# Developing a Framework for International Projects of ERP Implementation

INAUGURAL-DISSERTATION
zur Erlangung des akademischen Grades eines
Doktors der Wirtschaftswissenschaften
an der Wirtschaftswissenschaftlichen Fakultät
der Julius-Maximilians-Universität Würzburg

vorgelegt von
Kourosh Yazdani Rashvanlouei, MBA, B.Sc.
aus Mashhad, Iran

Würzburg 2016

# Developing a Framework for International Projects of ERP Implementation

INAUGURAL-DISSERTATION
zur Erlangung des akademischen Grades eines
Doktors der Wirtschaftswissenschaften
an der Wirtschaftswissenschaftlichen Fakultät
der Julius-Maximilians-Universität Würzburg

vorgelegt von
Kourosh Yazdani Rashvanlouei, MBA, B.Sc.
aus Mashad, Iran

Erstgutachter
Prof. Dr. Rainer Thome
Digital Business Synergy, Universität Würzburg

Zweitgutachter
Prof. Dr. Axel Winkelmann
Lehrstuhl für BWL und Wirtschaftsinformatik, Universität Würzburg

Würzburg 2016

# Abstract (Deutsch)

Enterprise Systeme werden immer mehr von Bedeutung, was sie in die Mitte der Aufmerksamkeit und der Berücksichtigung durch Organisationen in verschiedensten Formen rückt – seien es Unternehmen oder Industrien von riesigen öffentlichen oder privaten Organisationen bis hin zu mittleren und kleinen Dienstleistungsunternehmen. Diese Systeme verbessern sich ständig, sowohl funktionell, als auch technologisch und sie sind unumgänglich für Unternehmen, um ihre Produktivität zu vergrößern und um in dem nationalen und globalen Wettbewerb mitzuhalten.

Da lokale Softwarelösungen die Bedingungen, speziell von großen Betrieben, funktionell und technologisch nicht erfüllen konnten und da riesige globale Softwarehersteller, wie SAP, Oracle und Microsoft ihre Lösungen rapide verbessern und sie ihren Markt immer mehr über den Globus expandieren, nimmt die Nachfrage für diese globalen Marken und deren nahezu einwandfreien Softwarelösungen täglich zu. Die Zustimmung für internationale ERP Unternehmensberatungsanwendungen nimmt deswegen exponentiell zu, während die Forschung der beeinflussenden Faktoren und des Fachwissens wenig verbreitet ist. Deswegen ist es so dringlich, dieses Gebiet zu erforschen.

Das schlussendliche fünf-in-fünf Framework dieser Studie sammelt zum ersten Mal in der Geschichte alle historisch erwähnten, kritischen Erfolgsfaktoren und Projektaktivitäten. Diese wurden in fünf Phasen unterteilt und nach den fünf Schwerpunkten der internationalen ERP Projektdurchführung kategorisiert. Dieses Framework bietet einen Überblick und bildet einen umfassenden Fahrplan für solche Projekte.

# Abstract (English)

The importance of enterprise systems is increasingly growing and they are in the center of attention and consideration by organizations in various types of business and industries from extra-large public or private organizations to small and medium-sized service sector business. These systems are continuously advancing functionally and technologically and are inevitable and ineluctable for the enterprises to maximize their productivity and integration in current competitive national and global business environments.

Also, since local software solutions could not meet the requirements of especially large enterprises functionally and technically, and as giant global enterprise software producers like SAP, Oracle and Microsoft are improving their solutions rapidly and since they are expanding their market to more corners of the globe, demand for these globally branded low-defect software solutions is daily ascending. The agreements for international ERP implementation project consultancy are, therefore, exponentially increasing, while the research on the influencing factors and know-hows is scattered and rare, and thus, a timely urgency for this field of research is being felt.

The final developed five-in-five framework of this study, for the first time, collects all mentioned-in-the-history critical success factors and project activities, while sequencing them in five phases and categorizing them in five focus areas for international ERP implementation projects. This framework provides a bird's-eye view and draws a comprehensive roadmap or instruction for such projects.

# Acknowledgment

The author of this study acknowledges the following persons or entities:

- Prof. Dr. Rainer Thome – the first supervisor of this study whose continuous guidance and timely practical comments during the years this research was running were the only and most promising motivation to accomplish the study. His insistence on applicability of this study, like others under his supervision, promises new practical achievements in terms of projects, start-ups, etc.
- Prof. Dr. Axel Winkelmann – the second supervisor of this study for his comments.
- Academy of Management OCIS members (Organizational Communication and Information Systems) for their comments on primary research proposal of this study during 2012 annual meeting in Boston, MA.
- IEEE enterprise systems' research chair members for their comments on quiet final structure of this study during 2015 international conference on Industrial Engineering and Engineering Management in Singapore.
- Dr. Khashayar Yazdani, Prof. Dr. Hansrudi Lenz and Dr. rer. pol. Paivand Sepehri for their guidance, sympathy and friendship during the years this study was running.

To my parents

# Table of Contents

# List of Tables

# List of Figures

## Chapter One

# 1 Introduction

> *"Things being investigated, knowledge became complete, thoughts were sincere, hearts were rectified, persons were cultivated, families were regulated, states were rightly governed, the whole kingdom was then made tranquil and happy."*
>
> Confucius (551 B.C. – 479 B.C.) Chinese social philosopher

## 1.1 General overview and problem statement

Enterprise systems are the wide-ranging complicated application/software systems and tools underlying many of manufacturing and business' administrative- and management-support processes. Examples consist of the systems affiliated with finance and accounting, human resources, procurement-to-distribution planning, customer relationship management and several others. These systems process daily a huge amount of business transactions in which data are entered, processed, and stocked for both analytical targets and operational ones. The resulting information resources constitute a valuable corporate asset that is used not only for daily operational planning, but also for strategic analysis and decision making.

In recent half century, advances in enterprise systems and solutions have had a considerable influence on the success and productivity of enterprises across all industries in four corners of the globe. The ERP market is anticipated to gartner approximately $41.69 billion in sales by 2020. Besides this, the market would register a CAGR (compound annual growth rate) of 7.2 percent during the forecast period 2014 -2020 (Chaudhari and Ghone 2015).

Because of such a vibrant and growing market, vendors as well as researches are focusing on advancement and improvement of enterprise systems to offer more efficient solutions and to design/define the next generation of organizational dashboards respectively. To do so, a very critical prerequisite is to identify and evaluate the evolution of enterprise systems which is done in recent years through different methodologies and within (not entirely) distinct contexts; from historical reviews to analytical researches on the need for new functions.

Studying the evolution history of enterprise systems, it is implied that the functional development of enterprise systems correlates highly with the computation capability advancement (which is named technological evolution in this research) during recent decades. With continuously advancing non-expensive hardware, and on-going software development, it was feasible to create new functions using a centralized database. The new technologies let system development to support increasing numbers of functions emerging the benefits of integration. To understand and plan for future of enterprise systems, therefore, it is necessary to investigate the evolution history, considering two main aspects; functional evolution versus technological evolution.

Enterprise systems (as popularly known as ERP systems) are to solve the problem of information cracking (fragmentation) in big corporations by uniting and/or combining all business processes into an integrated system environment to improve critical information loading to clients and enhance data reliability. Implementing an ERP system is very expensive and time consuming. However, this could put a financial load on enterprises before they realize a justifiable return on investment.

Benefits realization and simple operational stability after system run-up are probably the most considerable issues that companies are facing when

implementing their new enterprise systems. According to Panorama's 2016 ERP Report, in the year 2015 in comparison to 2014, the data interestingly shows a considerable drop in percentage of respondents that consider their project as non-successful (from 7% in 2014 to 21% in 2015), one percent drop in success rates, and a corresponding increase in the percentage of respondents claiming neutrality in regard to project outcomes (from 21% to 36%) (Panorama Consulting Solutions 2016).

During all stages of an ERP implementation project, the whole enterprise, particularly top management, is concerned about many different issues, from change management to project finance. Enterprises also insist on the importance of the project management effort whose variables are not as significant as anticipated in predicting punctual and on/under-budget implementations. When expressed as a percentage of revenue, the average company pays out an average of 6.5% of annual revenue (rather than 5.9% in 2014) (Panorama Consulting Solutions 2015, 2016) that is large and considerable and an ERP system's return on investment can be difficult to calculate because of the many intangible costs and benefits.

Regardless of many years of experience in selection, implementation, and utilization of enterprise systems, a large percentage of projects fails or exceeds time and budget, and current systems do not fulfill top managers' expectations and are afflicted with low user satisfaction. Several lists of "Dos and Don'ts" as well as vast critical success factors investigation regarding ERP projects have been published on the internet and in business magazines/scientific journals. Many researches during last decade propose an overall list of factors associated with project/system implementations. Also much more specific researches investigate this phenomenon from particular viewpoints such as organizational-related, project-related, etc. All the findings are obtained out of methodologies including identification and blend of those basic prerequisites for usage that have been suggested by specialists and academicians, and through a comprehensive review of the literature.

The international nature of the enterprise-vendor relationship is also of importance. There is unfortunately no precise statistics of success or failure

rate of international projects of ERP implementations but national case studies proof that the success rate seems to be not too high and satisfactory.

The implementation and utilization of ERP solutions get used to a number of problems due to their complicatedness and the effect they have on business processes. These problems are further aggravated in international environments in which national cultures and local necessities play an important role. Enterprises often should reach to equilibrium between the volume of modifications and local requirements.

Most studies have been allocated to developed countries, while in developing countries many enterprises are approaching to such software solutions. The Enterprise System related researches and instructions have almost been accomplished by technologically advanced countries. But developing countries have an alternate circumstance as opposed to the certain suppositions of developed countries.

Implementation strategies and methodologies are overwhelmingly designed for a western audience. This could lead to even higher failure rates in underdeveloped markets. Most large western firms have gone through several iterations of purchasing and implementing ERP and other large tool systems. They have some (although not always strong) capability and organizational memory around change. In developing nations, the businesses can be younger and going through these challenges for the first time.

As well as recent scattered publications including action research papers and case studies on international projects of ERP implementation there is a huge observations and records about the failure of such projects due to diverse set of reasons all around the world. These observations have been done through web search, public IT and Business Magazines, and unstructured and unofficial up-in-the-air interviews with non-western executive managers and chief information technology managers especially from Asian and Middle East countries.

This high rate of failure and low amount of practical instructions and frameworks based on systematically done research justify and emerge the need for the studies in this area. Some studies have tried to develop frameworks to compare ERP implementation issues in advanced and developing countries. Some other researchers have accomplished

investigations of the challenges surrounding ERP implementations across various organizational and national cultures. But there is a huge need for an overall investigation to develop a framework considering up-to-date researches and case studies regarding international projects of ERP implementation. This study has targeted to do so.

## 1.2 Research aims and questions

According to the general overview and the situation stated above, it seems to be obvious that organizational executive leaders, IT project managers, consultants, solution providers and also researchers in the field of management information systems and international project management strongly need to have a better understanding about international nature and characteristics of ERP implementation projects through an overall framework. The main aim of this investigation, therefore, is to come up with *a comprehensive framework/instruction for international ERP implementation projects covering all general and specific critical success factors being projected across whole project life-cycle.*

To do any non-basic investigation on enterprise systems, a deep and proper basic knowledge of them is required. Having either no idea or an incomplete or malformed knowledge about the functionalities and technologies of which enterprise systems are formed, any research will be guided to a wrong path. To recognize and comprehend the properties and technical specifications of enterprise systems, it is needed to review and evaluate the functional and technological evolution of these systems in recent decades. Also, this recognition and assessment helps us to perceive the advancement and development trend and, consequently, the future of these systems functionally and technologically. Thus, the first research question of this study is stated as:

Research Question 1: "*How has been the functional and technological evolution of enterprise systems?*"

Although this study intend to reach a framework for international ERP implementation projects, approaching this target is impossible without a comprehensive familiarity with IT adoption or ERP implementation projects

in general. Although there is a huge literature and previously done studies about such projects, most of recent researches are focusing on detail issues or factors and there is no recent investigation summarizing all up-to-date critical success factors and coming up with a best-practice project life-cycle. Thus, the second research question of this study is stated as bellow:

Research Question 2: "*What are the best practice project life-cycle and up-to-date general critical success factors for any ERP implementation in general?*"

To answer this research question and provide a richer understanding of enterprise system implementation projects, chapter three adopts and combines three major research trends in the literature to triangulate on simplifying almost all ERP related studies. First, all major studies on ERP implementation life-cycle, second, the widely recently cited critical success factors for ERP projects, and third, popular kinds of categorization and taxonomies.

Having a vast knowledge on enterprise systems' functionality and technology and the implementation projects in general by answering the first two research questions, this investigation, finally and particularly, aims to find out a framework for international projects of ERP implementations. To do so, recognition of characteristics and distinctions of international projects than domestic ones, and identification of specific critical success factors of such projects especially in the context of implementing ERP solutions cross borders are undoubtedly essential. Thus, the third research question of this study is stated as bellow:

Research Question 3: "*What are the specific critical success factors for international ERP implementation projects?*"

These three research question are respectively subjected to be answered in chapters two, three and four. But first of all, to make a systematic research to answer these questions, it is required to define a research method which would be compatible with the nature of such studies and also the research conditions and limitations.

## 1.3 Research methodology

To reach a conclusion about the research method which to be utilized in this study, it is predictable to evaluate the methodologies of similar investigations. During past three decades of research on enterprise systems various research methods have been utilized in these researches. Focusing on recent works since early 2000s so far, it is implied that most of studies have used quantitative or hybrid (quantitative and qualitative) research methods especially empirical surveys by the means of questionnaires to find implementations success or failure factors, or statistical/mathematical heuristic evaluations of literature review to list and prioritize the factors.

According to the aim of this study described in last section, this research is going to develop a framework for international projects of ERP implementations including all influencing factors and project life-cycles. Consequently a vast investigation of all recent major and minor related researches must be done and the desired framework must be emerged from the heart of this expanded investigation. Based on fundamental knowledge of business research methodology, a *conceptual research* is highly recommended for this kind of research purposes.

A conceptual research is primarily based on theoretical considerations, theories, frameworks, models, etc. Such studies tend to use no empirical data (sometimes to support certain thoughts and conclusions). The conceptual research has normally no intentions to run specific analytical procedures, due to the lack of empirical data.

"*Conceptual research focuses on the concept or theory that explains or describes the phenomenon being studied. What causes disease? How can we describe the motions of the planets? What are the building blocks of matter? The conceptual researcher sits at his desk with pen in hand and tries to solve these problems by thinking about them. He does no experiments but may make use of observations by others, since this is the mass of data that he is trying to make sense of. Until fairly recently, conceptual research was considered the most honorable form of research—it required using the brain, not the hands*" (Stevenson 2014).

Conceptual studies have their own importance. They are the starting point for many ideas, models, frameworks, theories etc. They may not face the rigor of a research paper yet their significance cannot be overlooked. Conceptual studies are counted as a qualitative research that is a method of inquiry utilized in many different academic disciplines, including not only the social sciences and natural sciences, but also in market research, in business, and other contexts including service demonstrations by non-profits (Denzin and Lincoln 2011). Qualitative research is considered in opposite of quantitative research which is based on experiments and empirical (statistical) analysis.

In quantitative researches, reliability and validity are important criteria in establishing and evaluating the quality of the research. However, there has been some discussion among qualitative researchers concerning their relevance for qualitative research. Some writers have suggested that qualitative studies should be judged or assessed according to quite different criteria from those used by quantitative researchers (Bryman and Bell 2011).

Denzin and Lincoln (2011) propose two primary criteria to evaluate a qualitative research that provide an alternative to reliability and validity: trustworthiness and authenticity. Trustworthiness is made up of four sub-criteria of credibility, transferability, dependability and confirmability, and authenticity is made up of some sub-criteria such as *fairness, ontological authenticity, educative authenticity, catalytic authenticity and tactical authenticity*. According to them, although the validity and reliability of quantitative researches are provable by statistical methods, the trustworthiness and authenticity of qualitative researches are not necessarily required to be proofed by the researcher. These kind of criteria are sensible by providing a comprehensive set of evidences such as a vast literature review (Denzin and Lincoln 2011).

Literature Reviews, similar to conceptual papers, normally tend to use no empirical data unless it is taken from existing publications to make a case for a specific argument which is performed through this study too. The aim of the literature review relies in summarizing, synthesizing, discussing, criticizing and, hopefully, showing research gaps. The research outcome normally yields in recommendations for future research.

## 1.4 Limitations of this study

The attributes of design or methodology in a research that influence the interpretation of the findings are the limitations of the study. "*They are the constraints on generalizability, applications to practice, and/or utility of findings that are the result of the ways in which the researcher initially chose to design the study and/or the method used to establish internal and external validity*" (Labaree 2009).

The conceptual research that is accomplished in this study is just based on a vast literature review in this field of research. Although a conceptual research is primarily based on theoretical considerations, existing theories and frameworks, and focuses on the concept or theory that explains or describes the phenomenon or problem being studied, the author feels the lack of at least one available and accessible international ERP implementation project for *validation* and *verification* of the result of this study which is a framework including the project life-cycle and impacting factors.

Considering the mentioned limitation of this study, it is possible to suggest a future research to verify and validate this study's developed theoretical framework through empirical research methods (i.e. surveys) or qualitative ones such as action researches or case studies.

## 1.5 Dissertation Structure

This study tries to evaluate and review up-to-date researches pivoting enterprise resource planning systems from three perspectives. First (in chapter two), the technological and functional evolution of enterprise systems will be reviewed as well as identification of major vendors of such systems. Second (in chapter three), after reviewing the ERP implementation suggested life-cycles, all most cited critical success factors will be generally investigated and categorized. And third (in chapter four), this study provides the readers with some clues for further investigations to detect specific success factors and define novel instructions regarding international projects of ERP implementation. This study wants to complement and extend previous

related researches by investigating the perceived significance of the success factors to the progress of an international ERP implementation.

The first chapter, as an introductory chapter, tries to warm the mind of the reader up by getting an overall image of the whole study. This short chapter provides the reader with a general overview on the nature and the business (and global market) of enterprise systems, and the implementation challenges and obstacles of such systems especially in international projects as the problem statement of this study. Referring to limitations of the study and the research methodology which has been selected due to them, this section ends with explaining the structure of the dissertation.

As the investigation and review of functional and technological evolution of enterprise systems help to have a better and deeper perception of the functionality and technology of such systems, the second chapter of this study explains the business process management theories and defines the characteristics of primary systems including Material Requirement Planning (MRP), Manufacturing Resource Planning (MRP II), and the primary and current Enterprise Resource Planning (ERP and ERP II) systems, while the chapter begins with a short philosophical preface about the role of armamentarium in Homo Faber and Homo Oeconomicus. As the new generations of enterprise systems are applicable in the context of high technologies, this chapter reviews, in continue, the technical evolution in this industry and ends with Cloud computing and In-Memory data management technologies. Also a short comparison of major global software vendors is provided in chapter two.

In chapter three, first, the concerns that are related to implementation of ERP systems and mentioned in reference articles and case studies such as the concerns of project finance, the realization of *integration* and etc are reviewed. Then the previously suggested project life-cycles are reviewed and, also, the process of Vendor and/or consultant selection will be evaluated by two viewpoints of strategic and mathematical ones. After an expansive deep investigation of critical success factors and related classifications and taxonomies, a list of up-to-date success factors on account of general ERP implementation projects is provided.

In chapter four, first, the characteristics and differences of international projects will be outlined. As the cultural dimensions are the most cited and so important factors in international projects, this chapter will review some cultural theories that are utilized in business and management studies especially Hofstede's cultural dimensions. Then, almost all significant researches on international IT adoption and ERP implementations based on national and organizational cultural dimensions, and other factors and frameworks will be reviewed. Studying some real specific national case studies or reports for different countries from four corners of the globe, the chapter ends with concluding and summarizing the factors impacting on international projects of ERP implementation.

Summarizing all content of the study, the last chapter then explains how the study come up with a five-in-five framework to collect almost all project activities in five phases and almost all impacting factors of international ERP implementation projects in five focus areas. The developed framework will be discussed in this chapter and the author will make the final conclusion for the study.

## Chapter Two

# 2 The Evolution of Enterprise Information Systems

> *"Any technological advance can be dangerous. Fire was dangerous from the start, and so (even more) was speech, and both are still dangerous to this day, but human beings would not be human without them."*
>
> Isaac Asimov - Russian-born American author

This chapter is presented at and has been already published on proceedings of IEEE international conference of industrial engineering and engineering management (IEEM 2015) under the following citation:

> K. Yazdani Rashvanlouei, R. Thome and K. Yazdani, "Functional and technological evolution of enterprise systems: An overview," 2015 IEEE International Conference on Industrial Engineering and Engineering Management (IEEM), Singapore, 2015, pp. 67-72. doi: 10.1109/IEEM.2015.7385610

*Abstract* - A considerable demand of real-time business intelligence analysis persuade enterprise application vendors to cope with state-of-the-art computing technologies such as cloud computing and in-memory data management systems, to provide business owners with systems "predicting the future". A general review and study of enterprise systems' history helps to better understand what such systems will be in close future. This abstract

review demonstrates that the evolution of these software solutions has two major aspects; functional evolution and computation revolutions.

*Keywords* – Enterprise Systems, ERP, In-Memory Data Management, Cloud Technology

## 2.1 Introduction

Enterprise systems are the wide-ranging complicated application/software systems and tools underlying many of manufacturing and business' administrative- and management-support processes. Examples include the systems associated with finance, human resources, procurement-to-distribution planning, customer relationship management, and several others.

In recent half century, advances in enterprise systems and solutions have had a considerable influence on the success and productivity of enterprises across all industries and all around the world. According to Gartner's report on enterprise systems global market share, the worldwide ERP software market grew 3.8% from $24.4B in 2012 to $25.4B in 2013 (the figures for 2014 are not released in time of writing these paper). Although there are dominant competitors such as SAP, Oracle, Sage, Infor and Microsoft in the market, some new vendors like Workday, Workforce Software, Cornerstone OnDemand and NetSuite have had massive fast grow proofing huge and increasing demand for enterprise systems.

Because of such a vibrant and growing market, vendors as well as researches are focusing on advancement and improvement of enterprise systems to offer more efficient solutions and to design/define the next generation of organizational dashboards respectively. To do so, a very critical prerequisite is to identify and evaluate the evolution of enterprise systems which is done in recent years (Jacobs and Weston 2007; Monk and Wagner 2012; Rashid et al. 2002) through different methodologies and within (not entirely) distinct contexts; from historical reviews to analytical researches on the need for new functions.

Studying the evolution history of enterprise systems from newly computerized reorder points (ROP) systems in 1960s to Cloud SaaSs

(Software as a Service) and new database generations today, it is implied that the functional development of enterprise systems correlates highly with the computation capability advancement (which is named technological evolution in this research) during recent decades. With continuously advancing non-expensive hardware, and on-going software development, it was feasible to create new functions using a centralized database. The new technologies let system development to support increasing numbers of functions emerging the benefits of integration (Jacobs and Weston 2007). To understand and plan for future of enterprise systems, therefore, it is necessary to investigate the evolution history, considering two main aspects; functional evolution versus technological evolution.

In this review paper, the functional and technological evolutions of enterprise systems are abstractly reviewed. In conclusion section, a merged timeline for these evolutions is drawn out.

## 2.2 Functional Evolution

### 2.2.1 Material Requirement Planning (MRP) and Manufacturing Resource Planning (MRP II)

Material Requirement Planning (MRP) are (or literally "were") production planning, scheduling and inventory systems to 1) assure that material are available for production and then products are available for sales, 2) procure the minimum level of material in inventory and optimum level of product in store, and 3) design purchasing plan, production procedures, and product delivery time table.

Two successive phases were recorded in the development of MRP; 1) Master Production Schedule to be realistic and maintained and 2) the MRP system should receive feedback from the other systems such as capacity planning, shop floor control and purchasing, and this concept was known as Closed Loop MRP.

In 2011, the third edition of Orlicky's planning method introduced a new type of MRP called "Demand Driven MRP (DDMRP)." Demand Driven MRP is a multi-echelon formal planning and execution technique with five distinct

components which are strategic inventory positioning, buffer profiles and level, dynamic adjustments, demand driven planning, and highly visible and collaborative execution (Ptak and Smith 2011).

Manufacturing resources planning (MRP II) systems evolved to incorporate the financial accounting system and the financial management system along with the old MRP systems. This made manufacturers able to have a more integrated enterprise system that "derived the material and capacity requirements associated with a desired operations plan, allowed input of detailed activities, translated all this to a financial statement, and suggested a course of action to address those items that were not in balance with the desired plan." (Umble et al. 2003)

### 2.2.2Enterprise Resource Planning (ERP)

The developed and extended version of previously known MRP and MRPII systems firstly named ERP by Gartner in 1990. ERP served any enterprise looking for information integration across all functional departments, the older systems was in charge only with manufacturing companies (Abdinnour-Helm et al. 2003).

ERP emerged to represent a bigger entity, bouncing back the incremental development of application integration far off production and financial planning. Developers diversely commenced with accounting, maintenance and human resources modules. ERP systems targeted all main functions of an enterprise in late 90s. Further on manufacturing companies, governments, service-oriented companies and NPOs also started to implement ERP systems. By the early 2000s, ERP systems experienced rapid advancement because Y2K problem and formation of European Union threw legacy systems in confusion. Many enterprises replaced legacy systems with newly fashioned ERPs (Roebuck 2012).

### 2.2.3 ERP II: New computing technologies and new functional demands

ERP systems formerly covered only automating back office modules that did not directly influence all supply chain. Front office modules like customer relationship management (CRM) take directly charge of customers, or e–business systems like e–commerce, or supplier relationship management systems melded later, when the Internet made communicating with external parties easy (Roebuck 2012). So "ERP II" was named in the mid 2000s.

In fact, ERP II is a combination of new functionalities and new technologies that are mostly under examination and assessment nowadays. New modules can be investigated in two categories. 1) Developed old functionalities such as Product Lifecycle Management (PLM) which evolves from MRP and helps is planning and optimization of manufacturing capacity, Supplier Relationship Management (SRM) which maximizes cost savings with support for the end-to-end procurement and logistics processes, and Distribution module which controls warehouse processes and manages movements in warehouse and responds faster to challenges and changes in supply and demand. 2) Newly established functionalities such as Corporate Governance and Performance which aims to streamline and gain greater control of the corporate services, Enterprise Asset Management (EAM) which manages efficiently and sustainably the entire assets lifecycle, improves asset usage and cuts costs by powerful analytics, E-Commerce module which focuses on external strategies, and at last not the least, the Business Intelligence (BI) module which analyses data and converts them to information needed by management.

Nowadays, all the main vendors have been utilizing the ERP II philosophy, either in terms of functional improvements or technical extensions. The evolution is resulted by the emerging new management and business needs and new IT capabilities as we have argued above was the case of the evolution of ERP. The new technologies (i.e. application frameworks (.NET or J2EE), databases (Oracle or MS SQL) or decision support systems (DSS)) are sourced from third-party vendors, but when incorporated into enterprise solutions, the business benefit increases. Business intelligence (BI) which refers to a broad category of analytical applications that help companies

make decisions based on the data in their ERP systems is an example of an analytical DSS tool (Møller 2005).

The conceptual framework of ERP II includes four layers as following:

1 the foundation layer which includes integrated database (DB) and application framework (AF);

2 the process layer which includes business process management (BPM) and enterprise resource planning (ERP);

3 the analytical layer which includes supply network management (SNM), customer relationship management (CRM), supplier relationship management (SRM), product lifecycle management (PLM), employee lifecycle management (ELM), and business intelligence (BI); and

4 the e-business (portal) layer which includes business-to-business (B2B), business-to-customer (B2C), and enterprise application integration (EAI)

In 2000 (Bond et al. 2000) and 2003 (Zrimsek 2003), Gartner Research Group loudly declared that "ERP is dead – Long live ERP II!" They define ERP II "a business strategy and a set of industry-domain- specific applications that build customer and shareholder value by enabling and optimizing enterprise and inter-enterprise, collaborative operational and financial processes." They claim that ERP II differs ERP in six aspects: 1) The role of system has been improved from only enterprise optimization to value chain participation and collaborative commerce (c-commerce) enablement, 2) the scope of usage has been changed from manufacturing and distribution to all industry sectors, 3) the functionality of system has been improved from manufacturing and financials to cross-industry, industry sector and industry-specific processes, 4) the covered processes has been expanded from internal and hidden processes to external connected ones, 5) technical architecture has been transferred from offline monolithic interfaces to open web-based and componentized ones, and 6) data in ERP are internally generated and consumed while in ERP II they are internally and externally published and subscribed.

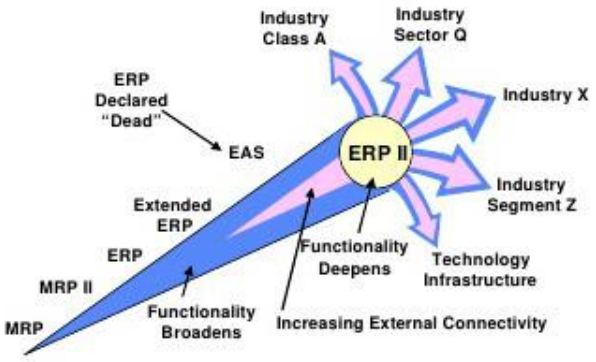


Figure 1 - ERP II Definition Framework

## 2.3 Technological Evolution

Earlier versions of computerized manufacturing and planning systems had utilized the then-available large-scale storage tool which was magnetic tape. Inventory data were saved on tapes, as transaction tapes were recorded during the week, and passing the tapes created a new master tape including order lists based on calculated order amounts, safety stocks and also on-hand balances. The invention of random access memory (RAM) changed the ordinary ways and methods by co-inventing Material Requirement Planning systems. The development of ever faster and higher volume disk storages was an incremental revolutionary technology to create and enhance more integrated Management Information Systems.

The Material Requirements theories by Orlicky's were the first steps that MRP logic developed completely in detail. Considerable parts of those theories were needed to explain to understand what would today be simply referred to as database logic. The first commercial method of Structured Query Language (SQL) relational database management system (DBMS) was launched by Oracle in 1979 that made it possible to develop software which could be run on different computers made by different vendors.

Continuously advancing non-expensive hardware, and on-going software development, it was feasible to create new functions using a centralized database. The new technologies let system development to support increasing numbers of functions emerging the benefits of integration.

AS400 computers were programmed in a transaction-oriented language developed by IBM and perfectly convenient for batch processing in 80s.

Digital Equipment Corporation (DEC), as another option during this period of time, developed mini-computer systems which was able to run the multiuser UNIX operating system. This offered the possibility of real-time recording and analysis of transactions and more precise decision making because reports could be made on demand.

Companies became able to transact any kind of data (in terms of format and language) internally and externally real-time when hardware and software platforms transformed to commodities and translation software processed any amount of data (Jacobs and Weston 2007). "Push information" based on interest areas defined by users are essential to the enterprise systems structure today. Great computing capacities and advancements in networking technologies (internet of things) have somehow transformed enterprise systems in terms of technical infrastructures. Cloud computing and In-Memory Data Management are two state-of-the-art under-construction and under-investigation technologies that influence enterprise systems a lot.

### 2.3.1 Cloud Computing Technology and Enterprise Solutions

Cloud technology “is an IT service model where computing services (both hardware and software) are delivered “on-demand and pay-as-you-go” to customers over a network in a self-service fashion, independent of device and location. The resources required to provide the requisite quality-of-service levels are shared, dynamically scalable, rapidly provisioned, virtualized and released with minimal service provider interaction. Users pay for the service as an operating expense without incurring any significant initial capital expenditure, with the cloud services employing a metering system that divides the computing resource in appropriate blocks.”

Using “clouds” for computing tasks promises a revolution in IT similar to the birth of the web and e-commerce because of much lower cost, faster time to market, and great opportunities for creating new sources of value. In fact, it dramatically lowers the cost of entry for smaller firms trying to benefit from compute-intensive business analytics that were available only to the largest of

corporations until now. It can, also, provide an almost immediate access to hardware resources, with no upfront capital investments for users, leading to a faster time to market in many businesses. Cloud computing makes it easier for enterprises to scale their services – which are increasingly reliant on accurate information according to client demand. SAP, AG., Oracle, IBM and Microsoft, as pioneers of business software solutions, have already turned to Cloud business solutions and applications. There are some other developing provider such as Salesforce, Capgemini, Vordel, RightScale and SuccessFactors.

There is business applications provided as SaaS for enterprises such as web-based ERPs. Web based ERP simplifies back-office process automation for mid-sized and growing business. It provides real-time information about finance, order management, purchase, inventory, employee management, e-commerce and much more. With Web Based ERP Solution, managers can accelerate business cycles, improve productivity and reliability, and provide higher levels of service to customers, suppliers and partners from wherever they are and whenever they want.

Cloud ERP is ERP software that is deployed into a cloud environment. Most (if not all) cloud environments are built using virtualization and load balancing technology that allows applications to be deployed across multiple servers and database resources. Cloud ERP is positioned as a revolutionary approach to deploy an ERP solution. It provides a solution that is flexible, adaptable, scalable, efficient and affordable. ERP software as a service (SaaS) for customers who want to acquire ERP without managing hardware, software, and upgrades while reducing up-front expenses. “Customers can build an internal cloud to reduce ongoing hardware costs while maintaining greater control over integration and require local access to their data server.” (Raihana 2012)

The ERP and Cloud Computing landscape has been changing dramatically over the last decade, but even more so over the last several years. Given the unparalleled economic drivers of the global financial collapse and subsequent global economic decline, companies of every industry and size have been crawling to meet the challenges of the marketplace with ERP applications and solutions. In this crawl, ERP Cloud Computing applications have been

getting very great following and demand for companies resisting the business challenges of the day which include revenue shortfalls and uncertainty, increasing competition, higher customer expectations and turnover, and changing market dynamics.

### 2.3.2 In-memory Data Management

Multi-core processors and the availability of large amounts of main memory at low cost are creating new breakthroughs in the software industry. It has become possible to store data sets of whole companies entirely in main memory, which offers performance that is orders of magnitudes faster than traditional disk-based systems. Hard disks will become obsolete. The only remaining mechanical device in a world of silicon will soon only be necessary for backing up data. With in-memory computing and insert-only databases using row- and column-oriented storage, transactional and analytical processing can be unified. "High performance in-memory computing will change how enterprises work and finally offer the promise of real-time computing." (Plattner and Zeier 2012)

Main memory databases are faster than disk-optimized databases since the internal optimization algorithms are simpler and execute fewer CPU instructions. Access-time in Main-Memory is about 50000 times faster than Disk-Memory while read-time is 120 times faster.

#### 2.3.2.1 In-Memory Data Management as a Basis for New Enterprise Systems

The change in the way data stored has and will continue to have a significant influence on enterprise software solutions. In-memory and multi-core technology have the potential to enhance the usage and productivity of software solutions and the value they can add to the enterprises. On the other hand, as organizations grow, they need to keep track of huge amounts of information across different business areas. New generation of enterprise software solutions "must" meet these requirements "in a timely manner". For example, analysis show that a medium-sized enterprise system comprises 100 GB of transactional data and 1 TB of read-only analytical data, while

values for a huge enterprise are more than 35 TB and 40 TB respectively. For another example, Researches in Hasso Plattner Institute for IT Systems Engineering show that SanssouciDB (in-memory database management system of SAP HANA) is able to improve the execution time of the dunning run from more than 20 minutes to less than one second. This outcome shows that in-memory technology is capable of improving the response time of existing applications by orders of magnitude (Plattner 2011).

The early researches on main-memory database systems (began around 1993 at Bell Labs) was prototyped as the Dali Main-Memory Storage Manager. This research leads to first commercial main-memory database, "Datablitz". This kind of state-of-the-art database system has recently attracted the attention of larger database vendors. "TimesTen", a start-up company founded as a spin-off from Hewlett-Packard, was acquired by Oracle Corporation in 2005. IBM acquired "SolidDB" in 2008, and "VoltDB", founded by DBMS pioneer Michael Stonebraker, announced the general availability of its in-memory database in May 2010 (Jennings 2012).

SAP announced general availability of its own in-memory computing platform, "SAP HANA", in June 2011. In January 2013, SAP enterprise resource planning software from its Business Suite was announced for HANA. In May 2013, a software as a service offering called the HANA Enterprise Cloud service was announced. HANA is "an in-memory computing platform that has completely transformed the relational database industry. It combines database, application processing, and integration services on a single platform. The same architecture also provides libraries for predictive, planning, text processing, spatial, and business analytics."

Enterprise applications are mostly built on a 20-year old data management infrastructure that was designed to meet a specific set of requirements. In the meantime, enterprise applications have become more sophisticated, data set sizes have increased, requirements on the freshness of input data have been strengthened, and the time allotted for completing business processes has been reduced. This situation promises a huge investigation on improvement and continuous development of enterprise systems' infrastructures technically rather than functionally.

These advanced capabilities help companies become highly collaborative and adaptive. Multiple users in functions such as sales, marketing, and HR can analyze planning results – either online or offline – and explore alternative scenarios with a user-friendly, graphical interface. Users can share plans in dashboards or reports, and easily prompt team members for comments and validation.

## 2.4 Chapter Conclusion

Enterprise Systems are now in a maturity level that both solution/system providers and clients understand the technological-, HR- and financial-related resources needed for the implementation and continuing utilization. They should be now easily configurable so that takes days and implementation which accomplished in weeks or at most couple of months. Existing technology of enterprise systems provides companies with a very intelligent planning and business processes that has changed a bit since late 70s in the logic associated with forecasting, reorder point logic, MRP, production scheduling, etc.

Although current systems are processing the old logic much faster and in real-time now, the area is ripe for innovative new approaches to these old-fashion problems.

A general review and study of enterprise systems' history demonstrates that the evolution of these software solutions has two major aspects; functional evolution and computation revolutions (Figure 2). The story begins with very simple algorithms to calculate bills of materials and develop production master plans, and today, a considerable demand of real-time business intelligence analysis persuade enterprise application vendors to cope with state-of-the-art computing technologies such as the internet, cloud computing and in-memory data management platform, and to provide business owners with systems "predicting the future"!

It is implied from this general overview that functional developments were primarily prior and preferred to technical improvements, but as computing technologies grew rapidly, new functions of enterprise systems emerged. The

faster advancement of computing technologies, the more functional developments of enterprise systems. To understand and plan for future of enterprise systems, therefore, it is necessary to investigate the evolution history, considering two main aspects; functional evolution versus technological evolution.

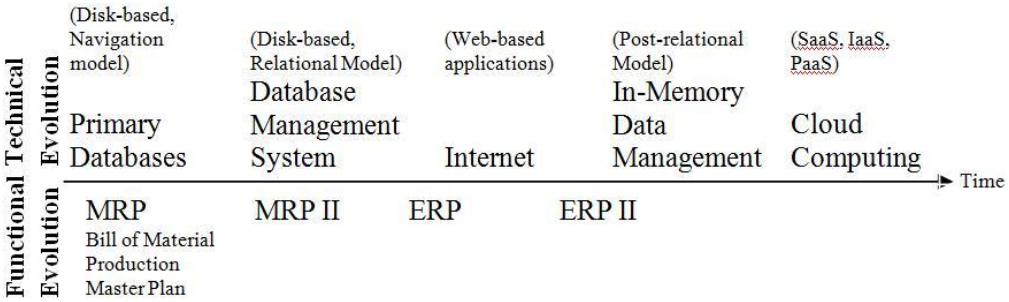


Figure 2 - A simple overview of technical and functional evolution of enterprise systems

## Chapter Three

# 3 General ERP implementation projects: life-cycle and up-to-date critical factors

> **"** *A mere lip service or lukewarm (unenthusiastic) support from top management is the kiss of death for any ERP implementation.* **"**
>
> Ike C. Ehie and Mogens Madsen, 2005

## 3.1 Introduction to chapter

Enterprise systems (as popularly known as ERP systems) are created to solve the challenge of information dispersion for middle-sized and large enterprises by uniting and/or combining all business processes into an integrated system environment to improve critical information loading to users and enhance data consistency (Lapiedra et al. 2011).

Implementing an ERP system is very expensive and time consuming. According to Deloitte Consulting, it can cost a large multi-national enterprise (e.g. a Fortune 500 company) around 30 million USD in license fees and 200 million USD in consulting fees and can take three years or more before the

system provides its maximum benefit, although it costs a small/medium-sized enterprises (domestic single-site companies) much less in terms of expenditure and time (Abdinnour-Helm et al. 2003).

Benefits realization and simple operational stability after system run-up are probably the most considerable issues that companies are facing when implementing their new enterprise systems. According to Panorama 2015 ERP Report, more than half of adopting enterprises at the time of go-live faced some kind of material operational disruption. At a greater volume, 60% of enterprises failed to realize the business goals they had targeted by their ERP implementations, "*which is an increase of approximately 10% rather 2014*" (Panorama Consulting Solutions 2015).

During all stages of an ERP implementation project, the whole enterprise (especially top management) is concerned about many different issues, from change management to project finance. Enterprises also insist on the importance of the project management effort whose variables, individually and collectively, are not as significant in predicting on-time and on/under-budget implementations as anticipated. When expressed as a percentage of revenue, the average company pays out an average of 5.9% of annual revenue that is large and considerable and due to the many intangible costs and benefits, an ERP system's ROI calculation could be difficult (Panorama Consulting Solutions 2015).

Regardless of many years of experience in selection, implementation, and utilization of enterprise systems, a large percentage of projects fails or exceeds time and budget, and current systems do not fulfill top managers' expectations and are afflicted with low user satisfaction. Several lists of "Dos and Don'ts" as well as vast critical success factors investigation regarding ERP projects have been published on the internet and in business magazines/scientific journals. However, some of these recommendations are generic to the level of common sense. Others are very specific (Munkelt and Völker 2013).

In vast investigations of success factors, many researches during last decade (Al-Mashari et al. 2003; Beheshti et al. 2014; Dezdar and Ainin 2009; Ehie and Madsen 2005; Esteves and Pastor 2006; Finney and Corbett 2007; Motwani et al. 2005; Nah and Delgado 2006; Ram and Corkindale 2014;

Somers and Nelson 2004; Thomas et al. 2012; Umble et al. 2003; Upadhyay et al. 2011) propose an overall list of factors associated with project/system implementations. Also much more specific researches investigate this phenomenon from particular viewpoints such as organizational-related, project-related, etc. All the findings are obtained out of methodologies including identification and synthesis of those critical requirements for implementation that have been recommended by practitioners and academicians, and through an comprehensive review of the literature. They show that initial strategizing, top management support, organizational change affairs, project management proficiency, organizational learning, business process reengineering and continuous system engineering are important during almost all implementation project.

As soon as enterprise systems are running, second-wave enterprise resource planning involves continues system engineering and learning as well as possibly changing success/failure factors, "If ERPs are to be exploited for *meaningful business value"*. Critical success factor research, therefore, deserve further confirmation and investigation because more findings are possible (Plant and Willcocks 2007).

To provide a richer understanding of enterprise system implementation project, this chapter adopts and combines three major research trends in the literature to triangulate on simplifying almost all ERP related studies. First, all major studies on ERP implementation life-cycle are reviewed using a stage model of project management. Second, the widely recently cited critical success factors for ERP projects are evaluated, and third, popular kinds of categorization are assessed.

In this chapter, first, the implementation concerns that mentioned in articles and case studies are reviewed. Then the project life-cycles are assessed by two viewpoints of strategic and mathematical ones. After an expansive deep investigation of critical success factors and related classifications and taxonomies, a staged instruction based on up-to-date factors is developed finally.

## 3.2 ERP Implementation Concerns

The top four grounds for implementing an ERP system have been (1) technology upgrade, (2) improving productivity/efficiency, (3) reducing operational costs, and (4) top management requested it (Beheshti et al. 2014). During all stages of an ERP implementation project, the whole enterprise (especially top management) is concerned about achieving these targets through comprehensive integration as a result and a proper project and change management.

Also four areas of concern by which the different stages of the ERP life-cycle should be analyzed are defined as following.

**Product** – This focuses on features related to the specific ERP solution in consideration, such as functionalities, and on related technical aspects, such as hardware and basic software requirements.

**Process** - This concentrates on re-designing processes to enable the enterprise to adapt to the new business models and utility needs of the ERP system in order to achieve more efficient performance.

**People** – This refers to the human resources and their capabilities and tasks in an ERP life-cycle.

**Change management** – This seeks to secure the acceptance of and readiness for the new system, allowing the enterprise to get the benefits of its use (Esteves and Pastor 1999; Nazemi et al. 2012).

According to the literature review, the most mentioned concerns of enterprises during the implementation projects are as bellow.

### 3.2.1 Integration

Although a real comprehensive information system requires integrating all functional units of the organization, not all companies that use ERP solutions use all of the modules for different causes. For instance, a company without production lines wouldn't choose the manufacturing functions. Another enterprise may think its HR department's work processes to be so disconnected from other processes that it would not integrate its HR module. Another company may consider that its internally developed manufacturing and inventory software provide it with a competitive advantage, and so the

organization would utilize the ERP Financial Accounting and Human Resources modules, but connects its own system into the packaged ERP solution. Generally, an organization's level of data integration is highest when the company uses one vendor to supply all of its modules. When a company uses modules from different vendors, additional software programming must be done to get the modules to work together (Monk and Wagner 2012). Gaining integration is dependent to configuration of the system in specific aspects. Configuration here means selecting which modules or functionalities to install and which parameters of system to set (Markus and Tanis 2000).

ERP systems are more complex to implement because of their integrative nature rather than other packages, because the implementation project should be planned and handled as a program of wide-ranging organizational change initiatives rather than as a software installation effort (Lapiedra et al. 2011).

### 3.2.2Project Finance

Based on figures and statistics of annual reports on Enterprise Systems global market, ERP implementation is an expensive IT reengineering project. The average total cost of a whole implementation project has been raised from $2.8M in 2014 to $4.5M in 2015. When expressed as a percentage of revenue, the average company pays out an average of 5.9% of annual revenue on their ownership. These numbers include software licenses, consulting fees for business process reconstructions, technical infrastructions, hardware upgrades, internal resource backfill costs and other costs required to fully deploy a new enterprise system (Panorama Consulting Solutions 2015).

**Software licensing fees** - most ERP vendors invoice annual license fees based on the number of users, the modules which are utilized other commercial criteria.

**Consulting fees** - ERP implementations need the use of consultants with detailed vast knowledge of how to install and setup the software to cover all the company's operational processes. Proper consultants have large considerable experience and know-how in the way ERP systems function practically, and they can help companies to make decisions that avoid

excessive and redundant data input, while capturing the required information to make managerial decisions.

**Project team member payment** - ERP projects need experts in the company to guide and lead the implementation. These team members have detailed knowledge of the organization's business processes, and they work with the consultants to make sure that the configuration of the ERP software will support the company's requirements. This literally means that experts are frequently leaving their daily responsibilities to participate in the implementation project.

**Employee training** - Project team members require training and reeducation programs in the ERP software so that they can perform effectively with the consultants in the implementation. The top team members sometimes cooperate with training consultants to create company-specific training plans and content for all other employees.

**Productivity losses** - No matter how smooth the ERP implementation, companies normally stop having ideal effectiveness and efficiency during the first weeks and months after jumping to the new enterprise system.

Also the cost of an ERP system implementation includes some other factors; the size of the ERP software which corresponds to the size of the company it serves, and the need for new hardware that is capable of running complex ERP software.

### 3.2.3 Business software-alignment vs. software business-alignment

An enormous majority of enterprises (93%) modified their software to some degree in 2015. Although most organizations start their ERP initiatives with the desire that they utilize the "vanilla" version, enterprises are obviously making changes yet to the way the software was aspired to be used (Panorama Consulting Solutions 2015). This may also partially explain the increasing failure rate among ERP implementations.

Enterprise systems are branded software packages; that is, they are bought or rented from software producers or sellers rather than being programmed or

customized internally. Rather than developing a system to meet the enterprise's specific operational processes, the adopters of an enterprise system often adjust the company's operations (such as production, inventory, HR, accounting, etc.) to fit the standard software (modifying packages has numerous negative consequences because as soon as an ERP system is implemented, trying to reconfigure it while keeping "data integrity" is expensive and time-consuming) (Markus and Tanis 2000). Also, organizations that purchase an enterprise system enter into long-term relationships with software vendors.

ERP standard software entails, by its structure, a certain method of doing operations, and they ask clients to obey that methodology. Some of a business's operations, and some parts of its operations, might not be a decent match with the specifications inherent in ERP. Therefore, it is imperative for a business to break down and redesign its own business strategy, operations, culture, and environment before choosing an ERP package.

ERP developers/sellers often offer a lot of setting options that help businesses modify the software to adapt their unique needs (Monk and Wagner 2012). Enterprises often would prefer to desist from reengineering their business processes and continue doing activities as they always have – rather than adopt the best practices built into the standard ERP solutions.

Although management has the ideal choice of changing the processes to match the system or the system to fit the processes, because customizations are normally associated with increased time and budget, and lack of vendor services such as software maintenance and upgrades, it should only be requested when it is essential or when there are competitive advantages derived from using non-standard processing (Motwani et al. 2005).

### 3.2.4Readiness

Sometimes, some enterprises are not ready for ERP and it means that they should perform a course of actions to make the organization ready for an implementation projects. ERP implementation complexities, usually, emerge when managers don't entirely perceive and recognize current operational procedures and cannot make decisions on implementation within a

reasonable timeframe. If an enterprise could not reshape and reengineer its operational processes to be more efficient, managers find their enterprise facing large amount of invoices for software package and consulting fees resulting no better performance in business.

Also sometimes, the readiness of an organization for ERP project depends to external circumstances. For instance, in the companies that management differs from the owners, although there might be a huge need to implement an ERP system recognized by management, the owners do not agree due to profit decrease or because of their conservative traditional point of view. In some cases, national economical (or even political) uncertainties lead to limitations for management to make a decision of implementation project.

### 3.2.5Change

Controlling the human aspects of an organizational change is called organizational change management (OCM). One of the keys to managing this change project is to realize that people do not care change, they mind being changed. If the ERP implementation is a project that is being compelled on the employees, they won't accept it and will resist it. But if employees look at the ERP implementation project as a chance to make the company more efficient and effective by improving business processes, and if these process improvements will make the company more profitable and therefore provide more job security, then there is a greater likelihood that employees will support the implementation efforts (Monk and Wagner 2012). When employees have contributed to a change process, they have a feeling of ownership and will presumably play a role in the project.

### 3.2.6Return on investment

The financial benefits resulted from an ERP system can be complicated to measure because sometimes ERP increases revenue and decreases costs in intangible forms that are difficult to calculate. Also, some efforts happen over such a long period of time that they are not easy to track (Monk and Wagner 2012). The return on an ERP investment can be evaluated and interpreted in

terms of following conditions that management should pre-investigate about them before the start of implementation.

Since ERP removes redundant data and duplicate activities it can generate savings in operations costs. Because an ERP system can help produce goods and services more quickly, more sales can be reached every month. In some cases, an enterprise that doesn't utilize an ERP system might be forced out of business by competitors that benefit an ERP system. (How is it possible to calculate the financial advantage of remaining in business?) Also, an easy functioning of an ERP system can save enterprise's human resources, suppliers, distributors, and customers much frustration. (A benefit that is real, but difficult to quantify.) Because both cost savings and raised revenues do not occur immediately, it is difficult to put an exact dollar figure to the amount arisen from the basic ERP investment.

Because ERP implementation projects are time-consuming, there may be other business factors influencing the costs and profitability which makes it difficult to isolate the impact of the ERP system alone. ERP systems provide real-time information, allowing enterprises to improve external relations to suppliers and customers. The better communication, the more customer relationship and sales.

## 3.3 ERP Implementation life-cycle

ERP systems can be complex and difficult to implement, but a structured and disciplined approach can greatly facilitate the implementation. That's why there is a considerable number of researches categorizing the whole ERP story in the enterprise which is called Life-cycle. The ERP life-cycle has been structured in dimensions and phases, generic enough to permit the classification of publications and comprehensive enough to give a general vision of the whole ERP lifecycle (Nazemi et al. 2012).

Esteves and Pastor (1999) conceptualized an ERP life-cycle framework aiming categorization of the research areas and cases. The framework was formed in phases and dimensions. Phases are the different stages of an ERP life-cycle within an enterprise and dimensions are the different viewpoints by which the phases could be analyzed (that mentioned before in the section

ERP Concerns). The phases of the ERP life-cycle include several stages that an ERP system goes through during its whole life within the implementing enterprise as following:

- Adoption decision phase – top management or the owners as main decision makers in a firm must ask the necessity for an/new ERP system,
- Acquisition phase - contains choosing the software that best matches the requirements of the enterprise to minimize the need for customization,
- Implementation phase - deals with the customization or parameterization and adaptation of the ERP package,
- Use and maintenance phase - the utilization of the software package in a way that returns expected advantages and minimizes disturbances and problems,
- Evolution phase - the system is upgraded by new technologies and additional functionalities (as mentioned in Chapter 2) are integrated into the ERP system, and
- Retirement phase - When new technologies appear or the ERP system or approach becomes inadequate (Esteves and Pastor 1999; Nazemi et al. 2012).

The eleven-step procedure of (Umble et al. 2003) is also one of the most cited and referred model of implementation life-cycle in recent years. They believe that implementation process includes

- Pre-implementation process review - which controls the successfully completion of software/vendor selection process,
- Required hardware installation and test,
- Software installation and performance check,
- System training,
- Training on a business case test environment,
- Security and access permission configuration,
- Accurate and reliable data migration from legacy systems,
- Policies and procedures documentation,
- Running the new system in either "cutover" method or "phased" one,

- Celebrate!, and
- Continuous improvements.

Since late 2000s, researches (Ehie and Madsen 2005; Munkelt and Völker 2013; Winkelmann and Klose 2008) have often divided ERP life-cycle into five major stages. Although most of the researches categorize the attempts in some-how similar phases in number, some of them have strategic and planning point of view while the others have technical one or both. Also there are some overlaps and exchanges in different definitions of phases in which more details come as following phases.

### 3.3.1 Initiatives

(Ehie and Madsen 2005) believe that project preparation is an all-inclusive and complete planning that involves determining the project plan, establishing budget targets and people handling leadership roles and to be followed-up, while (Winkelmann and Klose 2008) consider it as creating the infrastructural framework, mainly labeled the phase of project initialization.

From strategic project point of view, enterprises must organize the project through steering committee formation and project team selection, define the scope and vision of the project based on performances and objectives, and create detailed project plan including assignments and responsibilities in a very first stage of initialization.

From technical point of view, all attempts regarding hardware infrastructures and software configurations (i.e. launch of ERP Server, installation test system, installation and launch of Windows-Server and desktop clients, etc.) must be done in this early period of time.

Change management a crucial aspect especially during the first stage of any IT implementation project that is a socio-technical change that needs to be managed. Change management deals with all aspects of organizational changes including advertising the project, managing employee training and reeducation, and managing the transition to new operations and business processes enterprise-wide (Munkelt and Völker 2013).

This phase of initiatives that averagely takes 15 to 20 days include organizing the technical team, defining the system landscape (including servers and

network), selecting the hardware and database vendors, and, most importantly, defining the project's scope (Monk and Wagner 2012).

### 3.3.2From Requirement Analysis to Blueprint

The second phase includes a set of attempts regarding as-is analysis functionally and technically. In fact, the project team cooperating external consultants starts with analyzing the current business processes through business process re-engineering method, diagrams and flowcharts in order to find gaps and failures in processes and also find a fit ERP software package to cover as much business processes as possible.

(Ehie and Madsen 2005) mention that two main activities occur in this stage; first, Mastering the ERP system which is configuration and parameterization of selected ERP package, and second, New process design mapping which is the combination of software customization and enterprise-wide business process reengineering (BPR). All of new hierarchies, scenarios, tables and scripts should be accomplished in this stage.

Starting point of the as-is analysis has been the process and SWOT analysis, conducted in the context of the earlier software evaluation. During the as-is analysis, existing process documentation was extended by further summaries. (e.g. lists of work places or types of products with corresponding bill of materials) Technical as-is analyses such as current master and transaction data analysis and current IT solutions evaluation belong to this phase. Business document overviews and other reports, generated while performing the as-is analysis, are creating the basis of the to-be design (aka Project Blueprint), in terms of developing forms and user input masks and designing the role and user authorization concepts based on available staff lists (Winkelmann and Klose 2008).

The Blueprint also initially defines the users' access levels and deals with integration of external systems, e.g. offline Customer Relationship Management systems, Advanced Planning Systems, Computer Aided Quality Assurance systems, Data Warehouses, B2B platforms, B2C web frontends, and Smartphone applications. To-be analysis deals not only with software,

but also with the hardware of the IT infrastructure which includes an emergency and backup concept (Munkelt and Völker 2013).

When an old enterprise system should be upgraded to a new ERP package, it is critical to do the As-Is analysis as well. It should be controlled whether the current business processes and operations fit the formerly set-out "to-be" processes.

Business Blueprint that guides consultants and project team members in setting the ERP system up and migration from legacy systems averagely takes 25 to 40 days and provides a detailed documentation and explanation of how the enterprise intends to run its business with the ERP system (Monk and Wagner 2012).

### 3.3.3Realizing

The third phase, realization, focuses on developing the technical foundation through modifications and interfaces conversion while testing each process design on a conference room pilot and prototyping and adjustment toward final system.

All ERP systems can be configured to cover a variety of business processes. However, this flexibility is limited. Therefore, the need of customer specific development (modification/customization) arises. In most cases, it should be preferred to adopt the formerly determined best-practice "to-be" business processes to the ERP system rather than extending the ERP system (Munkelt and Völker 2013). Almost all related researches strongly and congruently do agree on avoiding the development of specific add-ons (known as customization) as much as possible.

Applying the customization to meet the specific requirements is done during the Realization stage, using a prototyping approach. System functionality was implemented and discussed with relevant employees of affected functional departments, based upon a typical mandate (Winkelmann and Klose 2008).

From a technical point of view, there are usually three different sorts of customization in an ERP realization: (Munkelt and Völker 2013)

- Codeless configuration: This kind of setting needs an in-depth and complete understanding of the ERP system and the new business processes, but it does not need writing source code. Rather, codeless configuration is performed in a built-in and often graphical application given by most of ERP software packages.
- Application development: This kind of software development is required to complete functional incompleteness with add-on applications which are designed and programmed by external providers because it normally does not pay off to establish the required expertise inside the enterprise. A smooth and thorough integration of the ERP package into the IT properties of the enterprise is a key success factor. In most cases, interfaces to Manufacturing Execution Systems, Product Data Management systems and Warehouse Management Systems are required.
- Key performance indicators and reports: ERP implementation projects always deal with reporting. Standard reports provided by the standard ERP software must be harmonized and compatible with enterprise specific reports which are already in use. Any inconsistencies and misinterpretation in this reconciliation lead to dissatisfaction, repeated “incidence reports”, long explanations, and thus additional effort. The expertise for report development should be gathered in-house – in contrast to application development.

### 3.3.4Testing

In the fourth phase, final preparation, the entire process design integration is tested under full data load and extreme situations and tuned through finalizing all processing options, profiles and menus, and testing robustness. Simultaneously, the people supposed to utilize the system and also those influenced by it will go through the reeducation and training programs on new processes, data disciplines and modules to learn how data flow and the system itself are operated at each point in the supply chain (Ehie and Madsen 2005).

Testing the software and solution is an imperative errand. The test ought not to be constrained to the parts of the product influenced by customization.

Even a just-out-of-the-box ERP system should not be expected as an error-free product. Although it is strongly suggested to make at least one trial run of each business process, testing the main processes could be enough due to their coverage of the majority of the business transactions (Munkelt and Völker 2013).

Final Preparation that averagely takes 35 to 55 days include testing the system throughput for critical business processes, Setting up the help desk where end-users can get support, Setting up operation of the Production system and transferring data from legacy systems, Conducting end-user training, Testing documentation by texts, screenshots and diagrams, and Setting the Go Live date (Monk and Wagner 2012).

### 3.3.5Go Live!

During the final phase of rolling-out and operation, the master data must be recognized and migrated from test system, system behavior should optimized through technical tuning, and user requirements should be adjusted. After extensively testing the system's functionality and integration, the ERP solution can be transferred to the production environment (Winkelmann and Klose 2008). The Go Live and support phase emphasizes process flow optimization and continuous enlargement and improvement of the system to benefit new competitive advantages (Ehie and Madsen 2005).

ERP system transition might be done either with a "Big Bang" (mentioned as cutover method in (Umble et al. 2003)) or in a phased approach. The phased approach seems to be safer at a first glance, but is outstandingly more complicated to accomplish due to the complex interdependencies between modules and business units (Munkelt and Völker 2013). Case studies recommend a Big Bang transition at least for key modules. Transition comprises data migration, system activation and user training. The change of fiscal or calendar year is the best occasion to activate the new ERP system.

Training and reeducation programs and also providing an enterprise specific user guide which is driven from consultant's experiences and primary implementation phases are other important facets of the transition stage. Also data migration from the legacy to the new system is a remarkable part of

the roll-out stage. While the migration of master data is rather easy, it is hard to transfer transaction data, since transaction data structures are more complicated and intertwined (Munkelt and Völker 2013). Wise managers try to schedule the Go Live date for a period when the company is least busy! Also a properly staffed *help desk* is critical for the success.

After successfully implementing the ERP solution, the existing systems need to be continuously analyzed to receive full information on the current usage and configuration of the software. This could uncover the unused potentials and lead to discovering necessary improvements (Thome and Hufgard 2006).

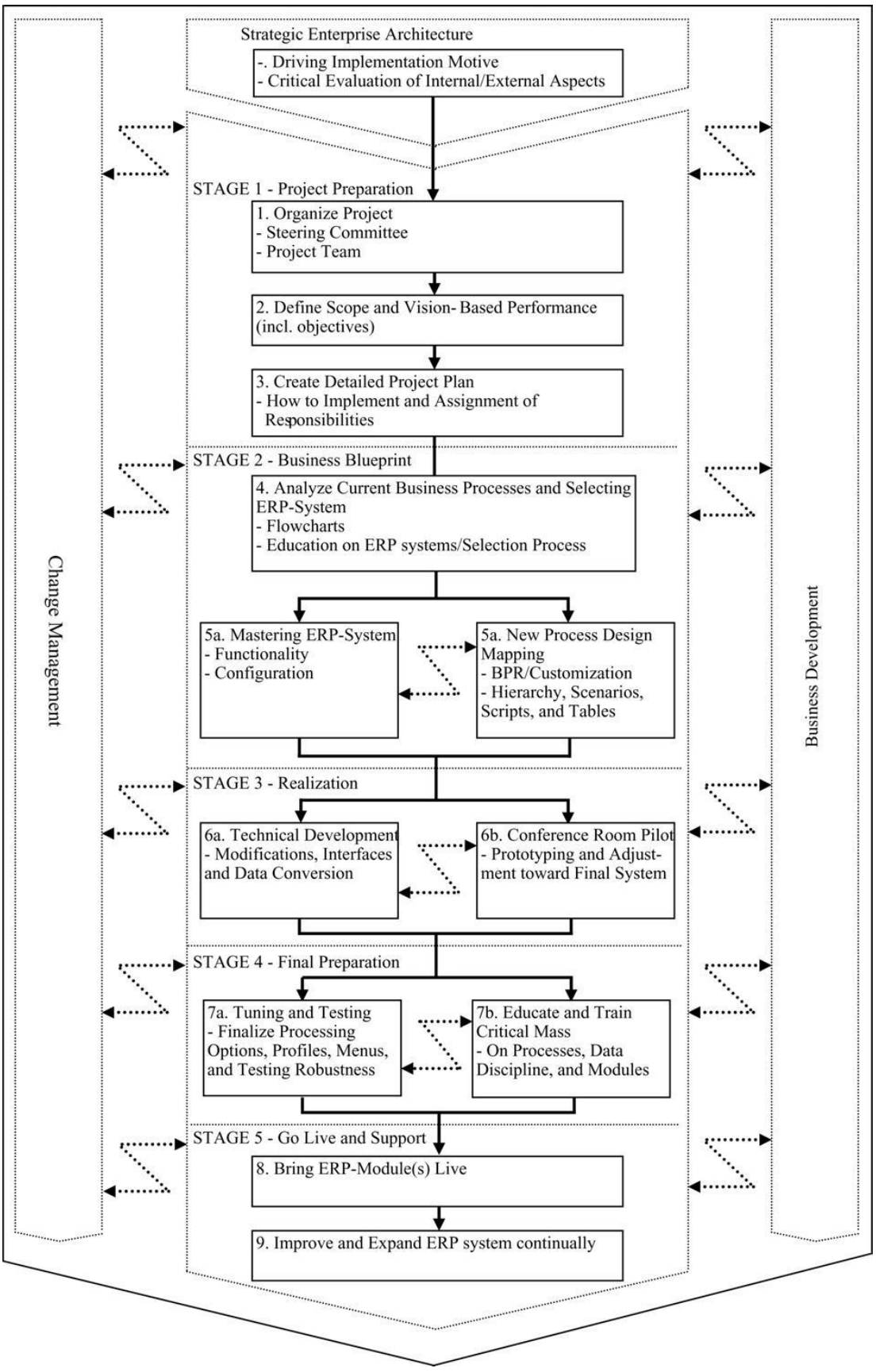


Figure 3 - A five-stage ERP implementation process, (Ehie and Madsen 2005)

## 3.4 Consultant and Vendor Selection

Deciding which ERP software package should be selected and finding an appropriate implementation partner/consultant, is the foundation of a successful first-time implementation of ERP or of an evolution of the enterprise system within an organization. The choice of the specific ERP software package requires prudent well-investigated decision making. It is also required to keep in mind that the software must fit the business processes. Many studies prescribe the necessity to benefit a consultant as an important part of the project. However, as part of this relationship, it is essential to transfer knowledge from the consultant to the enterprise employees who are affiliated to the project to decrease the dependency on the consultant/vendor (Al-Mashari et al. 2003; Finney and Corbett 2007; Motwani et al. 2005; Somers and Nelson 2004; Yazdani et al. 2013).

Enterprises choose vendors/consultants for the sake of different grounds. Sometimes they select a vendor who has a pioneer image or is a market leader. Sometimes they consider the quality and functionality of the software package and services offered by them (Beheshti et al. 2014).

As ERP software packages are somehow huge and complicated, one person is unable to fully understand a single ERP system and compare various systems properly. So, before choosing a software vendor, most enterprises analyze their requirements and then appoint an external team of software/business consultants to help select the accurate software vendor(s) and the best methodology to implementing ERP. Cooperating as a team with the customer which is the implementing enterprise, the consultants utilize their expertise and knowledge to selecting an ERP vendor (or vendors) that will best match operational and process requirements of their customers (Monk and Wagner 2012).

Although most ERP packages have similarities, they have considerable dissimilarities. Most ERP software vendors make assumptions about management philosophy and business operations and processes. Therefore, purchasing an enterprise system/ERP package means much more than buying software. It actually means buying into the software vendor's view of best practices for many of the company's processes (Umble et al. 2003). An enterprise that implements ERP should mostly accept the vendor's

assumptions about the business processes and change existing ones to conform to software defaults or built-in configuration possibilities. Therefore, each organization should try to select and implement a system that underlines its unique competitive strengths, while helping to overcome cut-throat weaknesses. The ideal aim should be to improve the productivity, not to implement software.

Two different approaches can be applied for system selection. One approach is to carry out some general business strategy by focusing on the information technology infrastructure. Some enterprises, especially large ones, may obtain their greatest benefit through the "centralization of data" and "increased control". The other approach is to determine the particular modules that are needed to run a specific business. So some enterprises, especially small and medium ones, may opt for software that closely matches the specific functions and processes of their business to more easily manage the business, increase efficiency of operations, and reduce costs (Umble et al. 2003).

However, the rate of partial or full failure for ERP projects is not relatively low. Also, many of these systems fail to deliver the desired results (Panorama Consulting Solutions 2015). Preventing failure the enterprise should run a very precise primary realistic analysis to assess requirements of enterprise regarding new technology (Beheshti et al. 2014). The significance of an effective vendor selection process must not be neglected. This chapter section includes some most cited and mentioned-as-practical procedures and suggestions for the selection process.

### 3.4.1 Strategic Management Approaches

As a very primary advice, based on the available sources and their own experiences, (Umble et al. 2003) recommend the following thirteen-step selection process:

- Create the vision: Defining the corporate mission, objectives, and strategy. Apply inter-functional groups and executive-level data and information to identify, inspect, and re-think existing business processes.

- Create a feature/function list: Recognizing the features and functions needed for the software to effectively cover each functional area as well as the general enterprise mission and vision.
- Create a software candidate list
- Narrow the field to four to six serious candidates
- Create the request for proposal (RFP)
- Review the proposals
- Select two or three finalists
- Have the finalists demonstrate their packages
- Select the winner
- Justify the investment (Cost/Benefit Analysis): Based on the specific ERP software that has been selected, the potential tangible and intangible benefits of the implementation can be compared to the costs.
- Negotiate the contract
- Run a pre-implementation pilot
- Validate a justification: Using all information accumulated to this point and make a final go/no-go decision on contract.

The consultants identify and suggest the modules that are effectively match to the business processes and built-in configurations that are most appropriate. This pre-planning has to include not only the consultants and IT department of the enterprise, but also the management of all functional business areas.

In the past 40 years, within the research field of industrial marketing, conceptual models such as Webster and Wind's General Model of Organizational Buying Behavior (OBB) and Sheth's Model of Industrial Buyer Behavior (IBB) have been developed to understand enterprises' purchasing procedures. Both the Webster and Wind, and the Sheth models recognize factors that influence the required product selection process. Based on these OBB and IBB models and some case studies, (Verville and Halingten 2003) purposed a six-stage model of ERP software acquisition process (MERPAP) as following which focuses mostly on planning, team building and selection criteria.

**Planning process** – this stage includes:

*Acquisition team formation*: Select the person who is responsible for supervising vendor selection process and the team who participate in this subproject.

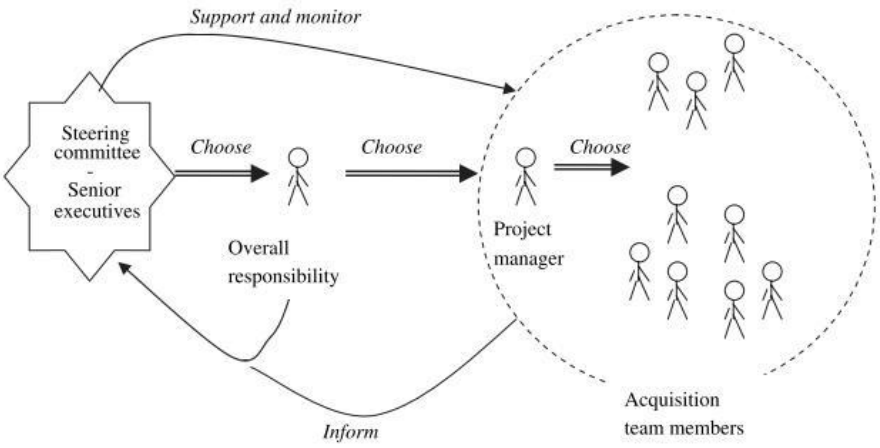


Figure 4 - Delegation process during acquisition team formation

Counseling with the steering committee (the senior executives), the project manager should be able to pre-define the required skill levels for the selection team members. Also, on an orderly basis, the committee should observe the team's progress against the predicted plan, and costs against budget. The team builder should ensure that each selected team member has relevant knowledge and experience, include user representatives within the acquisition team to increase credibility of acquisition decision, and have strong management commitment and support.

*Requirement definition*: Determine the enterprise's current technological environment, user areas and functions, and problems and opportunities. Is the platform that the enterprise intends for the proposed solution to operate on ideal for optimum performance? Is the enterprise's current Database Management System compatible with the proposed solution? Can the solution integrate into the enterprise's existing hardware architecture? And some other challenging issues such as scalability of the system, customization, training, etc. In fact, the more the acquisition team's awareness and perception of the enterprise processes and conditions, the more accurately it can define the requirements.

*Establishing selection/choice and evaluation criteria*: Determine assessment factors and selection criteria, and make sure criteria are based on determined requirements. The weight and significance given to each of them may change during the acquisition process, but the team should be agreed on what they are.

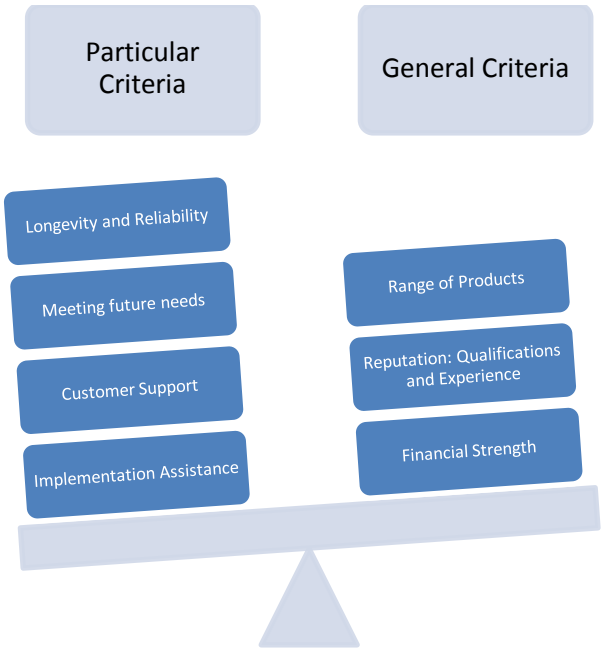


Figure 5 - Particular and general criteria regarding ERP vendor selection

Figure 5 shows a sample of vendor evaluation criteria which separate particular and general criteria. Some other cited criteria are as following:

- Market share (sales volume, size)
- Reputation (successful references)
- Product recognition
- Annual growth rate
- Strategic positioning
- Longevity
- Proposal quality
- Similar experiences
- Requirements and limitations analysis and understanding

Implementation plan and strategy properly position the proposed solution to achieve the maximum level of business benefits when implementation solutions are included.

*Choice of acquisition strategy*: Identify methods and specific activities which will be applied to make a contract with a software vendor (how to do the acquisition?) Actually the deliverables are strategies to proceed in subsequent phases, which could include a timetable and milestones.

*Forecasting acquisition issues*: Problems emerge in many forms, and the importance of a problem differs from one enterprise to another, which makes it difficult (but not impossible) to provide advice. There is no "surefire recipe", but trying to forecast possible problems is one way of managing and decreasing the risk associate with the ERP selection.

**Information search process** - Enterprises should find information about providers and existing technologies and solutions from different sources, establish a shortlist of them, and make sure that shortlist of vendors includes both major and minor providers. The information regarding specialized technologies and solutions is obtained from a variety of sources, including technical and trade publications, referrals/consultants and professional research companies.

**Pre-Selection process** - A go-between stage between the planning process and the evaluation process, and includes only two general affairs: Evaluation of RFI/RFQ/RFP (Request for Information/Quote/Proposal) Responses and Create Short list of Vendors/Technologies.

**Evaluation process** - Involving three different domains of evaluation: vendor, functional, and technical. The criteria and strategies that have been established during the planning process are utilized to apply all three sorts of evaluations.

**Choice process** - A final suggestion is presented to steering committee (or board of senior executives) who make the final decision.

**Negotiations process** - This is divided into two types of business negotiations and legal negotiations. As many issues as possible are addressed in the business negotiations phase. Then, once uncertain and unconfirmed agreements were reached, and the choice made, legal negotiations emerge and lead to the completion and sign off of the final contract (Verville et al. 2007). Munkelt and Völker (2013) have also defined a vendor/consultant selection similar methodology.

### 3.4.2Mathematical Approaches

There are also some mathematical/numerical approaches to vendor selection in literature review based on multi-criteria decision making (MCDM) methods such as a comprehensive methodology which considers both subjective and objective criteria while choosing the ERP software, in which by benefiting from the fuzzy set theory, quantitative criteria are regarded and an indicator called “fuzzy ERP suitability index” was used to determine the suitability of ERP alternatives and criteria importance weights (Wei and Wang 2004); a list of ERP selection criteria and the importance/weights of the criteria by a survey among the firms in Turkey (Baki and Cakar 2005); an AHP (Analytic Hierarchy Process) based approach to ERP system selection problem (Wei et al. 2005); a two-stage methodology in which in the first stage ERP system properties are determined by collecting information about the possible ERP sellers and in the second stage, a mathematical model is proposed to minimize the total expenditure related with procurement and integration (Ziaee et al. 2006); an ERP selection methodology based on the task-technology fit theory (Wu et al. 2007); a fuzzy-ANP(Analytic Network Process)-based decision making tool for ERP selection problem(Perçin 2008; Razmi et al. 2009); a combined decision making approach handling both quantitative and qualitative factors via fuzzy set theory and random experiment based solution (Şen et al. 2009); an ERP software selection methodology based on artificial neural network and analytic network process (Yazgan et al. 2009); and the wave of hybrid MCDM methodologies for ERP selection problem utilizing interacting criteria and different approaches (Gürbüz et al. 2012; Kilic et al. 2014, 2015).

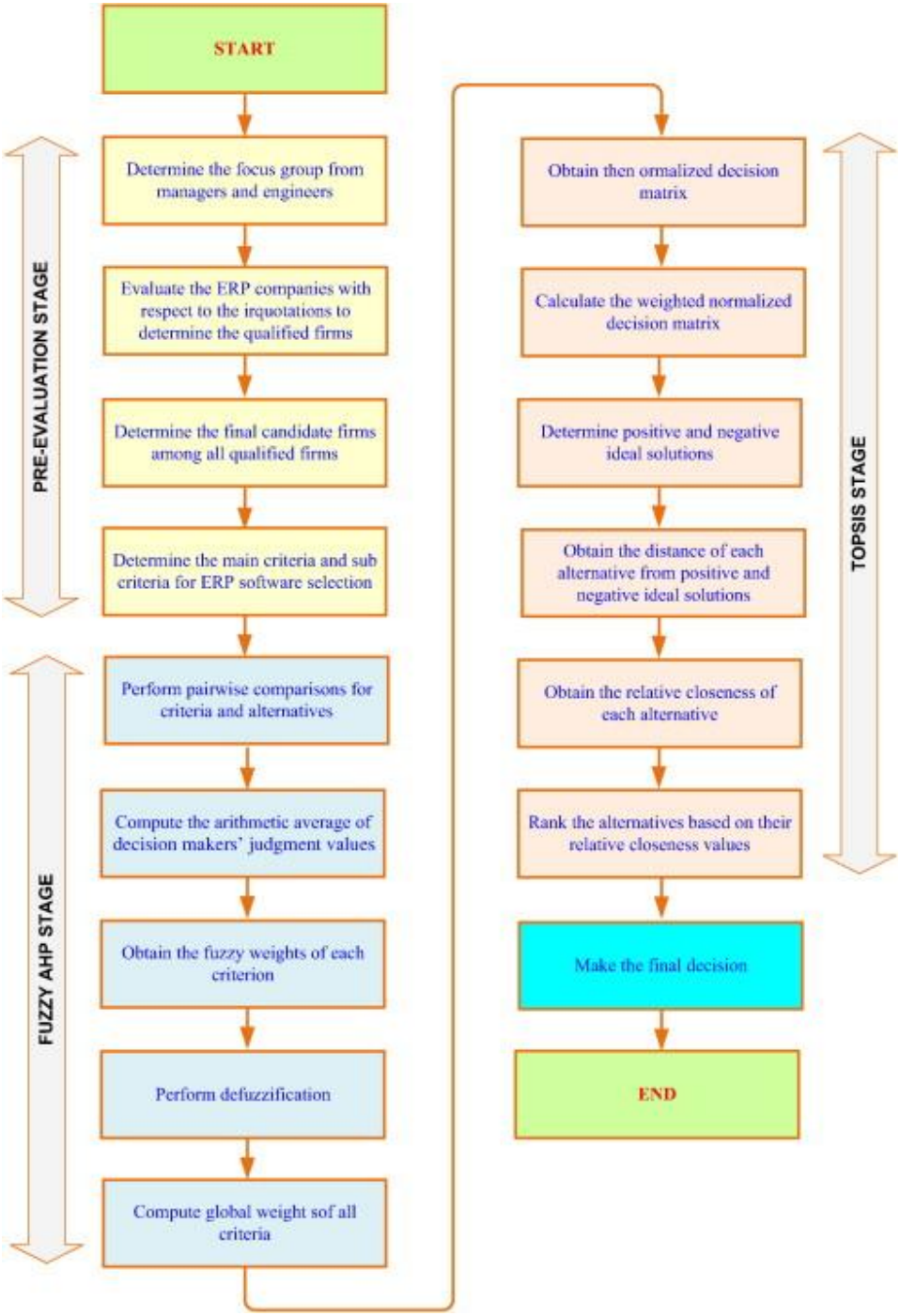


Figure 6 - The main structure of a hybrid methodology, (Kilic et al. 2014)

A proper match between the software vendor and user enterprise is correctly associated with packaged software implementation success and that enterprises have to try to maximize their flexibility with their vendors/consultants to increase the competitiveness and efficiency. There will always be new modules and versions to install and better fits to be achieved between business and system. Therefore, vendor support plays a

significant role including extended technical assistance, emergency maintenance, updates, and special user training (Somers and Nelson 2001).

Some enterprises are saying they would have chosen the same ERP software vendor again if they could do it all over again (69% in 2015 versus 76% in 2014). This means that enterprises are fighting for ERP systems' selection and implementation in a way that they would consider a success (Panorama Consulting Solutions 2015).

The expenditure of packaged ERP software, the effect of its selection on the enterprise, and the type and pure volume of issues that need consideration, all justify in-depth planning of the acquisition (Verville et al. 2007).

## 3.5 Critical Factors for ERP Implementation

Critical factors, in fact, can be viewed as situated examples that help to extend the boundaries of process improvement and whose effect is much richer if considered within the context of their importance in each stage of the implementation process (Somers and Nelson 2001).

Early ERP implementation reports confess that only a low percentage of enterprises experienced a smooth rollout of their new ERP systems and immediately began receiving the advantages they predicted. An uneven utilization and low return on expectations are normally rooted by human issues, not software failure. Therefore, the critical factors are investigated by enormous point of views, and categorized in multifarious frameworks.

As the most common lessons for a general enterprise system implementation project, experts overuse the argument of proper education and training for both employees and managers. Most people will naturally resist changing the way they used to do their tasks, and active top management support and change management are, therefore, crucial for successful acceptance and implementation of such enterprise-wide changes (Monk and Wagner 2012).

In a very primary vast investigation of success factors, (Al-Mashari et al. 2003; Kræmmergaard and Rose 2002; Nah et al. 2001; Somers and Nelson 2001, 2004) propose a then overall list factors associated with project/system implementations obtained out of a methodologies including identification

and synthesis of those critical requirements for implementation that have been recommended by practitioners and academicians, and through an comprehensive review of the literature. They show that top management support, project team competence, interdepartmental cooperation and partnership with vendor/implementer are important during almost all implementation stages.

Other researches provided detailed and focused investigation on factors associated with ERP projects rather than overall taxonomy reports. For example, (Motwani et al. 2002) detect that organizational environment, ready culture, and balanced network relationships are key factors to ERP success, and (Mabert et al. 2003) emphasize that a clear instructions on how to recruit outside consultants and apply detailed plans for training users are critical.

Findings on critical factors related to ERP implementation success have been continued and carrying currently on. Several studies have categorized multifarious factors into 8 to 12 major classes including top management support and commitment (Bradley 2008; Finney and Corbett 2007; Lin 2010; Muscatello and Chen 2008), effective project management and team (Chen et al. 2009; Finney and Corbett 2007; Skaf 2012; Umble et al. 2003), business process reengineering and continuous system engineering (Muscatello and Chen 2008; Somers and Nelson 2004; Thome and Hufgard 2006), vendor support and employees training (Bernroider 2008; Ehie and Madsen 2005; Finney and Corbett 2007; Upadhyay et al. 2011).

### 3.5.1 Initiatives: Clear understanding of strategic goals

Every process change normally starts with strategic initiatives (often included in the corporate strategic plan) from the board of top management. They could be a re-action to a requirement (e.g., enterprise's inability to provide integration through whole organization) or a pro-action to leverage potential opportunities. It's demonstrated that strategic changes are often incremental, informal, emergent, and founded on learning through small progresses versus being revolutionary and radical. Strategic initiatives include four

variables of Stimuli, Scope formulation, Decision making, and Strategy-led plans (Motwani et al. 2005).

Research studies recommend that insufficient determination of functional requirements results in somehow 60% of implementation failure (Guido and Pierluigi 2011). Several researchers repeated the need to address the implementation strategy and to, specifically, implement the ERP under a "phased approach". Other researchers addressed the question of whether the implementation should be centralized or decentralized, that has to be answered in strategies of the project (Finney and Corbett 2007). Therefore, an implementation strategy and timeframe is considered as critical.

There should also be clear definitions of aims, presumptions, and outcomes. The enterprise should carefully determine why the system is going to be implemented and what critical business requirements the system will tackle (Umble et al. 2003). Any project should begin with a conceptualization of the aims and feasible procedures to fulfill these aims. It is significant to define the aims of the project before even seeking top management support. The “triple constraint” of project management specifies three often competing and interrelated goals that need to be met: scope, time, and cost goals. Many ERP implementation projects deal with scope creep as a result of lacking a clear plan (Somers and Nelson 2001). Goals should also be measurable, planning should incorporate a certain level of risk and quality management, planning style should be reflective of tasks to be achieved, and finally, the planning should involve benchmarking internal and external best practices for ERP implementation (Al-Mashari and Al-Mudimigh 2003).

Expectations of an enterprise might be more than capabilities of the system. Attentive considerations of success measurement as well as management of expectations by the project manager are critical factors through all stages of implementation (Somers and Nelson 2001).

The implementation of an integrated system is a strategic action, and, as such, requires to be assessed by steering committee which is top management. The objectives of the whole enterprise, as well as a cross-functional and unifying overview, need to be worked out and publicized (Guido and Pierluigi 2011). This kind of business case involves conducting

economic and strategic justifications for implementing an ERP (Finney and Corbett 2007).

### 3.5.2 Consultant Selection and Knowledge Transfer

Consultant support and knowledge/expertise transfer are the two crucial factors for successful ERP implementation project. The consultants may push the progress of ERP implementation projects directly through their experience and technical expertise and indirectly through the effective transfer and sharing of knowledge among project members and system end-users. In fact, knowledge transfer may increase the level of user know-how, so then project members and users should be able to maintain and develop the system afterward without consultant help. Thus, hiring the supportive consultants is essential, especially since the consulting fees are nearly high (Maditinos et al. 2012).

Many enterprises use consultants to ease the implementation process. Consultants might have experience in certain industries, vast knowledge about specific modules, and might be more competent to determine which software package will fit for a given company. Consultants may be applied in different phases of the implementation project: performing requirements analysis, recommending a suitable solution, and handling the implementation.

External consultants play a pivotal role in the result of ERP implementation. Consultant eligibility is highly connected to the extent of support, help, and cooperation that they provide during the project. Competent consultants have knowledge about methodologies and experience from real system implementations.

When an enterprise utilizes the services of an external consultant, the key factor to reach the project targets is the quality of the client–consultant relationship and communication (Lapiedra et al. 2011). The use of an external consultant depends on internal know-how that the organization has at the outset of the project (Upadhyay et al. 2011).

The consulting that exists during and after the implementation of an ERP system is significantly crucial for every enterprise. The three main criteria

that relate to the ERP consulting affairs are communication effectiveness, conflict resolution, and knowledge transfer (Maditinos et al. 2012).

- Effective communication is a well-built basis of a reliable and honest cooperation between external consultants and enterprise employees. The more consultants and employees understand each other, the more effective the communication becomes (Wang and Chen 2006).
- Certain conflicts may take place between users and consultants which may influence the outcome of the consultant-client cooperation in an undesirable way. However, the appearance of dissents before, during and after implementation should not be counted as a negative point in the cooperation, but rather as a usual occasion during a long-lasting collaboration.
- Knowledge and technology transfer in the ERP consulting process could be considered as an incremental procedure in which knowledge (expertise and experience) and even technology (e.g. supplementary technologies like RFID, GPS, etc.) are being transferred from external consultants and vendors to the enterprise. An increased level of knowledge concerning the ERP system will enable the company to exploit the new technology to its full potential and continue to achieve benefits from the use of the system in the future (Wang et al. 2007; Yazdani et al. 2013).

The adopting enterprise should 1) assure that the knowledge transfer process is not short or inconclusive, since the limited consultation period is a factor that weakens potential positive effects (Nah et al. 2001), and 2) appoint its most notable employees (all related departments) to be able to play the role of the "internal consultant" after the contract period of the professionals (Maditinos et al. 2012). Consultant support is pivotal to achieve the required knowledge transfer to the enterprise. The more extended the consultant support is, the more successful the transfer of knowledge to the adopting company will be (Wang et al. 2007).

As the consultants have the technical knowledge and expertise to help users in filling the inevitable knowledge gap which is the consequence of new enterprise system, they play an important role in the ERP implementation project. An effective consultant owns both appropriate practical background,

as well as the skill to communicate knowledge and experience. That's why an effective communication and an a resulting form of negotiation during the whole implementation project should be achieved (Wang and Chen 2006).

They should also own an expansive understanding of the business practices and a real honest commitment towards resolving daily challenges regarding ERP system implementation. The consultant group should be considered as a valuable partner in the ERP implementation process that they need the support and the acceptance of the enterprise staff and top management to fully transfer their valuable expertise to have a new system that functions productively. If enterprise bears a negative attitude towards the professional team of consultants, the implementation project will surely fail or at least produce poor results (Maditinos et al. 2012).

Depending to how competent a consultant might be, ERP implementation will not operate integrated and effective unless the internal role-players (top management and users) are committed and intended to the adoption and the use of the ERP system (Wang and Chen 2006). Also there is a significant causal connection between service quality of system providers and implementation consultants, and the project management and then the system performance (Tsai et al. 2011).

### 3.5.3 Top Management Commitment

Any ERP implementation project is of failure unless it would be supported and promoted in a top-down way. The top management should be in charge of the project hundred percent to be successful.

The roles of top management in enterprise system projects include developing an understanding of the capabilities and limitations of IT, establishing rational targets for enterprise systems, demonstrating strong commitment to the successful accomplishment of the project, and communicating the corporate IT strategy to all employees (Somers and Nelson 2001).

Since executive level input is critical in the time of reengineering and analysis of existing business processes, the implementation project should have an steering committee (aka top management) that is committed to enterprise

integration, understands ERP methodology, fully supports the costs, demands payback, and champions the project (Umble et al. 2003).

The emphasize on management support proves the need for leadership to foresee any sudden malfunction that might be encountered and also the need for senior management who should be involved in the strategic planning, but who are also technically oriented (Motwani et al. 2005). It is also empirically shown that strong and committed leadership at the top management level is essential to the success of an ERP implementation (Finney and Corbett 2007).

For many employees it is confusing and complicated to understand that ERP implementation is not only simply a package installation, but also a long journey of small adjustments, upgrading, and continual learning. Thus, it may result in a sense of blocking, dissatisfaction and even anger at the system and in some cases total abandonment. An ERP implementation unlike any other IT project does not only change employees' computer screens, but it changes the way they do their jobs and how the company does business. Top management, therefore, should deeply perceive the degree to which changes and supports needed for the new project, and be comfortable with the fact that the decisions their planners make will have a deeply-felt effect on the whole supply chain (Lin 2010; Muscatello and Chen 2008).

ERP implementation and utilization success is complexly intertwined with the top management who set the strategic direction of the project. This factor strongly correlates with ERP effectiveness among all the factors recognized in various studies. This support should be continued by monitoring of the utilization. "A mere lip service or lukewarm (unenthusiastic) support from top management is the ‘‘kiss of death’’ for any ERP implementation" (Ehie and Madsen 2005).

### 3.5.4Organizational Change Management

ERP implementation brings a shocking amount of change for the enterprise employees and the supply chain. Project members and especially top level ones need to manage that change well so that the project and also system utilization goes smoothly.

Many ERP related researches have traditionally concentrated on internal factors, by emphasizing the significance of a corporate culture regarding change and learning. (Ke and Wei 2008; Kwahk and Lee 2008; Lapiedra et al. 2011)

ERP systems present enormous change that may cause resistance, confusion, human and information lay-offs, and errors. It is approximated that more than half of ERP implementations fail to achieve expected benefits because the enterprises remarkably underrate the attempts dealt with change management" (Guido and Pierluigi 2011; Somers and Nelson 2004).

Even the most flexible ERP system forces its own methodology and functionality on an enterprise's strategy, organization, and culture. Implementation of an ERP system may, therefore, impose the reengineering of key business processes and/or development of new business processes to support the enterprise aims. Redesigned processes need *comparable realignment* in organizational planning to empower the effectiveness of the reengineering efforts. This realignment typically influences most functional areas and also social systems within the enterprise. The emerging changes can outstandingly impact the structures, policies, processes, and staff of the enterprise. ERP implementations can activate deep changes in corporate culture. If the staff is not prepared for the imminent changes in an appropriate way, then denial, resistance and chaos will be correctly expected consequences of the changes emerged by the implementation. But if actual change management plans are used, the enterprise could be prepared to accept the opportunities provided by the new ERP system (Umble et al. 2003).

To manage this great change adequately, one key task is to shape user acceptance of the project and a positive attitude. This might be done through reeducation and conceptualization about the advantages and necessity for an ERP system. Part of this building of user acceptance should also include guarantying the support of opinion-leaders[1] all over the enterprise. A team leader is always required to effectively negotiate among various opinions all

[1] An Opinion-leader is a well-known individual or organization that has the ability to influence whole corporate opinion on the subject. They may be consultants, old retired managers, etc.

over the enterprise. ERP project planning must be considered as a change management initiative not an IT initiative (Abdinnour-Helm et al. 2003; Finney and Corbett 2007; Somers and Nelson 2001).

It is crucial to comprehend the business characteristics and believe the need for a culture that is conducive to change. Implementation costs must be decreased as much as possible from the viewpoints of all stakeholders. Attention should be given to recognize and apply strategies that are necessary to change the corporate culture (Tarafdar and Roy 2003).

Process approach to ERP research focuses on finding out how the change process derived by ERP implementation occurs over time. This approach views ERP implementation as a sequence of steps inwhich homologous efforts occur. The stage models introduce clear assumptions about the nature of change they all presume the existence of an underlying form, logic or plan that controls change process. Resistance to change is often the result of lack of *end-users involvement in defining the implementation process* (Guido and Pierluigi 2011).

Change management entails balancing forces in favor of a change over forces of resistance. Enterprises, departments or divisions, or individuals resist changes that they perceive threaten them. Corporate transformation comes with a general dissatisfaction with the status quo by employees who have to change, a vision of the future, and a well-managed change process. Revolutionary and evolutionary change theorists offer opposite approaches for change management that vary based on the type of human resource participation, communication about the change, and leadership nature. Therefore, the following change characteristics are the major constructs to manage it properly:

- Change pattern (formal versus informal)
- Readiness of management for change (i.e. being committed to it, participative in the process, or resistant to it)
- Change scope (continuous improvement versus radical change)
- Change management visions and tactics (evolutionary versus revolutionary change tactics) (Motwani et al. 2005).

"*Companies that get their implementations right the first time by investing in key critical success factors such as organizational change management and business process reengineering are spending less on their implementations in the long term*" (Panorama Consulting Solutions 2015). While change management is considered as one of two most extensively cited critical factors, there still appears to be much variation regarding what exactly is covered by the concept and what specific change management efforts would function (Finney and Corbett 2007).

#### 3.5.4.1 Organizational Learning

Increased efficiency can be the result of learning by doing and accumulation of knowledge through cross-functional cooperation. Learning can also be caused by scanning external information. This can come from technology gatekeepers who always review the environment for new developments and opportunities, consultants who span the boundary between the environment and the organization, and from customers. Learning capacity includes five variables of Adaptation and tendency to learn, Learning-by-doing, knowledge sharing, External-information-use (consultants, benchmarks, etc.), Learning strategy and type (Motwani et al. 2005).

The need for troubleshooting skills will be an ongoing requirement of the implementation process (Al-Mashari et al. 2003; Finney and Corbett 2007; Mandal and Gunasekaran 2003; Nah and Delgado 2006). While some findings emphasize the need to be flexible in ERP implementations and to learn from unforeseen circumstances, some others echo the need to prepare to handle sudden crises situations.

Corporate culture inhibits the integration of individual learning with organizational learning by empowering the capability to learn, share information, and make decisions thorough enterprise.

#### 3.5.4.2 Business process re-engineering (BPR)

Some managers blindly hope that new enterprise system will solve principal business problems that are not curable by the legacy systems. But the origin of the malfunctions may lie in unsound main business processes. Therefore,

unless the enterprise changes its business processes, it will just be computerizing the incorrect way to do business.

An ERP system alone cannot improve productivity and integration unless an enterprise redesigns its business processes to perfectly match software's best practice configurations. To maximize the profit of ERP investments, the supplementary reengineering of business processes assures the highest ROI, but also increases complexity, risks and costs (Somers and Nelson 2001).

Process management is defined as a set of theories and tactics aimed at better utilization and function of business processes. It merges methodological approaches with human resource management to improve the outcome of business process reengineering.

The need to conduct BPR and software configuration was the third most commonly cited critical factor for ERP success/failure. BPR leads to a comprehensive instruction of how the business will operate after the package is in use with the overall objective of fitting the goals/requirements to the implemented system. This stage may include business process change methods such as business process modeling or other vendor development tools (Somers and Nelson 2001, 2004). Special deliberation during this stage can involve the need to upgrade the ERP interface quality as well as the need to plan technical infrastructure (Mabert et al. 2003).

Effective BPM has following dimensions:

- Measurement
    - Process information capture
    - Process metrics
    - Process audit
    - Improvement feedback loop
- Tools and techniques
    - Quality control tools
    - Simulation
    - Data flow diagrams
    - CASE tools
- Documentation
    - Process flow chart analysis
    - Fishbone and root-cause analysis

Business Process Management has three variables or methods of Process measurement (mapping and diagnosing techniques), Process re-engineering tools and software, and Team-approach to design new processes (Motwani et al. 2002, 2005).

Occurrences in enterprises and the business environment in general are eminently dynamic in nature. Also the incessant rapid development of information technology, which affects organizational processes too, suggests that the only way to counteract or take advantage of these numerous dependencies and potentials is to utilize continuous system engineering (CSE) procedure whereby software is continually adapted to an ever-changing environment (Thome and Hufgard 2006).

### 3.5.5 HR issues; team building, communication and training

Some executives and IT managers skimp on employee education and training (Monk and Wagner 2012). When considering implementation intertwined with business process reengineering, it is a must for top management to re-educate key persons in terms of integration concept, train know-how to whole enterprise and communicate their goals and long-term perspectives to obtain support of all staff influenced by the changes.

The full advantages of ERP cannot be realized until end-users are working with the new system effectively. Primary trainings involve key users and IT personnel, takes place just after selection of ERP system, and is conducted by the software vendor or consultant. After all business processes are defined and the system is customized, the key users train the remaining users (Munkelt and Völker 2013). Furthermore, since it is difficult for consultants to pass the knowledge to computer illiterate employees, the adopting company should organize computer seminars prior to the implementation of the new ERP system (Maditinos et al. 2012).

ERP implementation seems to have a half-a-year learning curve at the beginning of the project. Everyone who deals with ERP system, at least, needs to be trained on how the system functions and how it relates to the business processes. Although many enterprises utilize consultants to help them during

the project, it is pivotal that knowledge is transferred from the consultant to internal employees (Somers and Nelson 2001).

To make the trainings effective, they should begin early, preferably well before the implementation starts. Top management should be intimately committed to consider adequate and integrated budget for steering committee reeducation and end-user training (up to 15% of total budget) (Umble et al. 2003).

"*While most researchers have generally mentioned the need for training, some researchers have specifically mentioned the need for project team training while others have focused on user training*" (Finney and Corbett 2007). It has been recommended that the training should comprehensively include the enhancement of IT skills and that it should be hands-on. Planning for training infrastructure is another pivotal deliberation. Top management should take into account how employees (end-users) may need to be reeducated/trained (Motwani et al. 2005) or how compensation plans may need to be evaluated and modified.

Post-implementation training is also mentioned as a key factor. Regular meetings of system users can help recognize bugs or malfunctions with the system and push the exchange of information learned through experience and increasing familiarity with the system (Umble et al. 2003).

#### 3.5.5.1 Team-building and communication

Panorama's 2016 ERP report shows that significant percentage (35%) of organizations dedicate ten or more full-time employees (FTEs) to their ERP projects, and 73-percent dedicate three or more FTEs (Panorama Consulting Solutions 2016).

To make ERP succeed, it is necessary to form a steering committee or group of "super-users". A project management approach with a "steering committee" involving senior management from across different organizational functions, project management representatives, and end-users that will have daily contact with ERP is a potent means of guarantying proper involvement.

ERP implementation teams typically include enterprise staff from a variety of functional areas and organizational sections that have both business and IT skills. The team is crucial because of its responsibility for developing the initial, detailed project plan or overall schedule for the entire project, assigning tasks for various activities (providing necessary requirements and resources), and determining due dates (Umble et al. 2003).

There is a key requirement to form a focused implementation team which is composed of the enterprise's most experienced and proper individuals. These individuals must have a proven reputation and there should be a commitment to "release" these staff to the project on a full-time manner. The team should be *authorized* to make necessary decisions within deadlines, so as to allow for correct timing with respect to the implementation (Finney and Corbett 2007).

The project manager (champion) should care and keep a high level of employee morale and interest during the project. It is imperative that the team champion forms a stimulating work environment and acknowledge the work of the members. Eventually, this should lead to a high level of staff loyalty. The prospect of losing staff because of their marketability out of the enterprise is a very real, but often overlooked, cause of project failure (Finney and Corbett 2007; Mandal and Gunasekaran 2003).

Also, Case studies show that under most circumstances cooperative, interpersonal and group behavior (*Network Relationships*) leads to project success. Organizations that can control these dimensions of competition and cooperation continuously can take advantage of employee incentives, as well as establish change more effectively. Two variables of "inter-organizational linkages" and "Cross-functional cooperation" account for this factor (Motwani et al. 2005).

A critical factor for an effective implementation of enterprise systems needs a corporate culture that highlights the value of *sharing* common targets over individual benefits and the value of *trust* between partners, employees, managers and corporations. ERP potential cannot be used to maximum advantage without strong cooperation among business and IT personnel (Somers and Nelson 2001). Formation of a conducive corporate culture

through an effective *communication channel* is another key factor for success (Upadhyay et al. 2011).

This necessitates a communication plan to guaranty that open communication and cooperation occurs within the entire enterprise, as well as with suppliers and customers (Mabert et al. 2003). Communication is essential within the project team, between the team and the rest of the organization, and with the client.

### 3.5.6 Project management issues

Project management attempts include a clear definition of goals, development of both work plan and resource plan, and watchful tracing of project progress. It will help the enterprise avoid the all-too-often "scope creep" phenomenon which can damage the project budget, threaten project progress, and complicate the implementation. The project scope has to be defined with clarity at the outset of the project, and should identify the modules selected for implementation as well as the affected business processes (Umble et al. 2003).

Project Management involves not only the planning phases, but also the allocating of responsibilities and tasks to various players, the determination of milestones and critical stages, training and human resource planning, and finally the definition of scales of success (Finney and Corbett 2007).

Another determining factor of ERP implementation success or failure is related to the knowledge, capabilities, abilities, and experience of the project manager as well as hiring of the right team members, which should not only be technically proficient but also perceive the enterprise and its business requirements and processes. The skills and knowledge of the project team is significant as is the application of consultants to provide expertise in areas where team members are in need of.

Project management activities surround the project life-cycle from initiating the project to closing it. Proper management of scope is critical to avoid schedule and cost overruns and necessitates having a plan and sticking to it (Somers and Nelson 2001).

An enterprise's failure to meet the required financial, human and other resources has been found to be a challenge in reengineering implementations. Resource requirements need to be defined early in the project and often surpass initial estimates and the inability to guaranty resource commitments up front may certainly destroy project attempts. It is important to know in advance and precisely what the implementation expenses will be and allocate the necessary financial resources (Somers and Nelson 2004). However, according to the nature of ERP implementations, there are normally unexpected and unpredicted incidents that increase the total costs. Therefore, a non-tight budgeting strategy within a project is highly advocated in literature (Finney and Corbett 2007).

The success of technological innovations has often been linked to the presence of a champion who has authority to change and make decisions and extensive knowledge of operational processes, and accomplishes the pivotal roles of transformational leadership, facilitation, and marketing the project to the system users. Project champions should own the function of change leaders for the life of the project and understand both the technology and the business and enterprise processes (Somers and Nelson 2001). He/she should possess strong leadership skills as well as business, technical and personal managerial competencies (Kræmmergaard and Rose 2002).

A well thought-out plan of project management principles and its application is strongly linked to ERP implementation success. This is achieved by carefully defining the scope of the project, building the project team and mandating their responsibilities with clear job descriptions, and determining the performance objectives.

### 3.5.7 Technical issues; infrastructure, data Accuracy and migration

ERP systems embed the norms, values, and cultures of the developers, which will interact with the local norms, values, and cultures of the location where they are implemented and used. As a result of the interaction, some technical issues will arise (Xue et al. 2005).

For example, because of the integrated nature of ERP, if someone enters the wrong data, the mistake can have a negative domino effect throughout the entire enterprise (Umble et al. 2003). Within an enterprise, the challenge is to find the proper data to be entered into the system and to convert all old disparate data architecture into a *single, consistent format*. Conversion can be a huge process, especially if enterprises do not know what is required to be included in the new systems and what to be omitted (Somers and Nelson 2001). Controlling the complication of information flows is much more important for enterprises with branch offices which need to be accessed remotely, leading to a lack of coordination (Upadhyay et al. 2011).

The functionality of the system and in fact the success of the project depends on the ability of the team to guaranty *data accuracy* during the conversion process. This step of the implementation may involve the cleaning up of suspect data (Finney and Corbett 2007; Somers and Nelson 2001, 2004; Umble et al. 2003). At the final steps of the implementation process, the project team should mind the inclusion of testing and simulation exercises before the system "goes live" (Al-Mashari et al. 2003; Nah et al. 2001).

Today, most enterprises may wish to upgrade their ERP system or migrate to another system because of the benefits of new software functionalities (i.e. Business Intelligence or Customer Relationship Management) or simply because their legacy systems run out of maintenance (Munkelt and Völker 2013).

The staff should be convinced that the enterprise is committed to use the new system, will completely changeover into the new system, and will not permit use of the old system anymore. To strengthen this commitment, *all legacy systems must be removed* or banned.

It is crucial to analyze the IT readiness of the enterprise, including the architecture and skills. If necessary, infrastructure may need to be upgraded or renovated. The role of IT infrastructure in ERP implementation project can be either dominant or as an enabler. IT led projects mostly fail to capture the business and human dimensions of processes, and has high probability to fail. Socio-technical design approach that suggests a mutual, bi-directional relationship between IT and the organization recommends synergy between

the business, human and IT aspects of an enterprise and could be promoted through cross-functional teams (Motwani et al. 2005).

The malfunctions and complications of existing business legacy systems should be effectively analyzed (*Legacy system considerations*) in place, since this will be a good indicator of the nature and scale of potential problems. This could directly affect the technical and organizational change required (Finney and Corbett 2007; Guido and Pierluigi 2011).

Some researches, although, emphasize that ERP implementation must not be considered as "just" an IT project but as a system that would modify the enterprise into a more productive organization. Emphasis on IT infrastructure is the least correlated factor to ERP implementation success (Ehie and Madsen 2005).

#### 3.5.7.1 Tool-based implementation

Implementation tools and programs provided by the vendors can significantly reduce the cost and time of deploying ERP systems. Another goal of implementation tools is the transfer of knowledge regarding the use of the software, recognizing and perceiving the business processes within the enterprise, and recognizing industry best practices (Somers and Nelson 2001). Accelerators provided by vendors include business process modeling tools that relate and connect business processes to the software, templates for industry-specific business practices, and bundling of server hardware with ERP software, or offering combined packages of software, services, and support. In fact, the high risks of ERP implementation projects indirect the necessity for multiple management tools such as external and internal integration devices and formal planning and results-controls.

Many tools are available to help manage implementation projects. Process mapping is perhaps the most critical. For an ERP implementation to go smoothly and provide value, it is critical that a company understand both its current processes and the state of the process after implementation (Monk and Wagner 2012).

For example, SAP provides Solution Manager, a tool that helps companies manage the implementation of SAP ERP. Also with the help of requirement

analysis tools (requirements navigators such as LIVE KIT) the consultant navigates the customer through ERP's adaptation options using a graphic step-by-step guide. In fact, structured inquiries are made into the user's business requirements and immediately checked against the ERP modules and configuration options (Thome and Hufgard 2006).

Also there is a tool based solution regarding continuous system engineering based on reverse business engineering (RBE) method with which it is possible to analyze running ERP systems in an automated process. Transaction usage, expansions, customizing, master and transaction data can all be selected and analyzed using different ABAPs (IBIS Prof. Thome AG. 2011).

## 3.6 Critical factors modelings and classifications

Classifications can help make researches easier by assigning concepts to a category and defining relationships between those categories. Also they matter because they help us organize existing knowledge and expertise. Of the many specifications of an instructive classification, two of the most important ones are 1) Structure which is a logical and disciplined hierarchical design of categories that make sense. Good classifications and taxonomies are not too deep or too wide. They summarize the hardship and complexity of a knowledge base and enable it to be reused without requiring the same discipline of the users, and 2) Completeness so that a good classification contains all the terms used to describe the business (Samler and Lewellen 2004; Sravanapudi 2004). In this section some most-cited modelings and classifications of ERP implementation success factors are reviewed to evaluate the existing models, recognize ideas for a new practical classification, and justify the need for.

Successful ERP implementation is correlated with effective project management efforts. Enterprises implementing or considering implementing an ERP system or any system that tries to integrate internal functions are at risk if they do not comprehend project management basics. Top management support is very pivotal to guaranty that ERP projects come to utilization. This support may contain developing strategic direction by being actively involved

in various high-level cross-functional implementation teams. The top management support factor has next to the strongest correlation to ERP implementation of all the other factors identified (Ehie and Madsen 2005).

An ERP implementation is not to change the hardware or software systems, but instead, it necessitates the evolution of the enterprise into a higher level of performance by streamlining business processes. When implemented in a right form and effectively run, ERP systems can change the way enterprises do business for the better. Recognition of these critical factors allows project stakeholders and also consultants to imagine a better understanding of issues around ERP implementation. Managers also can consider the factors to better prepare themselves for an economic implementation project. Successful ERP implementation necessitates continuous monitoring, system engineering and self-diagnosis throughout the implementation process.

(Xue et al. 2005) focus on the vibrant interaction among people and technology and offer the ensemble view which claims that ERP systems are not universal and they are formed by the values and assumptions of developers, users and other stakeholders. Critical factors are, therefore, related to contextual issues like social and cultural influences as well as technical issues. The quality of software solution itself is critical for success too, and technical characteristics of any IT solution have to be considered.

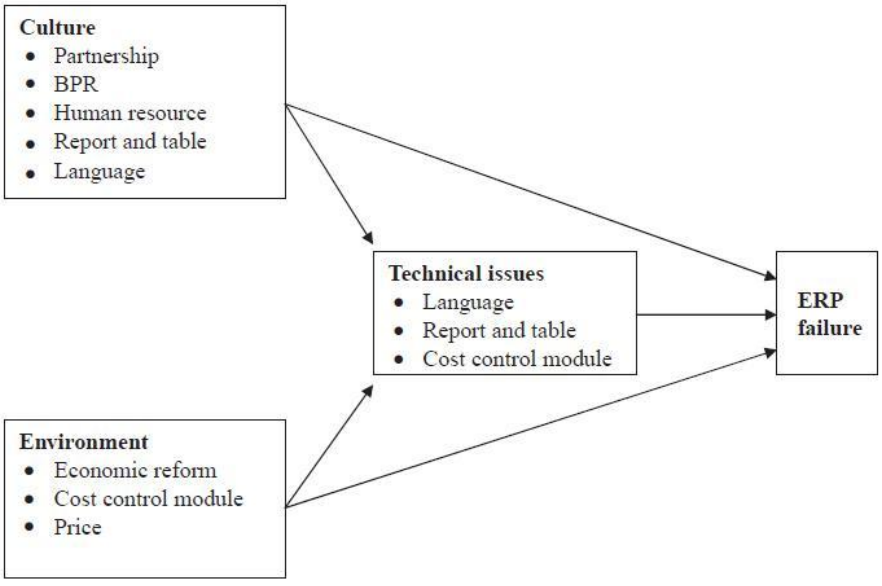


Figure 7 - Ensemble view of ERP, (Xue et al. 2005)

A corporate atmosphere with a high degree of organizational learning capability stimulates experimentation, risk taking, dialogue, interaction with the external environment, and participative decision making (Lapiedra et al. 2011). These components may ease the applicable use and learning of an ERP system and to be more likely to adapt easily to the requirements and necessities of the system. Thus, project members and the end-users will cooperate efficiently with external consultants in terms of making suggestions or corrections and best practice utilization learning. They consequently will be more satisfied with the new system.

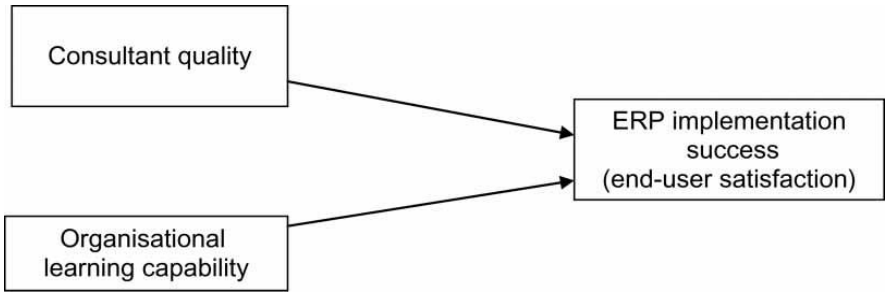


Figure 8 - Organizatioinal Learning Capability model of ERP success, (Lapiedra et al. 2011)

(Dezdar and Ainin 2011a) believe that every level in the project class and the various users require different training; the steering committee needs to get an eagle view of the system's functionality, the project team should have an in-depth knowledge of the system's functionality, and the end-users require to learn those modules that are related to their responsibilities. With this kind of comprehensive knowledge of all the staff, their satisfaction would help smoothing the project.

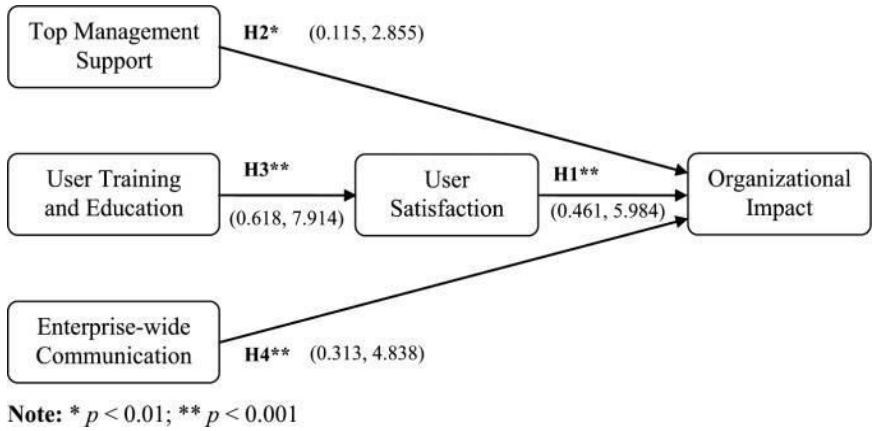


Figure 9 - Path analysis results for ERP implementation success model, (Dezdar and Ainin 2011a)

A cautious, evolutionary, bureaucratic implementation process backed with careful change management, network relationships, and cultural readiness has a positive impact on several ERP implementations. (Motwani et al. 2005) expand a well-known model of business process change management to describe factors that affects successful ERP implementations which end up as following.

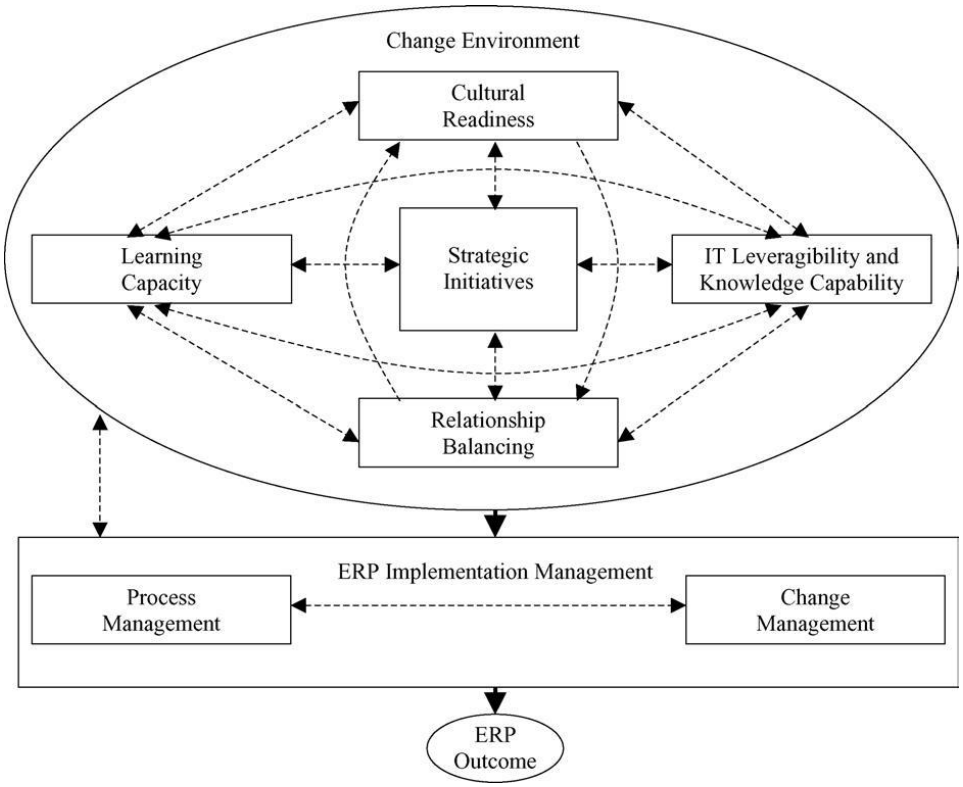


Figure 10 - Theoretical framework of ERP implementation management, (Motwani et al. 2005)

(Kerimoglu et al. 2008) offered a model of three common categorization of an ERP project, consisted of technology, organization, and the user. (Dezdar and Ainin 2009) utilized this categorization, while introducing two other categories of external expertise and ERP project. Further analysis was made and the categories were found to be representing two distinct environments of ERP adopting organization and ERP system, so that, as shown in figure 11, Organization, ERP Project, and ERP User were classified under the ERP adopting organization environment and ERP technology, and external expertise as ERP system.

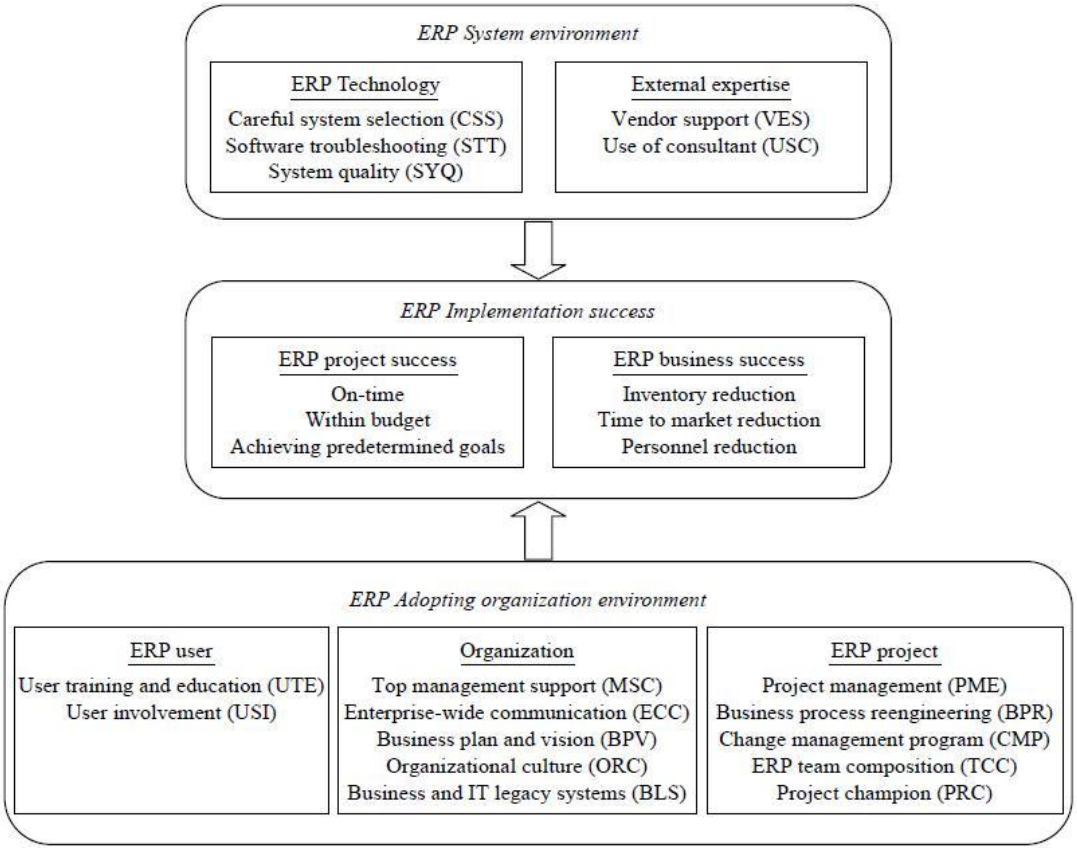


Figure 11 - ERP Implementation: Taxonomy of CSFs, (Dezdar and Ainin 2011a)

To understand what factors are critical for success in ERP implementations, (Thomas et al. 2012) review works for four leading authors on the topic (Al-Mashari et al. 2003; Nah et al. 2001; Somers and Nelson 2004) and categorized the factors in main three groups. They believe that all critical factors regarding ERP implementation are either people-related or business-management-related or technology-related, and then they focus on technical changes and subsequent impacts on implementation projects.

Table 1 - Three-dimension categorization of ERP CFSs, (Thomas et al. 2012)

| Management | People | Technology |
|---|---|---|
| • Business Process Reengineering<br>• Monitoring & Evaluation of Performance<br>• Project Management<br>• Appropriate Software Selection<br>• Dedicating Resources<br>• Tight time scheduling<br>• Justifications<br>• Problem Resolution<br>• Constrained Scope | • Training / Reeducation<br>• Change And Expectation Management<br>• ERP Teamwork & Composition<br>• Communication<br>• Top-Management Involvement<br>• Steering Committee<br>• Consulting groups<br>• Vendor Customer Constructive Relationship | • Appropriate Business & IT Legacy System<br>• Software Development, Testing and Teoubleshooting<br>• Analysis and Conversion of Data<br>• System Architecture Definition<br>• Minimize Customization |

In a similar but more expanded very recent study, (Ram and Corkindale 2014) investigate quite all researches of critical factors to ERP implementation projects and they recognized the fourth dimension of classification which is project-related category rather than the study of (Thomas et al. 2012).

Table 2 - Four-dimension categorization of ERP CFSs, (Ram and Corkindale 2014)

| Organization-related | Technological/ERP-related | Project-related | Individual-related |
|---|---|---|---|
| • Organisation culture and political structure<br>• Top management support<br>• Change management<br>• Cooperation<br>• Change agents and leadership<br>• Cross-functional cooperation<br>• Management readiness for change<br>• Scope for change<br>• Business plan/vision/goals/justificatio<br>• Project justification based on cost and economic scale<br>• Retrain IT workforce in new skills<br>• Employee moral | • Customisation of ERP<br>• Technological complexity<br>• Compatibility<br>• Legacy systems<br>• Data analysis and conversion<br>• Data Accuracy | • Project management<br>• Training and education<br>• System integration<br>• Business process re-engineering<br>• Full-time project manager<br>• Minimal customisation<br>• Communication<br>• Implementation strategy and methodology<br>• Teamwork and team composition<br>• Project team competence<br>• Steering Committee<br>• ERP Selection | • Perceived usefulness<br>• Attitude towards ERP system<br>• Ease of use<br>• Social Factors<br>• Shared belief in the benefit of the system<br>• Facilitating conditions<br>• Near-term consequences<br>• Long-term consequences<br>• Affect (feeling of joy or displeasure with a particular act)<br>• Users' absorptive capacity<br>• Usage performance<br>• User satisfaction<br>• Learning capacity<br>• User involvement |

It is finally perceived that most of CSF classification studies are doing categorization regarding general areas of theory and practice i.e. organizational, technological, project-related, and people-related. This kind of classification makes specialized experts in enterprise or consultants able to concentrate on specific factors. For example, top management focuses on organization-related factors, while IT-department works on technological factors, project managers find solutions for project-related issues, and HR department tries to overcome individual-related factors.

Although a major focus-based re-classification of all CSFs-related publications shows that 60 percent of classification studies have identified CSFs to ERP across various stages (Ram and Corkindale 2014), none of them has recently projected the up-to-date factors through stages of implementation. As a conclusion to this chapter, a staged instruction for ERP implementation based on up-to-date critical factors is developed in the next section.

## 3.7 Chapter Conclusion

Most of researches have divided an ERP project to five stages of Initiatives, Requirement analysis, Realization, Final Preparation and GO-Live (Ehie and Madsen 2005; Monk and Wagner 2012; Munkelt and Völker 2013; Winkelmann and Klose 2008). This type of phasing has two major weaknesses according to this study's point of view; 1) although the selection of consultant and/or vendor/software is very crucial to project success, it is a bit neglected to be considered in this life-cycle models, and 2) the capacity of activities is not divided in an equivalent form. In fact, if the selection processes for consultant and/or vendor/software are considered as activities in Initiatives phase (or any other), that phase lasts equal to other four phases.

This study, therefore, divide the project based on the attention that has been paid into the activities of a normal enterprise system implementation. There is a considerable emphasize on vendor selection during an enterprise system project, just after defining strategies and vision of the project. In fact, top management can start the implementation practically after selecting the vendor/software getting help from external consultants. Therefore, consultant and vendor selection is a stage alone right after initiatives and before practical implementation which begins with requirement analysis and blueprint development. Although some researches or cases separate the phases for requirement analysis (As-Is Analysis and To-Be Analysis), this study combine these stages because the target of all activities is actually similar which is to develop new business process definition and project blueprint. Also this study emphasize on the activities regarding a middle exclusive phase to test the system and migration issues, and continuous business information processing after final go-live or run-up!

Table 3 - Five phases of ERP implementation Life-cycle

| Phases | Activities |
|---|---|
| **Phase 1**<br>**Strategizing** | Comprehensive planning<br>Vision based on objectives<br>Budget targets (Economic justification)<br>Steering committee introduction<br>Training planning (content and infrastructure)<br>Top management reeducation<br>Project scope<br>Detailed project plan (assignments and responsibilities)<br>Implementation methodology<br>Hardware and network infrastructures development planning<br>System landscape (Servers and Network) |
| **Phase 2**<br>**Selections** | Comprehensive market analysis<br>Criteria and factors definition<br>Negotiations (business vs. legal)<br>Consultant selection<br>Vendor/Software selection<br>Project team selection<br>Vendor/Consultant's training and knowledge transfer evaluation<br>Project teams selection (consultant selection team, vendor selection team, and implementation team, and technical team selection)<br>IT-Department/Vendor acceptance and collaboration |
| **Phase 3**<br>**Process re-engineering** | Organ. Operation Analysis (Business Process Re-eng.)<br>Cooperation with consultants<br>Comparable realignment<br>Conflict resolution<br>Prototyping and adjustment toward final system<br>End-users involvement in defining the implementation process<br>Project members' training<br>Integration concept reeducation<br>Seminars and round-tables<br>Process documentation<br>New Process Simulation<br>Data flow diagrams<br>Project blueprint<br>New process design mapping<br>Current master and transaction data analysis<br>Cleaning up of suspect data<br>Tool based requirement analysis<br>Technical blueprint (Access levels, External system integration, Emergency and backup)<br>Technical infrastructure upgrading or renovation<br>Vendor support and upgrading<br>Legacy system consideration and analyses |
| **Phase 4**<br>**Migration and Testing** | Final preparation<br>Testing scenarios' definition<br>RUN-UP date scheduling<br>End-user trainings<br>Testing documentation and user's guide preparation<br>Extreme situations simulation and testing<br>New processes debugging<br>Testing (Full data load)<br>Testing and simulation exercises<br>Data migration and centralization<br>Software customization (Codeless configuration, Application development, KPI and reports)<br>Configuration and parameterization of software |
| **Phase 5**<br>**RUN UP and CSE** | Help-desk setting<br>System behavior optimization<br>User requirement adjustment<br>Continuous System Engineering<br>Empower internal consultants Enterprise specific guideline<br>Project completion and delivery<br>Post evaluation (self- and external- evaluation)<br>Master data migration from test-system<br>Technical tuning<br>All legacy system remove |

On the other hand, the recent CSF classification studies (Ram and Corkindale 2014; Thomas et al. 2012) are doing categorization regarding focus areas of organizational, technological, project-related, and people-related. According to this classification, the factors that reviewed and investigated in this chapter could be summarized and categorized as following.

Table 4 -ERP implementation impacting factors categorized in focus areas

| Focus area | Impacting factors | |
|---|---|---|
| **Management-related** | Top management support<br>Top-down promotion<br>Rational targets definition<br>Fully support the costs (necessary financial resources allocation)<br>Technologically oriented top management<br>Strong and committed leadership<br>Continuous monitoring<br>Clear selection criteria definition<br>Real experience and knowledge in same industry<br>Meeting future needs<br>Honest commitment | Change management<br>Corporate culture ready for change and learning<br>Organizational characteristics (strategy, resources, rewards, culture, and structure)<br>Revolutionary/evolutionary change tactics<br>Organization learning<br>Learning by Doing<br>Knowledge sharing<br>External information use<br>Learning strategy<br>Non-tight budgeting strategy<br>Enterprise-consultant support, acceptance and trust<br>Inter-departmental (cross-functional) collaboration and trust |
| **HR-related** | Balanced network relationship<br>Communication channel within enterprise and supply chain<br>Compensation plans to control team members marketability<br>Individual characteristics (knowledge, cognitive abilities, and motivation)<br>Group characteristics (goals, roles, norms, diversity, and problem solving) | Stimulating work environment and acknowledgment<br>Decision-making authorization<br>Post-implementation meetings<br>User accountability activation<br>Up-to-15% budget for training |
| **Project-related** | Project team-Vendor/consultant flexibility<br>Project team competence<br>Project champion familiar to IT, enterprise processes and leadership<br>Project definitions (scope, time and cost, milestones, etc.) | Risk evaluation<br>Performance Quality control (KPIs and Balanced Score Cards)<br>Benchmarking best-practices<br>Management of expectations |
| **IT-related** | Knowledge/technology transfer and Vendor support and update<br>Organization-Information Integration<br>Single consistent data format<br>Functionality and quality of the software and service | Data accuracy<br>Tool-based implementation<br>New technologies deployment (e.g. In-Memory data Management)<br>None-busy RUN-UP date |

Reviewing all major publications on ERP implementation life-cycle and critical factors since early 2000s, this chapter has come up with a suggested five-stage implementation life-cycle and a categorization of impacting factors in four focus areas, as mentioned above. This abstract information, in addition to the findings of the next chapter, will be the foundation of the framework to which this study has target to reach.

## Chapter Four

# 4 Specific Factors Affecting International ERP Implementation Projects

> **"***The international business, instead of detracting from our business, is now additive to our business.***"**
>
> Michael Casey, former Starbucks VP

## 4.1 Introduction to Chapter

The international nature of the enterprise-vendor relationship is also of importance (Plant and Willcocks 2007). The implementation and utilization of ERP solutions get used to a number of problems due to their complicatedness and the effect they have on business processes. These problems are further aggravated in international environments in which national cultures and local necessities play an important role. Enterprises often should reach to equilibrium between the volume of modifications and local requirements.

Most studies have been allocated to developed countries, while in developing countries many organizations have approached to such software solutions. The Enterprise System related researches and instructions have almost been accomplished by technologically-leading countries. But developing countries, which mostly confront with especial challenges, have a different condition from the implicit assumptions of leading countries (Amid et al. 2012).

Implementation strategies and methodologies are overwhelmingly designed for a western audience. This could lead to even higher failure rates in underdeveloped markets. Most large western firms have gone through several iterations of purchasing and implementing ERP and other large tool systems. They have some (although not always strong) capability and organizational memory around change. In developing nations, the businesses can be younger and going through these challenges for the first time.

Some studies tried to develop frameworks to compare ERP implementation issues in advanced and developing countries. Some other researchers have accomplished investigations of the challenges surrounding ERP implementations within various organizational and national cultures.

This study provides researchers with some clues for further investigations to detect specific success factors and define novel instructions regarding international projects of ERP implementation. This study wants to complement and extend previous related researches by investigating the perceived importance of the CSFs to the success of an international ERP implementation.

In this chapter, first, the characteristics and differences of international projects will be outlined. As the cultural dimensions are the most cited and so important factors in international projects, this chapter will review some cultural theories that are utilized in business and management studies especially Hofstede's cultural dimensions. Then, almost all significant researches on international IT adoption and ERP implementations based on national and organizational cultural dimensions, and other factors and frameworks will be reviewed. Expanding some real specific national studies for different countries from four corners of the globe, the chapter ends with concluding and summarizing the factors impacting on international projects of ERP implementation.

## 4.2 International project management environment

### 4.2.1 Distinctions

Projects which are done globally are not very divergent comparing normal projects when it comes right down into the nature of the organization, industry, value chain position and duration. Nevertheless, there are some evident and clear differences (Köster 2010):

*Purpose* - the main purposes of international projects are to search for new geographical presence or to have new international stakeholders, to increase global market share, market power, global political power or global impact, to realize efficiency gains, to access scarce and unique resources, and to reduce some business risks.

*Scope* - greater scope normally means more considerable complicatedness because volume of the project increases complexity regarding the increase in the number of go-betweens. Enterprises and their people have more challenge understanding something 'big' with regard to the parties involved, the countries involved, and the budget involved.

*Project stakeholders* - international projects, contrary to standard projects, usually involve non-domestic stakeholders, especially clients who are most of the time foreigner. In addition, since collaborative international projects are growing, more stakeholders outside an organization are expectable.

*High uncertainty levels* - due to the complexity of an international environment which is hard to analyze because changes are usually sudden and unexpected, and the complexity of the organizational structure with a large group of interfaces and numerous stakeholders involved.

Although project management knowledge, tools and techniques that apply for standard projects also apply for international projects, the management of international projects simply needs more disciplines and more skills.

### 4.2.2 Characteristics

Various stakeholders with possibly somehow conflicting interests, positioned in different units of the enterprise or outside of it at collaborators' or the client's sides lead to a large number of intertwined interactions that result in a very complicated project structure. Adopting a proper structure and system to bear up multi-interdependencies is crucial for the project manager of an international project. It is also essential to get to know the different 'hidden agendas' of involved stakeholders and to include them in the project planning.

Many international projects face budget and time overruns because of the complexity, albeit this is not abnormal with standard projects too. The international environment tolerates more risk such as unexpected political instability.

Having an international network of organizations, international alliances, international joint ventures, etc. makes the context that international projects are operating unique in terms of objectives and the organizations involved.

International projects often face numerous and sudden changes because of strong competition on global markets and various parties involved in the project with self-interests which can be non-obvious. In addition, this complicated environment provides many new opportunities and risks that should be treated swiftly.

The greater volume of an international project signifies a bigger amount of resources. More time is needed for adequate planning while more funds are required because of higher transportation and coordination attempts. Additionally, recruiting the staff with language and intercultural skills required in an international project is already a challenge too.

According to argumentations above, international projects have six main characteristics of uniqueness, diversity, complexity, risk, dynamics and limited resources which are also interrelated. For example, uniqueness is intensified by diversity, dynamics, uncertainty readiness and complexity. Complexity and limited resources also are factors in risk, and dynamics and diversity amplify complexity.

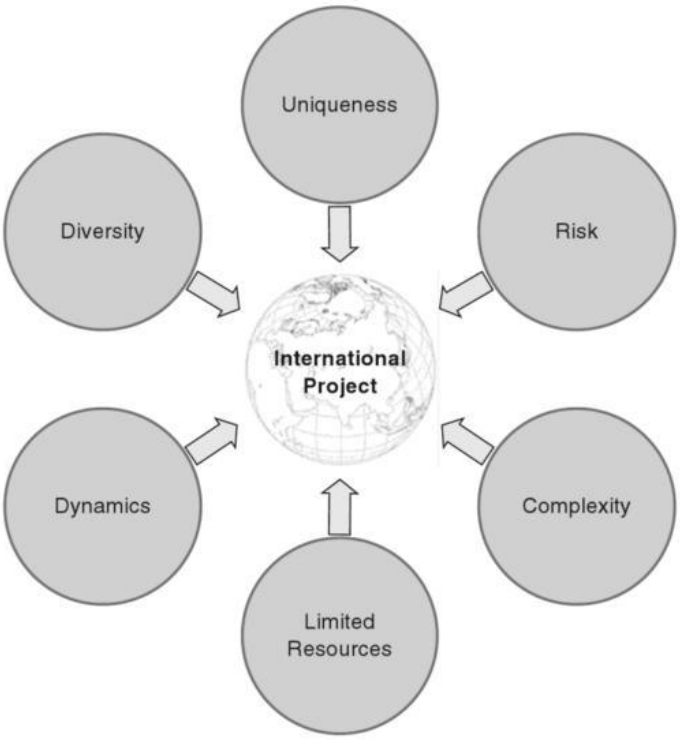


Figure 12 - Six main characteristics ofinternational projects, (Köster 2010)

## 4.3 Cultural Dimensions: National and Organizational

The most common definition utilized in cross-cultural related researches may be Hofstede's. According to Hofstede, culture is "the collective programming of the mind which distinguishes the members of one human group from another" (Hofstede et al. 2010).

The globalization of the world business during past half century presages the era that cultural differences have become extremely critical to leaders, managers and executives all four corners of the globe. The complicated nature of merging organizational cultures, leadership challenges, international decision-making, recruitment and task allocation are all accorded by the national culture of the people involved. What allowances must be made when outlining organizational culture?

It is often supposed that organizational culture is a subset of national culture. This belief is expanded because enterprises mostly operate within a certain country and employ members come from the same national culture. Managers and researchers, therefore, consider organizational culture as the

micro-context and the national culture as the macro-context in which employees act (Gallivan and Srite 2005).

Organizational and national culture can be outlined using multiple dimensions that give us a set of overlapping attributes with which to describe aspects of culture (Krumbholz et al. 2003).

One of the big concerns in analyzing an individual's cultural profile and finding out where to fit him or her into an existing organization is how to choose cultural factors to create a reliable evaluation. Several cross-cultural theories and frameworks have proposed such factors and/or dimensions. Edward Hall categorized cultures as mono-chronic or poly-chronic, high or low context and past- or future-oriented. Kluckholn and Strodtbeck saw six dimensions of the nature of people, the relationship with nature, duty towards others, form of activity, privacy of space, and time (temporal) orientation. Trompenaars classified cultures based on reciprocal dimensions as universalist vs. particularist, individualist vs. collectivist, specific vs. diffuse, achievement-oriented vs. ascriptive, and neutral vs. emotional. Tönnies basically defined cultures as Gemeinschaft (community) vs. Gesellschaft (society) cultures.

Visiting 135 countries and working in more than 20 of them, Richard Lewis came to the conclusion that cultures can be categorized into three clear tiers, based on their behavioral specifications namely Linear-active, Multi-active and Reactive (Lewis 2010). Hofstede's model was also basically considering power distance, collectivism vs. individualism, femininity vs. masculinity, uncertainty avoidance. He added two more dimensions of long-term vs. short-term orientation and indulgence vs. restraint later on (Hofstede et al. 2010). Here the Lewis and Hofstede's models are briefly explained while more studies related to cross-cultural issues in IT management are relying on Hofstede's model.

### 4.3.1 Lewis Model

Linear-active people behave like task- and results-oriented, highly organized planners who accomplish chains of actions by doing one thing at a time with a linear agenda. Tying up to logic rather than emotions, they are truthful

rather than diplomatic and do not fear confrontation. Multi-active people are talkative, impulsive types who pay great attention to feelings, relationships and people. They prefer to do many things simultaneously and tend to feel restricted by plans. Negotiations are ambiguous and animated, while they often speak and listen at the same time. Interruptions are frequent, pauses in conversation are few. Reactive or listening cultures rarely trigger action or discussion preferring first to listen to and understand the other's position then react to it and prepare their own.

The following diagram shows how countries worldwide are categorized in Lewis model. As it is obvious, the Linear-active group includes the English-speaking world (e.g. North America, Britain, Australia and New Zealand) and Northern Europe (e.g. Scandinavia and Germanic) countries. The Reactive group is located in all major countries in Asia, except the Indian sub-continent, which is hybrid. The Multi-actives are more scattered, covering Southern Europe, Mediterranean countries, South America, sub-Saharan Africa, Arab and other cultures in the Middle East, India and Pakistan and most of the Slavs.

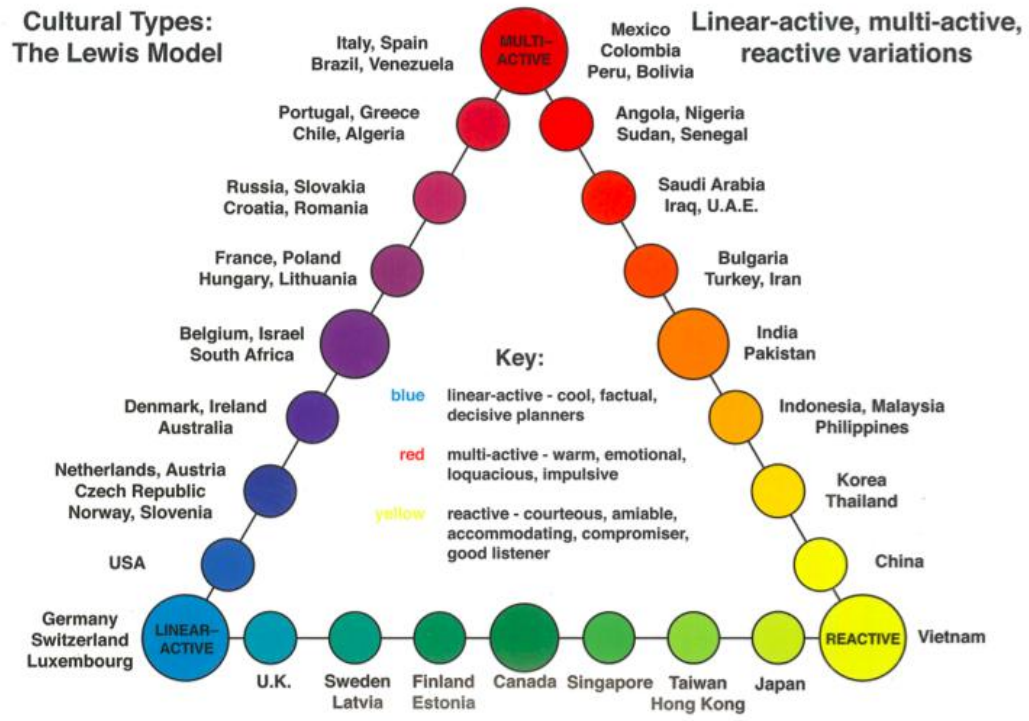


Figure 13 - Countries across three sides of Lewis Model, (Lewis 2010)

### 4.3.2 Hofstede Model

It is not reliable analyzing a research related to national culture without considering the contribution of Hofstede, whose findings have inspired hundreds of studies in both the International IT management and cross-cultural management literatures. He surveyed 116,000 employees of IBM, which is clearly a multinational corporation. Based on analysis of these data, he primarily identified four cultural dimensions that differentiated employees in different regions. In a subsequent work with Chinese scholars, Hofstede added a fifth dimension, whereas the sixth identified later on too. His survey has never considered IT utilization or impact, but he initiated a foundation on which many enterprise systems' and management researchers have constructed. The six dimensions are as following (Gallivan and Srite 2005; Hofstede et al. 2010; Rajapakse and Seddon 2005).

**Individualism** - describes the relationship between the individual and the collectivism which carries within a society. Individualism means mostly caring of oneself and one's immediate family. In contrast, collectivism relates to caring for both oneself and other groups. As shown in Table 5, the US is very high on individualism (91), and Germany (67) is also relatively high compared to Asia which is very low (average of 25).

**Uncertainty Avoidance** – that is related to the extent to which members of a society are discomfort with the unknown and desire to reduce ambiguity. There is a clear difference between US/Germany and Asia (both are not high), while conservative countries (e.g. Saudi Arabia, Turkey, etc.) are high in this index.

**Power Distance** – is to measure highest degree of distance across social or organizational classes as perceived by the less powerful of them. While the US and Germany have medium values on this dimension, Asian countries have relatively high values.

**Masculinity versus Femininity** – is the amount of acceptance of stereotypically masculine goals (e.g. power, achievement, etc.) against feminine values and views (caring, consensus, etc.) From organizational view,

this factor relates to gender-like differences in work goal importance. As it is perceived, there is no systematically huge difference in mentioned countries.

**Long-term Orientation** - Societies prioritize two existential attitudes of being past-oriented and future-oriented in different ways. Societies who score low on this dimension prefer to keep time-honored traditions and norms while those high scores, on the other side, encourage attempts in modern education to prepare for the future. In the business context this dimension is related to as "(short term) normative versus (long term) pragmatic"

**Indulgence** – that stands for a society that allows quite free fulfillment of basic and natural human desires regarding enjoy of life and having fun. On the other hand, restraint stands for a society that controls and abolishes fulfillment of desires and adjusts it by strict social norms (Hofstede et al. 2010).

Table 5 shows values, from Hofstede (2010), of these six dimensions for US and Germany (as the main solution providers worldwide) and some other countries that maybe mentioned in this chapter of the study.

Table 5 - Scores of cultural dimensions for some countries, (Hofstede et al. 2010)

| Country | Power | Individuali. | Masculinity | Uncertainty | Long-term | Indulgence |
|---|---|---|---|---|---|---|
| Germany | 35 | 67 | 66 | 65 | 83 | 40 |
| USA | 40 | 91 | 62 | 46 | 26 | 68 |
| Turkey | 66 | 37 | 45 | 85 | 46 | 49 |
| Iran | 58 | 41 | 43 | 59 | 14 | 40 |
| Saudi Arabia | 95 | 25 | 60 | 80 | 36 | 52 |
| India | 77 | 48 | 56 | 40 | 51 | 26 |
| China | 80 | 20 | 66 | 30 | 87 | 24 |
| Malaysia | 100 | 26 | 50 | 36 | 41 | 57 |
| Mexico | 81 | 30 | 69 | 82 | 24 | 97 |
| Singapore | 74 | 20 | 48 | 8 | 72 | 46 |

The widely acceptance of Hofstede's model in management research may be related to several reasons such as its large sample size, gradation of cultural aspects by quantitative indexes and emphasis on attitudes in the organizational environment.

## 4.4 ERP implementation or development: cultural perspective

### 4.4.1 Cultural aspects in inter- and multi-national ERP implementations

Some international corporations engage in a gradual roll-out of their worldwide enterprise system implementations. This incremental roll-out demonstrates cultural differences as an important part of the transfer puzzle. Regardless of organizational structure, national culture may be a significant factor in IS transfer projects and needs to be considered as an explicit part of international implementation projects.

Adapting the implementation to the existing cultural style is one important cause of international ERP implementation projects' underperformance.

Different national cultures have a prevalent impact covering all project management phases from beginning to the end of the project. Cultural differences should be bridged and managed in an efficient way (Köster 2010).

If more ERP implementations are to meet their promised expectations within time and budget, understanding how organizational and national culture influence ERP implementations is required and how this knowledge provides international consultants and clients with better methods and solutions for implementation.

While numerous researches has been done around the management of IT in multinational corporations, a literature review shows that very little work has been done bridging national culture with theories of information systems transfer.

The impact of culture (e.g. on information systems, communication technology acceptance, etc.) is an often-mentioned factor when globalization of businesses is the subject of analysis. There is although some researches claiming that culture may not be a very significant factor. However, culture remains an important factor in the study of international IT implementations, and results suggesting incorporate culture obviously in the study of global IT (Palvia et al. 2002).

Hofstede (2010) emphasizes that culture is hard to change and the speed of change in culture is very slow. Any motion in bridging this gap, therefore, must be done with a culturally sensitive strategy and be patient.

Hofstede's model could provide a reliable context to explain the texture of the problems that may occur when the transfer of information technology opens out. Especially, noticeable insight into the transfer procedure may be reached by investigation the process in which two dimensions of power distance and uncertainty avoidance may influence the adoption of a new system.

When an ERP system inflicts new methods and business processes, the work relationships are often influenced. This may occur as the new system provides low status employees with access to previously protected and/or inaccessible information. It also may occur as new lines of authority would be formed through new mediums of communication or it may occur as decision-making authority that was reserved previously for high status individuals and managers and now is transferred to end-users with less status. Enterprise systems which impose new business practices and require independent actions may directly conflict with main cultural attributes. Subordinates may, therefore, be as culturally unready to accept new authority relationships as their superiors.

Low power distance implies that end-users may now handle huge impact in the transfer process. They may feel entitled to say clearly their comments on the new system. Consequently, end-users may be actively involved in the systems' acceptance, rejection and critical assessment. It may also imply that certain methods or procedures that the adopting organization is familiar with, should be adjusted to get management and staff support.

Low uncertainty avoidance cultures are quite more tolerable of the uncertainty regarding risk-taking than ones with high values. They may be more eager to utilize new systems and IT infrastructures before it has been done in other enterprises. The high uncertainty avoidance cultures, on the other hand, don't conceal worries over the risk of new systems and new business processes and are particularly resistant to the abandonment of legacy systems with which they used to work. The way in which this concern and stress is expressed vary including criticism of headquarters, accusations about the new system, destruction or disruption of new business process, and

an increase in friction between management and end-users in adopting enterprise.

National culture does impact the cross-country ERP penetration levels, and moreover, the individual adoption behavior of companies operating in different national cultures. The more levels of Hofstede's uncertainty avoidance, masculinity and power distance dimensions in a national culture the less ERP adoption decisions of enterprises, while higher degrees of long-term orientation have a notable positive impact.

Table 6 - Charectristics of enterprises in four cultural dimensions and thier resulted influence on adoptation of ERP, (Van Everdingen and Waarts 2003)

| | Low scores on dimension | High scores on dimension | Expected Influence on adoption of ERPs |
|---|---|---|---|
| Power Distance | Decentralized decision structures Flat organization Use of personal experience Subordinates expect to be consulted Innovations need good champions<br>Managers involved in purchasing decisions | Centralized decision structures Hierarchy / authority Use of formal rules Subordinates expect to be told Innovations need good support from hierarchy Managers not involved in relevant purchasing decisions | Negative |
| Uncertainty Avoidance | Skepticism toward technological solutions Innovators feel independent of rules Tolerance for ambiguity in structure and procedures Innovations welcomed but not necessarily taken seriously | Strong appeal for technological solutions Innovators constrained by rules Highly formalized conception of management Innovations resisted, but if accepted, applied consistently | Negative |
| Individualism | Belief in collective decisions Innovation champions want to involve others Innovations within existing net- works Fewer invention patents granted Less social mobility across occupations | Belief in individual decisions Innovation champions want to venture out on their own Innovations outside existing networks More invention patents granted Greater social mobility across occupations | Positive |
| Masculinity | Relations and working conditions Stress on equality, solidarity and quality of work life Managers expected to use intuition, deal with feelings and seek consensus Lower job stress | Security, pay and interesting work Stress on equity, mutual competition, and performance Managers expected to be decisive, assertive, aggressive, competitive<br>Higher job stress | Positive |
| Long-term orientation | Focus on short-term results: the bottom line. Short-term virtues taught | Focus on building relationships and market position Long-term virtues taught | Positive |

The results of such studies can help managers to select/plan the best strategy for the international roll-out of their new systems and/or implementation projects. It can help managers further to regulate their communication and distribution plans regarding each country's cultural specifications. For example, in high context countries notifications about innovations may be

communicated effectively through transformational relations by testimonials, best-practice samples and industry group meetings, while in low context cultures informational relations by brochures, internet, and company visits might be an impressive form of getting the message of that innovation across (Van Everdingen and Waarts 2003).

The difference in implementation approach, also, can be clarified by Hofstede's study. Hofstede identifies China and Taiwan as low uncertainty avoidant and high collectivist cultures and US as medium uncertainty avoidant and high individualist. These national characteristics imply more insistent and hardworking approaches to the projects in China and Taiwan, as observed in some ERP implementation case studies (Sheu et al. 2004).

### 4.4.2 Cultural misfit in ERP software development

An ERP software solution was developed and initiated in the US headquarters. This new ERP system was to be implemented in international subsidiaries including the company's factories in France. Much to the irritation of the project manager, a total delay of 12 months occurred due to emerged additional requirements for the system and different operational processes that had been performing in deferent sites. Some of these factories produced for the defense sector and therefore strict specifications and security rules were applied. Some factories stored chemicals which needed to be treated away from other materials. Expiry dates needed to be entered into the system. Special disposal rules also had to be followed (Köster 2010).

IT artifacts, by definition, are not natural, neutral, universal, or given. They are designed, constructed, and used by people, and shaped by the interests, values, and assumptions of a wide variety of groups of developers, investors, users, etc. around the world (Orlikowski and Iacono 2001).

"Unlike past computer systems, ERP systems are off-the-shelf and impose their own logic on the company, often forcing companies to change the way they do business. While promising, the actual experience of using IT to redesign business processes is limited in developing countries (Huang and Palvia 2001)."

Even in the western countries like USA and Germany who are hosting major software developers, lack of “feature-function fit” between the enterprise’s requirements and the software solutions available in the marketplace is one of the reasons for non-adopting. Due to cultural and business operational differences in developing countries, these issues of fitness may be more noticeable in developing countries (Rajapakse and Seddon 2005).

ERP software producers have presuppositions, standards and principles about process positioning and alignment, flexibility, integration and particularity of every domain. These default-set values "can be" (literally "are") built into ERP systems and have the potential to form the organizations in various ways. The basic argument is, therefore, that the operational processes embedded in made-in-west ERP software are presumably to reflect North American and European organizational and national cultures, and problems may accordingly be raised if such systems would be implemented in other cultures (i.e. Asian countries, Middle East states, etc.)

The business processes including operational procedures on which most ERP systems are founded reflect European and North American industry practices. Having developed in different cultural, economic, and regulatory environments, these processes are most probably to be different in the countries in other regions of the globe. There is no certain ERP system that can be implemented in different countries successfully without resolving cultural misfits derived from national differences.

A vast investigation on enterprises adopting SAP R/3 ERP package in early 2000s in Scandinavian countries unfold evidence (in the form of stakeholders’ claims about the implementation problems) that emphasizes that the software producer’s culture, tacit in the solution, clashed with the client’s organizational culture. The implementations led to greater administrative workloads and inflexible processes in the warehouse that were identified as a more "German way of doing things." The study reports that warehouse employees should perform physical tasks, computer systems empower the organization, and warehouse employees' process orders were not supported by the software package in a flexible manner, while the Scandinavian stakeholders did not believe that the enterprises intentionally

went into undesirable changes in their organizational culture (Krumbholz et al. 2003).

Most of the ERP implementation problems can be linked with the infraction of some norm, which is grounded by the stakeholders' values and beliefs. This fact recommends one approach for an improved ERP implementation method: eliciting and analyzing core customer values for their fit with the ERP package can give greater leverage when predicting and handling implementation problems (Krumbholz and Maiden 2001).

Firms should redesign their existing business processes to make the ERP implementation project successful. Foreign ERP vendors and implementation consultants need to comprehend how do industries and businesses operate in other radically vibrant business environments and help them to accept that ERP results in totally new business processes, not simply a software that is easily installed (Xue et al. 2005).

In an effort to ease the international implementation of their solutions and consequently to increase license revenue, SAP took a number of strategies on: the software packages are continually revised to consider local requirements, a component particularly designed for global roll outs is included in its standard implementation methodology (ASAP) to assist in implementation project, and a globalization online portal that includes country-specific advice and knowledge base is established. It also would be necessary to assess this methodology regarding the specified suggestions for different countries around the world (Hawking 2007).

There are, also, some concerns about local ERP solutions. At first, they were developed around local practices and suffer lack of best-practice business processes. Lack of thoroughly and correct integration and knowledge of business process reengineering are other weaknesses of local solutions. Most of them, also, do not include important modules in ERP systems like Production Planning and Material Requirement Planning. By the way, they do not provide multicurrency and multi lingual support (Nikookar et al. 2010).

As mentioned above, the difference between the business processes that are tacit in the standard software solution and the business processes of adopting enterprise which is called Misfit is more related to cultural differences. In

chapter 3, it was clarified that organizations should reengineer their processes to align with the operations which are imposed by the standard software. Here it "must" be cleared that from the aspect of organizational and operational differences, enterprises should align with the software, but when it comes in cultural differences, it would be more and more difficult to manipulate the national and even organizational culture.

## 4.5 Other specific success factors and frameworks

There is no exact solution or instruction for international vendors and/or implementation consultants whereas following and considering them results in the success of the implementation project and ERP adoption. It seems to only be possible to draw a general view of international implementation projects by reviewing of all discussed written reports and articles (literature review) and studying some real cases and evaluation of critical factors derived out of them.

Success criteria and success factors should be distinguished from each other. Success criteria are generic evaluation metrics independent from the type of the project while success factors are more specific to a definite project and influence project outcomes directly. Success factors are easily mistaken with key performance indicators.

Researches of CSFs for ERP implementation have been so active and lively, and while attention to cultural issues regarding ERP implementations has been growing, there has been a limited research record of international vendor-client-consultant relationships considering an evaluation of CSFs as they relate to ERP implementations (Plant and Willcocks 2007).

The international aspect of a project anyway notably affects the CSFs for the implementation. Drawing upon the theoretical and case studies, some of the CSFs that are influenced by the international nature of the project will be assessed in following.

When it comes with the factors influencing information technology across borders, the following four categories of studies accounted over 95% of literature which is done so far, while the other multifarious ones investigated

other cross-cultural dimensions of IT management and use (Gallivan and Srite 2005).

- IT adoption, implementation or use in different national contexts
- IT diffusion within an international context
- IT professionals and human resource practices across different countries
- Senior managers' beliefs and practices related to IT management

The misalignment between ERP specifications (especially the philosophy behind) and organizational requirements, cross-cultural issues, integration and the level of economic development of different countries are some of the influencing factors that are more frequently identified globally (Rajapakse and Seddon 2005). Reasons for low successful international implementation of ERPs (for example in developing countries in Asia) appear to be as follows:

- Relatively high costs of ERP solution regarding national per-capita incomes for Asian enterprises rather than western ones
- Lack of implementation knowledge and expertise, and telecommunications infrastructures
- High level of integration provided by ERP solutions comparing to expectations of managers and enterprises
- Implementation discouragement by national- and organizational-cultural problems

Because of the great diversity existing in international projects, it is hardly challenging to set a target to which all project members feel deeply committed. Another challenge is keeping the commitment over a longer time period that is essential due to the long-lasting duration of international projects.

Communicating quickly and effectively across temporal, organizational, functional, geographic and cultural partitions is extremely important which requires a single language and intercultural communication capabilities. All project members should be able to utilize advanced communication technologies. Nevertheless, due to various technological development levels of the project locations, these capabilities might differ considerably among international project team members (Köster 2010).

When enterprise information systems are transferred across countries and cultures, this transfer process is affected by three factors: the national cultures of the enterprises, the competitive environment, and the difference between the legacy and new systems of the adopting enterprise (task congruency) (Shore and Venkatachalam 1996).

The competitive environment as well as the nature of the task itself, also, influences the impact that cultural attributes have over the information technology transfer process (Kappos and Rivard 2008).

In a very primary research of ERP implementation issues in international context, Huang and Palvia (2001) have modeled a framework to assess the impact of different factors on implementation projects. Several elements from the framework were important in these specific ERP implementation projects.

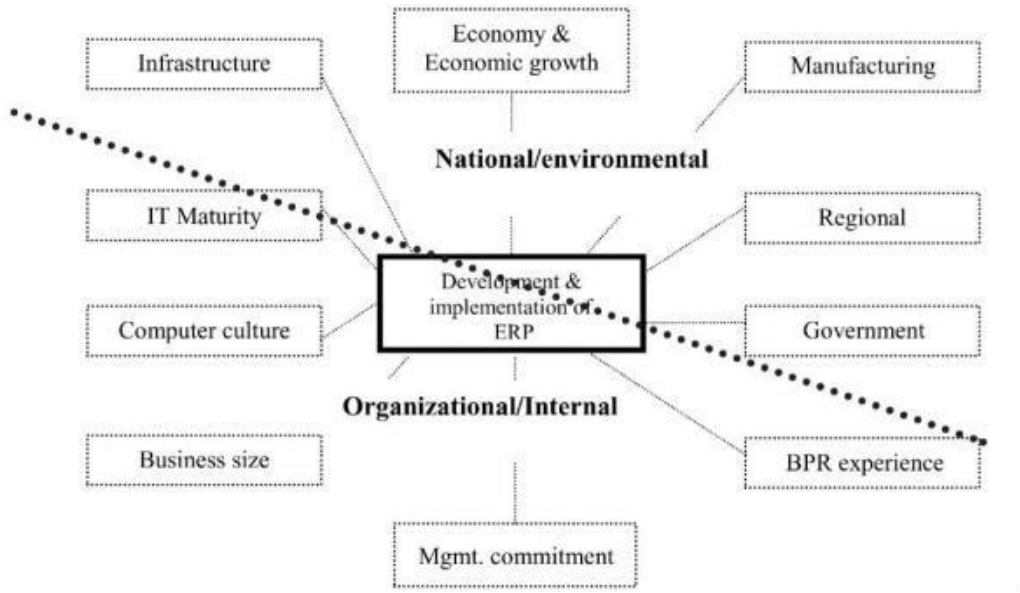


Figure 14 - A general framework for ERP implementation considering international aspects, (Huang and Palvia 2001)

Among national/environmental factors, current economic status and economic growth, infrastructure, and government regulations elementally influence IT acquisition and ERP adoption. In infrastructure there is definitely a poor record and suffering from the consequences in developing countries (i.e. transportation, telecommunications, Internet and intranet, mobile telecommunications, and public database systems). ERP is not a independent system and should be run in an integrated environment to gain

potential maximum performance. Other elements such as governmental policy that is strengthening foreign investment and fair competition are also critical.

Among organizational and internal factors, low IT knowledge and expertise (maturity), and lack of process reengineering and BPR experience obstruct IT acquisition and ERP adoption. Enterprises commonly suffer the lack of long-term strategy and project experience for information systems' implementation and utilization. Consequently, most applicants of IT solutions are subsidiaries of MNCs rather than domestic companies. SMEs play a constructive role in the national economy of developing countries. Affordability and availability are, therefore, main considerations for them. Enterprises also need process management attitude and BPR experience.

International ERP implementation projects raise another dimension of complicatedness which is national differences into the already complex make-up of ERP implementation in the context of global enterprise systems' studies.

Language, culture, politics, government regulations, management style, negotiation styles, and human resources skills and knowledge influence numerous ERP implementation projects at different countries. Indentifying these factors enable enterprises to be more prepared in defining project costs and time scope.

In a widely cited research, Sheu et al. (2004) have tried to distinctly answer questions such as which aspects of international ERP implementations are influenced by national differences? How and why are they influenced? And what factors of national differences influence international ERP implementation projects? How and why do they influence the implementation?

They demonstrate that national differences influences multinational ERP implementations in terms of the type and amount of ERP adaptation, centralization of implementation decisions, information sharing, project duration, project approach, and training programs, as shown in following diagram.

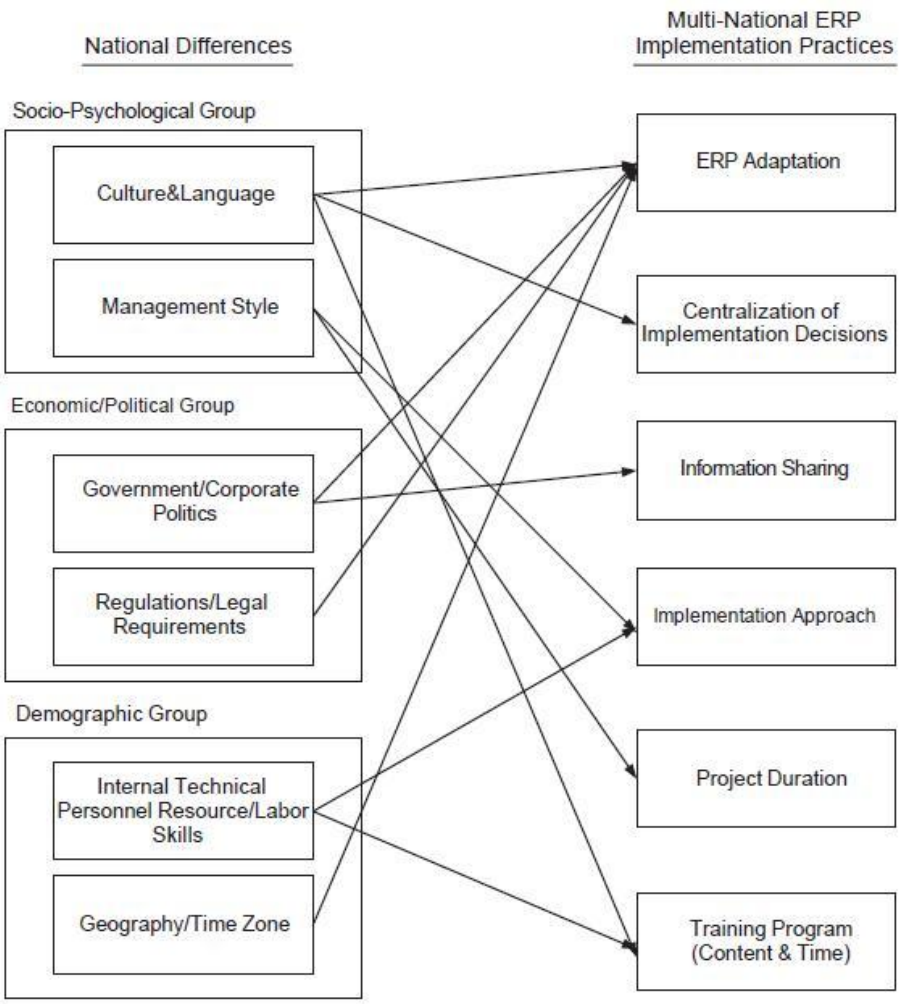


Figure 15 - The impact of national differences on international ERP implementation projects, (Sheu et al. 2004)

The most referred national difference is the national culture and language which affects the implementation project cultural resistance against foreign consultants and/or novel way of doing business, through technical problems in entering data, through communication barriers between facilities due to deferent languages, and through alteration of training programs in different places. Different management styles is considered as another national difference which affects implementation through variations in priority definition, implementation style (either “big bang" or “piecemeal” approach) and project duration. Countries are also different from aspect of their governmental and organizational politics that can affect implementation projects through different regulations for transborder information sharing and money transaction, through problems in information sharing between project stakeholders (information hiding), and through political conflicts between countries (mistrust between host and subsidiaries). Different administrational regulations influence implementation projects through

difficulty in developing standardization or universalization due to difference in forms, tax policy, procedures and others, and through substantial probable customization of ERP packages. Different levels of human resources knowledge and expertise, another aspect of national differences, affects the implementation projects through difficulty in exercising decentralized ERP implementation due to lack of local personnel resources, alteration of training programs in different locations, and complicated training and use support. Finally, complexity and technical problems in ERP adaptation due to different currencies and exchange rates, and also time differences between countries affects the success of implementation projects.

Language difference influences the implementation projects in managerial aspects. The use of a foreign language (usually English) increases human resources resistance to ERP implementations. While technical problems are in-comparison more comfortable to overcome, communication challenges resulting from language differences are far more complicated to resolve.

Businesses or industries at different countries have their specific procedures because of different processes and local requirements caused by national and local differences. *The initial plan should, therefore, be altered by allowing localized solutions and decentralized ERP implementations* (Sheu et al. 2004).

Managers in developing countries are highly forced by serious national and international competition, and they are severely feeling the need of implementing an ERP system to increase their competitiveness in the global and even national marketplace.

Management personality is another probable factor influencing the implementation quality (effectiveness) and duration. For example, Taiwanese managers have the personality type that takes additional attention to technical details and are more committed to complete short-term projects like ERP implementations. But European management style is more like "piecemeal" rather than "big bang" and so the projects take much longer than that of Taiwanese enterprises (Sheu et al. 2004).

Political, economic and regulatory factors directly or indirectly affect various IT-related areas (e.g. transborder data flow restrictions, trade and customs

regulations, etc.) The political pressures are quite hard to restrain (Palvia et al. 2002).

Negotiation styles are, also, reported as a critical factor in success of international projects of IT adoption. In the area of investigations about international negotiations, a few studies concentrate clearly on the interactions among different cultures. Also other intercultural negotiations have been studied usually regarding cultural dimensions like collectivism/individualism or high/low context cultures. Explaining negotiation style differences by differences in national cultures, some researches usually focus on them across different countries. Negotiating across borders differs significantly from negotiating within the domestic market. A number of new criteria must be considered, including different languages, cultural sensitivities, legal systems, tax regimes, labor regulations and different business approaches. Other aspects (e.g. gender, age, experience, tenure and educational level, and problem-solving behaviors) are also employed in this area of business and political science research (Agndal 2007; Hurn 2007).

The findings of a study on international business negotiations with the managers from Middle East show that the negotiators insist on building relationships and use referent power. It means the political uncertainty affects the bargaining power of the negotiators and the rate of political changes in the country affects the managers' use of time during negotiations (Khakhar and Rammal 2013).

Levels of human resources knowledge and expertise, also, vary from country to country, which can damage ERP implementation projects. For example, the lack of IT knowledge and skills in some countries persuade enterprises to centralize their implementation decisions. Also, depending on geographical distance, there may be as many as 12 hours time difference between countries that are cooperating in an ERP implementation project. This time difference could influence global trade operations from the aspect of communications, exchange rates for currency, etc.

An emerging need to identify every unique national context when adopting an ERP system in different countries is felt in recent years. Prior recognition of the relationship between ERP implementation and relevant national and

cultural difference variables provides a more accurate evaluation for budgeting and allows appropriate implementation project planning. Management should consult and negotiate with ERP vendors and implementation consultants prior to the start of the project to get additional information so to reduce expenses.

International ERP implementation projects should be leaded by a multi-cultural group of project managers who have a proper understanding of national and cultural differences and its implications to project management.

Communication between different nationalities faces many challenges due to national differences (e.g. languages, cultural conflicts, politics, etc.) This lack of effective and proper communication between adopting and consulting (or provider) enterprises reportedly leads to mistrust, project delay and over budget (Sheu et al. 2004).

Foreign ERP system vendors and implementation consultants should pay attention to the issues and challenges originating from national and cultural differences. The eight challenging factors which are investigated by Xue et al. (2005) are language, reporting formatting, Business Process Reengineering, economic situation effect, specific costs management, human resource related issues, pricing problem, and cooperation with ERP service companies (Xue et al. 2005).

Economic reform plans and the material pricing trends are taken to mean environmental factors in different countries. The fast-changing environments in many countries especially developing ones require flexible ERP systems allowing the enterprises to customize relevant modules to match their vibrant situation. Foreign ERP vendors, also, could design more empowered and comprehensive cost-control modules to cover more varieties of economic systems.

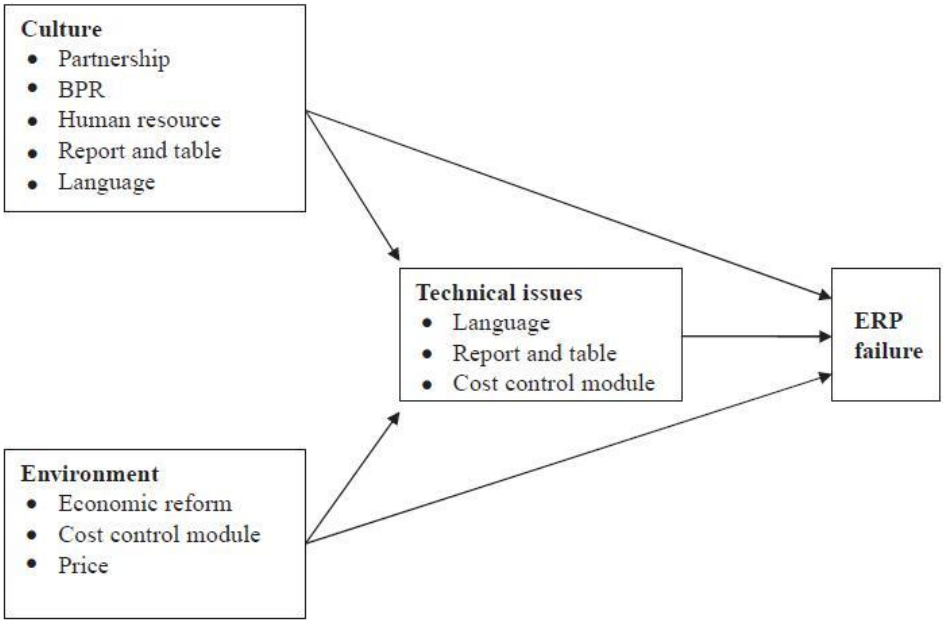


Figure 16 - An ERP implementation failure factor framework, (Xue et al. 2005)

Foreign ERP vendors and consultants also should reduce their pricing strategies (licensing, consultancy, etc.) since they are in competitive markets including local vendors and consultants who sell their services and products at lower prices though lower quality maybe.

Shadow systems (Excel, pencil & paper, etc.) are often huge enemies to implementation. It can often be easier for end users to keep using the old system even after the change to the new one has accomplished. You would be shocked of detecting the strange reactions people do to hide the legacy systems they still utilize.

Also, some of the stakeholders at the beginning of the project would not be the same stakeholders at the end of the project because people get promoted, put on other projects, moved to different departments, transferred to other locations, fired, laid off, resigned, etc. The new stakeholders have their own thought about what is required and their own different strategies for fixing things, and they don't want to use their predecessors' solutions since they can't claim credit for its successes and can easily blame its failures on their predecessors!

ERP systems are not widely applied in Asia yet and most of employees there are not yet trained or experienced in running and implementing ERP systems. Consequently, learning and re-educating them is even more of

importance. As they don't give direct negative feedback most of the time, it is crucial to them to fulfil prepared tests or assignments and to answer "compiled control questions", so that, their comprehension could be evaluated and escalated if necessary (Munkelt and Völker 2013).

Vendor selection is made in part by considering the training issues to be assumed during and following implementation. Due to language and cross-cultural differences training programs are expected to be more time-consuming and challenging. The workforce's previous knowledge and experience with other software solutions (regular Microsoft products) lower the employees' learning curve. Therefore, *careful package selection* is a specific factor here.

According to a case-study, *vendor support* had been used on a limited basis, problems were thoroughly examined internally and the vendor was contacted only when all attempts to solve them were exhausted. This is a policy decision as external vendor support is simply too expensive to be used without real cause (Plant and Willcocks 2007). The Case enterprise was considering implementing ERP's at its other divisions a contract that the consultant/vendor might gain if the first implementation smoothly accomplished (*vendor partnership*). Access to physical *resources* (importing servers and the equipment) is also sometimes a difficult and frequently frustrating process in some non-developed countries and considered as an important factor to on-time implementations.

The issue of *trust* is another CSF for international projects that is considered vitally important and essential. Some companies are very protective of their business and/or manufacturing processes (e.g. the formulas for the products and their preparation), but they sometimes have to release the information to the consulting partner who is running a parallel implementation at their location, for example. The legal dimension is a very important aspect of this CSF and the lawyers forth over a long time period. The issue is compounded by the fact that adopting enterprises and the consultants/vendors in international projects are usually using different legal authorities and regulations as the basis for their contracts.

From the perspective of international CSFs, the issue of trust among partners is a key. The endowment of key corporate intellectual property to third

parties is a very sensitive subject that make whole project more difficult when the legal systems under which the partners operate are not consistent. The selection of a system based upon the scale of implementation in relation to resources available is also a factor. The costs associated with an international consultant/vendor-client relationship are extremely high and for small to medium sized enterprises and the usage of external parties in consulting, training and supporting roles could suck the project budget if applied in a wrong or inappropriate way.

It is also clear that customization should be minimized because, not only, this would avoid the need to write custom unintegrated codes for particular processes as well as the associated cost, but also, it would restrict the exponential effect of the distance from consultant on total costs. A strong consultant relationship and support is crucial considering the time and distance that are separating many of the business units from the consultant. Nevertheless, there are cultural differences between the consultant and the adopting organization that while not finally catastrophic, is resource consuming and stress inducing on the project team at any time, and which with easier and greater communication can be controlled and marginalized (Plant and Willcocks 2007).

The use of international consultants doesn't reduce the quality of the implementation and helps to facilitate clear objectives and project targets. International consultants enhance the project team's merit and facilitate training on new business processes (Plant and Willcocks 2007).

## 4.6 ERP projects' national case studies

In parallel to some theoretical works investigating international aspect of ERP implementation projects, there has been a large number of case reports studying the specific factors influencing ERP implementation projects in different desperate countries of the world having different national and organizational cultures. Case studies in South East Asian countries like China, Taiwan and Singapore (Hawking 2007; Soh et al. 2000; Srivastava and Gips 2009; Xue et al. 2005), Central Asian countries like India and Sri Lanka (Molla and Bhalla 2006; Palvia et al. 2002; Rajapakse and Seddon

2005), Middle Eastern countries like Saudi Arabia, Jordan and Bahrain (Al-Turki 2011; Hawari and Heeks 2010; Kamhawi 2008), Iran (Amid et al. 2012; Naseri Taheri et al. 2008; Nikookar et al. 2010), multinational European projects (Gulla 2004; Koh et al. 2006), American countries like Brazil and Mexico (García-Sánchez and Pérez-Bernal 2007; Huang and Palvia 2001; Utecht et al. 2004), and Turkey (Baki et al. 2004) share sometimes similar and sometimes specific implications for international ERP implementation which is outlined in this study.

ERP acceptance has been much lower in developing countries, with an approximate calculation of some 10-15 percent of global ERP market in 2010 (Hawari and Heeks 2010). Nevertheless, these countries seem to be ready to become the strategic position for a considerable expansion of ERP implementations. So far, reports and researches on ERP failures in developing countries have emerged recommending that these implementations encounter particular difficulties in addition to those found in developed countries (Hawari and Heeks 2010; Huang and Palvia 2001; Molla and Bhalla 2006; Rajapakse and Seddon 2005; Xue et al. 2005).

In Europe, the picture is even more complicated because organizations also have diverse national cultures that affect the organizational cultures and make the success of international ERP implementations difficult (Gulla 2004).

In a study of seven public hospitals in Singapore, Soh et al. (2000) defined a cultural misfit as the distance between the "should-be" processes offered by the software solution and that as-is way of doing business in the adopting enterprise. They advise that misfits may be poorer in Asia because the operational practices underlying most ERP solutions mirror European and US business processes. They also suggest that ERP cultural misfit has its origins in the enterprise-, or country-specific requirements which don’t suit the specifications of the software package (Soh et al. 2000).

In a comparing research in 2002 at Taiwan, a significantly higher user satisfaction for the locally developed ERP system comparing foreign developed ERPs is found as the former reflects the local user likings. ERP software producers are often North American or European and consequently unexpected to support various aspects of the national and organizational

culture of other countries. For example, the majority of reports in ERP systems tend to be online while Asian workers prefer paper based reports (Hawking 2007).

Also an expanded case-study and literature review in 2009 summarized Chinese cultural implications for ERP implementation. The researchers categorized the specific influencing factors to four main areas as bellow.

Table 7 - Summary of specific culture related factors impacting ERP projects in China, (Srivastava and Gips 2009)

| Culture Aspect | The way ERP project is affected |
|---|---|
| **Management Culture** | Limited employee involvement<br>Lack of top management visibility<br>Inexperience, poorly formed project team with IT only focus<br>No widespread understanding or acceptance of ERP |
| **Trust and Respect** | Distrust of European expatriates on the implementation team<br>Implementation team exposed weaknesses in Chinese managers and face was lost |
| **Change Culture** | Legacy system was kept in place<br>Business processes were not redesigned |
| **National Cultural** | Chinese staff adopted a passive attitude toward the project<br>Employee training program was ineffective and insufficient |

They believe too that ERP implementation benefits can be reduced to the point of near exclusion because the ERP strategic value propositions (or strategic benefits) are gradually restricted by business culture embedded in a strong societal culture.

Issues surrounding a distributed, multinational implementation of SAP R/3 surveyed through a huge case-study project at Hydro-Agri Company. Hydro Agri (now called Yara International ASA) is a Norwegian chemical firm whose largest business activity is the manufacturing of nitrogen fertilizer, dry ice, nitrates, ammonia, urea and other nitrogen-based chemicals. When the company acquired a number of companies in the UK, Holland, France, Germany and Italy, decided to harmonize the processes across scattered sites and utilize the ERP system to integrate data. The project involved over 500 members for more than 4 years and was carried out in cooperation with Accenture and over 3000 end-users were trained. The author has finally considered the enterprise's efforts to manage multiple languages, different legal and value systems. Jobs, tasks, reports, cooperation, operative principles, and system resources are just as important when integrating scattered organizational sites, but cannot be visually documented and

discussed the same way due to international differences in culture, language and legal systems (Gulla 2004).

Based on Hofstede's cross-cultural dimensions, Rajapakse and Seddon (2005) have case-studied 6 companies in Sri Lanka and found out why ERP systems may be adopted less and are less effective in developing countries in Asia. They consider that most of ERP software packages reflecting western (north American and European) national cultures based on Hofstede's dimensions and then draw opposing sub-characteristics of all dimensions that can be reduced to four main ones and name them as cultural clashes for ERP systems in developing countries in Asia. They claim that Asian countries have more centralization and less level of accountability and discipline, less level of commitment and less level of change, while ERP solutions are suited and tailored for decentralized western cultures that have more level of accountability and discipline, more level of commitment and more level of change (Rajapakse and Seddon 2005).

Middle East countries are considered important players in the international trade, investment and political affairs due to its geographical location and the natural resources found in the region. Despite its significance, there has been limited research undertaken on how business is conducted in the region (Ali 2009).

Interviewing top project team members in 16 ERP adopted manufacturing firms in Bahrain, Kamhawi (2008) presents a new momentum (literally motivation) for evaluating ERP practices in less developed countries' settings. He demonstrates that the main challenges to ERP implementations are simply the high start-up costs and the long time periods their projects consume. Resources problems are also ones perceived as challenges by interviewees (Kamhawi 2008).

Studying ERP implementation projects in Jordan, Hawari and Heeks (2010) present a design-reality gap model to explain ERP failures in developing countries. They demonstrate that there are more generic actions (i.e. mapping organizational realities, using hybrids, and being incremental) that can be identified on the basis of gap-closing potential. In fact, project owners and managers should find ways to uncover the must-be situation within the organization, and integrate that into implementation processes. In this way,

hybrid ERP professionals are those who merge and unite the understandings of information systems and the main business of the client organization. These experts can, therefore, act as a bridge linking the methodology behind the ERP system and organizational reality, helping to detect and minimize gaps. Also, breaking the whole change down into smaller steps (to the extent possible with an ERP system) and therefore decreasing the extent of gap between design and reality is another generic action suggested by them (Hawari and Heeks 2010).

In a series of vast researches focusing on ERP implementation in Iran, some researchers in recent years have identified specific critical failure factors (CFFs) in Iranian industries through an expanded project of semi-structured interviews, instrument development, data collection and data analysis using qualitative and quantitative methods. Some of mentioned factors in these researches are intensively related to structural problems of Iranian organizations with high hierarchical levels, high bureaucracy and formalization, etc, while it is predictable that they can be probably consistent for other developing countries especially nearby, which suffer from the same cultural structures (Amid et al. 2012; Dezdar and Ainin 2011b; Naseri Taheri et al. 2008; Nikookar et al. 2010).

High rate of managements' substitution or replacement in top levels of organizations' hierarchy and absence of any stable managerial position in public sector, achieving short term operational goals, country-specific regulations and procedures especially in finance processes, lack of any clearly defined IT strategies and its alignment with business strategies and goals, the lack of a full time and balanced project team, lack of a process oriented vision among employees that results in major customizations to fit current prevalent functional oriented structures of enterprises, and focus on technical and financial aspects of the project and neglecting to consider non-technical issues like human resources prevent ERP solutions (especially the international systems) to being successfully implemented and fitted in Iranian industries (Amid et al. 2012).

The issue of poor vendors and consultants that strongly relates to international sanctions against Iran in recent years is one of the most mentioned failure factors. They highly limited top tier ERP vendors and

consultants to widely participate in Iranian ERP projects. This limitation forced Iranian organizations to invite second tier vendors and consultants, which are of less experience, to assist them. On the other hand, there are some internal ERP vendors, which are not well qualified in the field.

Lack of strategic thinking and planning among top level management to select and implement ERPs, high amount of license purchasing and implementation costs, and lack of experienced and qualified implementers and consultants inside the country are the most reportedly important reasons for the sake of them Iranian managers are reluctant to ERPs (Naseri Taheri et al. 2008).

The results of an exploratory study of ERP implementation in Saudi Arabia which suggest that the critical issues for successful implementation of ERP systems are the same regardless of the cultural differences (Al-Turki 2011) differs from similar studies conducted in different cultures. Also a research shows that Mexican enterprises have similar obstacles and opportunities for success in the implementation process of an ERP system, as do enterprises in other countries where the generalized use of ERP systems is in process. However, the importance levels of these obstacles and opportunities may be linked to cultural differences (García-Sánchez and Pérez-Bernal 2007).

## 4.7 Chapter conclusion

The failure of global ERP projects raises the importance of studies that are investigating the factors and conditions impacting international aspects of these projects. This chapter reviews almost all recent studies which have focused on international projects of IT adoption and ERP implementation.

To do so, in this chapter, the differences and characteristics of international projects in general have been reviewed. Studying and evaluating the conditions surrounding and the factors impacting international projects demonstrates that national and consequently organizational cultures in different countries strongly matter. There are some best practice cultural theories which are utilized in international business and management studies like Hofstede's dimensions and Lewis model, both of them are explained in this chapter.

Almost all significant and mostly cited researches which are investigating cultural perspectives of IT management and ERP adoption are utilizing Hofstede's model (Van Everdingen and Waarts 2003; Gallivan and Srite 2005; Hwang and Grant 2011; Krumbholz et al. 2003; Rajapakse and Seddon 2005; Sheu et al. 2004; Shore 2006; Srivastava and Gips 2009; Zhang et al. 2005). A very abstract sense of these studies imply that low power distance, low uncertainty avoidance, high collectivism and more long-term oriented cultures may handle huge impacts of transborder ERP implementation projects because these projects require open communication through all enterprise (critical assessments and clear comments), low resistance to change (risk-taking), teamwork, and optimistically futuristic top management and staff. But the studies do not observe any evidence to relate the success of such projects to Hofstede cultural dimensions of Masculinity and Indulgence.

The other cultural aspect which is paid attention is the misfit between business and operational processes behind standard software packages that are generally recommended and the actual business and operational processes in adopting enterprise. Although ERP vendors and implementation consultants need to comprehend how the industries and businesses in other radically vibrant business environments are functioning, to modify and generalize their software packages and help them to accept that these systems make effect just in totally new business processes, adopting enterprises should also fully understand the importance of business process reengineering and continuous system engineering.

Studying other specific impacting factors and implementation frameworks for international projects of ERP adoption shows that a strong commitment to longer time period of projects, open communication through advanced technologies, single language reporting (oral and written) standards, reducing high costs resulted from different money values and economies, empowering implementation skills and knowledge by special trainings, increasing task congruency and bolding and emphasizing the competitive environment to reduce the impact of cultural misfit, initial planning based on localized solutions and decentralized implementations, and establishing partnership between foreign vendor/consultant and local developers/consultants are some specific factors that can strongly help the

projects to be successful as well as long-term strategies, governmental policies to strengthen foreign investment and fair competition, careful package selection, minimizing customization, and at last, not at least, a bilateral trust among all project stakeholders during project negotiations.

In parallel to some theoretical works investigating international aspect of ERP implementation projects, there has been a large number of case reports studying the specific factors influencing ERP implementation projects in different desperate countries of the world having different national and organizational cultures. Case studies in different countries that are reviewed in this chapter share sometimes similar and sometimes specific implications for international ERP implementation.

The failures of foreign ERP implementation projects convince the international consultants to have a more localized strategy which is *cooperation with a local ERP service company* that is more familiar with the host culture and domestic business and overall conditions to guide enterprises who implement their new systems. Partnership with local ERP service companies raises another challenge for foreign vendors/consultants namely Training. They should ensure that their partners know their services, products and tools very well and are reliable.

Implementation consultants who look forward entering foreign markets can use the framework and results of this study to better accomplish international ERP projects and to adopt better strategies. They can also recognize the environmental and internal essentials and prepare in a way that is appropriate to the particular circumstances.

## Chapter Five

# 5 Framework development and conclusion

> **"***I have come to the conclusion, after many years of sometimes sad experiences that you cannot come to any conclusion at all.***"**
>
> Vita Sackville-West, an English novelist and garden designer

## 5.1 Introduction to chapter

Enterprise systems are the wide-ranging complicated application/software systems and tools underlying many of manufacturing and business' administrative- and management-support processes. Examples include the systems associated with finance, human resources, procurement-to-distribution planning, customer relationship management, and several others. Every day these systems process thousands of business transactions in which data are entered, manipulated, and stored for both operational and informational purposes. The evolution of these systems (functionally and technologically) is so fast and makes the implementations more complicated.

The project of enterprise system adoption (i.e. ERP implementation) is regarded as complex, cumbersome and costly, and, very often, it exceeds the initial estimated resources. During past four decades, a massive amount of research has accomplished to investigate this kind of projects finding best-practice procedures, project life-cycle, and influencing criteria called as critical success factors. In recent fifteen years, the researchers in this field either have tried to conclude previous researches through different methodologies or focused on very specific and particular factors or issues regarding such projects.

A large portion of ERP implementation projects are done transborder that is called in this study international ERP implementation project. These projects have absolutely their specific conditions and requirements that have not been investigated widely, coherently and effectively in recent years.

This study which is summarized and concluded in this chapter tries to triangulate three main research streams respectively, first, the ERP implementation project life-cycle, second, the up-to-date critical success factors identification and categorization, and third, international projects of ERP adoption and implementation. Summarizing chapters three and four, this chapter ends with developing and discussing a framework for international projects of ERP implementation.

## 5.2 Summarizing

### 5.2.1 Implementation Life-Cycle

ERP systems can be complex and difficult to implement, but a structured and disciplined approach can greatly facilitate the implementation. That's why there are a considerable number of researches categorizing the whole ERP story in the enterprise which is called Life-cycle. The ERP life-cycle has been structured in dimensions and phases, generic enough to permit the classification of publications and comprehensive enough to give a general vision of the whole ERP lifecycle (Nazemi et al. 2012).

Primary researches suggest instructions by steps. (Esteves & Pastor, 2001) and (Umble et al., 2003) have presented most cited ERP implementation procedures respectively in 6 and 11 steps. Since late 2000s, researches (Ehie

and Madsen 2005; Munkelt and Völker 2013; Winkelmann and Klose 2008) have often divided ERP life-cycle into five major stages. These phases are preceded by a critical look at the strategic enterprise architecture and surrounded by change management and business development components. The strategic enterprise architecture analyzes the driving motive for implementing an ERP system while change management and business development seek to integrate the human resource dimension and coordinate daily operations with the new business process design, respectively (Ehie and Madsen 2005). Although most of the researches categorize the attempts in some-how similar phases in number, some of them have strategic and planning point of view while the others have technical point of view. This study considers both views. Also there are some overlaps and exchanges in different definitions of phases, but this study tries to merge them and introduce a comprehensive plan of actions by phases as below.

**Initiatives; Strategic and Technical**

A comprehensive planning including activities such as vision statement based on objectives, budget targeting (Economic justification), steering committee introduction, training planning (content and infrastructure), top management reeducation, project scope and detailed project plan (assignments and responsibilities) definition, implementation methodology, and hardware and network infrastructures development planning are normally done in this very primary phase.

**Selections**

The second phase includes a set of attempts pivoting selections of people, partners and software package/s. Project team member selection (technical team selection, consultant and vendor/software selection) must be done through comprehensive market analysis, criteria and factors definition, negotiations (business vs. legal), and forecasting selection consequences. Also vendor/consultant's training and knowledge transfer evaluation is done in this phase.

**As-Is to To-Be: Analysis to Blueprint**

Most of basic analytical activities are done in this phase of project (e.g. organization's operational analysis, project members' training, integration

concept reeducation, seminars and round-tables, process documentation, new process simulation, process measurement, new process design mapping, current master and transaction data analysis, tool-based requirement analysis, and technical infrastructure upgrading or renovation.)

With the help of requirement analysis tools (requirements navigators such as LIVE KIT) the consultant navigates the customer through ERP's adaptation options using a graphic step-by-step guide. In fact, structured inquiries are made into the user's business requirements and immediately checked against the ERP modules and configuration options (Thome and Hufgard 2006).

**Tests and Final Preparation**

Final preparation activities such as help-desk planning, run-up date scheduling, end-user trainings, new processes debugging, full data load, data migration and centralization, and software customization through codeless configuration or parameterization, application development and KPI and reports design are done in fourth phase as well as testing activities like testing scenarios' definition, testing documentation and user's guide preparation, and extreme situations simulation and testing.

**Go Live! And Continuous System Engineering**

During the final phase of rolling-out and operation, ultimate and ending activities such as help-desk setting, system behavior optimization, user requirement adjustment, empower internal consultants, enterprise specific guideline, project completion and delivery, post evaluation (self- and external- evaluation), master data migration from test-system, and technical tuning should be handled. Also it is emphasized that all legacy systems should be removed.

After successfully implementing the ERP solution, the existing systems need to be continuously analyzed to receive full information on the current usage and configuration of the software. This could uncover the unused potentials and lead to discovering necessary improvements (Thome and Hufgard 2006).

### 5.2.2 Up-to-date general critical factors in categories

Early ERP implementation reports confess that only a low percentage of enterprises experienced a smooth rollout of their new ERP systems and immediately began receiving the advantages they predicted. An uneven utilization and low return on expectations are normally rooted by human issues, not software failure. Therefore, the critical factors are investigated by enormous point of views, and categorized in multifarious frameworks.

In a very primary vast investigation of success factors, (Al-Mashari et al. 2003; Kræmmergaard and Rose 2002; Nah et al. 2001; Somers and Nelson 2001, 2004) propose a then overall list factors associated with project/system implementations obtained out of a methodologies including identification and synthesis of those critical requirements for implementation that have been recommended by practitioners and academicians, and through an comprehensive review of the literature. They show that top management support, project team competence, interdepartmental cooperation and partnership with vendor/implementer are important during almost all implementation stages.

Other researches provided detailed and focused investigation on factors associated with ERP projects rather than overall taxonomy reports. For example, (Motwani et al. 2002) detect that organizational environment, ready culture, and balanced network relationships are key factors to ERP success, and (Mabert et al. 2003) emphasize that a clear instructions on how to recruit outside consultants and apply detailed plans for training users are critical. Individual characteristics (knowledge, cognitive abilities, and motivation), group characteristics (goals, roles, norms, diversity, and problem solving), and organizational characteristics (strategy, resources, rewards, culture, and structure) could affect the ERP implementation (Xue et al. 2005).

Several studies have categorized multifarious factors into 8 to 12 major classes including top management support and commitment (Bradley 2008; Finney and Corbett 2007; Lin 2010; Muscatello and Chen 2008), effective project management and team (Chen et al. 2009; Finney and Corbett 2007; Skaf 2012; Umble et al. 2003), business process reengineering and continuous system engineering (Muscatello and Chen 2008; Somers and

Nelson 2004; Thome and Hufgard 2006), vendor support and employees training (Bernroider 2008; Ehie and Madsen 2005; Finney and Corbett 2007; Upadhyay et al. 2011). Findings and classifications on critical factors related to ERP implementation success have been continued and carrying currently on. The original research of this paper has studied first almost all major papers that are covering critical success factors of ERP implementation and then categorizes them as following.

**Initiatives and/or clear understanding of strategic goals**

Including a well-developed strategy that includes flexibility and adaptability for selecting, implementing, maintaining and/or upgrading an enterprise system (Beheshti et al. 2014), Clear definition of aims, presumptions, and outcomes (integration-oriented, measurable and considering risk and quality Mgmt) (Al-Mashari and Al-Mudimigh 2003; Umble et al. 2003), Benchmarking internal and external best practices, a cross-functional and unifying overview (Guido and Pierluigi 2011), conducting economic and strategic justifications (Finney and Corbett 2007), key architectural considerations. (Centralization or decentralization, compatibility of existing tools, identification of bolt-ons, etc.) (Munkelt and Völker 2013), right vendor and/or consultant selection, knowledge management and knowledge transfer strategies and plans, and quality of the client–consultant relationship (communication effectiveness, conflict resolution and technology transfer) (Lapiedra et al. 2011; Maditinos et al. 2012; Upadhyay et al. 2011; Wang et al. 2007; Yazdani et al. 2013).

**Top Management Commitment**

Including commitment to enterprise integration, understands ERP methodology, fully supports the costs, demands payback, and champions the project (Umble et al. 2003), leadership to foresee any sudden malfunction, technically orientation (Motwani et al. 2005), deeply perception of change, and authorizing the project members (Lin 2010; Muscatello and Chen 2008). "*A mere lip service or lukewarm (unenthusiastic) support from top management is the "kiss of death" for any ERP implementation*" (Ehie and Madsen 2005).

**Organizational Change Management; Organizational Learning and BPM**

Including the significance of a corporate culture regarding change and learning (Ke and Wei 2008; Kwahk and Lee 2008; Lapiedra et al. 2011), Managing resistance, confusion and human- and information-layoff (Guido and Pierluigi 2011; Somers and Nelson 2004), reeducation and conceptualization about the advantages, guarantying the support of opinion-leaders (Abdinnour-Helm et al. 2003; Finney and Corbett 2007; Somers and Nelson 2001), satisfaction of stakeholders by decreasing the costs (Tarafdar and Roy 2003), process approach to implementation project, existence of an underlying form, logic or plan that controls change process (Guido and Pierluigi 2011), Open communication and innovative behavior, cross-functional training, Risk aversion, Organizational learning strategy (learning by doing, scanning external information by gatekeepers, consultants, and customers, information/knowledge sharing (Motwani et al. 2005), troubleshooting skills (Nah and Delgado 2006), and business process reengineering (BPR) through reverse business engineering and continues system engineering (Somers and Nelson 2004; Thome and Hufgard 2006).

**HR Issues; Team building, communication and training**

Including whole enterprise training programs and communication channels (Upadhyay et al. 2011), primary trainings involve key users and IT personnel (Munkelt and Völker 2013), computer seminars prior to the implementation (Maditinos et al. 2012), -educate key persons in terms of integration concept, training infrastructure (on-board, online), compensation plans (Motwani et al. 2005), Post-implementation meetings: bugs recognition, experience exchange, etc. (Umble et al. 2003), team building (steering committee, project members), a commitment to "release" project members to the project on a full-time manner (Finney and Corbett 2007), project champion (leader) (Finney and Corbett 2007; Mandal and Gunasekaran 2003), and cooperative, interpersonal and group behavior (*Network Relationships*)(Motwani et al. 2005).

**Project Management Issues**

Including a clear definition of goals, development of both work plan and resource plan, and watchful tracing of project progress, project scope

(selected modules and affected processes)(Umble et al. 2003), allocating of responsibilities and tasks to various players, the determination of milestones and critical stages, non-tight budgeting strategy (Finney and Corbett 2007), resource requirements evaluation (financial, human, etc.) (Somers and Nelson 2004), project monitoring and project assessment indexes (KPIs) (Umble et al. 2003), Feedback network and focused performance measures (Mandal and Gunasekaran 2003; Tarafdar and Roy 2003), ERP performance modeling (Nazemi et al. 2012).

**Technical Issues; Infrastructure, Data Accuracy and Migration**

Including proper infrastructure (Hardware, Networks, OS, etc.), data conversion (to a single, consistent format), controlling the complication of information flows (Upadhyay et al. 2011), *data accuracy* during the conversion process, cleaning up of suspect data (Finney and Corbett 2007; Somers and Nelson 2001, 2004; Umble et al. 2003), testing and simulation(Al-Mashari et al. 2003; Nah et al. 2001), Legacy system considerations (all legacy systems must be removed or banned)(Winkelmann and Klose 2008), and tool-based implementation (navigators, BPM tools)(Monk and Wagner 2012; Thome and Hufgard 2006). "*ERP implementation must not be considered as just an IT project, ... Emphasis on IT infrastructure is the least correlated factor to ERP implementation success*." (Ehie and Madsen 2005)

### 5.2.3 Specific factors associated with international projects

The failure of global ERP projects raises the importance of studies that are investigating the factors and conditions impacting international aspects of these projects. This section summarizes the chapter four that have focused on international projects of IT adoption and ERP implementation.

Almost all significant and mostly cited researches which are investigating cultural perspectives of IT management and ERP adoption are utilizing Hofstede's model (Van Everdingen and Waarts 2003; Gallivan and Srite 2005; Hwang and Grant 2011; Krumbholz et al. 2003; Rajapakse and Seddon 2005; Sheu et al. 2004; Shore 2006; Srivastava and Gips 2009; Zhang et al.

2005). A very abstract sense of these studies imply that low power distance, low uncertainty avoidance, high collectivism and more long-term oriented cultures may handle huge impacts of transborder ERP implementation projects because these projects require open communication through all enterprise (critical assessments and clear comments), low resistance to change (risk-taking), teamwork, and optimistically futuristic top management and staff. But the studies do not observe any evidence to relate the success of such projects to Hofstede cultural dimensions of Masculinity and Indulgence.

The other cultural aspect which is paid attention is the misfit between business and operational processes behind standard software packages that are generally recommended and the actual business and operational processes in adopting enterprise. Although ERP vendors and implementation consultants need to comprehend how the industries and businesses in other radically vibrant business environments are functioning, to modify and generalize their software packages and help them to accept that these systems make effect just in totally new business processes, adopting enterprises should also fully understand the importance of business process reengineering and continuous system engineering.

Studying other specific impacting factors and implementation frameworks for international projects of ERP adoption shows that a strong commitment to longer time period of projects, open communication through advanced technologies, single language reporting (oral and written) standards, reducing high costs resulted from different money values and economies, empowering implementation skills and knowledge by special trainings, increasing task congruency and bolding and emphasizing the competitive environment to reduce the impact of cultural misfit, initial planning based on localized solutions and decentralized implementations, and establishing partnership between foreign vendor/consultant and local developers/consultants can strongly help the projects to be successful as well as long-term strategies, governmental policies to strengthen foreign investment and fair competition, careful package selection, minimizing customization, and at last, not at least, a bilateral trust among all project stakeholders during project negotiations.

In parallel to some theoretical works investigating international aspect of ERP implementation projects, there has been a large number of case reports studying the specific factors influencing ERP implementation projects in different desperate countries of the world having different national and organizational cultures. Case studies in different countries that are reviewed in this chapter share sometimes similar and sometimes specific implications for international ERP implementation.

The failures of foreign ERP implementation projects convince the international consultants to have a more localized strategy which is cooperation with a local ERP service company that is more familiar with the host culture and domestic business and overall conditions to guide enterprises who implement their new systems. Partnership with local ERP service companies raises another challenge for foreign vendors/consultants namely Training. They should ensure that their partners know their services, products and tools very well and are reliable. Also a better and more efficient negotiation strategy is recommended for all international projects.

## 5.3 Framework development and discussion

Project Managers plan the project based on the project time-line and influencing criteria such as budget, risks, quality expectations, etc. which are known as critical success factors in details in the literature. A framework containing almost all these information and criteria would be like an eagle-view to the project for the top management and the project leaders. This study has reviewed most-cited modelings and classifications of ERP implementation success factors to evaluate the existing models, and to recognize ideas for a new practical classification/framework.

The vast literature demonstrates that a successful ERP implementation often needs identification and management of critical factors and their components at each stage of the ERP Life-cycle (Beheshti et al. 2014). Literature review also shows that recent publications are more focused on organizational, managerial and strategic aspects of ERP implementation rather than technical and system issues that had been reflected in former publications till mid 2000s. Recent publications add new and significant less-paid-attention

factors and criteria into the old lists of critical success factors. The assessment of these factors and also the attempt for categorization of them hand over a new framework to understand an ERP implementation project life-cycle, and activity areas classification and importance.

To do so, after precise evaluation of the most cited and recent publications and case studies in the field of critical success factor identification and ERP project life-cycle definition, a new staged instruction (framework) for international ERP implementation projects based on up-to-date critical factors is developed. This framework models an enterprise system implementation project by two major dimensions of project stages and focus area. Although the activities can/should be divided through project stages, almost all critical factors are effective during whole project while they can be categorized by activity areas.

Table 8 -The modeling structure of the instruction developed by this study

| | **Phases** |
|---|---|
| **Activities and factors focus area** | To-dos |
| | Critical success factors that are valid during whole project |

Most of researches have divided an ERP project to five stages of Initiatives, Requirement analysis, Realization, Final Preparation and GO-Live (Ehie and Madsen 2005; Monk and Wagner 2012; Munkelt and Völker 2013; Winkelmann and Klose 2008). This type of phasing has two major weaknesses according to this study's point of view; 1) although the selection of consultant and/or vendor/software is very crucial to project success, it is a bit neglected to be considered in this life-cycle models, and 2) the capacity of activities is not divided in an equivalent form. In fact, if the selection processes for consultant and/or vendor/software are considered as activities in Initiatives phase (or any other), that phase lasts equal to other four phases.

This study, therefore, divide the project based on the attention that has been paid into the activities of a normal enterprise system implementation. There is a considerable emphasize on vendor selection during an enterprise system project, just after defining strategies and vision of the project. In fact, top management can start the implementation practically after selecting the vendor/software getting help from external consultants. Therefore, consultant and vendor selection is a stage alone right after initiatives and

before practical implementation which begins with requirement analysis and blueprint development. Although some researches or cases separate the phases for requirement analysis (As-Is Analysis and To-Be Analysis), this study combine these stages because the target of all activities is actually similar which is to develop new business process definition and project blueprint. Also this study emphasize on the activities regarding a middle exclusive phase to test the system and migration issues, and continuous business information processing after final go-live or run-up!

On the other hand, the recent CSF classification studies (Ram and Corkindale 2014; Thomas et al. 2012) are doing categorization regarding focus areas of organizational, technological, project-related, and people-related. This study adds the focus area of international-related issues to make a framework for international projects of implementations. This kind of classification makes specialized experts in enterprise or consultants able to concentrate on specific activities and factors.

As the origin and nature of management-, HR- and Project-related activities are so close to each other, some researches consider them as a unique area of organization-related activities, while recent researches are focusing to separate them in detail to define particular tasks and responsibilities and identify specific success factors for all project members and departments. Thus, although the activities and factors which are affiliated with international-related issues could be counted or considered as organizational activities and factors too, they are separated as an exclusive focus area just for the sake of their importance in international projects.

Projecting project stages on focus areas helps project members not only to focus on their specialized activities and success factors, but also to prioritize their tasks and responsibilities considering related factors to which they have to pay attention. Also it makes top management able to have an overall view of the project to plan and strategize. For example, in strategizing phase, management-related factors have more relevance than technological factors.

Because of the whole-project-importance nature of the success factors, they are supposed not to be categorized by phases in this study, but some factors seem to be specified to only one or two phases. For example in management-related area, factors concerning selection criteria are belonging specifically to

selection phase of the project while they are applicable somehow in other phases though. Therefore, one possible future research idea or recommendation could be developing a more detailed instruction model which separate factors step-by-step in the project, while some of them would be projected to whole period of project.

Projecting project stages on activity areas helps project members not only to focus on their specialized activities and success factors, but also to prioritize their tasks and responsibilities considering related factors to which they have to pay attention. Also it makes top management able to have an overall view of the project to plan and strategize.

Table 9 - New staged instruction for Enterprise System implementation based on up-to-date critical factors

| | **Phase 1**- Strategizing | **Phase 2** – Selections | **Phase 3** – Process Re-engineering | **Phase 4** – Migration and Testing | Phase 5 – RUN-UP and CSE |
|---|---|---|---|---|---|
| Management-**related** | Comprehensive planning<br>Vision based on objectives<br>Budget targets (Economic justification)<br>Steering committee introduction | Comprehensive market analysis<br>Criteria and factors definition<br>Negotiations (business vs. legal)<br>Consultant selection<br>Vendor/Software selection<br>Forecasting selection consequences | Organ. Operation Analysis (Business Process Re-eng.)<br>Cooperation with consultants<br>Comparable realignment<br>Conflict resolution<br>Prototyping and adjustment toward final system | Final preparation<br>Testing scenarios' definition<br>Help-desk planning<br>RUN-UP date scheduling | Help-desk setting<br>System behavior optimization<br>User requirement adjustment<br>Continuous System Engineering |
| | Top management support<br>• Top-down promotion<br>• Rational targets definition<br>• Fully support the costs (necessary financial resources allocation)<br>• Technologically oriented top management<br>• Strong and committed leadership<br>• Continuous monitoring<br>Clear selection criteria definition<br>• Real experience and knowledge in same industry<br>• Meeting future needs<br>• Honest commitment | | Change management<br>• Corporate culture ready for change and learning<br>• Organizational characteristics (strategy, resources, rewards, culture, and structure)<br>• Revolutionary/evolutionary change tactics<br>Organization learning<br>• Learning by Doing<br>• Knowledge sharing<br>• External information use<br>• Learning strategy<br>Non-tight budgeting strategy<br>Enterprise-consultant support, acceptance and trust<br>Inter-departmental (cross-functional) collaboration and trust | | |
| **HR-related** | Training planning (content and infrastructure)<br>Top management reeducation | Project team selection<br>Vendor/Consultant's training and knowledge transfer evaluation | End-users involvement in defining the implementation process<br>Project members' training<br>Integration concept reeducation<br>Know-how training<br>Seminars and round-tables | End-user trainings<br>Testing documentation and user's guide preparation | Empower internal consultants<br>Enterprise specific guideline |
| | Balanced network relationship<br>Communication channel within enterprise and supply chain<br>Compensation plans to control team members marketability<br>Individual characteristics (knowledge, cognitive abilities, and motivation)<br>Group characteristics (goals, roles, norms, diversity, and problem solving) | | Stimulating work environment and acknowledgment<br>Decision-making authorization<br>Post-implementation meetings<br>User accountability activation<br>Up-to-15% budget for training | | |

| | **Phase 1-** Strategizing | **Phase 2 –** Selections | **Phase 3 –** Process Re-engineering | **Phase 4 –** Migration and Testing | Phase 5 – RUN-UP and CSE |
|---|---|---|---|---|---|
| **Project-related** | Project scope<br>Detailed project plan (assignments and responsibilities)<br>Implementation methodology | Project teams selection (consultant selection team, vendor selection team, and implementation team) | Process documentation<br>New Process Simulation<br>Process measurement<br>Data flow diagrams<br>Project blueprint<br>New process design mapping | Extreme situations simulation and testing<br>New processes debugging | Project completion and delivery<br>Post evaluation (self- and external- evaluation) |
| | Project team-Vendor/consultant flexibility<br>Project team competence<br>Project champion familiar to IT, enterprise processes and leadership<br>Project definitions (scope, time and cost, milestones, etc.) | | Risk evaluation<br>Performance Quality control (KPIs and Balanced Score Cards)<br>Benchmarking best-practices<br>Management of expectations | | |
| **Information Technology-related** | Hardware and network infrastructures development planning<br>System landscape (Servers and Network) | Software selection<br>Technical team selection<br>IT-Department/Vendor acceptance and collaboration | Current master and transaction data analysis<br>Cleaning up of suspect data<br>Tool based requirement analysis<br>Technical blueprint<br>• Access levels<br>• External system integration<br>• Emergency and backup<br>Technical infrastructure upgrading or renovation<br>Vendor support and upgrading<br>Legacy system consideration and analyses | Testing:<br>• Full data load<br>Testing and simulation exercises<br>Data migration and centralization<br>Software customization<br>• Codeless configuration<br>• Application development<br>• KPI and reports<br>Configuration and parameterization of software | Master data migration from test-system<br>Technical tuning<br>All legacy system remove |
| | Knowledge/technology transfer and Vendor support and update<br>Organization-Information Integration<br>Single consistent data format<br>Functionality and quality of the software and service | | Data accuracy<br>Tool-based implementation<br>New technologies deployment (e.g. In-Memory data Management)<br>None-busy RUN-UP date | | |
| **International-related** | Initial planning based on localized solutions and decentralized implementations<br>Legal consultation | Careful package selection<br>Establishing partnership between foreign vendor/consultant and local developers/consultants | Process Reengineering based on national and org. cultures<br>Empowering implementation skills and knowledge by special trainings | | Continuous relationship with consultants |
| | Cultural investigations based on cross-cultural models<br>Reducing the impact of "Cultural Misfit" by<br>• Comprehensive BPM<br>• Minimum customization<br>• Increasing task congruency<br>• Bolding and emphasizing the competitive environment | | Strong commitment to long-term strategies, longer project duration and extra budget<br>Open communication through advanced technologies<br>Single language reporting (oral and written) standards<br>Reducing high costs resulted from different money values and economies<br>Governmental policies to strengthen foreign investment and fair competition<br>More efficient and trustable negotiation strategy | | |

Although the activity areas of Management-related, HR-related, Project-related and IT-related seem to have nearly equal capacity of activities and success factors during an enterprise system project, it is obviously perceivable that management and organization area has a more significant and directing role in the whole project.

There are also some overlaps of some activities and/or factors among different phases or activity areas. For example, training affairs as well as communication activities are not limited to a certain phase, although they are bold and more constructive in process re-engineering phase. And it is not possible to restrain planning or selection type activities to a certain area of for example management-related activities, while project members are to select or plan in different areas in enterprise.

Because of the whole-project-importance nature of the success factors, they are supposed not to be categorized by phases in this study, but some factors seem to be specified to only one or two phases. For example in management-related focus area, factors concerning selection criteria are belonging specifically to selection phase of the project while they are applicable somehow in other phases though. Therefore, one possible future research idea or recommendation, in line with (Esteves and Pastor 2006), could be the development of a more detailed instruction model which separate factors step-by-step in the project, while some of them would be projected to whole period of project.

## 5.4 Dissertation Conclusion

The importance of enterprise systems is increasingly growing and they are in the center of attention and consideration by organizations in various types of business and industries from extra-large public or private organizations to small and medium-sized service sector business. These systems are continuously advance functionally and technologically and are *inevitable* and *ineluctable* for the enterprises to maximize their productivity and integration in current competitive national and global business environments.

Also, since local software solutions could not meet the requirements of especially large enterprises functionally and technically, and as giant global enterprise software producers like SAP, Oracle and Microsoft are developing and since they are improving their solutions and products by huge investments and international talented human work forces, and expanding their market to more corners of the globe, demand for these globally branded low-defect software solutions is daily ascending. The consultants that are implementing such systems in developed countries (e.g. North America and Europe) face a great request for implementation consultancy in other (especially developing) countries (e.g. Asia, Middle East and South America). The agreements for international ERP implementation project consultancy are, therefore, exponentially increasing, while the research on the influencing factors and know-hows is scattered and rare, and thus, a timely urgency for this field of research is being felt.

From the general perspective for ERP implementation projects, this study reviews almost all related publications since early 2000s and tries to summarize all previously investigated success factors and make a single conclusion and categorization for both old mostly mentioned factors as well as recently-addressed detail investigations, while assessing the mostly referred suggested project life-cycles to come up with a promising effective phased life-cycle for these projects. Not so surprisingly, this study repeats the importance of top management support, clear selection criteria definition, change management strategies, organizational learning, trainings, project management efforts, consultant support, compensation plans, decision making authorization, and realistic time and budget planning as well as risk evaluation, tool-based implementation and continuous system engineering, although the aim of this study is to develop an all-in-one framework for international ERP implementation projects.

This study suggests a five-stage project life-cycle including strategizing, selection, re-engineering, migration, and go-live and continuous system engineering. Phased approach to the project enables the enterprise management, project team and consultants to organize all activities of the project in a timeline, while each phase should be started when the previous

one is quite wrapped up. In line with very recent researches, this study recommends the project stakeholders to separate all activities and also impacting factors into focus areas in order to more concentration on related issues and an effective and efficient resource/task allocation. The general ERP implementation project activities and critical factors are categorized in four focus areas of management-, HR-, project- and IT-related issues, which are inter-rowed or intertwined by five stages of project life-cycle to form this study's framework. Also this study focuses on international projects of ERP implementation and as the activities and specific factors related to the international nature of these projects should be addressed separately because of their unignorable importance, this study adds the fifth focus area of international-related issues to the framework.

From the international perspective for ERP implementation projects, this study reviews and integrates all sporadic and diffused investigations about international projects of ERP implementation as well as some about IT adoption projects because the impacting factors could be common. The result of this integration demonstrates that paying an especial attention into national and organizational (that is influenced by national culture too) cultural differences with the help of cross-cultural theories in the time of strategizing and planning, special vast cultural process re-engineering and a minimum customization to eliminate the cultural misfit between software and adopting enterprise, single-language high-technology communication and documentation standards, and more commitment to longer project duration and extra budgets are very critical to be considered in these projects. This study also recommends the international consultants who are seeking new markets in foreign countries to localize their solutions and also establish partnerships with local vendors/consultants to reduce the high costs that are derived due to different economies and money values, research more on legal differences, and at last but not at least, do their bests to create a trustable relationships especially during primary negotiations.

The final developed five-in-five framework of this study, for the first time, collects all mentioned-in-the-history critical success factors and project activities, while sequencing them in five phases and categorizing them in five

focus areas for international ERP implementation projects. This framework provides a bird's-eye view and draws a comprehensive roadmap or instruction for such projects. The author of this study strongly believes that, due to some methodological limitations, the study is not the bible and needs further considerations and supplementary investigations.

# References

Abdinnour-Helm, S., Lengnick-Hall, M. L., and Lengnick-Hall, C. a. 2003. "Pre-implementation attitudes and organizational readiness for implementing an enterprise resource planning system," *European Journal of Operational Research* (146), pp. 258–273 (doi: 10.1016/S0377-2217(02)00548-9).

Agndal, H. 2007. "Current trends in business negotiation research:An overview of articles published 1996-2005," *Working Paper Series in Business Administration* (Vol. 3), Stockholm (available at http://swoba.hhs.se/hastba/papers/hastba2007_003.pdf).

Al-Mashari, M., and Al-Mudimigh, A. 2003. "ERP implementation: lessons from a case study," *Information Technology & People* (16:1), pp. 21–33.

Al-Mashari, M., Al-Mudimigh, A., and Zairi, M. 2003. "Enterprise resource planning: A taxonomy of critical factors," *European Journal of Operational Research* (146:2), pp. 352–364 (doi: 10.1016/S0377-2217(02)00554-4).

Al-Turki, U. M. 2011. "An exploratory study of ERP implementation in Saudi Arabia.," *Production Planning & Control* (22:4), pp. 403–413 (doi: 10.1080/09537287.2010.491490).

Ali, A. 2009. *Business and management environment in Saudi Arabia: challenges and opportunities for multinational corporations*,

Routledge.

Amid, A., Moalagh, M., and Zare Ravasan, A. 2012. “Identification and classification of ERP critical failure factors in Iranian industries,” *Information Systems* (37), pp. 227–237 (doi: 10.1016/j.is.2011.10.010).

Baki, B., and Cakar, K. 2005. “Determining the ERP package-selecting criteria: The case of Turkish manufacturing companies,” *Business Process Management Journal* (11:1), pp. 75–86.

Baki, B., Dereli, T., and Baykasog˘lu, A. 2004. “An investigation on the readiness of Turkish companies for enterprise resource management,” *Journal of Manufacturing Technology Management* (15:1), Emerald Group Publishing Limited, pp. 50–56.

Beheshti, H. M., Blaylock, B. K., Henderson, D. A., Lollar, J. G., Beheshti, H. M., Blaylock, B. K., Henderson, D. A., and Lollar, J. G. 2014. “Selection and critical success factors in successful ERP implementation,” *Competitiveness Review* (24:4), pp. 357–375 (doi: 10.1108/CR-10-2013-0082).

Bernroider, E. W. N. 2008. “IT governance for enterprise resource planning supported by the DeLone–McLean model of information systems success,” *Information and Management* (45:5), pp. 257–269 (doi: 10.1016/j.im.2007.11.004).

Bond, B., Genovese, Y., Miklovic, D., Zrimsek, B., and Rayner, N. 2000. “ERP is dead-long live ERP II. Gartner Group Research Note,” *Strategic Planning Assumption* (4).

Bradley, J. 2008. “Management based critical success factors in the implementation of Enterprise Resource Planning systems,” *International Journal of Accounting Information Systems* (9:3), pp. 175–200 (doi: 10.1016/j.accinf.2008.04.001).

Bryman, A., and Bell, E. 2011. *Business Research Methods* (Third.), Oxford: OUP Oxford (available at https://books.google.de/books?id=YnCcAQAAQBAJ).

Chaudhari, S., and Ghone, A. 2015. “World ERP SOFTWARE Market -

Opportunities and Forecasts, 2013 - 2020," (available at https://www.alliedmarketresearch.com/ERP-market).

Chen, C., Law, C. C. H., and Yang, S. 2009. "Managung ERP implementation failure: A project management perspective," in *IEEE Transactions on Engineering Management* (Vol. 56), pp. 157–170.

Denzin, N. K., and Lincoln, Y. S. 2011. *The SAGE Handbook of Qualitative Research*Sage Handbooks, London: SAGE Publications (available at https://books.google.de/books?id=AIRpMHgBYqIC).

Dezdar, S., and Ainin, S. 2009. "Successful enterprise resource planning implementation: taxonomy of critical factors," *Industrial Management & Data Systems* (109:8), pp. 1037–1052.

Dezdar, S., and Ainin, S. 2011a. "The influence of organizational factors on successful ERP implementation," *Management Decision* (49:6), pp. 911–926.

Dezdar, S., and Ainin, S. 2011b. "Examining ERP implementation success from a project environment perspective," *Business Process Management Journal* (17:6), pp. 919–939 (doi: 10.1108/14637151111182693).

Ehie, I. C., and Madsen, M. 2005. "Identifying critical issues in enterprise resource planning (ERP) implementation," *Computers in Industry* (56), pp. 545–557 (doi: 10.1016/j.compind.2005.02.006).

Esteves, J., and Pastor, J. A. 1999. "An ERP Life-cycle-based Research Agenda," in *First International Workshop on Enterprise Management Resource and Planning Systems EMRPS*, Venice, Italy, pp. 359–371 (available at http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.10.1675&rep=rep1&type=pdf).

Esteves, J., and Pastor, J. A. 2006. "Organizational and technological critical success factors behavior along the ERP implementation phases," in *Enterprise information systems VI*, Springer, pp. 63–71.

Van Everdingen, Y. M., and Waarts, E. 2003. "A multi-country study of the adoption of ERP systems," Rotterdam, The Netherlands (available at

http://erim.eur.nl).

Finney, S., and Corbett, M. 2007. “ERP implementation: a compilation and analysis of critical success factors,” *Business Process Management Journal* (13:3), pp. 329–347 (doi: 10.1108/14637150710752272).

Gallivan, M., and Srite, M. 2005. “Information technology and culture: Identifying fragmentary and holistic perspectives of culture,” *Information and Organization* (15:4), pp. 295–338 (doi: 10.1016/j.infoandorg.2005.02.005).

García-Sánchez, N., and Pérez-Bernal, L. E. 2007. “Determination of Critical Success Factors in Implementing an ERP System : A Field Study,” *Information Technology for Development* (13:3), pp. 293–309 (doi: 10.1002/itdj).

Guido, C., and Pierluigi, R. 2011. “Awareness of Organizational Readiness in ERP implementation process : results from case studies,” in *XII Global Information and Technology Management Association*, Greensboro, USA, pp. 1–13.

Gulla, J. A. 2004. “Understanding requirements in enterprise systems projects,” in *Requirements Engineering Conference, 2004. Proceedings. 12th IEEE International*, IEEE, pp. 176–185.

Gürbüz, T., Alptekin, S. E., and Işıklar Alptekin, G. 2012. “A hybrid MCDM methodology for ERP selection problem with interacting criteria,” *Decision Support Systems* (54:1), pp. 206–214 (doi: 10.1016/j.dss.2012.05.006).

Hawari, A., and Heeks, R. 2010. “Explaining ERP failure in a developing country: a Jordanian case study,” *Journal of Enterprise Information Management* (23:2), pp. 135–160.

Hawking, P. 2007. “Implementing ERP Systems Globally : Challenges and Lessons Learned for Asian Countries,” *Journal of Business Systems, Governance and Ethics* (2:1), pp. 21–32 (available at http://www.jbsge.vu.edu.au/issues/vol02no1/Hawking.pdf).

Hofstede, G., Hofstede, G. J., and Minkov, M. 2010. *Cultures and*

*Organizations: Software of the Mind, Third Edition*, McGraw-Hill Education (available at https://books.google.de/books?id=04OqTgV3V00C).

Huang, Z., and Palvia, P. C. 2001. "ERP implementation issues in advanced and developing countries," *Business Process Management Journal* (7:3), pp. 276–284.

Hurn, B. J. 2007. "The influence of culture on international business negotiations," *Industrial and Commercial Training* (39), pp. 354–360 (doi: 10.1108/00197850710829058).

Hwang, Y., and Grant, D. 2011. "Behavioral aspects of enterprise systems adoption: An empirical study on cultural factors," *Computers in Human Behavior* (27:2), pp. 988–996 (doi: 10.1016/j.chb.2010.12.003).

IBIS Prof. Thome AG. 2011. "Reverse Business Engineering; Analyzing productive SAP systems with RBE," Wuerzburg, Germany.

Jacobs, F. R., and Weston, F. C. T. 2007. "Enterprise resource planning (ERP)-A brief history," *Journal of Operations Management* (25), pp. 357–363 (doi: 10.1016/j.jom.2006.11.005).

Jennings, W. 2012. *In-memory database - Unabridged Guide*, Emereo Publishing (available at https://books.google.de/books?id=xd0DBwAAQBAJ).

Kamhawi, E. M. 2008. "Enterprise resource-planning systems adoption in Bahrain: motives, benefits, and barriers," *Journal of Enterprise Information Management* (21:3), Emerald Group Publishing Limited, pp. 310–334.

Kappos, A., and Rivard, S. 2008. "A three-perspective model of culture, information systems, and their development and use," *MIS quarterly* (32:3), pp. 601–634.

Ke, W., and Wei, K. K. 2008. "Organizational culture and leadership in ERP implementation," *Decision Support Systems* (45), pp. 208–218 (doi: 10.1016/j.dss.2007.02.002).

Kerimoglu, O., Basoglu, N., and Daim, T. 2008. "Organizational adoption of

information technologies: Case of enterprise resource planning systems," *The Journal of High Technology Management Research* (19:1), pp. 21–35 (doi: 10.1016/j.hitech.2008.06.002).

Khakhar, P., and Rammal, H. G. 2013. "Culture and business networks: International business negotiations with Arab managers," *International Business Review* (22:3), Elsevier Ltd, pp. 578–590 (doi: 10.1016/j.ibusrev.2012.08.002).

Kilic, H. S., Zaim, S., and Delen, D. 2014. "Development of a hybrid methodology for ERP system selection: The case of Turkish Airlines," *Decision Support Systems* (66), Elsevier B.V., pp. 82–92 (doi: 10.1016/j.dss.2014.06.011).

Kilic, H. S., Zaim, S., and Delen, D. 2015. "Selecting 'The Best' ERP system for SMEs using a combination of ANP and PROMETHEE methods," *Expert Systems with Applications* (42:5), pp. 2343–2352 (doi: 10.1016/j.eswa.2014.10.034).

Koh, S. C. L., Simpson, M., Padmore, J., Dimitriadis, N., and Misopoulos, F. 2006. "An exploratory study of enterprise resource planning adoption in Greek companies," *Industrial Management & Data Systems* (106:7), Emerald Group Publishing Limited, pp. 1033–1059.

Köster, K. 2010. *International Project Management* (10th ed.), London: Sage Publications Ltd. (available at http://www.uk.sagepub.com/textbooks/Book231732).

Kræmmergaard, P., and Rose, J. 2002. "Managerial Competences for ERP Journeys," *Information Systems Frontiers* (4:2), pp. 199–211 (doi: 10.1023/A:1016054904008).

Krumbholz, M., Galliers, J., and Maiden, N. 2003. "Implementing Enterprise Resource Planning Packages? Considering Different Organizational and National Cultures'.," in *Second-Wave Enterprise Resource Planning Systems: Implementing For Effectiveness*G. Shanks, P. Seddon, and L. Willcocks (eds.), Cambridge, UK: Cambridge University Press, Cambridge, pp. 388–418.

Krumbholz, M., and Maiden, N. 2001. "The implementation of enterprise

resource planning packages in different organisational and national cultures," *Information Systems* (26:3), pp. 185–204 (doi: 10.1016/S0306-4379(01)00016-3).

Kwahk, K. Y., and Lee, J. N. 2008. "The role of readiness for change in ERP implementation: Theoretical bases and empirical validation," *Information and Management* (45), pp. 474–481 (doi: 10.1016/j.im.2008.07.002).

Labaree, R. V. 2009. "Research Guides: Organizing Your Social Sciences Research Paper: Limitations of the Study," *University of Southern California* (available at http://libguides.usc.edu/writingguide).

Lapiedra, R., Alegre, J., and Chiva, R. 2011. "The importance of management innovation and consultant services on ERP implementation success," *The Service Industries Journal* (31:789296667), pp. 1907–1919 (doi: 10.1080/02642069.2011.556189).

Lewis, R. 2010. *When Cultures Collide, Third Edition: Leading Across Cultures*, Nicholas Brealey Publishing (available at https://books.google.de/books?id=Tz7Va7vBUtMC).

Lin, H.-F. 2010. "An investigation into the effects of IS quality and top management support on ERP system usage," *Total Quality Management & Business Excellence* (21:3), Routledge, pp. 335–349 (doi: 10.1080/14783360903561761).

Mabert, V. a., Soni, A., and Venkataramanan, M. a. 2003. "Enterprise resource planning: Managing the implementation process," *European Journal of Operational Research* (146), pp. 302–314 (doi: 10.1016/S0377-2217(02)00551-9).

Maditinos, D., Chatzoudes, D., and Tsairidis, C. 2012. "Factors affecting ERP system implementation effectiveness," *Journal of Enterprise Information Management* (25), pp. 60–78 (doi: 10.1108/17410391211192161).

Mandal, P., and Gunasekaran, A. 2003. "Issues in implementing ERP: A case study," *European Journal of Operational Research* (146:2), pp. 274–283 (doi: 10.1016/S0377-2217(02)00549-0).

Markus, M. L., and Tanis, C. 2000. "The Enterprise System Experience — From Adoption to Success," in *Framing the Domains of IT Management: Projecting the Future Through the Past*, pp. 173–207.

Molla, A., and Bhalla, A. 2006. "Business transformation through ERP: a case study of an Asian company," *Journal of information technology case and application research* (8:1), Taylor & Francis, pp. 34–54.

Møller, C. 2005. "ERP II: a conceptual framework for next-generation enterprise systems?," *Journal of Enterprise Information Management* (18:4), pp. 483–497 (doi: 10.1108/17410390410566715).

Monk, E., and Wagner, B. 2012. *Concepts in Enterprise Resource Planning*, Cengage Learning (available at https://books.google.de/books?id=AWAJAAAAQBAJ).

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), pp. 83–96 (doi: 10.1016/S0925-5273(01)00183-9).

Motwani, J., Subramanian, R., and Gopalakrishna, P. 2005. "Critical factors for successful ERP implementation: Exploratory findings from four case studies," *Computers in Industry* (56), pp. 529–544 (doi: 10.1016/j.compind.2005.02.005).

Munkelt, T., and Völker, S. 2013. "ERP systems : aspects of selection , implementation and sustainable operations," *International Journal of Information Systems and Project management* (1:2), pp. 25–39 (doi: 10.12821/ijispm010202).

Muscatello, J. R., and Chen, I. J. 2008. "Enterprise resource Planning (ErP) Implementations," *International Journal of Enterprise Information Systems* (4:1), p. 78.

Nah, F., and Delgado, S. 2006. "Critical success factors for enterprise resource planning implementation and upgrade.," *Journal of Computer Information Systems*. (47:5), pp. 99–113.

Nah, F., Lau, J., and Kuang, J. 2001. *Critical factors for successful*

*implementation of enterprise systems Business Process Management Journal* (Vol. 7).

Naseri Taheri, P., Taheri Ardekani, H., and Khalou Bagheri, H. 2008. "Iran ERP Market Characteristics," *Tadbir* (19:195), Tehran, pp. 42–48.

Nazemi, E., Tarokh, M. J., and Djavanshir, G. R. 2012. "ERP: A literature survey," *International Journal of Advanced Manufacturing Technology* (61), pp. 999–1018 (doi: 10.1007/s00170-011-3756-x).

Nikookar, G., Yahya Safavi, S., Hakim, A., and Homayoun, A. 2010. "Competitive advantage of enterprise resource planning vendors in Iran," *Information Systems* (35:3), pp. 271–277 (doi: 10.1016/j.is.2009.09.002).

Orlikowski, W. J., and Iacono, C. S. 2001. "Research Commentary: Desperately Seeking the 'IT' in IT Research—A Call to Theorizing the IT Artifact," *Information Systems Research* (12:2), INFORMS, pp. 121–134 (doi: 10.1287/isre.12.2.121.9700).

Palvia, P. C., Jain Palvia, S. C., and Whitworth, J. E. 2002. "Global information technology: a meta analysis of key issues," *Information and Management* (39:5), pp. 403–414 (doi: 10.1016/S0378-7206(01)00106-9).

Panorama Consulting Solutions. 2015. "2015 ERP REPORT A Panorama; Consulting Solutions Research Report," Denver, USA (available at http://panorama-consulting.com/resource-center/2015-erp-report/).

Panorama Consulting Solutions. 2016. "2016 REPORT ON ERP SYSTEMS AND ENTERPRISE SOFTWARE," Denver, USA.

Perçin, S. 2008. "Using the ANP approach in selecting and benchmarking ERP systemsnull," *Benchmarking: An International Journal* (15:5), Emerald, pp. 630–649 (doi: 10.1108/14635770810903196).

Plant, R., and Willcocks, L. 2007. "CRITICAL SUCCESS FACTORS IN INTERNATIONAL ERP IMPLEMENTATIONS : A CASE RESEARCH APPROACH," *Journal of Computer Information Systems* (47:3), pp. 60–70 (doi: 10.1016/j.ijpe.2010.05.008).

Plattner, H. 2011. “SanssouciDB: An In-Memory Database for Processing Enterprise Workloads.,” in *BTW* (Vol. 20), pp. 2–21.

Plattner, H., and Zeier, A. 2012. *In-Memory Data Management: Technology and Applications*In-memory Data Management: An Inflection Point for Enterprise Applications, Springer Berlin Heidelberg (available at https://books.google.de/books?id=HySCgzCApsEC).

Ptak, C., and Smith, C. 2011. *Orlicky’s Material Requirements Planning, Third Edition*, McGraw-Hill Education (available at https://books.google.de/books?id=lRsULeiVTroC).

Raihana, G. F. H. 2012. “Cloud ERP–A Solution Model,” *International Journal of Computer Science and Information Technology & Security* (2:1), pp. 76–79.

Rajapakse, J., and Seddon, P. B. 2005. “ERP Adoption in Developing Countries in Asia: A Cultural Misfit,” in *28th Information System Seminar in Scandinavia*, pp. 6–9.

Ram, J., and Corkindale, D. 2014. “How ‘critical’ are the critical success factors (CSFs)?: Examining the role of CSFs for ERP,” *Business Process Management Journal* (20:1), pp. 151–174 (doi: 10.1108/BPMJ-11-2012-0127).

Rashid, M. A., Hossain, L., and Patrick, J. D. 2002. “The evolution of ERP systems: A historical perspective.,”

Razmi, J., Sangari, M. S., and Ghodsi, R. 2009. “Developing a practical framework for ERP readiness assessment using fuzzy analytic network process,” *Advances in Engineering Software* (40:11), pp. 1168–1178 (doi: 10.1016/j.advengsoft.2009.05.002).

Roebuck, K. 2012. *ERP - Enterprise Resource Planning: High-impact Strategies - What You Need to Know: Definitions, Adoptions, Impact, Benefits, Maturity, Vendors*, Emereo Publishing (available at https://books.google.de/books?id=jcAQBwAAQBAJ).

Samler, S., and Lewellen, K. 2004. “Good taxonomy is key to successful searching,” *EContent* (27:7/8), Online Inc., p. S20.

Şen, C. G., Baraçlı, H., Şen, S., and Başlıgil, H. 2009. "An integrated decision support system dealing with qualitative and quantitative objectives for enterprise software selection," *Expert Systems with Applications* (36:3), pp. 5272–5283 (doi: 10.1016/j.eswa.2008.06.070).

Sheu, C., Chae, B., and Yang, C.-L. 2004. "National differences and ERP implementation: issues and challenges," *Omega* (32:5), pp. 361–371 (doi: 10.1016/j.omega.2004.02.001).

Shore, B. 2006. "Enterprise Integration Across the Globally Disbursed Service Organizations," *Communications of the ACM* (49:6), pp. 102–106.

Shore, B., and Venkatachalam, A. R. 1996. "Role of national culture in the transfer of information technology," *The Journal of Strategic Information Systems* (5:1), pp. 19–35 (doi: 10.1016/S0963-8687(96)80021-7).

Skaf, R. M. 2012. "In the Trenches-Reversing the Trend," *PM Network-Project Management* (26:12), p. 24.

Soh, C., Kien, S. S., and Tay-Yap, J. 2000. "Enterprise resource planning: cultural fits and misfits: is ERP a universal solution?," *Communications of the ACM* (43:4), pp. 47–51 (doi: 10.1145/332051.332070).

Somers, T. M., and Nelson, K. 2001. "The Impact of Critical Success Factors across the Stages of Enterprise Resource Planning Implementations," in *Proceedings of 34th Annual Hawaii International Conference on System Sciences*, IEEE, pp. 1–10.

Somers, T. M., and Nelson, K. G. 2004. "A taxonomy of players and activities across the ERP project life cycle," *Information and Management* (41:3), pp. 257–278 (doi: 10.1016/S0378-7206(03)00023-5).

Sravanapudi, A. 2004. "Categorization: it's all about context," *EContent* (27:7/8), p. S23.

Srivastava, M., and Gips, B. J. 2009. "Chinese cultural implications for ERP implementation," *Journal of Technology Management and Innovation* (4:1), pp. 105–113 (doi: 10.4067/S0718-27242009000100009).

Stevenson, W. 2014. “Conceptual vs. Empirical Research: Which is Better?,” *Enago* (available at http://www.enago.com/blog/conceptual-vs-empirical-research/; retrieved April 21, 2014).

Tarafdar, M., and Roy, R. K. 2003. “Analyzing the adoption of enterprise resource planning systems in Indian organizations: a process framework,” *Journal of Global Information Technology Management* (6:1), Taylor & Francis, pp. 21–51.

Thomas, W. S., Spillan, J. E., and Carolina, N. 2012. “The Impact of a Focus on Change in Technology in Successful Implementation of SAP Enterprise Resource Planning Systems in North and South America,” *Journal of Management Policy & Practice* (13:5), pp. 19–34.

Thome, R., and Hufgard, A. 2006. *Continuous system engineering: Entdeckung der Standardsoftware als Organisator*, Germany: Oxigen Verlag.

Tsai, W., Shaw, M. J., Fan, Y., Liu, J., Lee, K., and Chen, H. 2011. “An empirical investigation of the impacts of internal / external facilitators on the project success of ERP : A structural equation model,” *Decision Support Systems* (50:2), Elsevier B.V., pp. 480–490 (doi: 10.1016/j.dss.2010.11.005).

Umble, E. J., Haft, R. R., and Umble, M. M. 2003. “Enterprise resource planning: Implementation procedures and critical success factors,” *European Journal of Operational Research* (146), pp. 241–257 (doi: 10.1016/S0377-2217(02)00547-7).

Upadhyay, P., Jahanyan, S., and Dan, P. K. 2011. “Factors influencing ERP implementation in Indian manufacturing organisations: A study of micro, small and medium-scale enterprises,” *Journal of Enterprise Information Management* (24:2), pp. 130–145 (doi: 10.1108/17410391111106275).

Utecht, K. M., Hayes, R. B., and Okonkwo, P. A. 2004. “Enterprise resource planning and the competitive advantage: the ease of integrating information between corporate headquarters in the United States and factories in Mexico,” *Competitiveness Review: An International*

*Business Journal* (14:1/2), Emerald Group Publishing Limited, pp. 13–17.

Verville, J., and Halingten, A. 2003. "A six-stage model of the buying process for ERP software," *Industrial Marketing Management* (32), pp. 585–594 (doi: 10.1016/S0019-8501(03)00007-5).

Verville, J., Palanisamy, R., Bernadas, C., and Halingten, A. 2007. "ERP Acquisition Planning: A Critical Dimension for Making the Right Choice," *Long Range Planning* (40), pp. 45–63 (doi: 10.1016/j.lrp.2007.02.002).

Wang, E. T. G., and Chen, J. H. F. 2006. "Effects of internal support and consultant quality on the consulting process and ERP system quality," *Decision Support Systems* (42:2), pp. 1029–1041 (doi: 10.1016/j.dss.2005.08.005).

Wang, E. T. G., Chia-Lin Lin, C., Jiang, J. J., and Klein, G. 2007. "Improving enterprise resource planning (ERP) fit to organizational process through knowledge transfer," *International Journal of Information Management* (27), pp. 200–212 (doi: 10.1016/j.ijinfomgt.2007.02.002).

Wei, C.-C., Chien, C. F., and Wang, M.-J. J. 2005. "An AHP-based approach to ERP system selection," *International Journal of Production Economics* (96), pp. 47–62 (doi: 10.1016/j.ijpe.2004.03.004).

Wei, C.-C., and Wang, M.-J. J. 2004. "A comprehensive framework for selecting an ERP system," *International Journal of Project Management* (22:2), pp. 161–169 (doi: 10.1016/S0263-7863(02)00064-9).

Winkelmann, A., and Klose, K. 2008. "Experiences while selecting , adapting and implementing ERP systems in SMEs : a case study," in *Proceedings of the 14th Americas Conference on Information Systems (AMCIS 2008)*, Toronto, CA, pp. 1–11.

Wu, J.-H., Shin, S.-S., and Heng, M. S. H. 2007. "A methodology for ERP misfit analysis," *Information and Management* (44:8), pp. 666–680 (doi: 10.1016/j.im.2007.09.001).

Xue, Y., Liang, H., Boulton, W. R., and Snyder, C. a. 2005. "ERP

implementation failures in China: Case studies with implications for ERP vendors," *International Journal of Production Economics* (97), pp. 279–295 (doi: 10.1016/j.ijpe.2004.07.008).

Yazdani, K., Ramliy, M. K., Ismail, K., and Omar, W. Z. W. 2013. "The Impact of Privatization in Technology Transfer Offices on University-Industry Connection," in *1st International Conference on New Directions in Business, Management, Finance and Economics (ICNDBM 2013)*.

Yazgan, H. R., Boran, S., and Goztepe, K. 2009. "An ERP software selection process with using artificial neural network based on analytic network process approach," *Expert Systems with Applications* (36:5), pp. 9214–9222 (doi: 10.1016/j.eswa.2008.12.022).

Zhang, Z., Lee, M. K. O., Huang, P., Zhang, L., and Huang, X. 2005. "A framework of ERP systems implementation success in China: An empirical study," *International Journal of Production Economics* (98:1), pp. 56–80 (doi: 10.1016/j.ijpe.2004.09.004).

Ziaee, M., Fathian, M., and Sadjadi, S. J. 2006. "A modular approach to ERP system selection: A case study," *Information Management & Computer Security* (14:5), Emerald Group Publishing Limited, pp. 485–495.

Zrimsek, B. 2003. "ERP II Vision," in *US symposium/ITxpo*, pp. 23–27.

Abdinnour-Helm, S., Lengnick-Hall, M. L., and Lengnick-Hall, C. a. 2003. "Pre-implementation attitudes and organizational readiness for implementing an enterprise resource planning system," *European Journal of Operational Research* (146), pp. 258–273 (doi: 10.1016/S0377-2217(02)00548-9).

Agndal, H. 2007. "Current trends in business negotiation research:An overview of articles published 1996-2005," *Working Paper Series in Business Administration* (Vol. 3), Stockholm (available at http://swoba.hhs.se/hastba/papers/hastba2007_003.pdf).

Al-Mashari, M., and Al-Mudimigh, A. 2003. "ERP implementation: lessons from a case study," *Information Technology & People* (16:1), pp. 21–33.

Al-Mashari, M., Al-Mudimigh, A., and Zairi, M. 2003. "Enterprise resource

planning: A taxonomy of critical factors," *European Journal of Operational Research* (146:2), pp. 352–364 (doi: 10.1016/S0377-2217(02)00554-4).

Al-Turki, U. M. 2011. "An exploratory study of ERP implementation in Saudi Arabia.," *Production Planning & Control* (22:4), pp. 403–413 (doi: 10.1080/09537287.2010.491490).

Ali, A. 2009. *Business and management environment in Saudi Arabia: challenges and opportunities for multinational corporations*, Routledge.

Amid, A., Moalagh, M., and Zare Ravasan, A. 2012. "Identification and classification of ERP critical failure factors in Iranian industries," *Information Systems* (37), pp. 227–237 (doi: 10.1016/j.is.2011.10.010).

Baki, B., and Cakar, K. 2005. "Determining the ERP package-selecting criteria: The case of Turkish manufacturing companies," *Business Process Management Journal* (11:1), pp. 75–86.

Baki, B., Dereli, T., and Baykasogˇlu, A. 2004. "An investigation on the readiness of Turkish companies for enterprise resource management," *Journal of Manufacturing Technology Management* (15:1), Emerald Group Publishing Limited, pp. 50–56.

Beheshti, H. M., Blaylock, B. K., Henderson, D. A., Lollar, J. G., Beheshti, H. M., Blaylock, B. K., Henderson, D. A., and Lollar, J. G. 2014. "Selection and critical success factors in successful ERP implementation," *Competitiveness Review* (24:4), pp. 357–375 (doi: 10.1108/CR-10-2013-0082).

Bernroider, E. W. N. 2008. "IT governance for enterprise resource planning supported by the DeLone–McLean model of information systems success," *Information and Management* (45:5), pp. 257–269 (doi: 10.1016/j.im.2007.11.004).

Bond, B., Genovese, Y., Miklovic, D., Zrimsek, B., and Rayner, N. 2000. "ERP is dead-long live ERP II. Gartner Group Research Note," *Strategic Planning Assumption* (4).

Bradley, J. 2008. “Management based critical success factors in the implementation of Enterprise Resource Planning systems,” *International Journal of Accounting Information Systems* (9:3), pp. 175–200 (doi: 10.1016/j.accinf.2008.04.001).

Bryman, A., and Bell, E. 2011. *Business Research Methods* (Third.), Oxford: OUP Oxford (available at https://books.google.de/books?id=YnCcAQAAQBAJ).

Chaudhari, S., and Ghone, A. 2015. “World ERP SOFTWARE Market - Opportunities and Forecasts, 2013 - 2020,” (available at https://www.alliedmarketresearch.com/ERP-market).

Chen, C., Law, C. C. H., and Yang, S. 2009. “Managung ERP implementation failure: A project management perspective,” in *IEEE Transactions on Engineering Management* (Vol. 56), pp. 157–170.

Denzin, N. K., and Lincoln, Y. S. 2011. *The SAGE Handbook of Qualitative Research*Sage Handbooks, London: SAGE Publications (available at https://books.google.de/books?id=AIRpMHgBYqIC).

Dezdar, S., and Ainin, S. 2009. “Successful enterprise resource planning implementation: taxonomy of critical factors,” *Industrial Management & Data Systems* (109:8), pp. 1037–1052.

Dezdar, S., and Ainin, S. 2011a. “The influence of organizational factors on successful ERP implementation,” *Management Decision* (49:6), pp. 911–926.

Dezdar, S., and Ainin, S. 2011b. “Examining ERP implementation success from a project environment perspective,” *Business Process Management Journal* (17:6), pp. 919–939 (doi: 10.1108/14637151111182693).

Ehie, I. C., and Madsen, M. 2005. “Identifying critical issues in enterprise resource planning (ERP) implementation,” *Computers in Industry* (56), pp. 545–557 (doi: 10.1016/j.compind.2005.02.006).

Esteves, J., and Pastor, J. A. 1999. “An ERP Life-cycle-based Research Agenda,” in *First International Workshop on Enterprise Management Resource and Planning Systems EMRPS*, Venice, Italy, pp. 359–371

(available at http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.10.1675&rep=rep1&type=pdf).

Esteves, J., and Pastor, J. A. 2006. "Organizational and technological critical success factors behavior along the ERP implementation phases," in *Enterprise information systems VI*, Springer, pp. 63–71.

Van Everdingen, Y. M., and Waarts, E. 2003. "A multi-country study of the adoption of ERP systems," Rotterdam, The Netherlands (available at http://erim.eur.nl).

Finney, S., and Corbett, M. 2007. "ERP implementation: a compilation and analysis of critical success factors," *Business Process Management Journal* (13:3), pp. 329–347 (doi: 10.1108/14637150710752272).

Gallivan, M., and Srite, M. 2005. "Information technology and culture: Identifying fragmentary and holistic perspectives of culture," *Information and Organization* (15:4), pp. 295–338 (doi: 10.1016/j.infoandorg.2005.02.005).

García-Sánchez, N., and Pérez-Bernal, L. E. 2007. "Determination of Critical Success Factors in Implementing an ERP System : A Field Study," *Information Technology for Development* (13:3), pp. 293–309 (doi: 10.1002/itdj).

Guido, C., and Pierluigi, R. 2011. "Awareness of Organizational Readiness in ERP implementation process : results from case studies," in *XII Global Information and Technology Management Association*, Greensboro, USA, pp. 1–13.

Gulla, J. A. 2004. "Understanding requirements in enterprise systems projects," in *Requirements Engineering Conference, 2004. Proceedings. 12th IEEE International*, IEEE, pp. 176–185.

Gürbüz, T., Alptekin, S. E., and Işıklar Alptekin, G. 2012. "A hybrid MCDM methodology for ERP selection problem with interacting criteria," *Decision Support Systems* (54:1), pp. 206–214 (doi: 10.1016/j.dss.2012.05.006).

Hawari, A., and Heeks, R. 2010. “Explaining ERP failure in a developing country: a Jordanian case study,” *Journal of Enterprise Information Management* (23:2), pp. 135–160.

Hawking, P. 2007. “Implementing ERP Systems Globally : Challenges and Lessons Learned for Asian Countries,” *Journal of Business Systems, Governance and Ethics* (2:1), pp. 21–32 (available at http://www.jbsge.vu.edu.au/issues/vol02no1/Hawking.pdf).

Hofstede, G., Hofstede, G. J., and Minkov, M. 2010. *Cultures and Organizations: Software of the Mind, Third Edition*, McGraw-Hill Education (available at https://books.google.de/books?id=04OqTgV3V00C).

Huang, Z., and Palvia, P. C. 2001. “ERP implementation issues in advanced and developing countries,” *Business Process Management Journal* (7:3), pp. 276–284.

Hurn, B. J. 2007. “The influence of culture on international business negotiations,” *Industrial and Commercial Training* (39), pp. 354–360 (doi: 10.1108/00197850710829058).

Hwang, Y., and Grant, D. 2011. “Behavioral aspects of enterprise systems adoption: An empirical study on cultural factors,” *Computers in Human Behavior* (27:2), pp. 988–996 (doi: 10.1016/j.chb.2010.12.003).

IBIS Prof. Thome AG. 2011. “Reverse Business Engineering; Analyzing productive SAP systems with RBE,” Wuerzburg, Germany.

Jacobs, F. R., and Weston, F. C. T. 2007. “Enterprise resource planning (ERP)-A brief history,” *Journal of Operations Management* (25), pp. 357–363 (doi: 10.1016/j.jom.2006.11.005).

Jennings, W. 2012. *In-memory database - Unabridged Guide*, Emereo Publishing (available at https://books.google.de/books?id=xd0DBwAAQBAJ).

Kamhawi, E. M. 2008. “Enterprise resource-planning systems adoption in Bahrain: motives, benefits, and barriers,” *Journal of Enterprise Information Management* (21:3), Emerald Group Publishing Limited,

pp. 310–334.

Kappos, A., and Rivard, S. 2008. “A three-perspective model of culture, information systems, and their development and use,” *MIS quarterly* (32:3), pp. 601–634.

Ke, W., and Wei, K. K. 2008. “Organizational culture and leadership in ERP implementation,” *Decision Support Systems* (45), pp. 208–218 (doi: 10.1016/j.dss.2007.02.002).

Kerimoglu, O., Basoglu, N., and Daim, T. 2008. “Organizational adoption of information technologies: Case of enterprise resource planning systems,” *The Journal of High Technology Management Research* (19:1), pp. 21–35 (doi: 10.1016/j.hitech.2008.06.002).

Khakhar, P., and Rammal, H. G. 2013. “Culture and business networks: International business negotiations with Arab managers,” *International Business Review* (22:3), Elsevier Ltd, pp. 578–590 (doi: 10.1016/j.ibusrev.2012.08.002).

Kilic, H. S., Zaim, S., and Delen, D. 2014. “Development of a hybrid methodology for ERP system selection: The case of Turkish Airlines,” *Decision Support Systems* (66), Elsevier B.V., pp. 82–92 (doi: 10.1016/j.dss.2014.06.011).

Kilic, H. S., Zaim, S., and Delen, D. 2015. “Selecting ‘The Best’ ERP system for SMEs using a combination of ANP and PROMETHEE methods,” *Expert Systems with Applications* (42:5), pp. 2343–2352 (doi: 10.1016/j.eswa.2014.10.034).

Koh, S. C. L., Simpson, M., Padmore, J., Dimitriadis, N., and Misopoulos, F. 2006. “An exploratory study of enterprise resource planning adoption in Greek companies,” *Industrial Management & Data Systems* (106:7), Emerald Group Publishing Limited, pp. 1033–1059.

Köster, K. 2010. *International Project Management* (10th ed.), London: Sage Publications Ltd. (available at http://www.uk.sagepub.com/textbooks/Book231732).

Kræmmergaard, P., and Rose, J. 2002. “Managerial Competences for ERP

Journeys," *Information Systems Frontiers* (4:2), pp. 199–211 (doi: 10.1023/A:1016054904008).

Krumbholz, M., Galliers, J., and Maiden, N. 2003. "Implementing Enterprise Resource Planning Packages? Considering Different Organizational and National Cultures'.," in *Second-Wave Enterprise Resource Planning Systems: Implementing For Effectiveness*G. Shanks, P. Seddon, and L. Willcocks (eds.), Cambridge, UK: Cambridge University Press, Cambridge, pp. 388–418.

Krumbholz, M., and Maiden, N. 2001. "The implementation of enterprise resource planning packages in different organisational and national cultures," *Information Systems* (26:3), pp. 185–204 (doi: 10.1016/S0306-4379(01)00016-3).

Kwahk, K. Y., and Lee, J. N. 2008. "The role of readiness for change in ERP implementation: Theoretical bases and empirical validation," *Information and Management* (45), pp. 474–481 (doi: 10.1016/j.im.2008.07.002).

Labaree, R. V. 2009. "Research Guides: Organizing Your Social Sciences Research Paper: Limitations of the Study," *University of Southern California* (available at http://libguides.usc.edu/writingguide).

Lapiedra, R., Alegre, J., and Chiva, R. 2011. "The importance of management innovation and consultant services on ERP implementation success," *The Service Industries Journal* (31:789296667), pp. 1907–1919 (doi: 10.1080/02642069.2011.556189).

Lewis, R. 2010. *When Cultures Collide, Third Edition: Leading Across Cultures*, Nicholas Brealey Publishing (available at https://books.google.de/books?id=Tz7Va7vBUtMC).

Lin, H.-F. 2010. "An investigation into the effects of IS quality and top management support on ERP system usage," *Total Quality Management & Business Excellence* (21:3), Routledge, pp. 335–349 (doi: 10.1080/14783360903561761).

Mabert, V. a., Soni, A., and Venkataramanan, M. a. 2003. "Enterprise resource planning: Managing the implementation process," *European*

*Journal of Operational Research* (146), pp. 302–314 (doi: 10.1016/S0377-2217(02)00551-9).

Maditinos, D., Chatzoudes, D., and Tsairidis, C. 2012. "Factors affecting ERP system implementation effectiveness," *Journal of Enterprise Information Management* (25), pp. 60–78 (doi: 10.1108/17410391211192161).

Mandal, P., and Gunasekaran, A. 2003. "Issues in implementing ERP: A case study," *European Journal of Operational Research* (146:2), pp. 274–283 (doi: 10.1016/S0377-2217(02)00549-0).

Markus, M. L., and Tanis, C. 2000. "The Enterprise System Experience — From Adoption to Success," in *Framing the Domains of IT Management: Projecting the Future Through the Past*, pp. 173–207.

Molla, A., and Bhalla, A. 2006. "Business transformation through ERP: a case study of an Asian company," *Journal of information technology case and application research* (8:1), Taylor & Francis, pp. 34–54.

Møller, C. 2005. "ERP II: a conceptual framework for next-generation enterprise systems?," *Journal of Enterprise Information Management* (18:4), pp. 483–497 (doi: 10.1108/17410390410566715).

Monk, E., and Wagner, B. 2012. *Concepts in Enterprise Resource Planning*, Cengage Learning (available at https://books.google.de/books?id=AWAJAAAAQBAJ).

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), pp. 83–96 (doi: 10.1016/S0925-5273(01)00183-9).

Motwani, J., Subramanian, R., and Gopalakrishna, P. 2005. "Critical factors for successful ERP implementation: Exploratory findings from four case studies," *Computers in Industry* (56), pp. 529–544 (doi: 10.1016/j.compind.2005.02.005).

Munkelt, T., and Völker, S. 2013. "ERP systems : aspects of selection , implementation and sustainable operations," *International Journal of*

*Information Systems and Project management* (1:2), pp. 25–39 (doi: 10.12821/ijispm010202).

Muscatello, J. R., and Chen, I. J. 2008. "Enterprise resource Planning (ErP) Implementations," *International Journal of Enterprise Information Systems* (4:1), p. 78.

Nah, F., and Delgado, S. 2006. "Critical success factors for enterprise resource planning implementation and upgrade.," *Journal of Computer Information Systems*. (47:5), pp. 99–113.

Nah, F., Lau, J., and Kuang, J. 2001. *Critical factors for successful implementation of enterprise systems Business Process Management Journal* (Vol. 7).

Naseri Taheri, P., Taheri Ardekani, H., and Khalou Bagheri, H. 2008. "Iran ERP Market Characteristics," *Tadbir* (19:195), Tehran, pp. 42–48.

Nazemi, E., Tarokh, M. J., and Djavanshir, G. R. 2012. "ERP: A literature survey," *International Journal of Advanced Manufacturing Technology* (61), pp. 999–1018 (doi: 10.1007/s00170-011-3756-x).

Nikookar, G., Yahya Safavi, S., Hakim, A., and Homayoun, A. 2010. "Competitive advantage of enterprise resource planning vendors in Iran," *Information Systems* (35:3), pp. 271–277 (doi: 10.1016/j.is.2009.09.002).

Orlikowski, W. J., and Iacono, C. S. 2001. "Research Commentary: Desperately Seeking the 'IT' in IT Research—A Call to Theorizing the IT Artifact," *Information Systems Research* (12:2), INFORMS, pp. 121–134 (doi: 10.1287/isre.12.2.121.9700).

Palvia, P. C., Jain Palvia, S. C., and Whitworth, J. E. 2002. "Global information technology: a meta analysis of key issues," *Information and Management* (39:5), pp. 403–414 (doi: 10.1016/S0378-7206(01)00106-9).

Panorama Consulting Solutions. 2015. "2015 ERP REPORT A Panorama; Consulting Solutions Research Report," Denver, USA (available at http://panorama-consulting.com/resource-center/2015-erp-report/).

Panorama Consulting Solutions. 2016. “2016 REPORT ON ERP SYSTEMS AND ENTERPRISE SOFTWARE,” Denver, USA.

Perçin, S. 2008. “Using the ANP approach in selecting and benchmarking ERP systemsnull,” *Benchmarking: An International Journal* (15:5), Emerald, pp. 630–649 (doi: 10.1108/14635770810903196).

Plant, R., and Willcocks, L. 2007. “CRITICAL SUCCESS FACTORS IN INTERNATIONAL ERP IMPLEMENTATIONS : A CASE RESEARCH APPROACH,” *Journal of Computer Information Systems* (47:3), pp. 60–70 (doi: 10.1016/j.ijpe.2010.05.008).

Plattner, H. 2011. “SanssouciDB: An In-Memory Database for Processing Enterprise Workloads.,” in *BTW* (Vol. 20), pp. 2–21.

Plattner, H., and Zeier, A. 2012. *In-Memory Data Management: Technology and Applications*In-memory Data Management: An Inflection Point for Enterprise Applications, Springer Berlin Heidelberg (available at https://books.google.de/books?id=HySCgzCApsEC).

Ptak, C., and Smith, C. 2011. *Orlicky’s Material Requirements Planning, Third Edition*, McGraw-Hill Education (available at https://books.google.de/books?id=lRsULeiVTroC).

Raihana, G. F. H. 2012. “Cloud ERP–A Solution Model,” *International Journal of Computer Science and Information Technology & Security* (2:1), pp. 76–79.

Rajapakse, J., and Seddon, P. B. 2005. “ERP Adoption in Developing Countries in Asia: A Cultural Misfit,” in *28th Information System Seminar in Scandinavia*, pp. 6–9.

Ram, J., and Corkindale, D. 2014. “How ‘critical’ are the critical success factors (CSFs)?: Examining the role of CSFs for ERP,” *Business Process Management Journal* (20:1), pp. 151–174 (doi: 10.1108/BPMJ-11-2012-0127).

Rashid, M. A., Hossain, L., and Patrick, J. D. 2002. “The evolution of ERP systems: A historical perspective.,”

Razmi, J., Sangari, M. S., and Ghodsi, R. 2009. “Developing a practical

framework for ERP readiness assessment using fuzzy analytic network process," *Advances in Engineering Software* (40:11), pp. 1168–1178 (doi: 10.1016/j.advengsoft.2009.05.002).

Roebuck, K. 2012. *ERP - Enterprise Resource Planning: High-impact Strategies - What You Need to Know: Definitions, Adoptions, Impact, Benefits, Maturity, Vendors*, Emereo Publishing (available at https://books.google.de/books?id=jcAQBwAAQBAJ).

Samler, S., and Lewellen, K. 2004. "Good taxonomy is key to successful searching," *EContent* (27:7/8), Online Inc., p. S20.

Şen, C. G., Baraçlı, H., Şen, S., and Başlıgil, H. 2009. "An integrated decision support system dealing with qualitative and quantitative objectives for enterprise software selection," *Expert Systems with Applications* (36:3), pp. 5272–5283 (doi: 10.1016/j.eswa.2008.06.070).

Sheu, C., Chae, B., and Yang, C.-L. 2004. "National differences and ERP implementation: issues and challenges," *Omega* (32:5), pp. 361–371 (doi: 10.1016/j.omega.2004.02.001).

Shore, B. 2006. "Enterprise Integration Across the Globally Disbursed Service Organizations," *Communications of the ACM* (49:6), pp. 102–106.

Shore, B., and Venkatachalam, A. R. 1996. "Role of national culture in the transfer of information technology," *The Journal of Strategic Information Systems* (5:1), pp. 19–35 (doi: 10.1016/S0963-8687(96)80021-7).

Skaf, R. M. 2012. "In the Trenches-Reversing the Trend," *PM Network-Project Management* (26:12), p. 24.

Soh, C., Kien, S. S., and Tay-Yap, J. 2000. "Enterprise resource planning: cultural fits and misfits: is ERP a universal solution?," *Communications of the ACM* (43:4), pp. 47–51 (doi: 10.1145/332051.332070).

Somers, T. M., and Nelson, K. 2001. "The Impact of Critical Success Factors across the Stages of Enterprise Resource Planning Implementations," in *Proceedings of 34th Annual Hawaii International Conference on*

*System Sciences*, IEEE, pp. 1–10.

Somers, T. M., and Nelson, K. G. 2004. "A taxonomy of players and activities across the ERP project life cycle," *Information and Management* (41:3), pp. 257–278 (doi: 10.1016/S0378-7206(03)00023-5).

Sravanapudi, A. 2004. "Categorization: it's all about context," *EContent* (27:7/8), p. S23.

Srivastava, M., and Gips, B. J. 2009. "Chinese cultural implications for ERP implementation," *Journal of Technology Management and Innovation* (4:1), pp. 105–113 (doi: 10.4067/S0718-27242009000100009).

Stevenson, W. 2014. "Conceptual vs. Empirical Research: Which is Better?," *Enago* (available at http://www.enago.com/blog/conceptual-vs-empirical-research/; retrieved April 21, 2014).

Tarafdar, M., and Roy, R. K. 2003. "Analyzing the adoption of enterprise resource planning systems in Indian organizations: a process framework," *Journal of Global Information Technology Management* (6:1), Taylor & Francis, pp. 21–51.

Thomas, W. S., Spillan, J. E., and Carolina, N. 2012. "The Impact of a Focus on Change in Technology in Successful Implementation of SAP Enterprise Resource Planning Systems in North and South America," *Journal of Management Policy & Practice* (13:5), pp. 19–34.

Thome, R., and Hufgard, A. 2006. *Continuous system engineering: Entdeckung der Standardsoftware als Organisator*, Germany: Oxigen Verlag.

Tsai, W., Shaw, M. J., Fan, Y., Liu, J., Lee, K., and Chen, H. 2011. "An empirical investigation of the impacts of internal / external facilitators on the project success of ERP : A structural equation model," *Decision Support Systems* (50:2), Elsevier B.V., pp. 480–490 (doi: 10.1016/j.dss.2010.11.005).

Umble, E. J., Haft, R. R., and Umble, M. M. 2003. "Enterprise resource planning: Implementation procedures and critical success factors," *European Journal of Operational Research* (146), pp. 241–257 (doi:

10.1016/S0377-2217(02)00547-7).

Upadhyay, P., Jahanyan, S., and Dan, P. K. 2011. "Factors influencing ERP implementation in Indian manufacturing organisations: A study of micro, small and medium-scale enterprises," *Journal of Enterprise Information Management* (24:2), pp. 130–145 (doi: 10.1108/17410391111106275).

Utecht, K. M., Hayes, R. B., and Okonkwo, P. A. 2004. "Enterprise resource planning and the competitive advantage: the ease of integrating information between corporate headquarters in the United States and factories in Mexico," *Competitiveness Review: An International Business Journal* (14:1/2), Emerald Group Publishing Limited, pp. 13–17.

Verville, J., and Halingten, A. 2003. "A six-stage model of the buying process for ERP software," *Industrial Marketing Management* (32), pp. 585–594 (doi: 10.1016/S0019-8501(03)00007-5).

Verville, J., Palanisamy, R., Bernadas, C., and Halingten, A. 2007. "ERP Acquisition Planning: A Critical Dimension for Making the Right Choice," *Long Range Planning* (40), pp. 45–63 (doi: 10.1016/j.lrp.2007.02.002).

Wang, E. T. G., and Chen, J. H. F. 2006. "Effects of internal support and consultant quality on the consulting process and ERP system quality," *Decision Support Systems* (42:2), pp. 1029–1041 (doi: 10.1016/j.dss.2005.08.005).

Wang, E. T. G., Chia-Lin Lin, C., Jiang, J. J., and Klein, G. 2007. "Improving enterprise resource planning (ERP) fit to organizational process through knowledge transfer," *International Journal of Information Management* (27), pp. 200–212 (doi: 10.1016/j.ijinfomgt.2007.02.002).

Wei, C.-C., Chien, C. F., and Wang, M.-J. J. 2005. "An AHP-based approach to ERP system selection," *International Journal of Production Economics* (96), pp. 47–62 (doi: 10.1016/j.ijpe.2004.03.004).

Wei, C.-C., and Wang, M.-J. J. 2004. "A comprehensive framework for selecting an ERP system," *International Journal of Project Management*

(22:2), pp. 161–169 (doi: 10.1016/S0263-7863(02)00064-9).

Winkelmann, A., and Klose, K. 2008. “Experiences while selecting , adapting and implementing ERP systems in SMEs : a case study,” in *Proceedings of the 14th Americas Conference on Information Systems (AMCIS 2008)*, Toronto, CA, pp. 1–11.

Wu, J.-H., Shin, S.-S., and Heng, M. S. H. 2007. “A methodology for ERP misfit analysis,” *Information and Management* (44:8), pp. 666–680 (doi: 10.1016/j.im.2007.09.001).

Xue, Y., Liang, H., Boulton, W. R., and Snyder, C. a. 2005. “ERP implementation failures in China: Case studies with implications for ERP vendors,” *International Journal of Production Economics* (97), pp. 279–295 (doi: 10.1016/j.ijpe.2004.07.008).

Yazdani, K., Ramliy, M. K., Ismail, K., and Omar, W. Z. W. 2013. “The Impact of Privatization in Technology Transfer Offices on University-Industry Connection,” in *1st International Conference on New Directions in Business, Management, Finance and Economics (ICNDBM 2013)*.

Yazgan, H. R., Boran, S., and Goztepe, K. 2009. “An ERP software selection process with using artificial neural network based on analytic network process approach,” *Expert Systems with Applications* (36:5), pp. 9214–9222 (doi: 10.1016/j.eswa.2008.12.022).

Zhang, Z., Lee, M. K. O., Huang, P., Zhang, L., and Huang, X. 2005. “A framework of ERP systems implementation success in China: An empirical study,” *International Journal of Production Economics* (98:1), pp. 56–80 (doi: 10.1016/j.ijpe.2004.09.004).

Ziaee, M., Fathian, M., and Sadjadi, S. J. 2006. “A modular approach to ERP system selection: A case study,” *Information Management & Computer Security* (14:5), Emerald Group Publishing Limited, pp. 485–495.

Zrimsek, B. 2003. “ERP II Vision,” in *US symposium/ITxpo*, pp. 23–27.