CRITICAL SUCCESS FACTORS FOR SUCCESSFUL IMPLEMENTATION OF ENTERPRISE RESOURCE PLANNING SYSTEMS IN MANUFACTURING ORGANIZATIONS

by

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1

DEDICATION

I dedicate this work to ………

To my parents
For being great supporters in my journey

To my dear wife, Ruba
for her encouragement, moral support and understanding

and

To my beloved daughter, Larissa
for her smile ☺ when I was stressed up

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TABLE OF CONTENTS

Chapter 5:   DISCUSSION AND CONCLUSION

LIST OF TABLES

LIST OF FIGURES

ABSTRAK

Kajian ini bertujuan untuk membuat penyelidikan faktor kejayaan kritikal bagi implementasi sistem Enterprise Resource Planning (ERP) di sektor perkilangan di Malaysia. Kepuasan pengguna dan sasaran yang dikenalpasti telah digunakan untuk melihat sama ada implementasi sistem ERP berjaya atau gagal. Sebanyak 27 faktor kritikal telah dikenalpasti daripada penyelidikan lalu. 10 faktor kejayaan kritikal yang utama telah dipilih oleh pengarah Teknologi Maklumat daripada 10 syarikat perkilangan di Penang, Malaysia. Kemudian satu kajian soalselidik telah dijalankan di antara 113 kilang pengeluaran di Malaysia dan sejumlah 69 maklumbalas yang menyumbang kepada kadar respons sebanyak 61.06% telah diterima. Kajian ini telah mengenalpasti penglibatan pihak pengurusan atasan, visi dan rancangan perniagaan, sokongan vendor, kerjasama kumpulan dan komposisi, dan komunikasi adalah kritikal untuk pengenalan ERP di sektor perkilangan di Malaysia. Tambahan pula, rintangan organisasi menyederhanakan hubungan di antara faktor kejayaan kritikal (pengurusan projek dan komunikasi) dan kepuasan pengguna.

ABSTRACT

This study attempts to study critical success factors affecting Enterprise Resource Planning (ERP) systems implementation success in Malaysian manufacturing organization. Organizational resistance is used in order to understand the moderating effect on the above relationship. User satisfaction and predetermined goals were used to judge whether an ERP system implementation is a success or failure. First survey was carried out to identify top 10 critical success factors from a list of 27 critical success factors compiled from past research. Information Technology directors from 10 different manufacturing organizations in Penang, Malaysia rated the list and top 10 critical success factors were identified for further research. A questionnaire survey has been carried out among 113 manufacturing companies in Malaysia and a total of 69 responses were received representing response rate of 61.06%. This study concluded that top management involvement, business plan and vision, vendor support, change readiness, teamwork and composition and communication are important critical success factors to ensure smooth introduction for successful ERP implementation in Malaysian manufacturing organization. In addition, organizational resistance moderates the relationship between critical success factors (project management and communication) and user satisfaction.

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Chapter 1

INTRODUCTION

1.1 Introduction

The business environment has become increasingly complex and the marketplace has changed from local to global. Constant pressure is applied on the management to improve competitiveness by lowering operating cost and improving logistic. Organizations therefore have to continuously re-adjust or realign their operations to meet all these challenges by being responsive to the customer and competition. A useful tool that businesses are turning to in order to build strong capabilities, improve performance, undertake better decision-making and achieve a competitive advantage is Enterprise Resource Planning (Al-Mudimigh, Zairi & Al-Mashari, 2001). ERP as a business solution aims to help the management by setting better business practices and equipping them with the right information to take timely decision. The Star, Jan 15th 2002 reported that ERP has become the pre-requisite for companies to compete in global economies, especially in e-commerce era. Based on AMR Research, ERP application is expected to grow by 32% over the next 5 years and total market value will reach USD66.6 billions by 2003 (AMR Research, 1999a). It represents 43% of the application budget of the organizations (AMR Research, 1999b). In May 2001, Boston-based AMR Research predicted that total ERP company's revenue will grow at a 14% compounded annual growth rate, increasing to USD36 billion in 2005 from USD21 billion in 2001.

Despite the benefits that can be achieved from a successful ERP system implementation, there is already evidence of failure in projects related with ERP implementation (Davenport, 1998). As reported in "The Star, January 15, 2002", only 10-

15% of all ERP implementations have a smooth introduction. While others either experiencing either teething problems or a significant shortfall in delivered benefits, with a full 30% experiencing "a nasty surprise". Griffith, Zammuto and Aiman-Smith (2001) also reported that three quarter of the ERP projects were judged to be unsuccessful by the ERP implementing firms. However companies such as Eastman Kodak, Cisco System and Tektronix have reaped the expected benefits of ERP systems, but many other businesses are discovering that, their ERP implementation has been a nightmare (Chen, 2001). A good example is Chocolate manufacturer, Hershey, reported in 1999, a drop of 19% in the third-quarter profits and a 12% sales decline caused by the USD112 million ERP implementation (Stedman, 1999). On top of that an increase in typical delivery times from 5 days to 12 days, a 29% increase in year-to-year inventory costs, strained customer relations and expected market share losses were also reported. Even more extreme is the Texas based USD5 billion pharmaceutical distributor FoxMeyer Drug, where the company collapsed by a failed ERP system (Bicknell, 1998). In addition, Miller Industries reported a USD3.5 million operating loss in the fourth quarter of 1999 due to the costs and inefficiencies of its ERP system, while WW Grainger Inc. reported USD11 million reduction in operating earnings from its improper ERP implementation (Earl, 1994). In summary, these large investments and return on investments (ROI) have created a whirlpool of controversies, rampant company politics and even a number of lawsuits.

Given the large financial commitment that ERP projects' requires and the potential benefits it can offer if successfully implemented, it is important to understand what is needed to ensure a successful implementation (Motwani, Mirchandani, Madan &

Gunasekaran, 2002). In order to solve these problems, some researchers are using the critical success factors (CSFs) approach to study ERP implementation.

1.2   What is ERP System?

Enterprise Resource Planning (ERP) system is a packaged business software system that enables a company to manage the efficient and effective use of resources (materials, human resources, finance, etc) by providing a total integrated solution for the organization's information processing needs (Nah, Zuckweiler & Lau, 2003). Kumar et al. (2000) defined ERP system as "configurable information system packages that integrate information and information based processes within and across functional areas in an organization". It supports a process-oriented view of business as well as business processes standardized across the enterprise. ERP understands the need of any organization belonging to any industry since all ERP software address the core business processes such as order processing, order fulfillment, shipping, invoicing, BOM processing, purchase order processing, preparation of Balance Sheet, etc which are common to all industry segments. In short an ERP provides a much better insight into the organizational systems and procedures. It also breaks the "empire" that work at cross-purposes in many organizations.

1.3   History of ERP System

The history of ERP system can be traced back to the 1960's, when the focus of most software systems were mainly to handle inventory based on traditional inventory concepts. Metaxiotis, Psarras & Ergazakis, (2003) mentioned that the most popularly

known among the software systems was economic order quantity (EOQ). Those days, companies could afford to keep lots of "just-in-case" inventory on hand to satisfy customer demand and still stay competitive. The 1970's witnessed a shift of focus towards Material Requirement Planning (MRP). It became increasingly clear that companies could no longer afford the luxury of maintaining large quantities of inventory. MRP was the first off-the shelf business application (Orlicky, 1975). MRP system helped in translating the master production schedule into requirements for individual units like sub-assemblies, components and other raw material planning and procurement. In the early 1980s, MRP expanded from a material planning, and control system to a company-wide system capable of planning, and controlling virtually all the firm's resources (Chen, 2001). Wight (1984) coined the term MRP II, which refers to Manufacturing Resource Planning because the expanded approach was so fundamentally different from the original concepts of MRP. Though MRP II, in the beginning was an extension of MRP to include shop floor and distribution management activities, during later years, MRP II was further extended to include areas such as product design, information warehousing, materials planning, capacity planning, communication systems, finance, human resources, and project management. This gave birth to ERP, which covered the cross-functional coordination and integration in support of the production process. Lopes (1992), praises ERP systems as a better, faster and more economical business solution. The main modules in any ERP application include finance and accounting, customer order management, MRP, materials management, decision support, data warehousing, logistics and inventory control. The breakdown of the modules in any ERP application can be found in Table 1.1.

Table 1.1
Modules in Any ERP Application

Module	1996	1997	1998	1999	2000	2001
Finance and accounting	27.0	28.7	30.0	31.2	32.1	32.9
Customer order management	14.6	14.7	14.6	14.4	14.1	13.7
MRP	16.1	15.5	15.0	14.4	14.1	13.8
Materials management	11.3	11.1	10.9	10.8	10.5	10.2
Decision support	5.2	5.0	4.8	4.6	4.4	4.1
Other (logistics, inventory control, sales etc	25.7	24.9	24.6	24.6	24.8	25.2
Total	100.0	100.0	100.0	100.0	100.0	100.0

Source: AMR Research (1999a, b)

ERP has evolved dramatically in the past years and will keep evolving in the future. "The Star, January, 2003", reported ERP2 is now available in the market and is defined as extended Enterprise Resources Planning (ERP2) where it comprises Enterprise Resources Management (ERM), Supply Chain Management (SCM) and Customer Relationship Management (CRM). A good ERP2 system should consist of individual modules which can be adapted to suit the specific needs of each customer, eliminating the need to shoehorn the customer's business processes into the ERP2 system.

Five major players in the ERP market in 2000 are SAP (leader), Oracle Application, People Software, JD Edwards, and Baan (Kumar & Van Hillegersberg, 2000). Figure 1.1 indicates that among the ERP software vendors, SAP, Oracle and People Software are the top three ERP producers, contributing about 57% of the total market share in 2001.
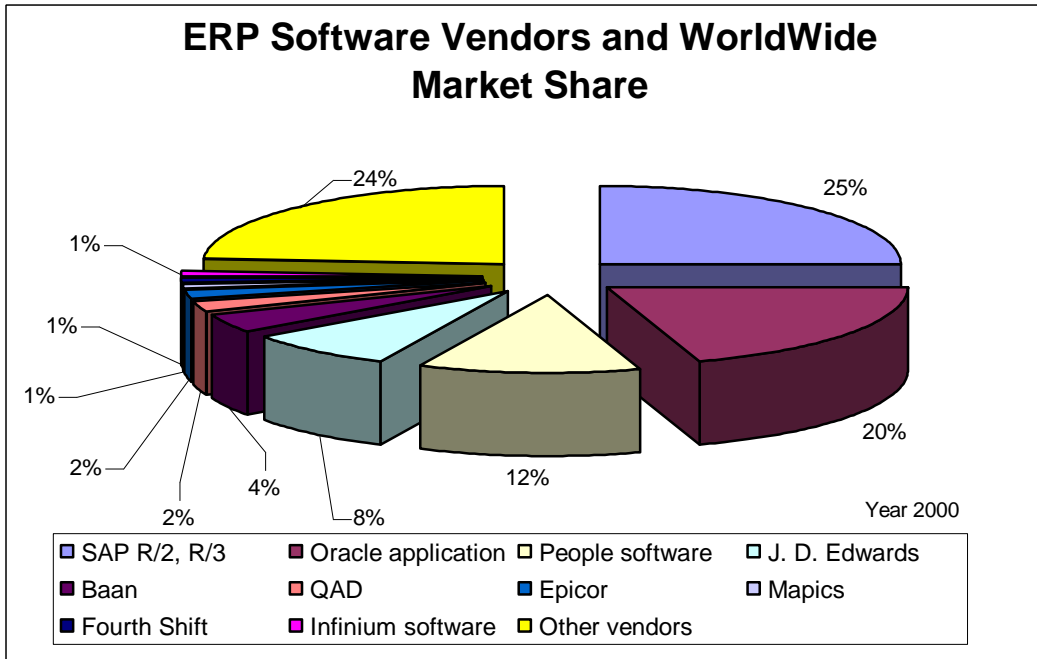
Figure 1.1. Market Share of ERP Applications
Source: Integrating ERP, CRM, Supply Chain Management, and Smart Materials
2001, Dimitris N. Chorafas

1.4 Advantages Of ERP System

According to Lequeux (1999), among the most important characteristics of ERP

are:

(i)   The effective management of various company activities by automating and

integrate an organization's business processes.

(ii)   The existence of a common database by sharing common data and practices

across the entire enterprise; and

(iii)   The capability to react quickly to operating rules by producing and accessing

information in a real-time environment.

ERP has had a positive impact on the ability of businesses to improve working capital, implement a total quality management culture, lower inventory levels, optimize raw materials and sell and deliver products to the customer (Shtub, 1999). ERP has helped alleviate the arduous job of supporting inflexible systems that in most cases result in cost increases, data redundancy, and above all, various inefficiencies (O'Leary, 2000). ERP also provides two major benefits that do not exist in non-integrated departmental systems (Umble & Haft, 2003):

(i)   A unified enterprise view of the business that encompasses all functions, and departments; and

(ii)   An enterprise database where all business transactions are entered, recorded, processed, monitored and reported.

This unified view increases the requirement for, and the extent of, interdepartmental cooperation, and coordination. Ideally, ERP is a computer system that keeps managers informed about what is happening real-time throughout a corporation and its global connections (Jacobs & Whybark, 2000).

1.5   ERP System in Malaysia

ERP2 market is forecasted (Source: IDC, 2002) to grow steadily in Malaysia. ERP2 captured RM432.44 million sales in year 2000 and this is expected to grow to RM691.4 million by year 2005. This shows a steady growth of 59.9% from year 2000 to 2005. The breakdown of ERP2 market can be found in Table 1.2.

Table 1.2
ERP2 Market Forecast (*) in Malaysia

Year	RM (million)
2000	432.44
2001	473.48
2002	521.36
2003*	565.17
2004*	621.03
2005*	691.64

Source: IDC, 2002

According to George Chua (Professional Services Group Manager, KarenSoft Technology Berhad, Penang), Malaysian ERP market trend adopts to the organization and not to the ERP system itself. In addition, there are fewer competitors in the market catering ERP for Small Medium Business (SMB), service oriented architecture, industry solutions, supply chain management, E-Business, outsourcing, decision support from technical to strategic focus and manufacturing to service sector. Companies in Malaysia are discovering that customizations are complex, time consuming, expensive, and make the system nearly impossible to upgrade.

1.6   Research Problem

While some firms announced their ERP implementation as a success, many other reported negative results of ERP implementation (Davenport, 2000). In addition, in a

recent Deloitte Consulting (1999) report on ERP evolutions in manufacturing, it was concluded that ERP is not an all-winner tool. "For some companies, it helps to create a reenergized organization with customers, shareholders and employees more empowered than ever to drive new business value. For others, however, the results can be an organization fatigued from the long implementation experience, people frustrated by a perceived lack of business benefits and uncertainty of their company's direction". Further, in an information technology survey by the Standish Group (1996), it was shown that 40% of software projects failed completely, in that the system was not delivered or was unusable. It is well known by now that improper implementation (Figure 1.2) of ERP software projects can cause considerable loss for companies (Soh, Tien & Yap, 2000). ERP project typically cost users more than their pay back in measurable financial benefits and resulted in USD13 K lost per minute on average.
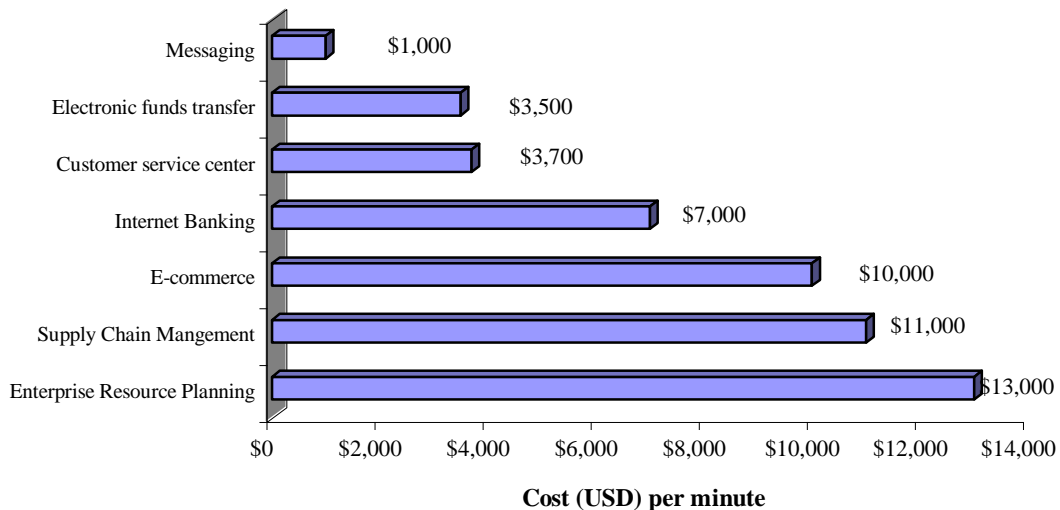
Figure 1.2. Price Tag of ERP Implementation Failure
Source: The Standish Company and Computer Associates International, INC, 2000

9

High profile client like Bang and Olufsen who experienced " a total halt in deliveries for eight days", at cost to the business of 8.5 million pound, are starting to air their frustration openly due to improper implementation (Kennerly and Neely, 2001). On the other hand, however, McKesson HBOC has reported a successful implementation of it's USD50M ERP back-office system which now processes orders totaling 1.5M of line items and USD100M of business each day (Stedman, 1999a). On another study, CaseBook Water and Power Technologies, a USD30M manufacturer of water purification systems have seen improvements in materials management, project management and employee productivity due to its ERP system (Wah, 2000). Given the large financial commitment that an ERP projects requires and the potential benefits it can offer if successfully implemented, it is very important to understand what is needed to ensure a successful ERP implementation. Further, there are limited empirical studies that have been conducted to assess the critical success factors for successful implementation of ERP system in Malaysian manufacturing organization. Hence, it is important to examine how can we avoid some of these costly mistakes.

1.7   Research Objective

Xinxin and Ling, (2002) stated that given the complexity and complication of the problems to low success rate of ERP implementation, adopters could not simply choose critical success factors from the West and implement them in a country. Therefore, the primary purpose of this research is to identify what are the critical success factors (CSF) for successful ERP implementation in a manufacturing organization and also the

moderating effect of organizational resistance in Malaysia. Other research objectives were to determine the percentage of ERP implementation delays, to estimate amount of loss and duration delayed, and finally to determine the perceived benefits prior to ERP system implementation in Malaysian manufacturing organizations.

1.8   Research Questions

In seeking to achieve the above objectives, this study is actually examining the individual CSF's such as top management support, business plan and vision, teamwork and composition, project management, project champion, learning competency, user training and education, change readiness, vendor support and communication in an attempt to answer the following research questions:

1. What is the percentage of ERP implementation delays in Malaysian manufacturing organizations?

2. What was the estimated amount of loss and duration delayed caused by ERP implementation failures in Malaysian manufacturing organization?

3. How are the ERP benefits perceived prior to ERP system implementation in Malaysian manufacturing organizations?

4. What are the CSF's for successful implementation of ERP in a manufacturing organization?

5. Organizational resistance moderates the relationship between CSF's and successful ERP implementation in Malaysian manufacturing organization?

1.9 Definition of Key Terms

Brief definitions of the variables are as follows:

(i) Organizational Resistance

Employee behavior that seeks to challenge, disrupt or invert prevailing assumptions, discourses and power relations. (Dent & Goldberg, 1999)

(ii) User Satisfaction

The extend of which users believe the information system available to them meets their information and system requirement (Baroudi et al., 1983).

(iii) Predetermined Goals

The perceived deviation from the expected project goals such as cost overrun, schedule overrun, system performance deficit and failure to achieve the expected benefits (Hong & Kim, 2001).

(vi) Top Management Support

The degree of support top management gave to the users in term of management's involvement and allocation of resources to accomplish the project goals.

(v) Business Plan and Vision

Business plan outlines proposed strategic and tangible benefits, resources, costs, risk and timeline (Wee, 2000).

(vi) Team Work and Composition

A group that consists of dedicated team members from all of the functional departments in an organization. These people are the best people recruited in the ERP team and are empowered to make quick decisions (Shanks et al., 2000).

(vii) Communication

Communication refers to sharing information between the project team and also communicating regularly to the organization on updates and development during the implementation.

(viii)   Project management

Project management involves activities such as planning organization, information system acquisition, personnel selection, management and monitoring of software implementation (Appealrath & Ritter, 2000)

(ix)   Project Champion

A project champion refers to a person who has both the position and the skills that are critical for handling organizational change. Project champion will market the project throughout the organization (Chee, 2003)

(x)   Learning Competency

Learning competency refers to activities intended to identify cutting edge ERP techniques from both internal and external sources (Stratman & Roth, 2002).

(xi)   User Training and Education

Teaching users how to use the newly implemented ERP, to input, process and retrieve data's.

(xii)   Change Readiness

Organizational refers to the body of knowledge that is used to ensure that a complex change associated with ERP implementation to get the right results. A proper change management allows the organization to derive benefits from the new system (Chee, 2003).

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(xiii)   Vendor Support

Vendor support involves standard technical assistance, emergency maintenance,

updates and special user training (Somers and Nelson, 2001).

1.10   Significance of the Study

Somers, Nelson, and Ragowsky (2000) in their studies stressed that high failure

rate of ERP implementation requires a better understanding of its CSF's. This study is

intended to act as a medium of communication or knowledge for organizations in

Malaysia who intends to implement ERP systems or have already implemented ERP

systems but are facing a lot of teething issues to be resolved. Sharing information and

knowledge, learning from one another will help our Malaysian companies to be more

productive and stay competitive in the changing business environment. By understanding

the CSF's and how the human factors interacts with the successful ERP implementation,

will help to avoid or minimize the losses in their organization during and after ERP

implementation. In addition project managers are given a warning up even before

thinking of technical and financial issues alone whereby other factors are equally

important for the successful ERP implementation. Further, feedback obtained from the

survey will closely reflect a snapshot of how well manufacturing companies operating in

Malaysia are in control of ERP systems.

1.11   Organization of the Report

This report is organized into five chapters. Chapter 1 provides an overview of an ERP system, benefits, success and failure stories, importance of the research for Malaysian manufacturing organizations, research problem, research objective, research questions and significance of the study. Chapter 2 presents the literature on critical success factors, organizational resistance, ERP successful implementation and the development of theoretical framework. Chapter 3 discusses the research methodology used in this research. Chapter 4 details the statistical analyses and hypotheses testing. The survey findings are then concluded in Chapter 5, with a discussion of the findings and limitation of the study.

Chapter 2

LITERATURE REVIEW

2.1　Introduction

This chapter focuses on the top 10 factors that were identified during preliminary survey, as being critical to successful implementation of ERP system. Organizational resistance and success criteria of ERP implementation will also be discussed in detail.

2.2　Critical Success Factors Characteristics

Somers and Nelson (2001), views critical success factors as situated exemplars that help extend the boundaries of process improvement, and whose effect is much richer if viewed within the context of their importance in each stage of the implementation process. Table 2.1 summarizes the CSF's and the studies. From this table, factors such as top management support, and project management seems to be a broad consensus among these researchers.

A list of 27 CSF's were compiled from the past research done by Somers and Nelson (2001), Stratman and Roth (2002), Esteves, Sousa, Pastor and Collado (2000), Nah, Zuckweiler and Lau (2003) and Markus and Tanis (1999). Information Technology directors from 10 different manufacturing organizations in Penang, Malaysia were requested to rate this list (Appendix A). Result of the survey can be found in the Table 2.2, with the top 10 CSF's italicized. In the remainder of this research, the author will focus on the top 10 CSF's. The selection for this number was somewhat arbitrary and the author found this figure manageable for further research. However, this practice is not

something new but had been practiced by Akkermans and Helden, (2002) in their

research.

Table 2.1
Critical Success Factors Mentioned in the Literature

	Critical Success Factors (CSF's)	a	b	c	d	e	f	g	h	i
1	Appropriate business and IT legacy systems			X	X				X	X
2	Architecture choices	X			X	X			X	
3	Business Plan & Vision		X	X	X	X			X	X
4	Business Process Reengineering	X	X		X	X		X	X	
5	Careful package selection	X				X	X	X		
6	Change readiness & Culture	X	X	X	X	X			X	X
7	Clear Goals & Objective	X				X	X			
8	Communication	X		X	X	X	X		X	X
9	Data analysis & conversion	X						X		
10	Education on new business processes	X				X				X
11	Empowered decision makers					X				
12	Learning competency	X	X							
13	Management of expectations	X					X			
14	Minimal customization	X				X				
15	Monitoring and evaluation of performance			X				X		
16	Organizational Trust between partners					X	X			
17	Partnership with vendor	X								
18	Project champion	X			X	X	X		X	
19	Project management	X	X	X	X	X	X	X	X	X
20	Strategic IT Planning		X			X				X
21	Teamwork & Composition	X	X		X	X	X	X		X
22	Top management support	X	X	X	X	X	X	X	X	X
23	Use of consultants	X				X				
24	Use of steering committee	X								
25	Use of vendors' tools	X								
26	User training and education	X	X	X		X		X		
27	Vendor support	X					X	X		X

Legend:
Studies: a: Somers & Nelson, (2001); b: Stratman & Roth, (2002); c: Al-Mudimigh, Zairi & Al-Mashari, (2001); d: Nah, Zuckweiler & Lau, (2003); e: Esteves, Sousa, Pastor & Collado, 2000; f: Akkermans & Helden, (2002); g: Zhang, Lee, Zhang & Banerjee, (2002); h: Nah & Lau, 2001; i: Holland, Light & Gibson, (1999)

Table 2.2

Mean Ranking of CSF's by Degree of Importance in ERP Implementation.

Item	Critical success factors (CSF)	Mean	Std_Dev
1	*Top management support*	*2.0*	*1.6*
2	*Business Plan & Vision*	*2.3*	*1.1*
3	*Teamwork & Composition*	*6.8*	*4.5*
4	*Project management*	*7.5*	*3.8*
5	*Project champion*	*8.0*	*3.9*
6	*Learning competency*	*8.6*	*6.9*
7	*User training and education*	*9.4*	*6.2*
8	*Change readiness*	*9.8*	*3.5*
9	*Vendor support*	*12.2*	*8.3*
10	*Communication*	*12.3*	*8.4*
11	Clear Goals & Objective	13.1	6.0
12	Use of steering committee	13.2	5.0
13	Data analysis & conversion	14.8	8.0
14	Monitoring and evaluation of performance	15.4	6.0
15	Management of expectations	15.4	7.6
16	Business Process Reengineering	16.3	5.4
17	Partnership with vendor	17.0	5.6
18	Careful package selection	17.0	6.1
19	Empowered decision makers	17.5	4.6
20	Education on new business processes	17.5	8.7
21	Use of consultants	17.6	6.6
22	Architecture choices	18.6	5.8
23	Use of vendors' tools	19.2	5.9
24	Minimal customization	20.7	4.2
25	Organizational Trust between partners	20.8	5.8
26	Appropriate business and IT legacy systems	22.6	3.6
27	Strategic IT Planning	23.4	2.7

2.2.1 Top Management Support

Top management support was ranked the third most important CSF's among 13

factors identified in a survey of general Information Systems (IS) implementation success

factors (Jiang et al., 1996). However, in Somers and Nelson's, (2001) survey of CSF's across the stages of ERP implementations, top management support is ranked the most important among 22 factors. The author's survey also confirms the same finding. Slevin and Pinto (1987) defines top management support as the willingness of top management to provide the necessary resources, and authority or power for project success. Willingness to provide the necessary resources is an important indicator of top management commitment towards successful implementation of ERP projects. The implementation could be seriously handicapped if some of the critical resources such as people, funds, equipments etc are not available (Zhang, Lee, Zhang, & Banerjee, 2002). Furthermore, top management support does not end with invitation and facilitation alone, but must accompany the full implementation of ERP system (Jarrar et al, 2000). They should also continually monitor the progress of the project and provide necessary direction to the working committee or ERP implementation team (Bingi et al, 1999).

2.2.2 Business Plan and Vision

It is critical to have a business plan that outlines proposed strategic and tangible benefits, resources, costs, risk and timeline (Wee, 2000). Holland et al, (1998) stated that business model of how the organization should operate behind the implementation effort should be clear and the need for identifiable, measurable goals or benefits. Such goals should be clearly defined, communicated and well understood (Shanks et al., 2000). ERP, being an enterprise-wide IS, needs a clear business plan and vision to steer the direction of the implementation project (Buckhout, Frey, & Nemec, 1999). There should be justifications for investment in an ERP system based on a change in work processes that

is aligned with the future direction of the organization involved (Falkowski, Pedigo, Smith and Swanson, 1998).   Furthermore, a long-term vision is usually established by organizations progressing toward continuous improvement in ERP implementation (Ross, 1999).

2.2.3   Teamwork and Composition

ERP projects typically require dedicated team members from all of the functional departments in an organization. It demands the effort and cooperation of technical and business experts as well as end-users (Nah, Zuckweiler & Lau, 2003). The team should consist of a mix of consultants and internal staff so the internal staff can develop the necessary technical skills for design and implementation (Sumner, 1999).   Both business and technical knowledge are essential for success of ERP implementation (Bingi et al., 1999; Sumner, 1999). Further, the best people from the organization should be recruited in the ERP team (Buckhout et al., 1999; Bingi et al., 1999; Rosario, 2000; Wee, 2000) and must be empowered to make quick decisions (Shanks et al., 2000). Organizations should be able to make decisions as quickly as possible, as even a small delay can have an impact on such a long-term project (De Bruin, 1997). The sharing of information among the various parties involved, especially among the implementation associates, is very important and requires partnership trust (Stefanou, 1999). Partnerships should be managed with regular meetings. Incentives and risk-sharing agreements will aid in working together to achieve shared goals (Wee, 2000).

2.2.4 Project Management

Project management deals with numerous aspects of the project, such as planning organization, information system acquisition, personnel selection, management and monitoring of software implementation (Appealrath & Ritter, 2000; Peak, 2000). In any projects, especially mega-projects, it's essential to emphasis on writing an extensive and detail project handbook, so that every person involved directly or indirectly would know what to do, when and how to carry out their individual task (Akkermans & Helden, 2002). The complexity of ERP implementation is very high, involving all business functions and often requiring between one to two years of effort. Therefore companies should have an effective project management strategy to control the implementation process, avoid budget overrun and ensuring implementation within schedule (Zhang et al., 2002). Boehm, (1991) noted that project management must extend beyond a clear scope and goals to include other aspects and issues of the project. Issues such as unrealistic schedules and budget (Boehm, 1991), lack of measurement system (Block, 1983), people crash and lack of effort can cause ERP implementation failure if not properly managed (Nah, Zuckweiler and Lau, 2003).

2.2.5 Project Champion

Project champion role is very crucial for marketing the project throughout the organization (Sumner, 1999). Technological innovations success has often linked to the presence of a champion who performs the crucial functions of transformational leadership and facilitation (Beath, 1991; McKersie & Walton, 1991). There should be a high level executive sponsor who has the power to set goals, legitimize change

(Falkowski et al., 1998) and continually strive to resolve conflicts and manage resistance (Nah & Lau, 2001). Willcocks & Sykes (2000) noted that one obvious candidate to look for the role of champion is the Chief Information Officer (CIO), or else the Chief Executive Officer (CEO) or Vice President (VP) in charge of Information Technology (IT).

2.2.6　Learning Competency

Learning competency refers to activities intended to identify cutting edge ERP techniques from both internal and external sources (Stratman & Roth, 2002). It also includes the formal and/or informal process of pilot-testing these new techniques of using the capabilities of ERP system to deliver business value in day-to-day operations. Since process knowledge is dynamic, organizations may benefit from procedures and practices that repetitively promote the double loop that allows underlay business processes to be improved in a systematic fashion (Argyris & Schon, 1978; Nonaka, 1994; Roth, Marucheck, Kemp & Trimble, 1994). From an external perspective, to gather ERP best practices, benchmarking activities are often used (Levitt & March, 1988). Internally, human resource systems may contribute to sustained competitive advantage through the development of firm-specific competencies and the generation of organizational knowledge (Snell and Dean, 1992).

2.2.7　User Training and Education

A specific challenge in ERP implementation is to tailor a good training program that covers both technical staff and end-users. Normally training starts with the education

of the project team in system, line, project management and ends with system's users (Welti, 1999). However, it is also important to stress that the primary goal of ERP training should be the effective understanding of the various business processes behind the ERP implementation (Gupta, 2000). According to Ettlie (1998), both formal training and regular review sessions are necessary to ensure that managers and employees stay up to date with ongoing system and process changes. Clearly, lack of user training and failure to completely understand how enterprise applications change business processes often seem to be responsible for failures and problem in the implementations (Wilder & Davis, 1998 and Crowley, 1999). A research done by Bingi et al. (1999) reported that due to lack of training, about 30% to 40% of front-line workers will not be able to handle the demands of a new ERP system. In summary, ERP training gives opportunity for employees to improve their skill, knowledge and also provides a better understanding on how their jobs are related to other functional areas within the company (Zhang, Lee, Zhang & Banerjee 2002).

2.2.8   Change Management/Readiness

Many ERP implementation failures have been caused by the lack of focus on "the soft issues" such as the business process and change management (Kelly et al., 1999 & Summer, 1999). Appleton (1997), and Pawlowsiki and Boudreau (1999) estimated that half of ERP projects failed to achieve the expected benefits because companies "significantly underestimated the effort involved in change management". Acknowledging the need for a change is very important as the stronger the need for a change, the more likely top management and stakeholders will support the ERP

implementation (Falkowski et al., 1998). Early user involvement in the design and implementation of new business processes as well as extensive top down and cross-functional communication may generate enthusiasm for ERP (Stratmart & Roth, 2002). Wee (2000) advocated that establishing a support organization such as help desk, online user manual, etc is also critical to meet users' needs and manage organizational change. Norris et al., (2000) pointed out that the tools of management are leadership, communication, training, planning and incentive systems. They argued that these tools can all be used as levers and can move great obstacles with the minimum of efforts when applied properly.

2.2.9 Vendor Support

ERP systems are a way of life that maybe a lifetime commitment for many companies (Davenport, 1998). There will be always be new models and versions to install and better alignment to be achieved between business and system. Consequently, vendor support represents an important factor with any packaged software including a standard technical assistance, emergency maintenance, updates and special user training (Somers & Nelson, 2001). Organizations implementing ERP should work closely with vendor and consultants to resolve software problems. Vendor should not only be competent in IT, but be knowledgeable in manufacturing as well. Vendor also should possess good interpersonal skills and be able to work with people (Sum, Ang & Yeo, 1997).