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Critical Success Factors for ERP Implementations

CAPSTONE REPORT

Lori Hogan
Greenbrier Companies

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Approved by

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Dr. Kara McFall
Lecturer, AIM Program

**Critical Success Factors (CSF) for
Enterprise Resource Planning Implementations**

Lori Hogan

Greenbrier Companies

Abstract

Enterprise resource planning software integrates the administration of all parts of a business into one system that provides process efficiencies and real time visibility of business activities. ERP projects are complex and require a review of critical success factors before implementation. Determining the key critical success factors and their application is critical for all project stakeholders. This study focuses on these elements and provides relevant information for project managers, project teams, steering committees, and project sponsors.

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Introduction

Problem Statement

"Enterprise Resource Planning (ERP) systems are software applications that use a single information architecture design to integrate a range of business functions in order to acquire an overview of the business" (Klaus, 2000, p141-162). The increased adoption of ERP systems has become more crucial for businesses in order to gain efficiencies and be competitive. "This growth is due mainly to the expected benefits and value promised by ERP systems in information capabilities and resources; intellectual capital through knowledge creation; and improvements in operational, managerial and strategic dimensions" (Ram, Wu, & Tagg, 2014, p. 1).   Many businesses find that "replacement of old fragmented legacy systems and the cost advantages and quicker deployment of packaged systems as compared to in-house development provide important benefits" (Luo & Strong, 2004, p.322). These packaged systems, better known as "commercial of the shelf" software, are assumed to have best practice processes built into the system designs out of the box (Vilpola, 2008, p 1). Umble, Haft and Umble (2003) suggest that,

> ERP provides two major benefits that do not exist in non-integrated departmental systems: (1) a unified enterprise view of the business that encompasses all functions and departments; and (2) an enterprise database where all business transactions are entered, recorded, processed, monitored, and reported. (p. 241)

Because of the potential benefits of ERP systems, the ability to master the successful implementation of these complex systems is crucial.   The key to successful ERP implementation projects is the understanding and management of key success factors

(Vilpola, 2008). Project success factors as defined by Müller and Jugdev, (2012) are "the elements of a project which, when influenced, increase the likelihood of success; these are the independent variables that make success more likely" (p. 758). Some key success factors in these types of projects include "positive associations between having business vision and external expertise" and "implementation quality and organisational readiness" (Ram, Corkindale, & Wu, 2013, p. 159). In order to maximize the likelihood of a successful ERP implementation, it is important to fully understand what components make up these key success factors, how to achieve them, and other key success factors identified by industry experts as critical to ERP implementations.

ERP implementations are not always successful. "In a survey of 64 fortune 500 companies, 25% suffered from poor performance of ERP in the post implementation stage" (Ha & Ahn , 2014, p. 1065).   ERP implementations historically fail for a variety of reasons: cost overruns, significant drop in organizational income that negatively affects the ability to fund continued efforts, and not meeting expectations for functionality (Ram, Corkindale & Wu,2013). Many of these factors result in either project abandonment or court filings to recover fees from consultants or software vendors (Ram, Corkindale & Wu,2013).

Mabert, Soni, and Venkataramanan (2003) performed a study that compared various approaches to ERP implementations and the ensuing outcomes in terms of meeting schedule and budget goals. Key findings include:

- Projects where a single ERP package was implemented were late an average of 41% of the time and over budget an average of 39%.

- Projects where major modifications were made to the system were late an average of 53% of the time and over budget an average of 56% of the time.

- Projects where limited reengineering was performed did not show much of an improvement over those where major modifications were made; 51% were late on average and 50% on average were over budget.

Given the large number of ERP projects which failed to meet budget and schedule goals, a thorough understanding of key success factors to positively influence these project parameters is crucial.

Purpose

Organizations that wish to embark upon ERP implementations face complex projects with historically low rates of success (May, Dhillon & Caldeira, 2013).   Key issues with ERP implementations include: budget overruns, not meeting project timelines, and a mismatch between results and the expectations of project deliverables (Ram, Corkindale, & Wu, 2013). Research has shown that employing key best practices during ERP implementation projects can mitigate the risks on ERP implementation projects and improve the likelihood of success (May, Dhillon & Caldeira, 2013).

The purpose of this study is to examine literature in an effort to identify and explore the key success factors related to the successful implementation of ERP projects. Background research is performed on common risks in ERP implementation projects in order to provide a context for the need to identify and employ best practices on these types of projects. Key areas examined in identifying best practices include project management and organizational

effectiveness as they relate to ERP implementation projects. Literature is identified to inform project managers, team members and steering committee leadership on the means to improve the success of these projects and achieve important efficiencies in business operations as the ultimate result of these initiatives.

Audience

"IS (information systems) are both a *product of* human action and an *influence on* human action. People initiate, design, implement, and use an IT system" (Boonstra & Govers, 2009, p. 180). Information systems like ERP systems affect and influence all facets of a business, as well as the roles in a business that rely on the system when performing their jobs or collecting information on how the business is running (Chen, Law & Yang, 2009).   Although the impact of these types of projects is widespread, it is the project staff such as the project manager, the systems and business analysts, and the management staff that are involved in guiding the project throughout the implementation that benefit the most from understanding critical success factors (Chen, Law & Yang, 2009).

The main purpose in educating these key groups in critical project success factors is to help them in performing their project roles more effectively. Project managers are integral to integrating these CSFs into the project plan and are ultimately given responsibility for project success (Ram,Wu, & Tagg, 2014).   Project sponsors and steering committees need to be aware of how to supply and monitor the elements that help in project success and to support the project manager in providing project direction (Ha & Ahn, 2014). The technical team members also play a part in monitoring these factors at a more detailed level and in bringing awareness to the project team throughout the project to head off potential problems (Vilpola, 2008).

Research Question

What are the key success factors to employ in ERP implementation projects to ensure the highest levels of success in achieving project objectives on time and within budget?

Sub questions.

1. Which key project success factors are the most important to project managers, management, and team members on the project?

2. What is the ranking of the key project success factors and how can each be best attained throughout the project?

3. How does the attainment of these factors translate into success of the project?

Search Report

Search Strategy

UO Libraries is the source for the majority of the research material; limited internet journal searches are performed using the same keywords. Keywords from the articles are used to expand the search based on areas of research related to the problem statement. Searches outside of UO Libraries including Google, Google Scholar and Microsoft Network (MSN) are used to find additional online documents that relate to the topic of study.

Established indexing descriptors. The majority of the studies in this research topic is performed by people in computer science or engineering professions with a focus on how certain factors influence these large and risky projects. The basis for many of these studies is to "identify and analyze the interrelationships of the critical issues involved in implementations of

ERP" (Amad & Cuenca, 2013, p 1). Keywords that are common in sources authored by experts

in the field such as Amad and Cuenca (2013) include:

- project management
- ERP
- stakeholders
- critical success factors
- complexity
- implementation
- post implementation
- enterprise resource planning systems
- customization
- change management
- user centered design
- implementation model
- continuous improvement

The above keywords were used singly and in combination to search for reference

material for this study.

Search engines and databases. The study is focused mainly on source material from UO

Libraries using the simple search and expanded key word searching. The databases containing

the key information are as follows: Academic Search Premier, JSTOR, Project Muse, and Web of

Science. These databases are good sources of information on computer science and technology

topics and have a combination of peer-reviewed and non- peer-reviewed articles, journals and

books. Secondary to those searches, articles identified with searches using Google, Google

Scholar, and MSN appear in less educational material more centered on business information;

these articles are used to support and back up existing sources as well as expand on the

information gathered in earlier sources.

Documentation approach. The collection of supporting material for this study is created by saving documents to a folder for future reference and also saving APA citation information in a separate document in order to maintain a reference list. Zotero (www.zotero.com) is also used to store sources and documents due to its ease of searching for information in later edits of the paper. These collection methods provide ease in finding quoted sections and main content when material is referenced multiple times. Articles are categorized by major topics within the study, including critical success factors, project stakeholders and history of ERP.

Reference evaluation. References were evaluated using the five criteria proposed by Bell and Frantz (2013): authority, objectivity, quality, currency, and relevancy.

Authority. All sources contained in this study are peer-reviewed, which validates the accuracy and impartiality of the material presented. All of the authors are either affiliated with a university or business school or work in computer science, business management or technology.

Objectivity. The content of the articles is evaluated for the appearance of opinions expressed by the authors or bias toward certain themes; this factor is also assumed to have been validated as part of the peer review process.

Quality. The structures of the journal articles are evaluated to ensure they follow the APA guidelines for scholarly writing. Content is reviewed to ensure that it is free of grammatical, spelling, and typographical mistakes. Sources are selected that have been published in educational and scientific journals that are well known and validated during the peer review process.

Currency. The focus of this research is to review materials published within the last 10 years in order to address the history of ERP implementations and the evolution toward current models of implementation in today's technology environment. Including articles published throughout this evolution is important in providing a complete review of best practices or critical success factors in ERP implementations today.

Relevancy. The sources within this study are all from scholarly sources gathered from the UO Libraries databases rather than popular media gathered from the general internet or written by freelance authors. The articles provide primary and secondary sources regarding the content material with analysis of information presented in case study format.

Annotated Bibliography

The annotated bibliography for this study includes sources related to ERP implementations and the critical success factors related to success or failure. The sources are broken down into major categories of: (a) ERP project critical success factors, (b) ERP implementation project stakeholders, and (c) ERP history and background. Each article within the sections is organized similarly with an APA formatted citation, a published abstract and a summarized conceptual analysis of the article with a discussion of its relation to the topic of study. The summary provided at the end of each citation is based on ideas pulled from each article and not claimed as representing original ideas of the author of this paper.

Category 1: ERP Project Critical Success Factors

Browning, T. (2014). A quantitative framework for managing project value, risk, and

opportunity. *IEEE Transactions on Engineering Management*, *61*(4), 583-598.

http://dx.doi.org/10.1109/TEM.2014.2326986

Abstract.   Projects should create value. That is the desire and plan, but uncertainties cloud the paths to this destination. All project work should add value in terms of both the resources consumed and the benefits provided (e.g., scope, quality, technical performance, features, and functions), yet adding value is not always straightforward. Conventional techniques such as earned value management focus on time and cost but do not address quality, uncertainty, risk, and opportunity. An integrated approach is needed to account for all of these. This paper presents an integrated framework for quantifying and monitoring project value in terms of the key attributes that matter to its stakeholders. The framework distinguishes four types of project value: desired, goal, likely, and actual. Project management is value management. Project goals, capabilities, risks, and opportunities are evaluated with respect to each key attribute of the desired value. The project value, risk, and opportunity framework is useful for project planning, monitoring, control, and tradeoff decision support. An example project, developing a drone aircraft, demonstrates the framework's application to project planning and monitoring, including setting project goals that balance risk and opportunity. New indices for risk, opportunity, and learning are introduced to track project progress and operationalize new constructs for researchers. [ABSTRACT FROM PUBLISHER]

Summary.   This study focuses on quantitative measurement of three key elements of project success: time, cost and performance. Due to the complexity of ERP projects and the need to provide value to stakeholders, having project management tools to measure

each of these variables throughout the lifecycle of the project is key in ensuring the

project is on track and to ensure stakeholders' expectations are met.   This study

provides a method for measuring stakeholder expectations and goals of the project,

which contributes to a greater ability for project managers to maintain control of risk

and control project timelines and budgets. This examination also provides an example

of how to continuously redefine the project in order to stay on track and in line with

changing demands or goals of the company. A critical success factor in ERP projects, as

outlined by this article, is managing stakeholder expectations and project value

expectations. This article ties to the topic of research in this study by identifying key

success factors for ERP project implementation success and proposing a means of

identifying, measuring and monitoring these factors throughout the life of the project.

Chen, C. , Law, C. , & Yang, S. (2009). Managing erp implementation failure: A project

management perspective. *Ieee Transactions on Engineering Management, 56*(1), 157-

170. http://dx.doi.org/10.1109/TEM.2008.2009802.

Abstract. Information technology (IT) projects are susceptible to changes in the

business environment, and the increasing velocity of change in global business is

challenging the management of enterprise systems such as enterprise resource planning

(ERP). At the same time, system success depends on the rigor of the project

management processes. Scope creep, poor risk management, inadequate allocation of

human resources over time, and vendor management are some common problems

associated with the implementation of an enterprise system. These issues pose threats

to the success of a large-scale software project such as ERP. This research adopts a case

study approach to examine how poor project management can imperil the implementation of an ERP system. Having learned the lessons from the failure of its first ERP implementation, the company in this case reengineered its project management practices to successfully carry out its second ERP implementation. Many critical project management factors contributed to the failure and success of this company's ERP system. This study explores and identifies critical elements of project management that contributed to the success of the second ERP implementation. For those organizations adopting ERP, the findings provide a roadmap to follow in order to avoid making critical, but often underestimated, project management mistakes.

Summary. This article focuses on a case study that reviews two ERP implementations. The first implementation failed to meet expectations and the second or reimplementation focused on the areas that were not addressed in the first project in order to improve the second result.   The identification of the project management controls of schedule, quality and budget is the focus of the study, with an emphasis on understanding that an ERP project is a "lifelong journey". The authors note that because of the cross-functional affects within the business, with a system such as an ERP system it is important to have representation from across the organization and to maintain communication with these areas throughout the project. In the second and more successful attempt in implementing ERP, the project stakeholders determined to go with a more "vanilla" set of functionality and to closely and frequently monitor the factors of schedule, quality and budget. This study reinforces that these controls are essential to ensuring ultimate success of the implementation.

Ghosh, S. , Skibniewski, M. , UNIV, V. , & Caposaldo, M. (2010). Enterprise resource planning

systems implementation as a complex project: A conceptual framework. *Journal of*

Business Economics and Management, *11*(4), 533-549.

http://dx.doi.org/10.3846/jbem.2010.26.

Abstract. The purpose of this paper is to investigate current literature on critical

success factors (CSF) and risk factors (RF) of enterprise resource planning (ERP) system

implementation and provide a systemic explanation of complexities involved in such

implementation. This study will compile literature that highlighted possible references

to CSFs of ERP implementations, definition of complex projects and ERP are compared

with project management and project governance impacts. By analyzing highly likely CFS

and RFs mentioned in literature, CSF and RFs will be mapped to project complexities

involved in any ERP implementation. This is an exploratory study as it is based on

literature review to understand ERP implementation and validations. The future

research needs to include data collection from ERP adopters and longitudinal analyses

of trends based on advances in ERP project management and governance capabilities in

different ERP implementations. This article will be significant contribution to current

body of knowledge because it helps us understand ERP application implementation as a

complex project instead of linear system as currently documented in the literature. This

article has outlined the conceptual revisions needed to extend the new project

management approach from its current linear way of looking into project management

of ERP projects. The article suggests that ERP project management is best understood

within the context of environmental complexities. This paper is the first attempt to

explore ERP implementations based on current enterprise environment and how to

meet those CSF and RFs from complexity perspective.

Summary. In this study, the authors first discuss the need for the review of critical

success factors with ERP implementation projects due to the high risk of failure during

implementation. The authors attribute the high risk to the complexity of the ERP

system, which spans the entire business and requires both business stakeholders and

technology stakeholders to work together to see the project to a successful end.

Complex, in this context, is defined as "one made up of a large number of parts that

interact in a non-simple way" (p. 537). Because of this complexity, it is important to

assess and understand fully the success factors that need to be controlled throughout

the project. This article addresses the importance of project management and the

project manager's ability to understand all aspects of the project, what critical factors

need to be monitored and what risk mitigations must be put in place where possible in

order to ensure the best possible project outcomes.

May, J. , Dhillon, G. , & Caldeira, M. , (2013). Defining value-based objectives for erp systems

planning. *Decision Support Systems, 55*(1), 98-109.

http://dx.doi.org/10.1016/j.dss.2012.12.036.

Abstract. The planning and subsequent implementation of Enterprise Resource

Planning (ERP) systems still present a significant challenge for most organizations.

Although consulting firms and customer enterprises have been acquiring more

experience and expertise in the field, the level of sophistication of these systems and

their wide organizational and social impact frequently leads to failed ERP

implementations. In an attempt to minimize these failure rates, this paper defines a set of value-based objectives that could be used to enrich the ERP systems planning process. ERP systems planning objectives grounded by stakeholder values can be used as a conceptual guide for enhancing the decision making processes involved in ERP projects. Using Keeney's value-focused thinking approach, a set of means and fundamental objectives was identified using data collected via in-depth interviews in three large European firms. The relationships and interdependencies among these objectives are also presented and provide a starting point for further research. Published by Elsevier B.V.

Summary. This article reviews success and failure factors for ERP implementations related to three case studies. The main points reinforced in the analysis are the importance of aligning the organization and the ERP processes. In-depth interviews are conducted with key stakeholders to determine the value-based objectives of the ERP project. This study is based off of Keeney's value focused thinking that reflects that the decision maker's values must be identified rather than letting the structure of the ERP system drive those objectives. These value-based objectives are translated into software requirements in order to ensure a link between the business' values and the end result of the implementation. The project planning process should start with an understanding of these objectives and the software fit to those objectives in order to ensure success. This article ties to this study by identifying additional critical success factors to be considered in reducing the failure rate of these types of projects.

Müller, R. & Jugdev, K. (2012),"Critical success factors in projects", *International Journal of*

Abstract. Purpose – Few scholars have been cited as frequently as Pinto, Slevin, and Prescott for their contributions to project success and related critical success factors (CSF) in the 1980s. Studies since then built on their articles to broaden and refine our understanding of the topic. The purpose of this paper is to discuss the reasons for the impact of these seminal contributions and how the topic of project success continues to evolve. Design/methodology/approach – The paper analyses the popularity of Pinto and his colleagues' contributions to project success and reviews the development of this field of research since then. Findings – Project success remains a vibrant school of thought as do the earlier definitions, measurement scales and dimensions, and assessment techniques that Pinto and his colleagues developed. The authors view success more broadly and think of it strategically because they consider longer-term business objectives. Some research is now based on managerial or organizational theories and reflects the multi-dimensional and networked nature of project success. Practical implications – Practically, the classic contributions in project success continue to be valid. The authors see diversity in how success is defined and measured. The CSFs vary by project types, lifecycle phases, industries, nationalities, individuals, and organizations. Originality/value – The paper relates earlier understandings of project success to subsequent research in the field and underscores the significant findings by Pinto, Slevin, and Prescott.

Summary. This article reviews a detailed history of project management and project success factors. Because of the changes in technology, the techniques and methods for project management change over time and have been constantly analyzed in order to ensure all critical success factors are reviewed and met. Over the last decade a major shift has happened, as outlined by this article, where success has been difficult to measure and at times has been considered in the "eye of the beholder" (p. 768). Successful projects today need to provide value to the organization in relation to the expense of the effort and software purchased as part of an implementation. The key success factors reviewed in this article relate to project management practices and how they are applied through the life of the project such as risk mitigation, monitoring of cost and timeline, and continual communication with key stakeholders. This information relates to the core topic of this study in that critical success factors have changed over time and are continuing to evolve as businesses understand better what an ERP system implementation means to an organization as far as future benefits. A key element as outlined in this article is adding value to the organization through the addition of this technology and managing the components of the project to ensure the maximum benefits are realized.

Ram, J. , Corkindale, D. , & Wu, M (2013). Implementation critical success factors (csfs) for erp: Do they contribute to implementation success and post-implementation performance?. *International Journal of Production Economics*, *144*(1), 157-174.

http://dx.doi.org/10.1016/j.ijpe.2013.01.032

Abstract. Frequent commentaries in the literature have stated that certain critical success factors (CSFs) have to be accomplished in an organisation for an enterprise resource planning (ERP) system project to be successful. In this study we argue and demonstrate empirically that success in implementing an ERP system and in gaining performance improvement should be conceptualised as two separate dependent variables. The distinction is made because the former aspect is based upon project delivery outcomes, while the latter assesses post-ERP project performance. We question whether some factors labelled as 'critical' success factors for ERP projects are in practice actually critical for achieving success in implementation and improving output performance. To examine this we report an empirical study that has investigated whether four major CSFs are in practice critical for achieving organisational performance improvements, and the role that successful implementation may play in influencing the relationship between CSFs and improvements in organisational performance. A conceptual model was devised and then analysed using structural equation modelling based on data collected from 217 organisations. We found that some CSFs were not critical to achieve success in ERP implementation but were critical to help an organisation achieve performance improvement from an ERP system. Additionally, we also found that achieving successful ERP system implementation mediates the degree to which a CSF affects output performance improvement. The managerial and research implications of these findings are discussed and the limitations of the study noted. (C) 2013 Elsevier B.V. All rights reserved.

Summary. This article is a summary of a study that reviews four specific project critical success factors: (a) project management, (b) business process re-engineering, (c) training and education, and (d) system integration. Each of these areas is examined in an effort to pinpoint what parts of each of these factors contribute the most or increase the chance for success during complicated projects like ERP implementations. This study collects its data via survey questionnaire and the participants were chosen from a pool of senior managers who had "dedicated" involvement in the ERP implementation project and therefore would be in the best positions to evaluate the success or failure of the projects and the impacts of the critical success factors in the results. This study ties directly to this review in its close analysis of critical success factors that contribute directly to ERP project success.

Ram, J. , Wu, M. , & Tagg, R. , (2014). Competitive advantage from erp projects: Examining the role of key implementation drivers. *International Journal of Project Management*, *32*(4), 663-675. http://dx.doi.o rg/10.1016/j.ijproman.2013.08.004

Abstract. In this study, we build a conceptual model, which draws upon information systems implementation theory, to investigate the relationship between critical success factors related to the implementation of ERP software and the goal of competitive advantage. We test this model with data from a survey of 217 Australian organisations, using structural equation modelling (SEM). We find that organisations can best achieve competitive advantage by carefully managing: a) training and education, and b) system integration activities. Perhaps unexpectedly, neither well-conducted business process re-engineering nor good project management necessarily lead to competitive

advantage. We have extended prior knowledge by providing empirical evidence that some CSFs do influence competitive advantage but that others may not. The results confirm that overall project delivery outcomes can be improved by understanding the influence of factors on both project management performance and post-implementation performance. Some theoretical and managerial consequences of the study's findings and limitations are discussed.

Summary. This study focuses on outlining the following key project success factors: (a) project management, (b) top management support, (c) system quality, (d) training and education, (e) business plan and vision, (f) business process re-engineering, (g) consultant quality, (h) organizational readiness, (i) change management, (j) use of "vanilla" technology, (k) system integration, and (l) vendor support, among others. Six dimensions of success are measured as part of this study: system quality, information quality, system use, user satisfaction, individual impact, and organizational impact. These factors provide a balanced scorecard for measuring system success by looking at system quality and information quality, which leads to more acceptance and more positive impact. It also states that organizational innovation such as a technology implementation occurs in the following stages: (a) initiation, (b) adoption, (c) adaption, (d) acceptance, (e) use, and (f) incorporation. These stages, if managed correctly with an understanding of the stages and the factors that affect each stage along with the critical success factors, will not only result in many of the purported benefits of ERP systems, but will also help to increase the likelihood of the implementation meeting its objectives.

Ranganathan, C. , & Brown, C. (2006). Erp investments and the market value of firms: Toward an understanding of influential erp project variables. *Information Systems Research*, *17*(2), 145-161. http://dx.doi.org/10.1287/isre.1060.0084.

Abstract. This study contributes to the growing body of literature on the value of enterprise resource planning (ERP) investments at the firm level. Using an organization integration lens that takes into account investments in complementary resources as well as an options thinking logic about the value of an ERP platform, we argue that not all ERP purchases have the same potential impact at the firm level due to ERP project decisions made at the time of purchase. Based on a sample of 116 investment announcements in United States—based firms between 1997 and 2001, we find support for our hypotheses that ERP projects with greater functional scope (two or more value-chain modules) or greater physical scope (multiple sites) result in positive, higher shareholder returns. Furthermore, the highest increases in returns (3.29%) are found for ERP purchases with greater functional scope and greater physical scope; negative returns are found for projects with lesser functional scope and lesser physical scope. These findings provide empirical support for prior theory about the organizational integration benefits of ERP systems, the contribution of complementary resource investments to the business value of IT investments, and the growth options associated with IT platform investments. The article concludes with implications of our firm-level findings for this first wave of enterprise systems.

Summary. This article focuses on the importance of companies seeing an ERP system implementation as more than an IT investment by expanding the implementation to

include other factors such as process re-engineering. Without including process re-

engineering as part of the scope of the project, it is difficult to successfully adopt a

system like an ERP system into an organization because of its cross functional influence.

The author breaks out the influencing factors of the project into physical scope,

functional scope and vendor package selection. Each of these factors can positively

affect the implementation in a different way. The data collection in this study is done

using a sampling of public information regarding announcements of IT investment,

determination of vendor selection and the size and scope of the project.   This

information provides another viewpoint on success factors in this type of IT project and

a different way to break out the critical success factors in measuring the project risk.

Rouhani, S. , & Ravasan, A. (2013). Erp success prediction: An artificial neural network

approach. *Scientia Iranica*, *20*(3), 992-1001.

http://dx.doi.org/10.1016/j.scient.2012.12.006

Abstract. The Enterprise Resource Planning system (ERP) has been pointed out as a new

information systems paradigm. However, achieving a proper level of ERP success relies

on a variety of factors that are related to an organization or project environment. In this

paper, the idea of predicting ERP post-implementation success based on organizational

profiles has been discussed. As with the need to create the expectations of

organizations of ERP, an expert system was developed by exploiting the Artificial Neural

Network (ANN) method to articulate the relationships between some organizational

factors and ERP success. The expert system role is in preparation to obtain data from

the new enterprises that wish to implement ERP, and to predict the probable system

success level. To this end, factors of organizational profiles are recognized and an ANN

model is developed. Then, they are validated with 171 surveyed data obtained from

Middle East-located enterprises that experienced ERP. The trained expert system

predicts, with an average correlation coefficient of 0.744, which is respectively high, and

supports the idea of dependency of ERP success on organizational profiles. Besides, a

total correct classification rate of 0.685 indicates good prediction power, which can help

firms predict ERP success before system implementation. (C) 2013 Sharif University of

Technology. Production and hosting by Elsevier B.V. All rights reserved.

Summary. This study focuses on ANN or Artificial Neural Network, a tool used to model,

analyze and solve complex problems such as the implementation of complex system

implementations like ERP systems. The basis for the study is to compare the ERP system

process as an expert system that simulates the actions of a person who would manually

perform activities with the actions of a system performing the task more efficiently.

This modeling points to one of the critical success factors in ERP implementation, which

is process re-engineering to match the organization's processes to those of a packaged

system. This study points to one of the many important critical success factors in the

adoption of an ERP system. The data in this study was collected via a questionnaire that

was sent to the respondents at the beginning of the project and then again after the

completion of the implementation to get a full view of success factors throughout the

life of the project.

Shaul, L. & Tauber, D. , (2013). Critical success factors in enterprise resource

planning systems: Review of the last decade. *Acm Computing Surveys, 45*(4) .

Abstract. Organizations perceive ERP as a vital tool for organizational competition as it integrates dispersed organizational systems and enables flawless transactions and production. This review examines studies investigating Critical Success Factors (CSFs) in implementing Enterprise Resource Planning (ERP) systems. Keywords relating to the theme of this study were defined and used to search known Web engines and journal databases for studies on both implementing ERP systems per se and integrating ERP systems with other well- known systems (e.g., SCM, CRM) whose importance to business organizations and academia is acknowledged to work in a complementary fashion. A total of 341 articles were reviewed to address three main goals. This study structures previous research by presenting a comprehensive taxonomy of CSFs in the area of ERP. Second, it maps studies, identified through an exhaustive and comprehensive literature review, to different dimensions and facets of ERP system implementation. Third, it presents studies investigating CSFs in terms of a specific ERP lifecycle phase and across the entire ERP life cycle. This study not only reviews articles in which an ERP system is the sole or primary field of research, but also articles that refer to an integration of ERP systems and other popular systems (e.g., SCM, CRM). Finally it provides a comprehensive bibliography of the articles published during this period that can serve as a guide for future research.

Summary. This study first reviews the history of ERP implementations over a ten-year time period and demonstrates its evolution and the elements that change the critical success factors in each of the years reviewed. The author then explores the link

between certain critical success factors that tie directly to certain phases of ERP

implementation and the importance of understanding which success factors apply at

each stage. Those phases are defined as: (a) planning, (b) implementation, (c)

stabilization, and (d) enhancement. Understanding these phases and what new or

changing critical success factors need to be monitored during each phase is important to

controlling project success or failure. This study analyzes two case studies, one that

reviews an unsuccessful ERP implementation and the other that reviews successful

projects. The link between this article and this study is the identification and analysis of

critical success factors and also the added information provided with the review of the

history of ERP projects and how these projects have changed to become increasingly

complex.

Yeh, C. & Xu, Y. (2013). Managing critical success strategies for an enterprise resource planning

project. *European Journal of Operational Research*, *230*(3), 604-614.

http://dx.doi.org/10.1016/j.ejor.2013.04.032.

Abstract. This paper develops an innovative objectives-oriented approach with one

evaluation model and three optimization models for managing the implementation of a

set of critical success strategies (CSSs) for an enterprise resource planning (ERP) project

in an organization. To evaluate the CSSs based on their contribution to the

organizational objectives, the evaluation model addresses an important issue of

measuring the relationship between objectives in a three-level hierarchy involving the

organization, its functional departments, and the ERP project. To determine the optimal

management priority for implementing the CSSs from the organization's perspective,

the three optimization models maximize their total implementation value by integrating

individual departments' management preferences. An empirical study is conducted to

demonstrate how these models work and how their outcomes can provide practical

insights and implications in planning and managing the implementation of the CSSs for

an ERP project. (C) 2013 Elsevier B.V. All rights reserved.

Summary. This article provides a review of critical success factors as they relate to

three different levels of project objectives: (a) departmental, (b) the project, and (c) the

organization. Since the objectives and priorities are different in each of these cases, this

discrepancy is a project management risk that must be monitored closely to ensure the

project moves forward toward an overall common set of objectives. The analysis is

done using the multiattribute decision-making model to measure project objectives as

they apply to the three levels identified. The information is organized by critical success

factors from each level of the hierarchy and then weighted to determine overall which

ones are most important. Once categorized, the critical success factors are placed in a

grid to show which ones are most pertinent overall for the entire organization. This

model applies to this study in that it provides a method for prioritization of the critical

project success factors when there are opposing or competing priorities.

Category 2: ERP Implementation Project Stakeholders

Boonstra, A. , & Govers, M. (2009). Understanding erp system implementation in a hospital by

analysing stakeholders. *New Technology Work and Employment*, *24*(2), 177-193.

http://dx.doi.org/10.1111/j.1468-005X.2009.00227.x

Abstract. Implementing enterprise resource planning (ERP) systems requires significant

organisational, as well as technical, changes. These will affect stakeholders with varying

perspectives and interests in the system. This is particularly the case in health care, as a

feature of this sector is that responsibility of services is shared between many

autonomous units. In these and similar settings, it is essential to analyse stakeholders

and to understand their expectations and attitudes towards the system. Such an

understanding will help implementers to address stakeholder interests and to

encourage acceptance. Therefore, the purpose of this paper is to develop a

theoretically based model to analyse how stakeholder attitudes and behaviours in a

hospital setting affect the outcome of ERP implementation. This model is applied in an

empirical study of a project to introduce an ERP system in medium-sized hospital in The

Netherlands. The study shows how the ERP implementation impacts the interests of

stakeholders such as physicians and administrators, which caused tensions. The paper

examines the reasons of these tensions. In doing so, it contributes to our understanding

of ERP implementation in health care and any other similar sectors from a stakeholder

perspective, and it may help implementers to manage this more effectively.

Summary. This study is primarily focused on the role of stakeholders and how they

influence a project outcome. This case study looks at stakeholders from two different

perspectives: first, how they influence the project and second, how they play certain

roles in a project's success. Stakeholders influence the project in multiple ways,

including by providing guiding roles for the project manager and team and in some cases

positively contributing to the outcome by communicating benefits to the organization

and reassuring company resources that the implementation will add value over the long

term and be a worthwhile endeavor. The data for this study was collected via a

questionnaire and observations of certain types of stakeholders during the

implementation of an ERP system. A key reason for this analysis and its importance to

this study is to understand that stakeholders in a project often have diverse motives in

helping these types of projects to succeed or fail. Because they often have equal power

and may have varied priorities, this situation can create a power struggle and contribute

to projects stalling or failing. The other factor that this study contributes is to

understand what type of people are considered project stakeholders and their roles in

complex projects such as ERP implementation projects.

Ferratt, T. , Ahire, S. , & De, P. (2006). Achieving success in large projects: Implications from a

study of erp implementations. *Interfaces*, *36*(5), 458-469.

http://dx.doi.org/10.1287/inte.1060.0203.

Abstract. Executives in charge of large projects must decide how to spend their

energies, even though typically they are not trained to manage such projects. We have

derived two implications for managers based on prior research: adhere to the

fundamentals of project management and unearth the best practices for large-project

success. Through a study of more than 70 enterprise-resource-planning (ERP) projects,

we have investigated our hypothesis that greater success in implementation is related

to greater adoption of the best practices. For most of the participants in our study, our

hypothesized model holds. For some, however, careful deviation from this model also

proved successful. Additional implications we have derived include recommendations to

specify a model of the project outcomes, understand the factors that make a project large and risky, and include a focus on managing large projects in executive education and development.

Summary.   This article reviews a study of large ERP implementation projects and how best to address the factors that control the success or failure of them. What the authors found in the analysis is that large projects and their related success factors are very different than smaller scale implementations and/or implementations where an organization chooses to implement more of a "vanilla" version of the software purchased. Some key elements the authors identify are to go back to best practices in project management and the differences in project management practices when completing a large project versus a small project. Project management best practices include such actions as planning and monitoring, providing consistent communication, and managing resources. These activities change when a project is large and there are more moving parts to the project. A project manager might use different modes of communication or different tools to manage cost and timeline because of the abundance of details in a large project as compared to a smaller effort where there are less factors involved. The data in this article was collected via survey and included implementation-specific questions as well as "lessons learned" in the post implementation. Respondents were asked to rank best practices during implementation with regard to their ERP experience. Some of those best practices include the following: top management support, competence of the project team, clear goals and objectives, effective project management, and effective management of expectations.

Category 3: History and Background of ERP Software

Vilpola, I. (2008). A method for improving erp implementation success by the principles and

process of user-centred design. *Enterprise Information Systems*, *2*(1), 47-76.

http://dx.doi.org/10.1080/17517570701793848

Abstract. Enterprise resource planning (ERP) systems are implemented to increase the

productivity and operational efficiency of companies. However, the implementation

activities and changes within operational processes pose a temporary threat to

productivity. Reported difficulties in implementation projects frequently relate to

organisational and human-centred issues; like the ability and motivation of the

organisation to accept the new ERP system. User-centred design (UCD) is a

multidisciplinary process that aims at improving human working conditions by early user

involvement in the system design, e. g. user observation or usability testing. UCD was

originally developed for the design of interactive computer systems. The underlying

question for this research is how the principles and process of UCD can be applied to

ensure the usability of an ERP system. This article presents: first, a literature review of

ERP implementations; second, a literature review of UCD applications; third, a method

to combine the UCD and ERP system implementation processes; and finally a discussion

of the UCD approach for ERP implementation.

Summary. The focus of this study is on "commercial off the shelf" systems and

companies that buy these types of systems in order to gain the benefits of the systems'

best practices while improving the time to implement the systems in organizations. As

with the other studies in this annotated bibliography, there is an emphasis on aligning

the business processes with the standard processes of the ERP system as a means of

shortening implementation timelines. A key success factor is to monitor the evolution

of the project and adjust project activities as an ongoing activity. This article ties into a

key theme of this study by identifying one of the critical success factors of ERP

implementations as the need to plan for the continual upgrade and maintenance of the

system to ensure its fit to the business over the system's lifetime.

Wu, L. , Ong, C. , & Hsu, Y (2008). Active erp implementation management: A real options

perspective. *Journal of Systems and Software*, *81*(6), 1039-1050.

http://dx.doi.org/10.1016/j.jss.2007.10.004

Abstract. Although enterprise resources planning (ERP) implementation has been one

of the most significant challenges of the last decade, it comes with a surprisingly high

failure rate due to its high risk nature. The risks of ERP implementation, which involve

both technical and social uncertainties, must to be effectively managed. Traditional ERP

practices address the implementation of ERP as a static process. Such practices focus on

structure, not on ERP as something that will meet the needs of a changing organization.

As a result, many relevant uncertainties that cannot be predefined are not

accommodated, and cause the implementation to fail in the form of project delay and

cost overruns. The objective of this paper is to propose an active ERP implementation

management perspective to manage ERP risks based on the Real Options (RO) theory,

which addresses uncertainties over time, resolves uncertainties in changing

environments that cannot be predefined. By actively managing ERP implementation,

managers can improve their flexibility, take appropriate action to respond to the often-changing ERP environment, and achieve a more successful ERP implementation. (C) 2007 Elsevier Inc. All rights reserved.

Summary. This article examines a variety of different models in its analysis of ERP implementations and their success factors, but the clear focus of the study is to look at how the organizational culture and business can be intertwined with the technology in order to successfully implement a complex system like an ERP system. The authors review the options theory, which describes the uncertainties of these kinds of projects and seeks to provide a means to control those uncertainties. This article ties into the critical success factors of this study in that it examines the risks that cannot be predicted initially and how to deal with them effectively when they pose a problem during the project implementation.

Conclusion

ERP systems are complex in nature but offer wide ranging benefits in terms of providing a unified view of an organization's critical business functions and accompanying data (Umble, Haft & Umble, 2003). Due to the complexity of these systems, ERP implementation projects frequently go over budget and schedule and fail to meet requirements (Chen, Law & Yang, 2009). The importance of these systems and the historic challenges in successfully implementing them led to this review of literature that is dedicated to the identification of key success factors that positively influence ERP implementation projects.

Common topics emerge from an examination of the data that is produced from both

qualitative and quantitative research on the topic. These topics are: (a) ERP project critical

success factors, (b) ERP implementation project stakeholders, and (c) history and background of

ERP software. A review of the common elements within each topic is provided below with an

explanation of how the individual findings relate to proposed solutions.

ERP Project Critical Success Factors

Each of the articles outlined in the annotated bibliography discusses the importance of

knowing the critical success factors before implementing an ERP system and managing the

factors throughout the project, not only from a project management standpoint, but also from

the perspective of other project stakeholders. In review of the reference sources in the

annotated bibliography common themes emerge that identify the major success factors.

Organizational change control. Organizational change control is accomplished through

the provision of ongoing informative communication and management support throughout the

ERP implementation project (Ram, Corkindale, & Wu, 2013). Because the implementation of an

ERP is a major change for a company, understanding and communicating the benefits of the

tool and securing the commitment of the company to the project are important to keep end

users informed and in support of the changes that affect them (Ha & Ahn, 2014).

Dedicated project management. The project manager not only guides the ERP

implementation project, but monitors all elements of cost, timeline, and quality (Mabert,

Soni, & Venkataramanan, 2003). These elements are in constant change throughout an ERP

project, so the project manager and project team must be aware of these changes and react to

them appropriately in order to make the adjustments necessary to deliver the project on time,

on budget, and according to requirements (Mabert, Soni & Venkataramanan, 2003).

Management of expectations.   ERP systems have been known to deliver many benefits:

process efficiencies, best practice functionality, real-time access to interdepartmental data, and

key financial performance indicators (Mabert, Soni & Venkataramanan, 2003). Ensuring that

management expectations are understood and attainable, as well as understanding how all

levels of the organization can influence the outcome, is key to maintaining control of the

project and delivering a final product that meets expectations (Ha and Ahn, 2014).

ERP Implementation Project Stakeholders

Defining stakeholders and managing their expectations is also a key component of

successful ERP implementation projects. The articles reviewed delve into the importance of

seeing beyond the standard stakeholder groups such as the steering committee members and

the sponsor to also understand how departmental management can be crucial to maintaining

communication with the end users of the system and also influencing their involvement in and

acceptance of the system. A common theme in the literature is that organizational change can

be difficult for all stakeholders but is crucial to the success of a complex system like an ERP

(Boonstra, & Govers, 2009; Chen, Law, & Yang, 2009). One means to positively influence a key

stakeholder group in ERP implementations that was recommended by Ferratt, Ahire, and De

(2006) is to include training on the management of large projects to the training plans of

organizational executives to further their skills in overseeing these large scale projects.

Ensuring that these stakeholders understand the process thoroughly will play a significant role

in managing their expectations and helping them to understand the effort, cost, and time involved in an ERP implementation.

History and Background of ERP Software

It is important to understand the difference between an ERP system and other software packages. A review of the history of ERP systems and how they have evolved into interrelated systems that span the entire organization helps to build the case that these projects require well-planned implementations and thorough reviews of all success factors. The articles that are selected for their information on the history of ERP systems demonstrate that ERP implementations result in not only important technology changes, but also require many organizational and process changes in order to gain the benefits from new functionality and efficiencies through the integrated architecture of the software. Vilpola (2008) notes that ERP implementation projects pose temporary threats to productivity and that organizations must have the ability and motivation to accept the new ERP systems in order for the implementations to be successful. Wu, Hong, and Hsu (2008) note that ERP implementation projects have historically high failure rates due to risks posed by technical and social uncertainties that must be managed in order to be effectively mitigated.

ERP system implementations are oftentimes over budget, go past deadline and may not deliver on the quality originally proposed (Chen, Law & Yang, 2009). Because of high failure rates as well as the expense of the software itself, it becomes more and more important to understand how to improve the likelihood of a successful ERP implementation (Chen, Law, & Yang, 2009). The material gathered in this study provides a picture of the factors that have historically influenced project success and a basis for further study of the important elements

that provide anticipated value to the company. Of the many critical success factors identified, it

is essential to determine those that are most relevant for the specific ERP project, the company

sponsoring the effort, and the organizational culture. A focus on the relevant success factors

will help an organization to navigate the ensuing changes and adapt as necessary once the

implementation is complete.

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