THE IMPACT OF ENTERPRISE RESOURCE PLANNING SYSTEM ON IRANIAN FIRMS PERFORMANCE

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DEDICATION

This thesis is dedicated to my brilliant, loving, and supportive wife, Rozila Banihashemi, our exuberant, sweet, and adorable little girl, Rosha Parto, and my always encouraging, ever faithful parents.
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ABSTRACT

In the past two decades, there has been a significant growth market for Enterprise Resource Planning (ERP) in developing countries. However, due to recent economic development of these countries such as Iran, the demand for ERP systems increased considerably. Besides these growths, failures in ERP implementation also have been increased. Therefore, there is an urgent need for understanding ERP implementation and post evaluation issues in developing countries. The main objectives of this study is to identify common ERP modules, critical success factors (CSFs) of ERP implementation among the manufacturing firms in Iran in order to assess the impact of ERP systems implementation on performance across four perspectives (financial, customer, internal process and learning) of the balanced scorecard (BSC). For this purpose, a theory-based model has been developed to examine the relationship between ERP system status and firms performance perspectives. Empirical analyses are based on survey data drawn from 93 Iranian manufacturing firms, which have adopted ERP systems for at least a year. Structural equation modeling (SEM) is employed to test the research hypotheses and Fuzzy DEMATEL method is applied to find the impact of ERP implementation modules and performance indicators. The result indicates that there is a positive significant relationship between ERP system status and changes in financial, customer and learning perspectives of performance. In addition, CSFs and ERP modules on performance perspectives indicated a positive interaction. On the other hand, fuzzy DEMATEL analysis shows, sale and distribution module of ERP had the strongest impact on performance within Iranian manufacturing firms. Consequently, the managers who want to implement ERP systems can use the ranking to choose suitable ERP modules. The results of the study suggest that firms that emphasize CSFs throughout the ERP implementation process achieve higher performance improvement. Further research should gather data from various sources and also from the service sectors.
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CHAPTER 1

INTRODUCTION

1.1 Research Background

Globalization has made managing a business more challenging due to expanding markets, increasing customer expectations, and competition. The challenges have given additional pressure on the firms to change rapidly. As such, an integrated system is required by the business management to run the whole business processes and maintain their competitive advantages and fulfill the global requirements (Dey et al., 2010). During the past two decades, globalization expansion has made the firms worldwide to get involved in new forms of competition and to begin a dynamic business environment. In this case, the information systems (IS) are powerful, universal drivers of business performance and sustainable organizational growth. For keeping such competitive pressures and environmental uncertainties under control, the firms try to engage in continual improvement, speed up the product improvement cycle, ensure production flexibility, and manage logistics channels. To gain these objectives, organizations are progressively implementing the Enterprise Resource Planning (ERP) systems.

The ERP has been defined in many different theoretical and practical ways in research studies. In the early 1990s, the ERP was used by the Gartner Group to explain a group of applications accustomed to supervise the whole business tasks of a firm. According to Minahan (1998), the ERP is a complicated system based on the software automatists, which makes a relation between the fundamental procedures of a business. The ERP systems has also been introduced as the enterprise systems (ES), enterprise resource management (ERM) systems and business systems (Davenport,
1998). O’leary (2000) defined that the ERP as a computerized system and enterprise-size database, designed for controlling an organization’s tasks and making real-time planning integration, production and customer response (configured for the client-server situations). Moreover, the ERP is deemed to compact a large amount of business procedures and provide for real-time information access.

A significant growth has been registered by the worldwide market for the ERP during the last twenty years (Mabert et al., 2000; Dey et al., 2010). The global ERP market’s revenues were estimated at $65 billion in 2008, $61 billion in 2009, and $65 billion in 2010 (D’Aquila et al., 2009). ERP implementation and failure reasons were analyzed by many researchers (Al-Mashari et al., 2003; Beatty and Williams, 2006; Finney and Corbett, 2007; Jones et al., 2006; Nah and Delgado, 2006; Remus, 2007; Shang and Seddon, 2002; Soja, 2006). The results of these studies stated that the main intention of companies are to standardize manufacturing processes, integrate financial data, increase sales, have real-time information, generate information for decision making, reduce costs, standardize human resource information, fulfill taxation requirements and respond to growing global competition.

This study is on ERP implementation was carried out because this topic is important. Schlichterb and Kraemmergaard (2010) found that from year 2000 to 2009, a total of 885 journal articles were published in 226 different journals. They categorized the academic researchers in ERP and provided a guideline for new researches. They further categorized the researches into ERP Implementation, ERP optimization, management and ERP issues, ERP Tools, supply chain management and ERP, ERP and education and ERP markets and industries.

However, several studies have shown that in both developed and developing markets, 50% to 70% of the ERP system implementations encounter difficulties, and were not able to attain their predefined goals (Buckhout et al., 1999; Hong and Kim, 2002; Umble and Umble, 2000; Umble et al., 2003). Even in firms that managed to reach successful implementations technically, the ERP system deployment has not led them to the predefined benefits. Moreover, firms’ failure in establishing organizational changes by focusing on the critical success factors (CSF) along with
the technical realization of their ERP systems are considered as the primary causes of implementations challenges (Scott and Vessey, 2000; Kennerley and Neely, 2001).

In accordance with the success factors in the ERP implementation, the scope, size, and complication of these systems need to focus directly on the whole ERP life cycle to gain the promised system profit (Law et al., 2010). Scholars have addressed critical factors in the ERP systems implementation to eschew prohibitive mistakes (Kemp and Low, 2008; Ngai et al., 2008). Several studies have reported that companies were not capable of prosperity extension and optimization of the ERP systems to gain stability in the post-implementation stage (Guo Chao Peng and Nunes, 2009; Wang et al., 2008).

Most research studies on the ERPs have been centralized on the evaluation, selection and ERP system implementation (Kouki et al., 2010; Shepherd et al., 2009), while a small number has focused on the post-implementation process, their impact on performance (financial and non-financial) (Law et al., 2010; McGinnis and Huang, 2007; Zhu et al., 2010). The projects often end with the accomplishment of a system. Implementation of the system signals, not the end of the project, but a shift into a new phase (Kouki et al., 2010; McGinnis and Huang, 2007).

ERP implementation comes with risks. Although the ERP systems have many advantages and can become a central point of the firms, the implementation is costly and time consuming (Sweat, 1998). The western vendors design most of the ERP systems. It is supposed that fundamental differences exist between the needs and function of the western ERP systems on one hand and requirement of organizations in the developing and underdeveloped societies on the other hand. As a result, the ERP fails when organizations in the developing and underdeveloped countries adapt these imported systems (Xue et al., 2005). The developing and underdeveloped countries firms deal with considerably different problems in comparison with the organizations in the developed countries, due to different situations, national differences, management style, business model, data formats and the extent of complexity of IT use among others (Ngai et al., 2008). However, there is not many
of research conducted in those countries, specifically in the Middle-East region (Kamhawi, 2007).

When assessing the potential effects of ERP systems, it is important to make a distinction between financial and non-financial performance effects. Financial performance refers to the ability to generate profits or profitability assessed by financial measures such as the return on investment ratio (ROI). Non-financial performance refers to organizational effectiveness and efficiency assessed by non-financial measures such as manufacturing lead time, labor efficiency variance and number of customer complaints. The potential non-financial benefits of ERPSs include productivity and quality improvements in key business areas such as product reliability, customer service, and knowledge management (Hunton et al., 2003). ERPSs are expected to result in a better designed information system, which in turn increases the organizational efficiency and the effectiveness of attaining desired organizational outcomes (Nicolaou, 2004b). However, the relationship between improvements in efficiency, effectiveness and the financial performance of the firm is empirically unclear (Kaplan, 1990; Fisher, 1992). Furthermore, the recent empirical evidence on the effects of ERPSs on organizational performance is contradictory; the existing literature shows statistically that those organizations which implemented ERPS a few years ago nowadays perform either better (e.g. Hunton et al., 2003; Nicolaou, 2004a; Nicolaou and Bhattacharya, 2006, 2008; Wier et al., 2007) or worse than the firms which have not implemented ERPS (Poston and Grabski, 2001). These contradictory results may be due to the time lag between the initial ERP system adoption and its desired effects on performance.

Iran is one of the developing countries with unbelievable growth in the ERP adoption in the recent years (Nikookar et al., 2010). Iranian companies started to employ information systems because of increased domestic competition and the growing overseas competition. Despite the introduction of ERP systems since the 1990s, no ERP post-implementation study has been conducted in Iran (Dezdar, 2012). Although recently researchers were attracted by the ERP issues in Iran, most of these researches focused on the pre-implementation phase of ERP, such as selection of suitable ERP system (Nikjoo et al., 2011; Jahanshahi et al., 2013) or
critical success factors of ERP among Iranian firms (Dezdar, 2012; Dezdar and Ainin, 2010, 2011, 2012; Dezdar and Sulaiman, 2009; Salimifard et al., 2010; Amid et al., 2012).

Based on the above-mentioned grounds, this study aimed to conduct a systemic assessment on the ERP system implementation, and sought to find post-implementation effects of the ERP on performance among the Iranian firms.

1.2 Statement of Problem

Companies around the United States spent between $1.3 million and $70 million to implement the ERP systems (Vilpola, 2008). The regular implementation duration was between six months to two years (Aloini et al., 2007). Accordingly, it is important for managers to focus on the post-implementation phase, because these systems are usually not replaced after implementation. Instead, they are upgraded and maintained to satisfy new business processes and to gain efficiency in the post-implementation phase (McGinnis and Huang, 2007).

Implementation of the ERP systems brings about both business gain and pain. The cost associated with ERP implementation is often greater than the estimation due to many hidden costs, such as training, customization and integration. Business managers with high level of ERP experience noted that the cost of starting an ERP system is normally more than the cost of rebuilding the firm’s information structure (Trott and Hoecht, 2004). Firms typically do not enjoy the advantages of ERP investment in the expected duration (Pollock et al., 2003; Barker and Frolick, 2003). In addition, researchers have paid less attention to the impact of implementing an ERP system on financial and non-financial performance. Unlike the software installation, the ERP system must be considered as an information system that would affect an organization both internally and externally. Therefore, it is crucial to make specific attention to the impact of ERP systems on organizational performance (Galy and Saucedo, 2014).
Despite the need for a comprehensive framework to understand the drivers of ERP implementation and its impacts, many researchers have focused on studying the critical success factors of ERP implementation (Al-Mashari et al., 2003; Nah and Delgado, 2006; Soja, 2006; Nah et al., 2001; Remus, 2007) and the direct relationship between the ERP implementation and business performance (Hendricks et al., 2007). Yet, there is lack of complete appraisal system and a method to analyze the relationship between the ERP implementation and performance, financial and non-financial perspectives (Galy and Sauced, 2014).

During the last decade, researchers have started to explore how some organizations develop firm-specific capabilities and how to renew competences to respond to a turbulent business atmosphere (Li et al., 2006; Sanders and Premus, 2005; Santhanam and Hartono, 2003). Galy and Sauced (2014) found a difference between the financial and non-financial benefits of the ERP implementation. Financial benefits are known as those that have the capability to gain profits, while non-financial benefits are intangible, such as the customer satisfaction, product quality and user satisfaction.

In this study, the most important issues are presented in the following sections.

1.2.1 Selecting Effective ERP Modules

The ERP investment is a critical investment that can strongly affect all aspects of an organization, especially its performance (Poston and Grabski, 2001). In the first step, organizations should understand the need for this type of system and then select suitable modules of the ERP system. Organizations fail in implementing the ERP for various reasons. One of the main roots of failure in ERP implementation is in recognizing an appropriate system and consequently, insufficiency of selection phase. There is no study has explored selection of suitable ERP system or modules among Iranian firms (Asl et al., 2012). To fill this gap, the present study sought to find out what are the adopted, effective ERP modules among Iranian firms.
1.2.2 Changes in Performance

Stratman (2007) and Cotteleer & Bendoly (2006) stated that the ERP system domain is not merely surrounded by a simple compilation of information processing modules, which support different intra and inter-firm activities. The authors stated that a systemic perception of the ERP system components could improve operational efficiency by the internal dependencies and connections between the modules. Past research overwhelmingly has reported that the immediate after-effects of ERP implementations are affected by productivity and profitability issues (Davenport, 1998; Poston and Grabski, 2001; Hunton et al., 2003).

Other researchers focused on impact of ERP on financial performance. For instance, Nicolaou et al. (2003) tested financial data of companies that pursued the ERP systems. The results showed performance differences across time periods. Furthermore, the empirical evidence on the effects of ERP system on organizational performance is conflicting; the existing literature shows statistically that those organizations that implemented the ERP system a few years ago are now performing either better (Hunton et al., 2003; Nicolaou and Bhattacharya, 2006; Wier et al., 2007) or worse than the firms that did not implement the system (Poston and Grabski, 2001). In relation to the above, Poston and Grabski (2001) evaluated four financial indicators, before and after ERP implementation and pointed out an increase in effectiveness in terms of reduction of staff number and ratio of employees to revenues for each year following the ERP implementation. Due to the mixed results of previous studies, this study, therefore sought to narrow this gap by testing the impact of ERP on performance in both financial and non-financial perspectives.

Most of the studies (Hunton et al., 2003; Nicolaou and Bhattacharya, 2006; Wier et al., 2007) tried to find the impact of ERP systems on different perspectives of performance, and there has not been any to test and appraise ERP impact on the whole performance. To fill this gap, this study applied the BSC framework as a general model of performance appraisal system. In the BSC framework, performance indicators are divided into four categories; financial, customer, internal and learning perspectives. In light of the above discussion, this study sought to examine the
impact of ERP system implementation on and firms performance in both financial and non-financial perspectives based on the BSC framework.

1.2.3 Critical Success Factors (CSF)

During the 1990s, the ERP systems became new management paradigm, and because of the lack of knowledge on the ERP systems, companies faced the challenge of choosing the accurate way of ERP implementation. In this case, firms faced new problems, such as finding experienced project managers and having limited vendors of ERP. Today, these problems have been solved; however, high rates of ERP failure are still observed (Maguire et al., 2010). Finding the cause of failure has been motivation of many studies worldwide (Liu and Seddon, 2009).

Although some issues of ERP implementation have been solved, failure in the ERP system implementation remains a concern (Liu and Seddon, 2009). The studies only identified the CSF for ERP implementation, and failed to develop a complete understanding of how these factors may influence the performance of an organization (El Sawah et al., 2008; Liu and Seddon, 2009).

A research study revealed that ERP projects were, on average, 178 percent over the budget, took 2.5 times longer than expected and delivered only 30 percent of the promised benefits (Zhang et al., 2005). Another study reported that more than 90 percent of the ERP implementations were delayed and required additional financial allocation (Wang et al., 2008). The developed countries face the same failure rates (if not more) in spite of high IT maturity, good IT infrastructure, and good ERP experience. The majority of ERP systems are designed in the western environment. Consequently, it is vital to identify factors leading to the success of ERP systems implementation (Dezdar and Ainin, 2011).

The CSF and its impact on the ERP system implementation and post-implementation (performance) results is not completely recognized (Finney and Corbett, 2007). The above discussion prompted the study to examine the moderating
effect of ERP system implementation on the relationship between CSF and performance in both financial and non-financial perspectives.

1.3 **Purpose of Study**

The aim of this study was to find effective ERP modules implementation among the Iranian firms, and to discover the impact of ERP implementation on firms in four perspectives (financial, customer, internal and learning) of performance by using the Structural Equation Modeling (SEM).

Furthermore, the study aimed to examine the moderating effect of CSF on the link between the ERP system implementation and performance, as well as the present ERP modules priority for companies, which are interested to implement ERP systems by using the fuzzy DEMATEL method.

1.4 **Objectives of the Study**

The study is designed to achieve the objectives listed below:

1. To identify the effective ERP modules commonly implemented in Iranian firms.
2. To evaluate the impact of ERP system implementation on performance in financial perspective.
3. To evaluate the impact of ERP system implementation on performance in non-financial perspective.
4. To examine the moderation effect of CSFs on the relationship between ERP system implementation and performance in financial perspective.
5. To examine the moderation effect of CSFs on the relationship between ERP system implementation and performance in non-financial perspective.
6. To rank ERP modules based on their impacts on performance in financial perspective among Iranian firms.
7. To rank ERP modules based on their impacts on performance in non-financial perspective among Iranian firms.

1.5 Research Questions of the Study

1. What are the adopted ERP modules among Iranian firms?
2. How does ERP implementation influence financial perspective of performance?
3. How does implementation influence the non-financial perspective of performance?
4. Is there any moderation effect of CSF on the relationship between ERP system implementation and financial perspective of performance?
5. Is there any moderation effect of CSF on the relationship between ERP system implementation and non-financial perspective of performance?

Table 1.1 is addressed the link between research questions and research objectives.

<table>
<thead>
<tr>
<th>Research Questions</th>
<th>Research Objectives</th>
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<tr>
<td>RQ1. What are the adopted ERP modules in Iran?</td>
<td>RO1. To identify the effective ERP modules commonly implemented in Iranian firms.</td>
</tr>
<tr>
<td>RQ4. Is there any positive interaction between ERP system implementation and CSF to impact financial performance?</td>
<td>R4. To examine the moderation effect of CSFs on the relationship between ERP system implementation and financial performance.</td>
</tr>
<tr>
<td>RQ5. Is there any positive interaction between ERP system implementation and CSF to impact financial performance?</td>
<td>R5. To examine the moderation effect of CSFs on the relationship between ERP system implementation and non-financial performance.</td>
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</table>
1.6 Scope of the Study

This study investigated the impact of ERP on performance, and the moderating role of CSF on the relationship between ERP system implementation and performance among the Iranian firms, therefore the unit of study was firms. This study emphasized specifically the post-implementation evaluation of ERP systems and the duration of ERP implementation is highlighted in the analysis. The firm performance appraisal is based on the BSC framework due to its comprehensive performance appraisal (both in financial and non-financial perspective). Firms that implemented the ERP system in a longer time were given bigger weight in the analysis. The respondents were the group of managers and the ERP team members of those firms, or anyone who was in charge and had sufficient information about the ERP implementation.

To achieve research the objectives two sets or questionnaire were developed and data were collected from January to August 2015 among the Iranian manufacturing firms. The first set was employed to collect data to achieve research objectives one to five. The data were collected among the ERP system adopted manufacturing firms in Iran. The respondents for this first set of questionnaire were ERP implementation team members for each of the firms and the collected data were analyzed by using structural equation modeling (SEM). While, the second set of questionnaire was employed to achieve research objectives six and seven and the data were collected within the above firms which adopted complete set of ERP modules and the respondents were top managers. The data were analyzed by using fuzzy DEMATEL method. This study was conducted within four years from August 2011 to August 2015.

1.7 Significance of Study

This study is important because it contributes to the comparative novelty of the ERP field, advancement in the ERP systems and the impact of ERP system implementation on firms’ performance financially and non-financially in the
developing countries. Practitioner oriented articles (Abdinnour-Helm et al., 2003; Romm and Pierluigi, 2011; Salimifard et al., 2010; Somsuk and Simcharoen, 2011; Trott and Hoecht, 2004; Woo, 2007; Yusuf et al., 2004; Zhou et al., 2011; Zhu et al., 2010) have a huge domination on the literature on this topic. The literatures are mostly on short-term concentration, focusing on the efficient supervision of the ERP system realization procedure.

Schlichter and Kraemmergaard (2010) found that between the year 2000 and 2009, more than 150 articles were published on the impact of ERP on different parts of organizations. Although there are a considerable number of studies on the impact of ERP on performance (Althonayan and Papazafeiropoulou, 2013; Daoud and Triki, 2013; Zhang et al., 2013; Zhang and Huang, 2012; Aslan et al., 2012; Zhang et al., 2012; Wickramasinghe and Karunasekara, 2012; Uwizeyemungu and Raymond, 2012; Chang et al., 2011; Zhang et al., 2011), most of them merely identified the relationship between the ERP and one perspective of performance which is normally financial. In addition, there is a lack of ERP studies conducted in the Asian countries, especially the Middle-East (Kamhawi, 2007). Iran as a developing country is predicted to be an important ERP market as it shifts from local software to recognized packaged systems. Iranian companies started to employ information systems, partially because of the increased domestic competition and somewhat due to the increased overseas competition because of signing the agreement with the World Trade Organization (WTO). Despite the introduction of ERP systems since the 1990s, there has been no similar study in Iran in this domain (Dezdar, 2012).

Consequently, this study also offers a broader understanding of ERP adoption in manufacturing Iranian firms as well as the factors that affect the success of its implementation and the impact of ERP system on financial, customer, internal and learning perspectives of performance. Similarly to private sector, in government manufacturing organization that uses ERP generalize result of this study.
1.8 Definition of Key Terms

In this section, definitions of key terms of the study are presented. This study mainly revolved around ERP systems, CSF for ERP implementations, different perspectives of firm performance in manufacturing firms among Iranian manufacturing firms. The descriptions of these terminologies are offered in the following subsections.

1.8.1 Enterprise Resource Planning

ERP is an integrated computer system that uses a relational database management system and client-server network architecture which integrates individual functional systems, standardizes information flow and captures valuable management data (Yusuf et al., 2004).

1.8.2 Critical Success Factors

Critical success factor (CSF) is the term for an element that is necessary for an organization or project to achieve its mission. It is a critical factor or activity required for ensuring the success of a company or an organization. The term was initially used in the world of data analysis, and business analysis (Rockart, 1979).

1.8.3 Firm Performance

The firm performance refers to the subset of organizational effectiveness that covers financial and non-financial in accordance with BSC method. Kaplan (2010), offers an enlightening measurement in the BSC method in four perspectives on organizational performance. These perspectives are financial, customer, internal process and learning and growth.
In this study overall firm performance included non-financial and financial firm performance perspectives respectively. Overall firm performance the sum of the four perspectives of organizational performance that were offered by Kaplan and Norton in the BSC measurement method, as follows:

➢ **Financial Perspective**: Seeks to explore the organizational approach to shareholders; How do we look at our shareholders? (Kaplan, 2008).

➢ **Customer Perspective**: Seeks to explore customers’ viewpoint of the organization to answer the question; How do customers see us? (Kaplan, 2008).

➢ **Internal Business Process Perspective**: Seeks to explore areas, core competencies, products or niches that the organization needs to excel; Where must we excel? (Kaplan, 2008).

➢ **Learning and Growth Perspective (LP)**: Is seeks to explore opportunities for continuous improvement and creation of value; can we continue to improve and create value? (Kaplan, 2008).

➢ **Non-financial Firm Performance**: In this study, non-financial perspective included customer, internal Business process and learning and growth perspectives respectively (Kaplan, 2008).

### 1.9 Structure of Thesis

This thesis consists of five chapters: after introductory chapter, Chapter 2 presents the literature review in the area of ERP, CSF and firms performance. It is reviewed meaning and literature of ERP and ERP modules as well as CSF and performance indicators. The research framework and hypothesis were developed in this chapter.
Chapter 3 presents study design, data collections and data analysis method used to conduct the research. It consists of research paradigm, research process, questionnaire design, target population and finally discusses the techniques of data analysis methods.

Chapter 4 starts with examining and screening data and focused on descriptive analysis and reliability test for data. This followed by measurement model and structural model testing with partial least squares approach and PLS software.

Chapter 5 discusses and concludes all findings from the questionnaire survey and results of analysis. This chapter also presents theoretical contributions and practical implications and finally highlighted limitation of the study and recommendation for future researches.


Soja, P. and Paliwoda-Pekosz, G. (Year) Published. Towards the causal structure of problems in enterprise system adoption. 2007. 3293-3304.


