The Importance of Critical Success Factors of Enterprise Resources Planning Implementation In China
Khadija Elmeziane*, Shuai Chuanmin* and Mourad Elmeziane*

Abstract
The Enterprise Resource Planning System (ERP) constitutes the most important Information Technology (IT) application supporting, effectively and efficiently, the operation of an organization. This article seeks possible reasons for major international ERP vendors not being able to dominate the Chinese ERP market. The study attempts to discuss the critical success factors affecting ERP systems implementation success in China. Seven generally accepted critical success factors (CSF) are identified based on the relevant survey: top management support, effective project management, business process reengineering, team work and composition, the suitability of software and hardware, education and training, and user involvement. An experience survey, using a questionnaire within five companies with 115 respondents, was conducted to verify whether these CSFs are also important and relevant for Chinese enterprises in Shanghai city. Data analysis shows that CSF is vital to ERP implementation.

Key words: Enterprise Resources Planning, China, Implementation, Critical Success Factors, Information Technology

INTRODUCTION
The rapid development of technology in 21st century drives the competitive advantage of enterprises transfer from the tangible resources to the intangible assets such as information technology. As an example of the application of information technology in the field of business management, ERP system has been invented and widely adopted by firms. ERP integrates business information flow, logistics and cash flow in order to optimize firm’s internal processes and business procedures. Moreover, it can enhance enterprise’s excavating capability, accelerate the pace of marketing, and facilitate business processes to create great value. A research has been done on factors that affect the implementation process to identify the critical success factors that are necessary for successful ERP implementation in Chinese companies.

Information Technology
Nowadays Information Technology has become inseparable part of any activity. But maybe IT has had more intensive effect on business. After come up the IT and Information Systems, business atmosphere changed forever. Production and service grew and quality promoted and in the same time competition between companies increased. In such competitively situation, organizations can survive better that improve quality, keep down costs in their whole supply chain, reduce inventories, diversify their products and services, provide more reliable delivery dates in better way in comparison to rivals. Advent of enterprise resource planning (ERP) system helped many companies and organization to overcome these problems. Today’s firms are finding that they can become more flexible and productive by coordinating their business processes more closely and, in some cases, integrating these processes so they focus on efficient management of resources and customer service (Laudon, 2005). ERP systems integrate information and information-based processes within and across functional areas in an organization (Kumar and Bjorn-Anderson, 1990).

Despite benefits that earn from ERP, implementation these systems can be very dangerous because of their complex nature. It reported that three quarters of the ERP projects were judged to be unsuccessful by the ERP implementation firms (Griffith et al., 1999). About 90 percent of ERP implementations are late or over budget (Martin, 1998). Recently ERP failure rate is estimated 40% to 60% (Liang et al., 2007). It has related antithesis statistics about ERP implementation failure rate yet. But it is obvious that ERP implementation is risky. In spite of these threats ERP market is growing sequentially. It

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has reported that the ERP market worldwide is expected to grow from US$47.8 billion in 2004 to US$64.8 billion by 2009 (Ifinedo, 2006). When we juxtapose all these facts it will clear how much ERP implementation can be perilous.

CHINESE ERP MARKET

ERP implementation first occurred in China in the 1980’s and companies like SAP AG have been in the market for over 10 years (Hartung, 2008). The Chinese ERP market has boomed in recent years as more business managers applied ERP systems in their organizations. According to China Center for Information Industry Development Consulting, the Chinese ERP market nearly doubled its growth from approximately USD 70 million in 2000 to USD 106 million in 2001. IDC, a premier global market intelligence and advisory firm in the information technology industries, reported that the Chinese ERP market grew from USD 78.4 million in 1997 to USD 243 million in 2002. From 2002 to 2005, the Chinese ERP market was increased with an annual growth rate of 25%. According to China Center for Information Industry Development, ERP sales in Mainland China reached US $226.9 million in 2003, and reached US $652.8 million in 2008, at an estimated growth rate of 23.5% over the next 5 years. Attracted by tremendous business opportunities in the Chinese ERP market, SAP, Oracle, and other foreign ERP vendors have entered China one after another. SAP entered the Chinese ERP market in 1988 and Oracle followed in the middle of the 1990s. Given their past success history, these ERP giants anticipated taking control of the Chinese ERP market. In reality, it has not been so easy for the global ERP vendors to tame the Chinese ERP market. In the 2009 report of Chinese ERP market from Gartner, domestic ERP vendors take a major share of the market. Figure 1 shows that the top seven players hold 86% of the ERP market, with three Chinese domestic companies holding 62% and the four foreign ERP leaders holding a 24% market share. UFIDA commands the most market share at 32%, while local rivals Inspur and Kingdee control 16%, and 15% respectively.

Evidently, in the competition to sell ERP systems, the foreign giants have not demonstrated their usual dominance. Instead, Chinese domestic ERP companies have held their ground against the foreign giants. Obviously, the Chinese ERP firms have emerged as dominant players in this important market.

Insert figure-1 here

The ERP market in China in 2010 is about $586 million. It is the largest segment of the enterprise applications market, commanding 31% market share in 2010. By 2014, the market should reach $1.06 billion (Gartner, 2009).

Global ERP Market

The ARC Advisory Group (2006) estimated that the worldwide market for ERP systems was $16.67 billion in 2005 and increase to surpass $21 billion in 2010. The three major ERP vendors account for approximately 34.2% of the ERP market and the top five ERP vendors account for 41.8% of the market (Table 1).

The inherent appeal of ERP has not gone unnoticed in Asia. Indeed, recent years have witnessed a dramatic increase in ERP adoption and diffusion in China (Huo, 2002). However, since ERP systems are extremely complex and difficult to implement, many implementing companies have encountered unexpected failures. ERP success is even harder to achieve when cultural issues are involved. Considering that most ERP systems are designed by Western Information Technology professionals and the structures and processes embedded in these systems reflect Western cultures, we assume that fundamental misalignments are likely to exist between foreign ERP systems and Chinese companies whose existing structures and processes are largely determined by the Chinese culture (Davison, 2002; Soh et al., 2000). As a result of these misalignments, ERP implementation failures tend to occur when Chinese companies attempt to adopt foreign ERP systems. Therefore, some international ERP giants could not establish their dominance in the Chinese ERP market (Liang et al., 2004).

Insert table-1 here

In contrast to foreign ERP vendors’ difficulty in the Chinese market, an interesting observation is that China’s domestic ERP vendors seem to be able to expand their market share, showing capability to compete against their international competitors. Taking an ensemble view of technology (Orlikowski and
Iacono, 2001), we conceptualize ERP systems as being embedded in complex social contexts, which heavily influence ERP implementation and use. We believe that a historical perspective should be taken in seeking explanations to this observation.

**Research Objectives and Methodology**

The objective of the paper is to use the data of Chinese companies to evaluate the importance of the critical success factors in ERP implementation in Chinese business society. A field study was conducted with 115 respondents within five companies in Shanghai City. Data were collected through an experience survey using a questionnaire designed with items for each one of these 7 selected factors. For each factor, a question assesses the level of importance that it has in the implementation process. This level, or grade, was provided based on the experience of the enterprise. A five-point Likert scale was used in order to determine the importance level of each critical factor. The scale goes from “Extremely critical and important for the success of the implementation” to “Neither critical nor important for the success of the implementation.”

**ERP Systems Evolution**

The focus of manufacturing systems in the 1960's was on Inventory control. Most of the software packages then (usually customized) were designed to handle inventory based on traditional inventory concepts. In the 1970's the focus shifted to MRP (Material Requirement Planning) systems which translated the Master Schedule built for the end items into time-phased net requirements for the sub-assemblies, components and raw materials planning and procurement.

In the 1980's the concept of MRP-II (Manufacturing Resources Planning) evolved which was an extension of MRP to shop floor and Distribution management activities. In the early 1990's, MRP-II was further extended to cover areas like Engineering, Finance, Human Resources, Projects Management etc i.e. the complete gamut of activities within any business enterprise. Hence, the term ERP (Enterprise Resource Planning) was coined.

In addition to system requirements, ERP addresses technology aspects like client/server distributed architecture, object oriented programming etc. ERP Systems - Bandwidth ERP solutions address broad areas within any business like Manufacturing, Distribution, Finance, Project Management. Service and Maintenance, Transportation etc. A seamless integration is essential to provide visibility and consistency across the enterprise.

An ERP system should be sufficiently versatile to support different manufacturing environments like make-to-stock, assemble-to-order and engineer-to-order. The customer order decoupling point (CODP) should be flexible enough to allow the co-existence of these manufacturing environments within the same system. It is also very likely that the same product may migrate from one manufacturing environment to another during its produce life cycle.

The system should be complete enough to support both Discrete as well as Process manufacturing scenario’s. The efficiency of an enterprise depends on the quick flow of information across the complete supply chain i.e. from the customer to manufacturers to supplier. This places demands on the ERP system to have rich functionality across all areas like sales, accounts receivable, engineering, planning, Inventory Management, Production, Purchase, accounts payable, quality management, production, distribution planning and external transportation. EDI (Electronic Data Interchange) is an important tool in speeding up communications with trading partners.

The Internet represents the next major technology enabler which allows rapid supply chain management between multiple operations and trading partners. Most ERP systems are enhancing their products to become “Internet Enabled” so that customers worldwide can have direct to the supplier's
ERP systems are building in the Workflow Management functionally which provides a mechanism to manage and control the flow of work by monitoring logistic aspects like workload, capacity, throughout times, work queue lengths and processing times.

CSFs in ERP Implementation in China

A critical success factor is something that the organization must do well to succeed. In terms of information system projects, a critical success factor is what a system must do to accomplish what it was designed to do. The proposed methodology of studying CSFs behind ERP implementations is very similar to the approach used in a variety of studies in Information Technology (IT) implementation research. Some of these proposed factors are the one that have been found to be significant in other IT implementations.

Many ERP research studies have determined several critical success factors in ERP implementations. These studies, however, discussed the success factors from different prospective and in different contexts. I arrange these factors in an organized and adequate set in order to have a better understanding and a clearer picture of the factors that are considered to be vital for successful ERP implementation. I generalize 7 CSFs into 3 categories: strategic factors, tactical factors, and operational factors.

A. Strategic factors

Top management support: earlier studies (Sumner (1999), Mabert et al (2001)) have shown that the ERP implementation was in general a top-down decision, and the success of such an implementation depended on the alignment of the ERP adoption with strategic business goals.

B. Tactical factors

Effective project management: in order to successfully accomplish the decision to implement an ERP system, the effective project management comes into play to plan, coordinate and control such an intricate project.

Re-engineering business processes: it is very important to consider the extent to which the company needs to re-engineer its current business processes in order to be compatible with the ERP software.

Suitability of software and hardware: management must make a careful choice of an ERP package that best matches the legacy systems, e.g. the hardware platform, databases and operating systems.

C. Operational factors:

Education and training: when the ERP system is up and running it is very important that the users be capable to use it, hence they should be aware of the ERP logic and concepts and should be familiar with the system’s features.

User involvement: participating in the system development and implementation, the users go through a transition period that gives them time to better understand the project’s consequences.

Teamwork and Composition: ERP team work and composition is important throughout the ERP implementation project. An ERP project involves all of the functional departments and demands the effort and cooperation of technical and business experts as well as end-users.

1- Teamwork and composition

The ERP team should involve of the best people in the organization (Loh and Koh, 2004). The success of projects is related to the knowledge, skills, abilities, and experiences of the project manager as
well as the selection of the right team members (Al-Mashari et al., 2006). Also, team should not only be technologically competent but also understand the company and its business requirements (Remus, 2006).

An ERP project involves all of the functional departments in an enterprise. It demands the effort and cooperation of technical and business experts as well as end-users (Loh and Koh, 2004). Both business experts and technical knowledge are important for success (Nah, 2003). The sharing of information between the implementation partners is essential and requires partnership trust (Loh and Koh, 2004). Moreover, the team should be familiar with the business functions and products so that they know what needs to be improved to the current system (Rosario, 2000).

Hypothesis 1: Strong ERP Teamwork and composition has a positive impact on ERP implementation in China.

2- Top Management support

Top management support has been identified as the most important success factor in ERP system implementation projects. According to Zhang et al. (2002), top management support in ERP implementation has two main aspects: providing leadership and providing the necessary resources. Reimers (2002) found that, managers in traditional Chinese companies do not trust the system in terms of data quality and also in terms of appropriateness of suggested decisions. The managers prefer to make the decisions according to their intuition and experience.

Hypothesis 2: Chinese “traditional” management style has a negative impact on ERP implementation.

3- Business process re-engineering

Hammer and Champy (2001) defined Business process re-engineering (BPR) as “the fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in critical, contemporary measures of performance, such as cost, quality, service and speed”. Somers and Nelson (2004) stated that BPR plays a significant role in the early stages of implementation. Aligning the business process to the software implementation is critical (Holland et al., 1999). Organizations should be willing to change their businesses to fit the software in order to reduce the degree of customizations (Murray and Coffin, 2001).

Hypothesis 3: Simultaneously combining Business process reengineering and Software modification has a positive impact on ERP implementation in China.

4- Effective project management

ERP systems implementation is a set of complex activities, involving all business functions and often requiring between one and two years of effort, thus companies should have an effective project management strategy to control the implementation process, avoiding overrun of budget and ensuring the implementation within schedule. There are five major parts of project management: (1) having a formal implementation plan, (2) a realistic time frame, (3) having periodic project status meetings, (4) having an effective project leader who is also a champion, and (5) having project team members who are stakeholders.

Hypothesis 4: Effective project management has a positive impact on ERP implementation success.

5- User involvement

User involvement refers to participation of the user in the process of ERP implementation. The functions of the ERP system rely on the user to use the system after going live, but the user is also a significant factor in the implementation. There are two areas for user involvement (Zhang et al., 2002): (1) User involvement in defining the company’s ERP system needs and; (2) User participation the implementation of ERP systems.
User involvement increase user satisfaction and acceptance by developing realistic expectations about system capabilities (Esteves et al., 2003). User involvement is essential because it improves perceived control through participating in the whole project plan.

Hypothesis 5: Involving user has a positive impact on ERP implementation success.

6- Education and training

User training should be emphasized, with heavy investment in training and re-skilling of developers in software design and methodology (Summer, 1999). However, education and training are frequently underestimated and are given less time due to schedule pressures, and less understanding of cross-functional business process is often reported. Educating and training users to use ERP is important because ERP is not easy to use even with good Information Technology skills (Woo, 2007). Nah et al., (2003) argued that sufficient training can assist increase success for ERP systems. However, lack of training may lead to a failure.

Hypothesis 6: Sufficient education and training has positive impact on ERP implementation in China.

7- Suitability of software and hardware

Due to the lack of professional expertise and experience on developing ERP systems in-house, many companies prefer to buy off-the-shelf systems to shorten the ERP implementation cycle. ERP packages provide generic off-the-shelf business and software solutions to customers. More or less they can’t fully meet the company’s needs, especially when the business processes of the company are unique.

Hypothesis 7: Suitability of software and hardware has a positive impact on ERP implementation success.

RESULTS

The 115 respondents in the five companies were analyzed and the following results were obtained: According to Table 2, a value of 1 represents “Neither critical nor important for the success of the implementation process” and a value of 5 represents “Extremely critical and important for the success of the implementation process”. A score of 3 points is labeled as “Moderately critical and moderately important for the success of the implementation process”. In this way, it can be considered that all the 7 Critical Success Factors analyzed in this study are relevant for the Chinese enterprises in the Shanghai area.

Insert tabl-2 here

In this paper, these CSFs are grouped into strategic, tactical and operational factors. This approach aims to offer some useful direction for ERP implementation. Table 3 presents the average of the three groups. The strategic factor is rated higher than other two. We can see that the averages in tactical and operational factors are almost same.

Insert Table-3 here

DISCUSSION

Strong teamwork mentality and composition has a positive impact on ERP implementation in China. The findings from the companies show the same results. Working with a teamwork mentality might be also encouraged in Chinese traditional companies during the ERP implementation as well, in order to ease the implementing procedure. The ERP team should be balanced, or cross functional and comprise a mix of external consultants and internal staff so that the internal staff can develop the necessary technical skills for design and ERP implementation.

The top management support has always proved to be one of the key factors, which gives a positive impact in ERP implementation. However, opposite results has obtained that the Chinese “traditional” management style has negative impact in the ERP implementation. The same phenomenon
is detected in this study in which the support and the attendance from the top management give a positive impact in ERP implementation within the companies. Top management support seems to be one of the essential issues to ensure the ERP projects to be successful, in terms of designing and controlling the whole implementing process. In addition, the attendance of the top management during the ERP implementation could also strengthen the employees’ confidence in the whole project.

The findings show that business process reengineering and software modification factors exist simultaneously, which seem to be a positively suitable solution for the companies. Such comprise happens while there is a conflict between the new Western business conceptions and Chinese business society. The Chinese business society welcomes new, advanced conceptions or solutions; however they also have to be suitable for the Chinese context.

Effective project management has a positive impact on ERP implementation success. The ERP vendors use different hardware platforms, databases, and operating systems. And certain ERP packages are only compatible with some companies’ databases and operation systems. Thus, companies should conduct requirements analysis first to make sure which problems need to be solved and select the ERP systems that most fit their requirements. The hardware then is selected according to the specific ERP systems’ requirements.

To increase the chance of success, management must choose software that most closely fits its requirements and companies should conduct requirements analysis first to make sure what problems need to be solved and select the ERP systems that most fit their requirements. The hardware then is selected according to the specific ERP systems’ requirements. Two aspects should be cared when selecting software and hardware:
1. Compatibility of software/hardware and company’s needs;
2. Ease of customization.

Involving user has a positive impact on ERP implementation success. System implementation represents a threat to users’ perceptions of control over their work and a period of transition during which users must cope with differences between old and new work systems. User involvement is effective because it restores or enhances perceived control through participating in the whole project plan.

Sufficient education and training has positive impact on ERP implementation in China. The companies realize the importance of the education and training in order to enable the ERP implementation going forward, for instance, the most simple example is that the training teaches the users how to operate with the new system. The extensive education and training of the ERP knowledge and know-how has also positive influences on the ERP implementation in the long term.

CONCLUSION

To adapt to today’s challenging and competitive business environment, organizations are implementing ERP systems to achieve a capability to plan and integrate enterprise-wide resources in order to shorten lead times, and to be more responsive to customer demands.

This paper attempts to review the ERP literature and identify the benefits, the global market, Chinese market, organizational culture and the critical success factor in ERP implementation. The paper aims to improve understanding critical factors that affect ERP implementation success in China and that are most important for companies and identifies the most cited success factors in the literature and illustrates their significant importance in ERP implementation.

Most of the articles stressed that each organization must assess itself, to see if it is ready for ERP. Many organizations that attempt to implement ERP systems run into difficulty because such
organizations may not be ready for integration and the various departments within it have their own agendas and objectives that conflict with each other.

Despite the fact that ERP integrates and optimizes the flow of information across the entire organization’s supply chain, the implementation of such software packages can be costly, and may even require reengineering the entire business operations. Combinations of factors have to be considered when undertaking an ERP implementation including: top management support, re-engineering business process, effective project management, suitability of software and hardware, teamwork and composition, user involvement and education and training.

REFERENCES


Figure 1: Chinese ERP market share by company, 2009 (Gartner, 2010)
Table 1: The world ERP market, 2010

<table>
<thead>
<tr>
<th>Brand</th>
<th>2010 ERP Software Revenues($M)</th>
<th>2010 Share (%)</th>
<th>Key Markets</th>
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<tbody>
<tr>
<td>SAP</td>
<td>6318</td>
<td>18.8%</td>
<td>Enterprise, SMB</td>
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<tr>
<td>Oracle</td>
<td>3718</td>
<td>11.0%</td>
<td>Enterprise, SMB</td>
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<td>Sage</td>
<td>1479</td>
<td>4.4%</td>
<td>SMB, Healthcare</td>
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<td>Infor/Lawson</td>
<td>1310</td>
<td>3.9%</td>
<td>Manufacturing, Healthcare</td>
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<td>Microsoft</td>
<td>1233</td>
<td>3.7%</td>
<td>SMB</td>
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<td>Epicor/Activant</td>
<td>526</td>
<td>1.6%</td>
<td>Retail, Distribution</td>
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<td>UNIT4</td>
<td>470</td>
<td>1.4%</td>
<td>Professional Services</td>
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<td>TOTVS</td>
<td>442</td>
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Source: APPS RUN THE WORLD, 2011

Table 2: The importance of critical success factors (CSF) in ERP implementations-Rating from 1 (extremely low) to 5 (extremely high).

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<tr>
<th>Critical Success Factors</th>
<th>Mean</th>
<th>Standard Deviation</th>
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<tr>
<td>Top management support</td>
<td>4.30</td>
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<td>Business process reengineering</td>
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<td>Sufficient education and training</td>
<td>4.19</td>
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<td>Effective project management</td>
<td>4.06</td>
<td>0.86</td>
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<tr>
<td>Team work and composition</td>
<td>3.93</td>
<td>0.71</td>
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<tr>
<td>User involvement</td>
<td>3.64</td>
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<tr>
<td>Suitability of software and hardware</td>
<td>3.36</td>
<td>0.89</td>
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Table 3: Average of Strategic, Tactical and Operational Factors

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<th>Critical Success Factors</th>
<th>Class</th>
<th>Mean</th>
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