, 4–7.

- Kumar, K. and Hillegersberg, J. (2000). ERP experiences and evolution, Communications of the ACM, 43 (3), 22-26.

- Latamore, G. (1999). Flexibility fuels the ERP evolution, The Performance Advantage, APICS, 44–50.

- Laughlin, S.P. (1999). An ERP game plan, Journal of Business Strategy, 32-37.

- Lee, S.C. and Lee, H.G. (2004), "The importance of change management after ERP implementation: an information capability perspective", Proceedings of the 25th International Conference on Information Systems, Washington, DC.

- Liang, H., Saraf, N., Hu, Q. and Xue, Y. (2007). "Assimilation of Enterprise Systems: The Effect of Institutional Pressures and the Mediating Role of Top Management," MIS Quarterly (31:1), pp. 59-87.

- Libby, R. (1981). Accounting and human information processing: theory and applications. Englewood Cliffs: Prentice-Hall.

- Lippitt, M. (1997). "Say what you mean, mean what you say", Journal of Business Strategy, Vol. 19. No. 4, 18-20.

- Lyytinen, K. and Hirschheim, R. (1987). Information system failures - A survey and classification of the empirical literature, Oxford Surveys in Information Technology 4: 257-309.

- Mabert, V.A., Soni, A. and Venkataramanan, M. (2000) Enterprise resource planning survey of U.S. manufacturing firms, Production and Inventory Management Journal, 4 (2),52-58.

- Mabert, V.A., Soni, A.K., Venkataramanan, M.A. (2003). The impact of organization size on enterprise resource planning (ERP) implementations in the US manufacturing sector. OMEGA 31, 235-246.

- MacCallum, R. C. and Browne, M. W. (1993). "The Use of Causal Indi cators in Covariance Structure Models: Some Practical Issues," Psychological Bulletin (114:3), 533-541.

- McHaney, R., Hightower, R. and Pearson, J. (2002), "A validation of the end-user computing satisfaction instrument in Taiwan", Information & Management, Vol. 39, pp. 503-11.

- Mahaney, Robert C., Albert L. Lederer. (2003). Information Systems Project Management: An Agency Theory Interpretation. The Journal of Systems and Software 68:1-9.

- Mandal, P., Gunasekaran, A. (2002). Application of SAP R/3 in on-line inventory control. International Journal of Production Economics 75, 47–55.

-Markus, M.L. and Tanis, C. (2000). The enterprise systems experience – from adoption to success, in R.W. Zmud, ed., Framing the Domains of IT Research: Glimpsing the Future Through the Past, Cincinnati, OH: Pinnaflex Educational Resources, 173-207.

- Martin, M.H. (1998). "An ERP Strategy", Fortune, 95-97.

- Mensah, M.L. (2003). The effect of audit quality on earnings management. Contemporary Accounting Research 15 (1), 1–21.

- Monks, R. A. G. (2002), "Equity Culture at Risk", Proceedings, 5th International Conference on Corporate Governance and Direction, Henley Management College, UK, 8–10.

- Motwani, J., Mirchandani, D., Madan, M. and Gunasekaran, A. (2002). Successful implementation of ERP projects: Evidence from two case studies. International Journal of Production Economics 75, 83–96.

- Muscatello, J. R. (2002) "An exploratory study of the implementation of ERP". Cleveland State University America.

- Nah, F.F-H., Zuckweiler, K.M. and Lau, J. L.-S. (2003). 'ERP implementation: chief information officers' perceptions of critical success factors', International Journal of Human-Computer Interaction, Vol. 16, No. 1, 5–22.

- Nandhakumar, J., Rossi, M. and Talvinen, J. (2005). The dynamics of contextual forces of ERP implementation, Journal of Strategic Information Systems 14. 221–242.

- Nicolaou, A.I. (2004), "Firm performance effects in relation to the implementation and use of enterprise resource planning systems", Journal of Information Systems, Vol. 18 No. 2, 79-105.

- Nilia and Viviyanti (2008), "Board meeting frequency and firm performance", Journal of Financial Economics, 113-142.

- Nour, M.A. and Mouakket, S. (2011). "A classification framework of critical success factors for ERP systems implementation: a multi-stakeholder perspective", International Journal of Enterprise Information Systems, Vol. 7 No. 1, 56-71.

- Nunnally, J.C. and Bernstein, I.H. (1994). Psychometric Theory, 3rd edition, New York: McGraw-Hill.

- Oliveira, T. and Martins, M.F. (2011), "Literature review of information technology adoption models at firm level", The Electronic Journal Information Systems Evaluation, Vol. 14. No. 1. 110-121.

- Parr, A., Shanks, G. and Darke, P. (1999). The identification of necessary factors for successful implementation of ERP systems, in Ojelanki, N., Introna, L. et al New Information Technologies in Organizational Processes. Kluwer Academic, Boston.

- Parker, M., Benson, R. and Trainor, E. (1988). Information Economics: Linking Business Performance to Information Technology. Englewood Cliffs, NJ, Prentice Hall.

- Phelan, P. and Frey, N. (2002). Avoiding failure in large IT projects: new risk and project management initiatives, Gartner: 16.

- Poston, R. and Grabski, S. (2001), “Financial impacts of enterprise resource planning implementations”, International Journal of Accounting Information Systems, Vol. 2 No. 4, 271-94.

- Pratolo, S. (2007).Good corporate governance and the performance of state owned enterprises in Indonesia. National Symposium of Accounting X. Makasar, Indonesia.

- Pressman, A. (1997). Switching Power Supply Design, Second Edition, McGraw-Hill, New York.

- Ram, J., Corkindale, D. and Wu, M.L. (2013). Implementation critical success factors (CSFs) for ERP: Do they contribute to implementation success and post-implementation performance? International Journal of Production Economics, 144, 157-174.

- Ramirez, P. and Garcia, R. (2005). Success of ERP Systems in Chile: An Empirical Study. In Americas conference on Information Systems (AMCIS).

- Ringle, C. M., Sarstedt, M. and Mooi, E. A. (2010). Response-Based Segmentation Using Finite Mixture Partial Least Squares Theoretical Foundations and an Application to American Customer Satisfaction Index Data. In Data Mining, Annals of Information Systems, 19-49.

- Ringle, C.M.; Wende, S. and Will, A. (2005). SmartPLS 2.0 M3.

- Rikhardsson, P. and Krcmmergaard, P. (2006). Identifying the impacts of enterprise system implementation and use: examples from Denmark. International Journal of Accounting Information Systems 7, 36–49.

- Rockness, H.O. and Zmud, R.W. (1989). Information Technology Management: Evolving Managerial Roles, Financial Executives Research Foundation, Morristown.

- Rosario, J. G. (2000). On the leading edge: Critical success factors in ERP implementation projects. Business World (Philippines).

- Russell, R.S., Taylor, B.W. (1995). Production and Operations Management: Focusing on Quality and Competitiveness. Prentice-Hall Inc., Englewood Cliffs. NJ.

- Saarinen, T. (1996), “An expanded instrument for evaluating information system success”, Information & Management, Vol. 31, 103-18.

- Sallé, M. (2004). IT Service Management and IT Governance: review, comparative Analysis and their impact on utility computing: Hewlett-Pakard Company.

- Sarker S. (2000). “Toward a Methodology for Managing Information Systems Implementation: A Social Constructivist Perspective”, Informing Science, 3(4), 195-205.

- Sarker S. and Lee A. (2000). “Using a Case Study to Test the Role of Three Key Social Enablers in ERP Implementations”. International Conference on Information Systems, Brisbane (Australia).

- Sauer, C. (1999). Where Project Managers are Kings: Lessons for IT from Construction Industry, Project Management Journal, 32:4, 39-49.

- Schneider, P. (2000). "Another Trip to Hell." CIO.

- Schragenheim, E. (2000). When ERP worlds collide, APICS—The Performance Advantage. 55–57.

- Scott, J. and Vessey, I. (2002). Managing risks in enterprise systems implementations. Communications of the ACM. 45 (4). 74-81.

- Seddon, P. B. and Kiew, M-Y. (1994). A Partial Test and Development of the DeLone and McLean Model of IS Success, Proceedings of the International Conference on Information Systems, December 14-17, Vancouver, 99-110.

- Shang, S. and Seddon, P.B. (2002), “Assessing and managing the benefits of enterprise systems: the business manager’s perspective”, Information Systems Journal, Vol. 12 No. 4, 271-300.

- Shankarnarayanan, S. (2000). ERP systems using IT to gain a competitive advantage.

- Shanks, G., Parr, A., Hu, B., Corbitt, B., Thanasankit, T. and Seddon, P. (2000). Differences in critical success factors in ERP systems implementation in Australia and China: A cultural analysis. Proceedings of the 8th European Conference on Information Systems, Austria, 537–544.

- Shattock, M. (2001) CAPSA and its implementation, Review of University Management and governance issues arising out of the CAPSA project, in Report to the Audit Committee and Board of Scrutiny, University of Cambridge. 179-204.

- Sirkisoon, F. and Shepherd, J. (2002). The steady stream of ERP investments: AMR Research.

- Smith, M. (2011). Research Methods in Accounting (2nd ed.). London: Sage Publications Ltd.

- Somers, T.M. and Nelson, K.G. (2004), “A taxonomy of players and activities across the ERP project life cycle”, Information & Management, Vol. 41, pp. 257-278.

- Spathis, C. and Constantinides, S. (2004). Enterprise resource planning systems’ impact on accounting processes. Business Process Management Journal 10, 234–247.

- Spender, J. C. (1996). 'Making Knowledge the Basis of a Dynamic Theory of the Firm', Strategic Management Journal, 17(Winter Special Issue): 45-62.

- Spike, B.K. and Lesser (1995). "We have met the enemy", Journal of Business Strategy, Vol.16. No 2, 17-23.

- Standish Group International Inc (1999) Chaos: A Recipe for Success, The Standish Group International Inc.

- Stefanou, C. (1999). Supply chain management (SCM) and organizational key factors for successful implementation of enterprise resource planning (ERP) systems. Proceedings of the Americas Conference on Information Systems, 800–802.

- Sternberg, E. (1998), "Corporate Governance: Accountability in the Marketplace", London: The Institute of Economic Affairs.

- Sum, C.C., Ang, J.S.K. and Yeo, L.N. (1997). Contextual elements of critical success factors in MRP implementation. Production and Inventory Management Journal 38, 77–83.

- Sumner, M. (1999). Critical Success Factors in Enterprise-Wide Information Management Projects, Proceedings of the Americas Conference on Information Systems, Milwaukee, 232-234.

- Supramaniam, M. and Kuppusamy, M. (2011). "Investigating the critical factors in implementing enterprise resource planning system in Malaysian business firms", The Electronic Journal of Information Systems in Developing Countries, Vol. 46. No. 5, 46.

- Teece, D, Pisano, G, Shuen, A. 1997. Dynamic capabilities and strategic management. Strategic Management Journal 18(7): 509–533.

- Travis, D. (1999). Selecting ERP, The Performance Advantage, 37–39.

- Trelevan, M.D., Watts, C.A., and Hogan, P.T. (2000). "Communicating Along the Supply Chain: A Survey of Manufacturers' Investment and Usage Plans for Information Technologies," Mid- American Journal of Business , 15(2), 53–61.

- Tricker, R. I. (1994). "International Corporate Governance: Text, Readings and Cases", New Jersey: Prentice Hall.

- Tushman, M. L., and Nadler, D. A. (1978). "Information Processing as an Integrating Concept in Organizational Design," Academy of Management Review (3), 613-624.

- Umble, E. J. (2002). Avoiding ERP Implementation failure, Industrial Management.

- Upadhyay, P., Jahanyan, S. and Dan, P.K. (2011). “Factors influencing ERP implementation in Indian manufacturing organizations: a study of micro, small and medium scale enterprises”, Journal of Enterprise Information Management, Vol. 24 No. 2, 130-145.

- Van Everdingen, Y., Van Hillegersberg, J. and Waarts, E. (2000). “ERP Adoption by European Midsize Companies,” Communications of the ACM, 43(4), 27–31.

- Vives, Z. (2000). Corporate governance: does it matter? Corporate Governance. Cambridge University Press.

- Volkoff, O. (1999). Enterprise system implementation: a process of individual metamorphosis, American Conference on Information Systems.

- Weston, F.C. (2001). ERP implementation and project management, Production & Inventory Management Journal 42 (third quarter) 75–80.

- Wiegers, K. (1998). Know your enemy: software risk management, Software Development, October.

- Willcocks, L. and Margets, H. (1994). Risk Assessment and Information systems, European Journal of Information Systems 3(2): 127-138.

- Willcocks, L. and Griffiths, C. (1994). Predicting risk of failure in large-scale information technology projects, Technological Forecasting and Social Change 47: 205-228.

- Wilson, F., Desmond, J. and Roberts, H. (1994). Success and failure of MRP II implementation. British Journal of Management 5, 221–240.

- Wu, F.; Mahajan, V. and Balasubramanian, S. (2003). An analysis of e-business adoption and its impact on business performance. Journal of the Academy of Marketing Science 31 (4), 425–447.

- Xu, H.; Nord, J. H.; Brown, N. and Nord, G. D. (2002). Data quality issues in implementing an ERP. Industrial Management & Data Systems, 47-58.

- Yusuf, Y., Gunasekaran, A. and Abthorpe, M.K. (2004). Enterprise information systems project implementation: A case study of ERP in Rolls-Royce. International Journal of Production Economics 87, 251–266.

- Zhang, J. and Wang, L. (2010). ERP implementation: a corporate governance perspective, International Journal of Public Information Systems, vol. 2010.

- Zuo, M. and Kuang, K. (2001). Information system development and management, Qinghua University.