CHAPTER (2)

LITERATURE REVIEW

2.0. Introduction

This chapter reviews previous studies from the literature relevant to the research area. In first section, the concept and definitions of the ERP system are described. The ERP system is viewed from different perspectives. The anatomy of ERP systems is demonstrated as well. The diverse range of benefits of ERP systems and their organizational impacts for adopting organizations are presented. The costs of ERP system implementation and also the size of the ERP market are illustrated. The different approaches to ERP system implementation and also the ERP project life cycle are explained. The second section introduces the critical success factors approach in the ERP system field. Using content analysis, the literature is analyzed to find an inclusive list of CSFs for successful ERP implementation. Later, a frequency analysis of success measures is conducted to recognize the significance of each success measure. Furthermore, comparative analysis is conducted to evaluate the results of content analysis with the findings of preceding studies. As a result, a comprehensive list of ERP success CSFs will be identified and presented. Also, each of the CSFs will be explained in detail. The third section addresses issues related to the key dependent variable of ERP implementation success. Using content analysis, frequency analysis and comparative analysis, the success measures of ERP implementation projects are identified. In addition, each of the ERP implementation success measures will be discussed.

2.1. Overview of ERP Systems

2.1.1. ERP Concept and Definition

ERP is the acronym for Enterprise Resource Planning, which was originally coined by the Gartner Group (Chen, 2001). Since then, some people have defined ERP in a different way. Kapp, Latham, and Ford-Latham (2001) highlighted that an ERP system presents a structured communication method which enforces the organization to follow the advanced operating strategies and philosophies. Klaus, Rosemann, and Gable (2000) explained the ERP system as a general name for an integrated enterprise computing system that assists the flow of data and information within an organization. They described the ERP system as integrated software that manages the majority of system requirements of a business in all functional areas including sales and marketing, human resources, finance, and manufacturing. Moreover, Davenport (2000) asserted that ERP was the earliest method to integrally join information technology concepts and business management. ERP systems help the organizations to eliminate problems related to cross-functional harmonization and counter-productive procedures. Kumar, Maheshwari, and Kumar (2003) pointed out that the primary idea of ERP is to utilize information technology to plan and integrate the software applications and organizational processes such as marketing, design, purchasing, production, and finance. This study has adopted the definition of Davis and Heineke (2005) for the ERP system as a system that provides a company with a common database and software infrastructure that facilitates transactions between diverse functional areas within a company, and between companies and their customers and suppliers.

The central building of an ERP system is constructed on a single database, one application, and an integrated interface across the whole organization. The anatomy of ERP systems is demonstrated in Figure (2.1). As can be seen, information flows both within and between enterprises into a single IT architecture, perhaps linking together customers and

suppliers. Ideally, once data are entered into an ERP system, everyone within different functional areas can share the same information in a real-time fashion. Furthermore, transactional data can be collected and transformed into useful information for analysis in order to support business decisions (Norris, Hurley, Hartley, Dunleavy, & Balls, 2000).

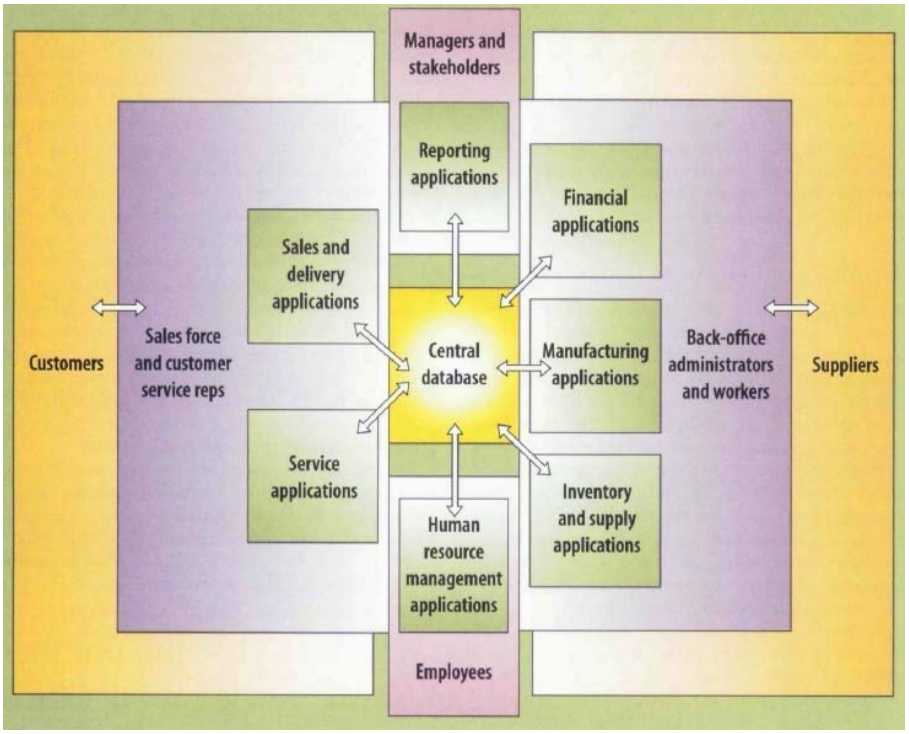

Figure (2.1) Anatomy of ERP Systems

(Source: Davenport, 1998)

Klaus et al. (2000) proposed that the ERP concept could be observed from diverse points of view. First of all, ERP is a computer software product. Second, ERP can be viewed as a complete integrative structure that manages all the data and processes of an organization. Third, ERP can be recognized as an infrastructure that brings a solution to the company. This concept of ERP systems indicates that it is an information technology solution and at the same time, a strategic business solution.

To better understand ERP, the ERP sophistication hierarchy of Kapp et al. (2001) is discussed (Figure 2.2). They argued that the ERP concept should be examined from five different levels or perspectives; An ERP system can be viewed as 1) a simple data management system or large repository for organizational data, 2) a group of modules all connected onto a central database, 3) a manufacturing philosophy and not a software program, 4) a business philosophy communication tool, and 5) a knowledge management system. In order to have a successful ERP system implementation, these perspectives must be understood. The different levels of an ERP system move up from the least sophisticated view to the most complex and strategic view, when a company receives increasing degrees of value. A company implementing an ERP system should focus on achieving the highest level in the hierarchy.

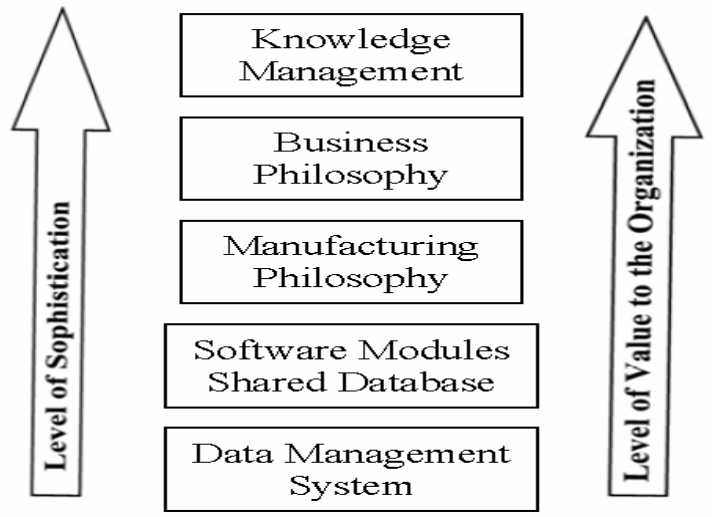

Figure (2.2) ERP Sophistication Hierarchy

(Source: Kapp et al., 2001)

2.1.2. Benefits and Organizational Impacts of the ERP System

The ERP system is multi-module software that helps an organization to manage its business through potential benefits such as reduced inventories, improved process flow, better data analysis, improved profit margins and better customer service (Fan et al., 2000). Kang, Park, and Yang (2008) stated that investment in ERP systems has a positive impact on a company's business performance. The ERP system seeks to integrate functional systems within a company into a web-enabled, consistent, and enterprise-wide network (Palaniswamy & Frank, 2000). ERP implementing companies look to realize a range of objectives such as making data accessible in real time, reducing the size and cost of the informatics department, utilizing new tools to keep pace with competitors, and electronically exchanging information with major customers (Umble, Haft, & Umble, 2003). Sumner (2006) also affirmed that ERP adopting organizations desire to acquire paybacks such as increased interaction across the organization, faster information response time, better communication with customers, lower inventory costs, shorter cycle times, quicker decision-making and inclusive control over distributed company operations. Chung, Skibniewski, Lucas, and Kwak (2008) believed that the main reason companies want to use ERP systems is to improve efficiency and eliminate waste.

The ERP system provides a range of flexible supply chain opportunities that help companies to create considerable cost and price advantages (Hayes, Hunton, & Reck, 2001). Mabert et al. (2001) confirmed that ERP standardizes data and manages them real time, so that it can carry out the necessary roles throughout a whole supply chain, from the upstream supply of raw materials to the downstream distribution of finished products, and from data entry to accounting to purchasing. ERP systems also reduce cycle times (the sum of time needed to complete a business operation from setting up to end), develop

throughput, and improve customer response times and delivery rates (Cotteleer & Bendoly, 2006).

According to Gattiker and Goodhue (2005), ERP benefits can be grouped into four categories. First of all, many companies implement ERP software to improve the information flow across departments. In addition, the integration and standardization of the business processes within functional divisions facilitates organizational jobs such as payroll and accounts payable. Furthermore, ERP systems could increase the capacity to set up new information system functionality and decrease the costs of information system maintenance. Moreover, ERP systems might be involved in shifting an enterprise from ineffective business processes to best practice business processes. Umble et al. (2003) claimed that the ERP system offers two great benefits. ERP software presents a unique database in which all transactions are entered, registered, processed and monitored. In addition, ERP software provides a unified outlook of the enterprise businesses involving all divisions and functions. Finally, Seddon, Shanks, and Willcocks (2003) divided the practical benefits of ERP systems into five categories, as can be seen in Table (2.1).

Table (2.1) ERP System Benefits

ERP Benefit Categories	ERP Benefit Details
Operational benefits	Cost reduction, cycle term reduction, productivity improvement, quality improvement, and improved customer service.
Managerial benefits	Better resource management, improved decision making and planning, and performance improvement.
Strategic benefits	Assist in business growth, alliance, innovation, cost, differentiation, and external linkages.
IT infrastructure benefits	Maintain business flexibility, reduced IT cost and marginal cost of business units' IT, and increased capability for quick implementation of new applications.
Organizational benefits	Support organization structure change, facilitating employee learning, empowering workers, and building common visions.

(Source: Seddon et al., 2003)

2.1.3. ERP Market and Implementation Costs

Organizations around the world need ERP systems to manage the fast changing business surroundings and progressively more competitive market (Pan & Jang, 2008). ERP software has been one of the biggest information technology investments in the last few years and it continues to be the largest section of the applications software budget (Chung & Snyder, 1999). According to Scott and Vessey (2002), ERP system diffusion is 67% while 15% of firms which have no ERP system plan to adopt it in the subsequent 12 months. Richardson (2004) asserted that the international ERP market had grown 3–13% annually, between the years 2000 and 2004. The ERP system market grew unexpectedly by 14% in 2004 and became a US$23.6 billion business. The ERP system market is estimated to see a 6% to 7% compound annual growth rate between the years 2005 and 2009. There are several ERP suppliers who are very active in the market. According to Richardson (2004), the top five ERP vendors with the highest market share in 2004 were SAP (40% share), PeopleSoft (now part of Oracle Applications) (12% share), Oracle Applications (10% share), the Sage Group (5% share), Microsoft Business Applications (formerly Microsoft Business Solutions) (4% share) and SSA Global Technologies (now part of Infor Global Solutions) (3% share). At the time of this study, there are five major ERP vendors: SAP, Oracle Applications, Infor Global Solutions, the Sage Group, and Microsoft Dynamics.

While implementing an ERP system will bring many benefits to the companies, the cost of protecting the ERP benefits may be very high (Umble & Umble, 2002). The ERP implementation projects contain costs of infrastructure, ERP software, customization, implementation, vendor support, training, change management, and consultancy. As Mabert et al. (2001) stated, on average, big organizations spend 5.6% of their annual revenues, while smaller companies spend up to 50% of their annual revenues on an ERP

implementation project. Switching to ERP software is a massive activity and its expenses do not come to an end at the primary acquisition. ERP systems implementation costs could range from US$50 million to US$500 million or more, depending on the ERP systems selected and the size of the adopting company (Davenport, 1998).

2.1.4. ERP System Implementation

ERP system implementation is a time consuming and complex project which integrates all business processes and consequently will cause key changes in the organization. ERP systems differ from other information systems in many ways, such as scope, scale, complexity, project costs, the need for business process re-engineering, and organizational change (Somers & Nelson, 2001; Klaus et al., 2000). The ERP implementation project consists of operational, technological, managerial, strategic, and organizational related elements (Yu, 2005; Markus & Tanis, 2000). ERP implementation should be considered as an organizational transformation, not as a big information technology project (Wood & Caldas, 2001). ERP adopting companies should follow an implementation strategy. The ERP implementation strategy should consist of visions, goals, methodologies, technological issues, budgets, time-plans, and managerial procedures (Al-Mashari et al., 2003). Al-Mudimigh, Zairi, and Al-Mashari (2001) stated that ERP implementation is " a process that involves macro-implementation at the strategic level, and micro-implementation at the operational level. The strategic, tactical and operational steps should be clearly defined and the expected benefits need to be evaluated and tracked" (p. 216).

Diverse strategies and approaches can be employed for implementing ERP software. O'Leary (2000) suggested two main approaches. The first approach is called Big-Bang implementation. According to this method, all the previous systems are upgraded to a new ERP system in one phase. The second approach is known as Phased Rollout. According to

this technique, the ERP subsystems are activated in sequence before moving on to the whole ERP implementation phase. Mabert, Soni, and Venkataramanan (2003) believed that the big bang method makes sense in the ERP environment. However, the phased rollout method sounds better for larger organizations. The ERP implementation time duration differs significantly depending on the installation strategy. The implementation duration is also associated with company size but a phased rollout approach lasts longer. Smaller firms are expected to employ the big-bang method which needs a smaller amount of time.

The life cycle of an ERP software implementation has been argued broadly by previous researchers (Davenport, 2000; Ehie & Madsen, 2005; Markus & Tanis, 2000; Myerson, 2002; Sandoe, Corbitt, & Boykin, 2001; Seddon et al., 2003; Somers & Nelson, 2004). Ehie and Madsen (2005) divided the ERP implementation procedure into five phases with a separate milestone. Their five-stage implementation process consisted of 'Project Preparation', 'Business Blueprint', 'Realization', 'Final Preparation' and 'Go Live and Support'. The project preparation phase provides an inclusive planning process. The planning practice establishes the budget targets, determines the project plan to be followed, and identifies the people handling management roles. The business blueprint phase presents an analysis of the existing business process, provides an insight to map out the new process design, and offers the background for system selection. A project management structure is also established to achieve the overall success of the ERP system. The realization phase concentrates on developing the practical foundation while testing all procedure design on a discussion room pilot. In the final preparation phase, the whole system integration is tested under complete data load and extreme conditions. At the same time, the people proposed to utilize the system and individuals influenced by the system will undergo training and education. Lastly, the go-live and support phase stresses the optimization of process flow and constant development of the system to benefit from new competitive advantage.

2.2. Critical Success Factors for ERP Implementation

Determining the critical success factors (CSFs) that are positioned behind a successful ERP system implementation has been a key research question in previous research (Plant & Willcocks, 2007). Implementation of an ERP system is a complex process including a great many factors and conditions which can potentially influence successful implementation. These factors might have a positive effect on the ERP implementation project outcome, whereas the lack of these conditions could create trouble through ERP implementation. Consequently, it is worthwhile to study the factors that determine whether the implementation of the ERP system will be successful. Many studies have been conducted during recent years to identify the factors affecting the success and failure of ERP implementation. Critical success factors were employed to examine information technology implementations by Rockhart (1979) for the first time. Rockhart (1979) defined CSFs as those well-known conditions that an enterprise required to get right in order to compete in the business successfully. Bingi et al. (1999), Holland and Light (1999), and Parr, Shanks, and Darke (1999) were early proponents of the CSF approach, as applied particularly to the ERP system. Since 1999, a lot of IS researchers have been increasingly utilizing CSFs to study ERP system implementations. In ERP system implementation, CSFs could be recognized as the few key areas where things must go right for the implementation to succeed (Finney & Corbett, 2007). These factors are crucial for realizing the predetermined corporate goals, and vital to the overall success of ERP system implementation. The CSFs of ERP implementation might be relevant to technical subjects as well as contextual issues which consist of the cultural and social impact on the interaction between ERP users and the ERP systems. The CSF method is an attractive method for researchers and managers because it facilitates the identification and prioritization of critical factors that will possibly affect successful ERP implementation

(Brown & He, 2007). Loh and Koh (2004) focused on the critical success factors of ERP system implementation and discovered that the identification and management of critical factors and their relevant components at each stage of the implementation project lead to successful ERP implementation.

The literature varies regarding what factors are vital for ERP implementation success or responsible for its failure (Zhang et al., 2005). Critical success factors of ERP implementation projects have been investigated from several diverse points of view (Nah et al., 2001). Many researchers have recognized a range of factors that could be critical to the success of an ERP system implementation. Some of the most outstanding studies are explained in the following paragraphs.

Holland and Light (1999), as one of the earliest research teams in the field of ERP systems, categorized the critical success factors into two broad groups consisting of strategic factors that cover the whole ERP implementation project and tactical factors that can be applied to particular parts of the ERP implementation project (Table 2.2).

Table (2.2) Critical Success Factors Model

Strategic	Tactical
• Legacy information system • Business vision • ERP strategy • Top management support • Project schedule/plan	• Client consultation • Personnel • Business process change and software configuration • Monitoring and feedback • Communication • Trouble shooting

(Source: Holland & Light, 1999)

Holland and Light (1999) grouped critical ERP factors into strategic and tactical factors whereas Stefanou (1999) categorized the critical ERP factors based on a new perspective, namely organizational and technological factors. However, Esteves-Sousa and Pastor-Collado (2000) concluded that the CSFs model of ERP implementation should have four perspectives: strategic, tactical, organizational and technical. Their model is based on the analysis of extensive research relating to implementation success factors. Using cross-referencing of every one of the critical factors with its documentation in the literature, Esteves-Sousa and Pastor-Collado (2000) derived the ERP implementation success matrix (unified critical success factors model) presented in Table (2.3).

Table (2.3) Unified Critical Success Factors Model

	Strategic	**Tactical**
Organizational	• Sustained management support • Effective organizational change management • Good project scope management • Adequate project team composition • Comprehensive business process reengineering • Adequate project champion role • User involvement and participation • Trust between partners	• Dedicated staff and consultants • Strong communication inwards and outwards • Formalized Project plan/ schedule • Adequate training programme • Preventive troubleshooting • Appropriate usage of consultants • Empowered decision-makers
Technological	• Adequate ERP implementation strategy • Avoid customization • Adequate ERP version	• Adequate software configuration • Legacy systems knowledge

(Source: Esteves-Sousa & Pastor-Collado, 2000)

Somers and Nelson (2001) recognized 22 critical success factors and assessed them across the phases of 110 ERP implementation projects. Their proposed critical success factors consisted of Top management support, Interdepartmental cooperation, Project team competence, Clear goals and objectives, Interdepartmental communication, Project management, Management of expectations, Vendor support, Project champion, Careful package selection, Dedicated resources, Data analysis and conversion, Use of steering committee, Education on new business processes, User training on software, Business process reengineering, Architecture choices, Minimal customization, Change management, Use of consultants, Partnership with vendor, and Use of vendors' tools.

Al-Mashari et al. (2003) identified 12 critical ERP factors and divided them based on three phases of ERP implementation project, including setting-up, implementation, and evaluation (Figure 2.3). According to their taxonomy, a business director and clear vision are essential for ERP system implementation success. The taxonomy also emphasizes the importance of several factors in the implementation phase such as ERP selection, project management, training and education, business process management, cultural and structural change management and so on. Lastly, the taxonomy implies that monitoring and evaluation of ERP systems implementation performance can lead the organization to achieve all predetermined business targets and objectives.

Nah et al. (2003) carried out a survey among the Chief Information Officers (CIOs) of Fortune 1000 companies. They intended to understand the CIOs' views in determining the relative importance of every one of the 11 CSFs for the success of an ERP system implementation. The CIOs ranked the critical success factors as follows: Appropriate business and IT legacy systems, Business plan and vision, Business process reengineering, Change management culture and programme, Communication, ERP teamwork and composition, Monitoring and evaluation of performance, Project champion, Project

management, Software development, testing, and troubleshooting, and Top management support.

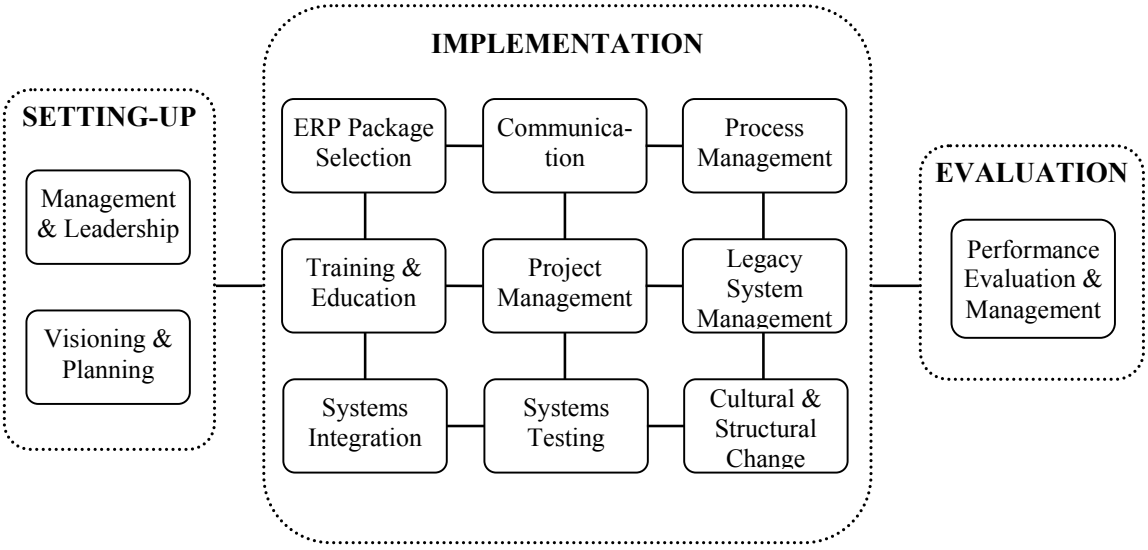

Figure (2.3) Taxonomy for ERP Critical Factors

(Source: Al-Mashari et al., 2003)

Umble et al. (2003) divided the CSFs for ERP implementation into 10 categories including Commitment by top management, Clear understanding of strategic goals, Excellent implementation project management, Great implementation team, Successfully coping with technical issues, Organizational commitment to change, Data accuracy, Extensive education and training, Focused performance measures, and Multi-site issues resolved.

Somers and Nelson (2004) claimed that every one of the critical success factors has a diverse degree of importance in different phases of the ERP implementation life cycle. In line with this perspective, they divided 22 CSFs into two main parts as demonstrated in

Table (2.4). The 'key players' consisted of 8 CSFs and 'key activities' included 14 CSFs of ERP implementation projects.

Table (2.4) Categorization of CSFs for ERP Systems

Key Players	Key Activities
• Top Management support • Project champion • Steering committee • Implementation consultants • Project team • Vendor-customer partnership • Vendors' tools • Vendor support	• User training and education • Management of expectations • Selection of appropriate package • Project management • Customization • Data analysis and conversion • Business process reengineering • Defining the architecture • Change management • Dedicating resources • Establishing clear goals and objectives • Interdepartmental communication • Education on new business processes • Interdepartmental cooperation

(Source: Somers & Nelson, 2004)

Gargeya and Brady (2005) conducted a comprehensive study by searching from among more than 100 books and articles. They employed the content analysis technique and finally proposed the following six broad CSFs for successful ERP system implementation: Worked with functionality/maintained scope, Internal readiness/training, Project team/management support/ consultants, Dealt with organizational diversity, Planning/ development/budgeting, and Adequate testing.

Sedera and Dey (2006) combined the findings of Esteves-Sousa, Casanovas, and Pastor-Collado (2003) and Nah et al. (2003) and proposed 11 critical success factors for ERP implementation success. Table (2.5) lists the 11 critical success factors and all their sub-factors.

Table (2.5) ERP Critical Success Factors and Sub-factors

Critical Success Factor	CSF Sub-factor
Top management support	• Approval and support • Identified project as a priority • Allocate resources
Project management	• Assign responsibility • Establish and control project scope • Evaluate any proposed change • Control and assess scope expansion requests • Define & set project milestones • Enforce project timelines • Coordinate project activities across all affected parties
Project champion	• Existence of project champion • High level executive sponsor as champion • Project sponsor commitment
Change management	• Recognizing the need for change • Enterprise-wide culture and structure management • User education and training • IT workforce re-skilling • Commitment to change
Business process reengineering	• BPR • Minimum customizing
Communication	• Targeted and effective communication • Communication among stakeholders • Expectations and progress communicated at all levels • User input
Teamwork composition	• Best people on team • Full-time team members • Partnership, trust, risk-taking and incentives • Empowered decision makers • Business and technical knowledge of team members and consultants
Business plan and vision	• Business plan or vision • Project mission or goals • Justification for investment in ES
Business and IT legacy systems	• Business setting • Legacy system
Monitoring Performance	• Track milestones/targets • Performance tied to compensation • Analysis of user feedback
Software development and testing	• Configuration of overall ES architecture • Appropriate modeling methods and techniques • Vigorous and sophisticated testing • Troubleshooting • Integration

(Source: Sedera & Dey, 2006)

Nah and Delgado (2006) also reviewed the literature associated with the critical success factors of ERP implementation projects. They identified an inclusive list of 49 critical factors and then structured them into seven main categories, as shown in Table (2.6).

Table (2.6) Classification of CSFs for ERP Systems

CSF Category	CSF Subcategory
Business plan and vision	• Business plan/vision • Project mission/goals • Justification for investment in ERP
Change management	• Recognizing the need for change • Enterprise wide culture and structure management • Commitment to change-perseverance and determination • Business Process Reengineering • Analysis of user feedback • User education and training • User support organization and involvement • IT workforce re-skilling
Communication	• Targeted and effective communication • Communication among stakeholders • Expectations communicated at all levels • Project progress communication
ERP team composition, skills and compensation	• Best people on team • Balanced or cross-functional team • Full-time team members • Partnerships, trust, risk-sharing, and incentives • Empowered decision makers • Performance tied to compensation • Business and technical knowledge of team members and consultants
Project management	• Assign responsibility • Clearly establish project scope • Control project scope • Evaluate any proposed change • Control and assess scope expansion requests • Define project milestones • Set realistic milestones and end dates • Enforce project timeliness • Coordinate project activities across all affected parties • Track milestones and targets
Top management support and championship	• Approval and support from top management • Top management identified project as top priority • Allocate resources • Existence of project champion • High level executive sponsor as champion • Project sponsor commitment
Systems analysis, selection und technical implementation	• Legacy system • Minimum customization • Configuration of overall ERP architecture • Vigorous and sophisticated testing • Integration • Use of vendors development tools and implementation methodologies • ERP package selection • Selection of ERP Architecture • Data conversion • Appropriate modeling methods/techniques • Troubleshooting

(Source: Nah & Delgado, 2006)

Brown and He (2007) identified 13 critical factors for ERP implementation success. They reviewed the ERP implementation literature and selected the critical factors based on their importance and/or frequency in the source text. Their findings included Top management support, Project team constitution and communication, Change in management arrangements, Training, Infrastructure, Technical support, Compatibility of the ERP system, Selection of implementation partners, Consultation, Business process re-engineering (BPR), Data accuracy, Project scope, and Vendor support.

Finally, the most recent comprehensive examination of the CSFs of the ERP implementation was carried out by Finney and Corbett (2007). They identified 26 critical success factors based on the investigation of all CSFs in the literature and grouped them into strategic and tactical categories as illustrated in Table (2.7).

Table (2.7) CSFs for ERP Implementation

Strategic CSFs	Tactical CSFs
• Top management commitment and support • Visioning and planning • Build a business case • Project champion • Implementation strategy and timeframe • Vanilla ERP • Project management • Change management • Managing cultural change	• Balanced team • Project team: the best and brightest • Communication plan • Empowered decision makers • Team morale and motivation • Project cost planning and management • BPR and software configuration • Legacy system consideration • IT infrastructure • Client consultation • Selection of ERP • Consultant selection and relationship • Training and job redesign • Troubleshooting/ crises management • Data conversion and integrity • System testing • Post-implementation evaluation

(Source: Finney & Corbett, 2007)

2.2.1. Content Analysis of ERP Implementation CSFs

Law and Ngai (2007) claimed that whereas the critical success factors of the ERP systems implementation have been discussed and analyzed by prior researchers, there have been many inconsistent and inconclusive findings. Moreover, Dawson and Owens (2008) argued that there are lots of discrepancies between the CSFs that the researchers define. They stated that "it is often the case that authors use different terminology to refer to the same CSF, and even encompass one CSF into what another author defines as two CSFs" (p. 13). Besides, the existing classifications of critical ERP success factors are not current. Amoako-Gyampah (2007) asserted that product life cycles of ERP systems have become very short, and ERP technology is changing speedily. So, new critical success factors may be arising. Consequently, it is necessary to update the prior CSFs classifications based on the findings of new research.

The purpose of this section of the study is to achieve a deep understanding of the various critical factors previously identified by other scholars. So, content analysis is a proper analytical approach. Harris and Attour (2003) claimed that content analysis is an appropriate technique when the event to be examined is communication, rather than physical or behavioural items. Patton (1990) described the content analysis as the process of identifying, coding, and categorizing the main patterns in the data.

Cavana et al. (2001) suggested a method for conducting content analysis using the constant comparative method. This method was developed to analyze the massive quantity of published documents. The following steps were adopted for conducting content analysis in this study. At the beginning, the researcher went through several databases and journals using keywords recognized in a preliminary review of the literature. Subsequent rounds of articles will be reviewed for the compilation. Critical success factors will then be identified by the content analysis method and inductive coding procedure. After that, frequency

analysis of the CSFs will be carried out to identify the relative importance of each CSF. Next, comparative analysis between the findings of this research and three prior researches will be conducted. As a result, a new list and classification of CSFs will be developed and presented.

In the first step, the data collection consisted of an extensive search of many databases which were available to the researcher. These databases consist of hundreds of journals that are categorized as belonging to the information system/ business management field:

- Scopus™
- SpringerLink
- IEEE Xplore™
- ScienceDirect®
- Wiley InterScience
- Emerald Intelligence
- ABI/INFORM @ProQuest®
- Business Source Premier (BSP) @EBSCOhost
- ACM (Association for Computing Machinery) Digital Library

Webster and Watson (2002) suggested that "while journal databases accelerate identification of relevant articles, scanning a journal's table of contents is a useful way to pinpoint others not caught by your keyword sieve" (p. xvi). Accordingly, the data collection phase involved a comprehensive search of many of the additional well-known information system / business management journals including, but not limited to, those outlined below:

- MIS Quarterly
- Information Systems Research
- Journal of Management Information Systems

- Communications of the ACM
- Management Science
- Decision Sciences
- European Journal of Information Systems
- Information & Management
- Business Process Management Journal
- International Journal of Production Economics
- Journal of Computer Information Systems
- Industrial Management & Data Systems
- European Journal of Operational Research
- IEEE Transactions

Keywords selected for the search were, in fact, chosen from the keywords provided by a number of the most cited articles (Akkermans & Helden, 2002; Al-Mashari et al., 2003; Nah et al., 2001; Somers & Nelson, 2001) identified in a preliminary literature review. Since different authors may have utilized diverse terms in their research, it was decided to define some alternative keywords for each main keyword. These alternative keywords consisted of some acronyms, synonyms, and antonyms, as shown in Table (2.8). For example, 'CSF' was used as an acronym of the keyword 'Critical Success Factor', and 'Failure' was employed as an antonym of the keyword 'Success'. Using this technique enabled the researcher to achieve the greatest coverage of the relevant articles while decreasing the likelihood of ignoring some important articles. Based on the conditions between keywords, several combinations of the keywords have been utilized. For instance:

- CSF (AND) ERP (AND) Implementation
- Critical Factor (AND) ERP System (AND) Success
- Critical Success Factor (AND) Enterprise Resource Planning

Table (2.8) Keywords Used for Search

Main Keywords	First Alternative	Second Alternative	Third Alternative	Fourth Alternative
Critical Success Factor	CSF	Success Factor	Critical Factor	Risk Factor
Enterprise Resource Planning	ERP	ERP System	ERP Software	Enterprise System
Implementation	Adoption	Adaptation	Assimilation	Project
Success	Performance	Effectiveness	Difficulties	Failure

The keywords were searched in the fields of article title, abstract, and keywords. Furthermore, the searches were limited to only those articles that were published in the last ten years, i.e. between 1999 and 2008. First, 117 articles were selected and downloaded based on the aforementioned criteria. Then, the abstracts of all these 117 articles were reviewed. If the article contained information relating to the critical success factors of ERP implementation, then the article was chosen for further analysis. Finally, 95 articles were selected. Articles were printed and assigned a source code. The source codes were chosen as unique, logical, and efficient for frequent use in content analysis. The CSFs which were employed by each of these 95 articles are presented in Appendix (A).

In the first round of reading the raw data (articles), all 95 articles, were read in detail, one by one. While this step takes only one sentence to express, it was the major and most time-consuming part of the analysis. The open coding phase allowed the researcher to open up the articles and explore critical success factors. In open coding phase, the researcher places themes and assigns primary labels or codes to compact collection of data categories (Neuman, 1997). In this part of the analysis, emphasis was placed on the words themselves not on the meaning of the words. As the articles were read, critical success factors emerged. When the first CSF was found, the articles were reviewed until the second CSF was

identified. This second CSF was compared with the first CSF identified to ensure that the two were different, and then the researcher continued reading until an obvious third CSF was identified. This third CSF was compared with the first and second CSFs. This process was called constant comparative analysis. The process of constant comparative analysis continued - every newly identified CSF being compared with previously identified CSFs to ensure that the new CSF does definitely add more understanding about the phenomenon under investigation. Using constant comparative procedure, a list of CSFs and a brief description of them was prepared on a separate sheet in the Microsoft Excel program. This provided a 'CSF index'. Finally, a primary list of 41 CSFs was identified.

In the second round of reading the articles, the researcher worked around the central axis of the terms until the CSFs became clear, as suggested by Neuman (1997). Thus, all of the 41 CSFs and their descriptions were reviewed and examined again. When needed, the related article was referred to for more details. Different categories have been used in the literature for defining CSFs. In fact, some of the CSFs were presented in the form of a super-CSF including some sub-CSFs. For example, while some researchers used 'Change management culture and programme' as one CSF with several sub-CSFs (like change management plan, commitment to change, business process reengineering, organizational culture, user training, user involvement, etc.), others employed these sub-CSFs as separate CSFs. The same problem existed for other CSFs such as 'business process reengineering and minimum customization', 'consultants/suppliers support', and so on. As a result, it was decided to break down the more prominent CSFs into subparts to have a clearer CSFs meaning, thereby increasing the chance of further analysis in the next step. Therefore, new CSFs emerged in this phase. Finally, the initial 41 CSFs were re-categorized into 54 CSFs.

In the third round of reading articles, it was necessary to look selectively for the facts that demonstrated or justified themes. Then, a comparison was made between subthemes

and themes to identify contrasts and investigate relationships across categories as recommended by Neuman (1997). In this stage, all CSFs were mapped out to investigate relationships across CSFs to create the CSF classification. For categorizing the final CSFs, two following criteria (Guba, 1978) were utilized:

- Internal homogeneity; the extent to which one particular CSF holds together the other particular CSF in a meaningful way.
- External heterogeneity; the extent to which the differences between CSFs are bold and clear.

According to Guba's (1978) criteria, any CSFs that implied the same meaning (considering all synonyms, acronyms, and also antonyms for each CSF) were categorized under the same CSF. 'Related concepts', which are similar to the main concept, were considered as well. An example concerns the words customization, modification, and localization, which have a similar meaning in the field of information systems and were placed within the same category. As another example, a wide range of terms and phrases such as Management support, Top management involvement, Top management commitment, Top management awareness, Executive commitment, Executive support, Executive involvement, Top management championship, Lack of business management support, Management participation, Company-wide commitment, Company-wide support, Dedicated resources, Employee recognition and incentive, Funds support, and so on, were classified into one category named Top management support and commitment. Also, 'opposite concepts' that are identical to the main concept but inversely defined, were considered. For instance, Ease of use has an opposite concept by the name of Complexity in the literature. Finally, based on the above discussion, all 54 CSFs were re-arranged into 17 mutually exclusive and collectively exhaustive categories of CSFs. The final compilation of CSFs for ERP implementation projects is presented in Table (2.9).

Table (2.9) Compilation of CSFs for ERP Implementation

No.	Critical Success Factors
1	**Top Management Support and Commitment** Top management/ Executive involvement; Top management/ Executive commitment; Top management/ Executive Awareness; Top management/ Executive participation; Company-Wide Support ; Company Wide Commitment; Dedicated resources; Employee Recognition and incentive; Funds support
2	**Project Management and Evaluation** Effective project management; Project planning; Project schedule and plan; Project scope; Work time schedule; Detailed schedule; Project completion time; Project cost; Auditing and control; Project management of consultants and suppliers
3	**Business Process Reengineering and Minimum Customization** BPR; Business Process Reengineering; Business Process Change; Business process improvement, optimization, and reengineering (BPIOR); Alignment of the business with the new system; Process adaptation level; Process standards; Business process skills; Job redesign; Worked with ERP functionality-maintained scope; Minimum customization
4	**ERP Team Composition, Competence and Compensation** Composition of project team member; Balanced implementation team; Project team: the best and brightest; Project team empowerment; Steering Committee; Project team competence; The domain knowledge of the ERP project team; Teamwork participation; Attitude of the ERP project team; Professional personnel; Constitution of project team; ERP team compensation
5	**Change Management Programme** Change management plan; Managing changes; Managing conflicts; Argument for change; Management of expectations ; Organizational resistance to change; Change readiness; Understanding changing requirements; Change in business goals during the project; Conflicts between user departments; Reasonable expectation with definite target
6	**User Training and Education** Training employee; Education on new business processes; Adequate training and instruction; Training of project team and end-user; Effective training; Hands-on training
7	**Business Plan and Vision** Business plan-vision-goals- justification; Vision statement and adequate business plan; Feasibility-evaluation of ERP project; Effective strategic thinking and planning strategic; Competitive pressure; Clear Goals and Objectives; Clear desired outcomes; Strategic IT planning; Link to business strategy; ERP strategy and implementation methodology; Consensus on organizational objectives; Clear ERP strategy-Vision
8	**Enterprise-wide Communication and Cooperation** Effective enterprise-wide communication; Interdepartmental communication; Interdepartmental collaboration; Interdepartmental cooperation; Open and honest communication among the stakeholders; Cross-functional coordination; Free flow of information in project team; Communicating ERP benefits; Communication with ERP project team

Table (2.9) Compilation of CSFs for ERP Implementation (continued)

No.	Critical Success Factors
9	**Organizational Culture** Cultural and Business Change; Cultural differences; Cultural readiness; Change culture; Cultural fit; Cultural issues; Shared beliefs; Centralization of decision making; Commitment to learning; National culture; Trust; Unfocused information-seeking; Deal with organizational diversity; Human resources commitment;
10	**Vendor Support** Vendor–Customer Cooperation; Vendor–customer partnership; Usage of Vendor's Tools; Technical competence of supplier; Effective communications with users; Domain knowledge of supplier; Implementation team members; Connectedness with user department; Effective communications with users; Service of the supplier of ERP
11	**Software Analysis, Testing and Troubleshooting** System development; Stabilization of ERP; Adequate testing; Data Accuracy; Data analysis and conversion; Data management; Data fit; Data migration; Accurate and prompt data acquisition; Trouble shooting; Tests and problem solutions; Country-related functional requirement; Technical issues
12	**Project Champion** Project manager; Project leader expertise; Strong and committed leadership; ERP project manager leadership
13	**Careful Selection of ERP Software** Adequate ERP selection; System selection process; Suitability of software; Package standards; Completeness of software; Selection of ERP vendor; ERP vendor quality; ERP vendor Reputation; Related experience of supplier; ERP supplier option and service; Technical competence of supplier; Domain knowledge of supplier
14	**Use of Consultant** Consultant–Customer Partnership; Consultant Involvement; Consultant support; Usage of Consultant's Tools; Consultant selection; Consulting services; Technical competence of consultants; Domain knowledge of consultant; Consultant implementation team; Connectedness with user department; Effective communications with users
15	**Appropriate Business and IT legacy Systems** Legacy systems and IT infrastructure; IT infrastructure- skills; Pre-existing data and systems; Suitability of hardware and software; Technological context; Technology or infrastructure in place; Integration and communication between legacy system and ERP
16	**System Quality** System reliability; System integrity; System stability; Compatibility of software; Timeliness; ERP adaptation level; ERP software features; Competency and flexibility of ERP; Ease of use; Perceived complexity; User fit; Fit between ERP and business process
17	**User Involvement** User participation; User support; Feeling of user involvement; Willingness to participate; Employee cooperation; Involving individuals and groups; Key user involvement

2.2.2. Frequency Analysis of ERP Implementation CSFs

Frequency analysis of identified CSFs enhances the understanding of the relative importance of the factors, as recommended by Finney and Corbett (2007). Table (2.10) shows the frequency of the CSFs' occurrence in the literature. As can be seen, five CSFs of 'Top management support and commitment, Project management and evaluation, Business process reengineering and minimum customization, ERP team composition, competence and compensation, and Change management programme' are among the most frequent CSFs.

Table (2.10) Frequency Analysis of ERP Implementation CSFs

No.	Critical Success Factors	Frequency (out of 95 articles)	Frequency (Percentage)
1	Top Management Support and Commitment	68	72
2	Project Management and Evaluation	66	70
3	Business Process Reengineering and Minimum Customization	59	62
4	ERP Team Composition, Competence and Compensation	53	56
5	Change Management Programme	48	51
6	User Training and Education	45	47
7	Business Plan and Vision	43	45
8	Enterprise-wide Communication and Cooperation	39	41
9	Organizational Culture	37	39
10	Vendor Support	36	38
11	Software Analysis, Testing and Troubleshooting	32	34
12	Project Champion	30	32
13	Careful Selection of ERP Software	28	30
14	Use of Consultant	25	26
15	Appropriate Business and IT legacy Systems	24	25
16	System Quality	24	25
17	User Involvement	22	23

To show the stability (level of agreement between findings of prior studies), the CSFs were categorized into three classes, namely, 'High, Medium, and Low'. CSFs with a high stability means that more than two thirds (66.66%) of prior research has recognized the factor as critical. Two CSFs with high stability in the literature consisted of 'Top management support and commitment and Project management and evaluation'. Also, CSFs with medium stability means that more than one third (33.33%) and less than two thirds (66.66%) of prior studies have identified the factors as critical. Based on Table (3.9), nine CSFs of 'Business process reengineering and minimum customization, ERP team composition, competence and compensation, Change management programme, User training and education, Business plan and vision, Enterprise-wide communication and cooperation, Organizational culture, Vendor support, and Software analysis, testing and troubleshooting' are among the CSFs with a medium level of agreement in prior research. In addition, CSFs with low stability means that less than one third (33.33%) of prior researchers had mentioned the CSF as critical. Six CSFs with the low stability in the literature consisted of 'Project champion, Careful selection of ERP software, Use of consultant, Appropriate business and IT legacy systems, System quality, and User involvement'.

2.2.3. Comparative Analysis of ERP Implementation CSFs

The new taxonomy could be examined by comparing it with some of the previously developed taxonomies as suggested by Larsen (2003). A comparative analysis was conducted between the findings of this research and the findings of three prominent articles in the field of ERP implementation success. Two of the articles have been the most cited articles (Nah et al., 2001; Somers and Nelson, 2001), and the third article was a recent compilation study, which was done by Finney and Corbett in 2007. The comparative

analysis can be viewed in Table (2.11). As can be seen, 12 out of the 17 CSFs from this research finding are in the range of other researchers' findings. It shows more than 70 percent harmony between the present study's results and prior results.

Table (2.11) Comparative Analysis of CSFs Ranking

No.	Critical Success Factors	Nah et al., 2001	Somers and Nelson, 2004	Finney and Corbett, 2007	Range	Result
1	Top Management Support and Commitment	3	1	1	1-3	+
2	Project Management and Evaluation	6	5	6	5-6	-
3	Business Process Reengineering and Minimum Customization	5	16	3	3-16	+
4	ERP Team Composition, Competence and Compensation	1	2	5	1-5	+
5	Change Management Programme	2	7	2	2-7	+
6	User Training and Education	2	14	4	2-14	+
7	Business Plan and Vision	4	4	8	4-8	+
8	Enterprise-wide Communication and Cooperation	8	3	11	3-11	+
9	Organizational Culture	2	-	13	2-13	+
10	Vendor Support	-	9	-	9	+
11	Software Analysis, Testing and Troubleshooting	9	11	3	3-11	+
12	Project Champion	10	8	10	8-10	-
13	Careful Selection of ERP Software	-	10	15	10-15	+
14	Use of Consultant	-	22	7	7-22	+
15	Appropriate Business and IT Legacy Systems	11	-	12	11-12	-
16	System Quality	-	-	-	-	-
17	User Involvement	-	-	-	-	-

However, there are some differences between the findings of the current research and prior findings. System quality and User involvement are two main differences which have not been mentioned in the other three studies. The differences may have occurred due to the varying aims and scope of the research and employing diverse research methods. For example, while this research consisted of 95 papers published from 1999 to 2008, the work of Finney and Corbett (2007) was composed of 45 papers and the research of Nah et al. (2001) consisted of 10 papers published from 1998 to 2000. Besides, Dawson and Owens (2008) affirmed that "it is often the case that authors use different terminology to refer to the same CSF, and even encompass one CSF into what another author defines as two CSFs" (p. 13). So, such differences in the findings of studies are reasonable.

2.2.4. Description of ERP Implementation CSFs

The critical success factors of ERP implementation projects identified from the content analysis of the literature are explained in subsequent paragraphs:

2.2.4.1. Enterprise-Wide Communication

Communication has been identified as one of the most difficult and challenging tasks in the ERP implementation project (Somers & Nelson, 2004). Shanks, Parr, Hu, Corbitt, Thanasankit, and Seddon (2000) interviewed some ERP project managers and consultants and found that ERP implementation was expected to fail when dates were not communicated well to stakeholders in advance. For successful implementation of ERP systems, communication across the various functions and levels of a company is needed (Akkermans & Helden, 2002). Esteves-Sousa and Pastor-Collado (2000) stated that both internal communication among ERP project team members and outward communication to the entire company are very essential. Goldhaber (1993) described communication as the

glue that binds the enterprise; the cornerstone of the company; the oil that softens the business functions; the force that permeates the firm; the thread that connects the diverse system together; and the binder that holds all relationships.

In ERP system implementation, it is vital to communicate project expectations, user input, and report project progress among all stakeholders (Sedera & Dey, 2006). When goals are communicated clearly, the ERP adopting companies can realize constant improvement in their ERP implementation. Nah et al. (2007) also stated that informing the employees about the objectives, scope, activities and updates in advance is essential to make ERP implementation more efficient. Sumner (2000) stated that communication just between an ERP project team and senior management is not a valuable communication. She emphasized that the whole organization should be given regular explanations of the objectives, scope, and activities of an ERP implementation project. Nah et al. (2003) stated that effective communication of the mission, direction, plan, requirements, user input, changes and feedback is vital to the entire phases of ERP implementation projects. According to Nah and Delgado (2006), communication should be reliable and constant and begin from the early stage of ERP implementation. It should offer a general view of the ERP system, the motives for its implementation, and a picture which shows how the company will change and how the ERP system will support these changes.

In addition, effective communication influences the success of change management practices in an ERP implementation project. Woo (2007) recommended communication as a proper tool in the implementation of change. It is employed to announce, explain and prepare all stakeholders for change, to decrease user uncertainty and resistance to change, and to increase employees' commitment to change. Nah et al. (2007) believed that ERP user inputs such as their comments, requirements, approval, and reactions should be managed. It is necessary to inform the users that the feedback they present about the ERP

implementation processes will be acknowledged and operated. Somers and Nelson (2004) advised that strong communication is essential through the different phases of ERP implementation to inform employees why change is needed, what is happening, and how it will benefit the firm. Kim, Lee, and Gosain (2005) recommended that communication is necessary for creating general acceptance and understanding of the ERP systems. Rosario (2000) also stated that an early confirmation of ERP project maintains employees' enthusiasm and reduces uncertainty. All users should be persuaded to abandon the previous systems while being convinced the new ERP system has is great benefit to them and the organization. The demonstration should be authorized by the top management of organization and ERP project champions.

Since the communication assists the ERP adopting company to minimize user resistance, it is critical from the initiation to the system acceptance phases (Somers & Nelson, 2004; Welti, 1999). Esteves-Sousa and Pastor-Collado (2000) also hypothesized that communication should take place at regular intervals throughout the ERP implementation cycles. Communication among different levels and functions of ERP implementation projects needs a communication plan (Kumar, Maheshwari, & Kumar, 2002) to guarantee that open communication happens in the whole organization (Yusuf, Gunasekaran, & Abthorpe, 2004) and with customers and suppliers (Mabert et al., 2003). The communication plan provides required data and information flow to explain to users about the ERP system's impacts on their everyday jobs. Muscatello and Chen (2008) argued that suitable communication plans should be set up to keep senior management informed on the subject of ERP project impact, challenges, risks, and progress. The communication should be conducted during ERP steering committee meetings and usual status reporting. Holland, Light, and Gibson (1999) studied several companies and identified that communication among stakeholders was as a critical success factor. The studied companies employed

communication tools such as newsletters, monthly bulletins or weekly meetings to keep users informed about ERP implementation project progress.

2.2.4.2. Business Process Reengineering

ERP software is developed based on the best practices that are employed by the industry. However, the majority of ERP implementing companies are not expected to have compatible structures and processes in accordance to the ERP systems applications, tools, and information (Holsapple, Wang, & Wu, 2005; Umble et al., 2003; Xue, Liang, Boulton, & Snyder, 2005). So, either the ERP software should be customized to fit an organization's requests or the firm's business processes must be changed to align themselves with the ERP system (Bradford & Florin, 2003; Wang et al., 2006). Bingi et al. (1999) believed that even the top ERP systems in the market can meet only 70 percent of the companies' requirements. They suggested that to achieve the remaining 30 percent, a company is required to customize the ERP package to suit its desires, or the company has to transform its processes to be in line with the ERP system. As a result, it is likely that firms adopting and implementing ERP systems have to reengineer some of their processes to keep the requirements of the ERP system. Organizations are supposed to be prepared to recognize the ERP embedded best practice and model their processes according to those presented by the ERP system (Murray & Coffin, 2001). Yusuf et al. (2004) recommended that business process reengineering (BPR) is a prerequisite for obtaining full advantage of the ERP system implementation. BPR is vital in the early phases of the ERP implementation from the initiation through the adaptation phase. Ehie and Madsen (2005) believed that the business processes have to be altered and not the ERP system, otherwise the implementation project will lead to late implementation without achieving the desired benefits. Nah et al. (2003) also confirmed that it is very important to align current business

processes with the ERP software and maintain the ERP system unchanged as much as possible.

The compatibility of ERP packages and the business processes of an organization has been a challenging issue for the adopting companies (Babu & Dalal, 2006; Everdingen, Hillegersberg, & Waarts, 2000; Wei, Chien, & Wang, 2005). ERP software obviously modifies not only the usual method of procedure within and between departments, but it also changes various social systems all over the company. In the ERP implementation process, a great amount of business process reengineering must take place iteratively to obtain advantage of the ERP system best practices. Shanks et al. (2000) confirmed that once the ERP system is in use, process reengineering should carry on with new updates to take full advantage of the ERP software abilities. The integrated feature of the ERP packages will require the adopting company to carry out business in a special way. Umble and Umble (2002) believed that computerizing present non-value-added or redundant business processes can cause an ERP implementation project to fail. When employees and other stakeholders are not appropriately prepared for such a major transformation, the expected reaction will be resistance to change which could interrupt the ERP system implementation. Sedera and Dey (2006) stated that in order to take advantage of ERP implementing benefits, a number of companies carry out additional business processes redesign to suit the system, while a number of organizations customize the ERP package. Customization relates to ERP implementation budget and also its success. Customizing the ERP system too much leads to a complex system which is very hard to support, and impractical to upgrade to the most recent versions. But, minimum customization leads to shorter implementation time and lower implementation costs. As Myerson (2002) stated, the ERP system should not be customized as far as possible; otherwise, it will decrease the benefit of newer releases and versions of ERP software. Muscatello and Chen (2008) also

affirmed these facts and stated that modifications must be avoided to decrease ERP errors. Murray and Coffin (2001) asserted that ERP implementing companies should be eager to modify their business processes to align them with the system and consequently decrease the extent of customizations required.

2.2.4.3. Project Management

ERP software implementation is a set of compound activities often requiring between one and two years of effort and involving all business departments. The huge combination of software and hardware and also organizational and users problems make many ERP implementation projects difficult, requiring effective project management (Somers & Nelson, 2004). Recent research illustrated that, on average, ERP implementation projects took 2.5 times longer than projected, were 178% over budget, and brought about only 30% of agreed benefits (Zhang et al., 2005). Moreover, Wang and Chen (2006) stated that more than 90 percent of ERP projects have been late and required further budgets due to many changes in the original plan. So, ERP implementing firms are required to have an effective project management strategy to manage the implementation process, avoiding budget overrun and ensuring implementation on schedule. Effective project management is a basic part of every ERP implementation project, from the initiating stage to the final stage (Law & Ngai, 2007). An ERP project management programme requires assigning the tasks, allocating the resources, controlling the project, and avoiding creep which is the trend of the ERP project to obtain further software customization and requirements (Rosario, 2000).

Project management is involved with different features of the ERP implementation project including planning, software acquisition, organizing, team member selection, management and monitoring of system implementation (Al-Mudimigh et al., 2001). Umble et al. (2003) recommended that successful implementation of ERP systems needs

outstanding project management which consists of a clear definition of objectives, development of a work plan and a resource plan, and also careful monitoring of project progress. Nah et al. (2003) also confirmed that the project management process, which consists of defining the scope, time and specification, is vital to ensure ERP project success.

ERP system implementations are risky and complex projects. These projects need excellent management for the diverse contributions from the business units, customers and suppliers, vendors and consultants involved in the project. They also require large scale business process reengineering and difficult planning to adjust to every existing or future system (Sandoe et al., 2001). Aladwani (2001) stated that ERP project management, which refers to determining timetables, milestones, equipment, workforce, and budgets, becomes very vital in the complex environment of ERP projects. Therefore, to realize the desired benefits of the ERP system, the implementation process must be carefully monitored and managed. The ERP project progress must frequently be monitored by standard meetings and reports. Zhang et al. (2003) believed that the frequency of meetings affects the effectiveness of project control. Furthermore, the project manger is able to determine any missed deadlines through standard meetings. Project management of an ERP project refers to the continuing management of the implementation plan. So, according to Nah et al. (2001), it involves not only the planning phases, but also the definition of critical paths and milestones, the allocation of responsibilities among different actors, human resource planning, training arrangement, and lastly determining measures of ERP project success.

Effective project management is critical because success in ERP system implementation, is usually assessed based on the degree to which predetermined budget and planned schedules are met (Rosario, 2000). The first stage of any ERP implementation project is a

plan with goals and objectives. Some ERP projects fail because they cannot meet the stakeholders' expectations. When a goal is proposed, the expectation should be carefully planned to ensure that this expectation is within the ERP system capability. The next stage of the ERP project is to clarify ERP project scope and ensure consideration of all the necessary efforts. Successful ERP project management consists of controlling the scope, allocating responsibilities, and determining and assessing project milestones to avoid budget and time overruns (Sedera & Dey, 2006). The scope contains ERP modules to be implemented and the entire activities to be undertaken. After the scope is identified and restricted, it is important to recognize the critical paths of the ERP project. Moreover, it is important that budget and schedule goals are tracked to maintain project trustworthiness (Shanks et al., 2000). The budget and schedule cause problems for the majority of ERP implementing companies. People always want the ERP implementation to be completed as soon as possible while maintaining a limited budget. The cost budget and schedule could be controlled by effective project management.

2.2.4.4. ERP Team Composition and Competence

Selecting the right team members for an ERP implementation project is another critical success factor. An ERP implementation project engages all of the functional units in a company. ERP implementation requires the cooperation of business and technical experts as well as end-users. Therefore, team composition and teamwork along with the ERP consultants and vendor have been highlighted in the literature (Nah & Delgado, 2006). Nah et al. (2007) affirmed that the ERP team should be cross-functional and have the required functional and technical abilities for ERP implementation and assimilation. Sedera and Dey (2006) also stated that the knowledge and skills of the ERP project team, which includes the best staff in the company, are very significant. Having the right composition in the ERP

implementation project team is very important (Aloini, Dulmin, & Mininno, 2007; Nah et al., 2001; Umble et al., 2003) but it may be difficult to achieve. ERP team members should be technically experienced, come from the business units affected by the ERP system, and understand the organization and its business. The ERP implementation team should be cross-functional (Nah et al., 2003) and include the best staff in the company (Bingi et al., 1999) to reflect the cross-functional character of ERP software. The ERP team is supposed to involve the most excellent employees in the firm to increase the likelihood of ERP implementation success (Rosario, 2000). The ERP team is supposed to integrate the ERP system's abilities with the company's functions and also hold the necessary qualifications to influence the required business process changes. In addition, the ERP team members must focus only on the ERP implementation project and this duty should be their main concern.

The ERP implementing organizations do not often realize the impact of selecting the employees with the right expertise. The knowledge and skills of the ERP project team are critical to ERP adopting organizations. The employees chosen for the ERP implementation team should not only be professional with regard to the firm's procedures but also be familiar with the best business practices in the industry. Both technical and business knowledge are crucial for ERP success (Nah et al., 2003). Shanks et al. (2000) believed that assigning the business experts with appropriate knowledge on the ERP implementation project on a full-time basis is extremely important. Huang, Chang, Li, and Lin (2004) concluded that the ERP team members' capabilities to work together, communicate well, and work within the guiding principle of a project plan are very vital to the success of ERP implementation.

It has been frequently mentioned all over the ERP literature that there is a vital need to establish an implementation team that consists of the company's best and brightest persons.

The best people in the company are supposed to be engaged in the ERP implementation team. The ERP team must be cross-functional, balanced, and comprise a combination of internal employees and external consultants. The internal employees can develop the essential technical proficiency for ERP implementation. It is also essential that companies choose a balanced ERP team and authorize them to make rational decisions. In addition, the business and technical know-how of the team members is critical for the ERP implementation success. The ERP project team should consist of technological analysts and others who are aware of the business processes used by a company. In ERP system implementations, business users have the responsibility to make sure that business process requirements are incorporated in the ERP software and that it is accepted and utilized by the end user group. As a result, the addition of business users on the ERP team to complement the technical parts is crucial to the ERP implementation success (Somers & Nelson, 2004).

In an ERP implementation project, the staff usually work long hours beyond their usual job responsibilities. Spending extensive hours at work and the subsequent tensions which arise from this may decrease the ERP team members' morale. So, ERP project management is needed to increase the morale of ERP team members and guarantee all the members' commitment. Incentives, compensation, and the praise for successfully implementing the ERP system within budget and on time should be offered to the ERP team to encourage teamwork in the ERP system implementation (Bradley, 2008; Nah et al., 2007; Sedera & Dey, 2006; Shanks et al., 2000). In one well-known success stories of ERP project cited by Buckhout, Frey, and Nemec (1999), the CIO stated that the development of specific measures to assess the project's success and then link each of these parameters directly to an executive compensation played a key role in their success. Ten percent of the executive management's bonus and 20 percent of the salary of the implementation team was linked to

the success of the project. Prior research showed that it is very important that ERP team members are remunerated for implementation project success (Nah et al., 2007; Sedera & Dey, 2006; Wang, Shih, Jiang, & Klein, 2008; Wu & Wang, 2006).

Employing a project manager with the essential authority and skills to manage ERP implementation is also very critical to ERP system success. Allen et al. (2002) speculated that ERP project managers are required to have both strategic and tactical project management competences to manage the ERP implementation project successfully. Nah and Delgado (2006) claimed that the role of an ERP implementation project manager is very comprehensive. The ERP project manager must have the capability to work at all levels of a company and be well balanced with the required business, technology, and project management expertise. In addition, the project manager is accountable for the successful direction of the ERP implementation project and also for making sure that the appropriate methodologies and controls are employed to manage the ERP system implementation. Effective project managers manage all application resources, the ERP vendor, consultants, project scope, organizational requirements, project risks, and communication with regard to a project. The project manager of an ERP project should be a high-level executive who has the authority to set targets and convince the organization about changes (Nah & Delgado, 2006; Rosario, 2000; Stratman & Roth, 2002; Zhang et al., 2003).

The success of ERP systems implementation has also been related to the existence of a champion, who carries out the fundamental tasks of change leadership, facilitation, and selling of the ERP project to the end users. Commitment of the project champion is important to drive agreement and to administer the whole life cycle of ERP implementation. Project champions should assume the responsibility of change champions for the entire life cycle of the ERP implementation project. The project champion is

supposed to understand the company and business environment as well as the ERP system. A project champion is usually someone at the higher management level of the organization who has the power to make decisions relating to extensive organizational changes which happen during ERP system implementation (Somers & Nelson, 2001).

2.2.4.5. ERP System Quality

System quality has a significant impact on the successful implementation of ERP systems (Zhang et al., 2005). ERP system quality is defined by several capabilities such as offering useful functionality for conducting jobs, providing reliable and accurate outputs, the ability to exchange data with other systems servicing different business units, and presenting user friendly features (Xu, Nord, Brown, & Nord, 2002). There are two points of view related to system quality that need to be clarified. Some prior ERP implementation research has employed system quality as a dimension of ERP success (Bernroider, 2008; Bradford & Florin, 2003; Gable, Sedera, & Chan, 2003; Häkkinen & Hilmola, 2008; Ifinedo, 2008), while others have utilized system quality as a critical success factor (Chen & Liu, 2008; Fan & Fang, 2006; Kositanurit, Ngwenyama, & Osei-Bryson, 2006; Uzoka, Abiola, & Nyangeresi, 2008; Zhang et al., 2005) in their research. Furthermore, a review of the literature shows that the system quality factor has not been employed in earlier research in developed nations as a critical factor. This is most likely because the ERP packages in western countries are assumed to be well matured and experienced and of acceptable quality (Zhang et al., 2005). But researchers in developing countries used ERP system quality as a critical success factor for ERP implementation projects. The results of studies conducted in Bahrain (Kamhawi, 2007), Turkey (Kerimoglu, Basoglu, & Daim, 2008), China (Brown & He, 2007; Chen & Liu, 2008; Zhang et al., 2005), Taiwan (Fan & Fang,

2006) and Botswana (Uzoka et al., 2008) confirmed that the quality of the ERP system could be a critical factor in ERP implementation success.

ERP system quality was defined as user perception of measuring the ERP system in terms of its accessibility, reliability, and flexibility (Fan & Fang, 2006). Measures of system quality are linked to the information processing system itself. DeLone and McLean (2003) believed that the quality of the system is at the technical level, where efficiency and accuracy of the system generating information were vital. These were object-based feelings and revealed perceptions of the end users. DeLone and McLean (1992) combined the earlier research and presented diverse potential of system quality metrics, with such extensive items as ease of learning and use, data accuracy, system integration and flexibility, and system efficiency and reliability. Furthermore, Seddon (1997) recommended that the existence of bugs was a basic concern of system quality, but added further items such as ease of use, quality of documentation, and the consistency of the user interface. In addition, Rai, Lang, and Welker (2002) proposed two scales for measuring system quality i.e. easy to use and user friendly. Moreover, Iivari (2005) examined the DeLone and McLean (1992) model empirically and structured perceived system quality as comprising integration, convenience, flexibility, language, and response time. With the emergence of ERP systems, ERP vendors tried to pay more attention to user requirements. They analyzed the user requirements and verified their requirements and expectations regarding the content of ERP systems. The ERP designers then included appropriate functions and objects into the systems. Nowadays, ERP users' environment is becoming more and more diverse, so the dissimilarities in the domain knowledge need to be harmonized for ERP system success. In fact, designing ERP systems with various interfaces for special users would be valuable (Calisir & Calisir, 2004).

2.2.4.6. ERP Vendor Support

ERP systems are a lifelong commitment for a lot of organizations which need constant investment in upgrades and new modules to attain better fits between the ERP system and business processes, to attach more functionality, and to realize companies' strategic value (Davenport, 1998). These are some of the reasons why it is evident that the ERP vendor support is a significant factor at every stage of the ERP implementation project (Nah & Delgado, 2006). Willcocks and Sykes (2000) claimed that vendor support facilitates the ERP implementation success through the external perspectives and knowledge that they have. Somers and Nelson (2004) also stated that ERP vendor support, in the form of emergency maintenance, comprehensive technical support, upgrades and updates, and particular user training, is a vital factor for ERP software during the implementation processes. Zhang et al. (2005) classified three dimensions of vendor support as response time of the services, qualified staff with knowledge of both the enterprise's business processes and ERP system, and participation in ERP implementation. ERP implementation projects require more vendor support than other information system projects because ERP implementation projects need a broad range of technical implementation knowledge and skills (Davenport, 2000). ERP implementing companies should complement the skill sets of their in-house teams with implementation resources from an ERP vendor or consulting company that could provide the required knowledge and skills. Sumner (2000) stated that the lack of expertise such as user experience, application-specific knowledge, and development capability contributes to ERP implementation risk.

ERP implementing companies usually do not have all the knowledge about the ERP software and its implementation. So, it is crucial that external ERP supports are provided during and after the implementation. Ranzhe and Xun (2007) confirmed that the vendor's employees are required to be knowledgeable in both ERP software functions and the

business processes of the ERP adopting company. Davenport (1998) claimed that it is of great importance that the ERP vendor has a good partnership with the ERP implementing company. This mutual relationship should be of a strategic nature where the ERP vendor improves a company's efficiency and competitiveness. A close working relationship between the firm's ERP project team and the ERP vendor's staff can lead to precious knowledge transfer in both directions (Ifinedo, 2008; Wang & Chen, 2006).

Implementing ERP software is different from convention information systems implementation because the ERP adopting company may have to transform some processes to align them with the ERP system. So, vast involvement of the ERP vendor is required in the form of training and educating. Training users is crucial for implementing multifaceted ERP systems due to large-scale changes in processes, contents, and job skills. Lack of user training has commonly been referred to as a key reason for ERP implementation failures (Al-Mashari & Al-Mudimigh, 2003). A failure to train and educate all pertinent staff will guarantee ERP implementation problems (Umble & Umble, 2002). Bradford and Florin (2003) confirmed that training ERP users enhances ease of use and reduces the level of user resistance which, in turn, increases the chances of ERP system use and ERP implementation success. Training will help users to take full advantage of the ERP software's capabilities. All ERP system users as well as top managers should be completely educated so that they realize how the ERP software is supposed to be incorporated into the overall organization operation.

2.2.4.7. Organizational Culture

The organizational culture was defined by Johnson and Scholes (2005) as a set of assumptions which is moderately common in a company and exists at the organizational level, and they work well enough to be considered valid. Schein (1992) divided the

organizational culture into three layers. In the inner layer, there are some assumptions which are taken for granted related to the characteristics of organizational life which are difficult for personnel to clarify and remember. In the middle layer, there are some beliefs which are the issues that the company's staffs talk about. In the outer layer, there are some values about the missions, strategies, and objectives of the company. All these cultural issues will nurture the system of company work. Organizational culture also presents people a general structure of orientation for changes in a company. When companies have different cultures, people have diverse opinions and understanding about organizational changes, which consequently influence staffs' willingness to accept changes (Lau & Woodman, 1995). As a result, organizational culture was identified as a critical factor for the success of projects relating to any organizational changes like ERP system implementation. Ke and Wei (2008) claimed that the lack of a match between the organizational culture of a company and the cultural assumptions embedded within an information system can lead to a costly implementation failure. Martinsons and Chong (1999) asserted that "even good technology can be sabotaged if it is perceived to interfere with the established social network" (p. 127). Cooper (1994) recommended that when an information system clashes with a company's culture, either the software will be abandoned or the software will be customized so that it matches the current organizational culture.

Enterprises around the world have various backgrounds and often vary in organizational culture and business requirements, while the beliefs, experiences, and attitudes of managers in a number of developing countries could negatively affect the ERP system implementation (Ngai et al., 2008). In addition, Seddon et al. (2003) claimed that when two organizations implement the exact identical ERP software, the implementation outcomes sometimes are dissimilar. Avison and Malaurent (2007) believed that the culture issues in an organization have a considerable effect on the ERP implementation success. The ERP

implementing company has two choices to bridge cultural diversity. First, the company could change its business process and organizational culture to fit into the ERP software package. Second, the company might customize the ERP software to smooth alignment of the ERP functionality to the company's business requirements. However, organizational culture as a major difference between developed and developing nations has been ignored in previous ERP implementation research (Al-Mashari et al., 2003; Motwani et al., 2002; Yusuf et al., 2004; Zhang et al., 2005).

Organizational culture is useful for understanding the successful implementation of ERP systems (Edwards & Panagiotidis, 2000). Skok and Legge (2002) underlined the importance of organizational culture and stated that ERP implementation problems generally lie in the workers feeling uncomfortable with the process changes and consequent cultural changes involved in ERP implementation. Dong (2001) believed that a company that eagerly accepts innovative models and can learn to adapt to new processes and tools, is able to implement new organization-wide software more successfully. On the other hand, a company that prefers to maintain the status quo and is doubtful about progress cannot implement a new ERP system effectively. The open and innovative organizational culture of a company assists the user involvement during the entire ERP system implementation process. Johnson and Scholes (2005) also confirmed that an organizational culture that encourages innovation and learning can affect the success of an enterprise's information technology innovation. According to Ross and Vitale (2000), "an open and creative culture recognizes employees as the primary source of ideas, actions, and delivery of performance, which results in a stable work environment that reinforces the loyalty of its employees" (p. 236). On the other hand, an organizational culture that does not support information sharing and organizational learning will discourage workers from discussing the likelihood of ERP systems implementation failure.

The relationship between enterprise-wide communication and ERP implementation success is positively moderated by the existence of an open system culture. Nah et al. (2007) confirmed that the complexity of ERP software forces almost all enterprise staff to learn new methods of working and new tools. Open culture in a company can facilitate the learning practices that are essential for ERP implementation success. Open system culture explains the communication environment of a company (Hofstede, 2001). The common style of internal and external communication can help to facilitate effective communication across the enterprise, which is a key to success of ERP implementation. An organizational culture that supports openness in communication helps the organizational learning process, which contributes to the success of ERP system implementation. In addition, a supportive and open organizational culture encourages improved relations and increased communication, which accordingly assist in communicating the multifaceted concepts of ERP systems to the end-users.

Given that the implementation of an ERP system involves substantial changes in the company, it is common that there is confusion, resistance, and errors in the implementing company. As a result, ERP implementation projects often fail to accomplish the projected benefits (Sumner, 2006). It is very important that people are prepared to change and accept a new ERP system (Hong & Kim, 2002). Change management actions are important in the early phases and go on all the way through the adaptation and acceptance stages of ERP implementation (Somers & Nelson, 2004). A result oriented culture which stands changes and mistakes is very essential to avoid resistance to change in ERP implementation (Scott & Vessey, 2002). A result oriented culture and open system also facilitate the carrying out of a project management plan, which supports the learning and changing processes (Hofstede, 2001) and accordingly raises the probability of the ERP implementation success

(Nah et al., 2007). These results confirm studies by the proponents of the learning culture theory (Edwards & Panagiotidis, 2000; Skok & Legge, 2002).

Since the ERP software integrates and brings together the different business departments within a company, ERP implementation teams are cross-functional by necessity. Umble et al. (2003) believed that to make the most of the ERP software, the cross-functional teams working on the ERP implementation project should not only be able to work well together, but also understand and appreciate the special skills and strengths that every member brings to the teams. Employee oriented companies are more expected to facilitate coordination and teamwork among cross-functional team members in an ERP implementation project (Nah et al., 2007).

2.2.4.8. Top Management Support

Top management support has been emphasized as a crucial factor in successful ERP implementation by a lot of researchers (Al-Mashari et al., 2003; Umble et al., 2003; Yusuf et al., 2004; Zhang et al., 2005). Ngai et al. (2008) claimed that there was a consensus of the researchers in every country or region on the significant role of top management support in the ERP implementation success. They concluded that top management support may be independent across countries and regions. Top management support is even more vital in the ERP implementation projects. This is because these projects are large-scale and need a lot of resources for the organization-wide project. The ERP system is required to receive support and approval from top management prior to its implementation (Nah et al., 2001). Top management must be involved in all the processes of the ERP implementation project. Al-Mashari et al. (2003) suggested that top management support should not stop with initiation and facilitation, but it is required to cover the whole ERP implementation process. Top management should look at ERP implementation as a renovation of the

method the organization uses to carry out its business. Top management should be ready to become involved and to assign necessary resources to the ERP implementation project (Holland & Light, 1999). The dedication of valuable resources to ERP implementation provides the useful support that is required to ensure project success (Holland et al., 1999). Davenport (1998) believed that since ERP implementation projects have an effect on various people and departments in a company, senior managers should mediate between different interest groups to resolve potential conflicts.

According to Zhang et al. (2005), top management support has two major aspects in ERP implementation projects: providing the necessary resources and providing leadership. The responsibilities of top management in ERP implementation consist of communicating the company strategy to all staff, developing an understanding of the restrictions and abilities, demonstrating commitment, and establishing rational objectives for implementing the ERP system (Umble et al., 2003). Moreover, top management should supervise the ERP project progress and present direction to the ERP implementation teams. Willocks and Sykes (2000) pointed out that top level championship, sponsorship, participation, and support is one of the critical facilitating factors in ERP project success. The senior executives must offer sincere, public, and clear support for the ERP implementation to highlight the priority of the project. A top management commitment that is very evident and sensible is a confident method to guarantee successful ERP implementation. Without clear commitment and leadership from top management, employees will find out ways to sustain the status quo, and the investment in the new ERP system will be wasted accordingly (Umble & Umble, 2002).

2.2.4.9. Change Management Programme

Change management is a major concern of various companies involved in ERP system implementation (Aloini et al., 2007; Babu & Dalal, 2006; He, 2004; Shanks et al., 2000; Somers & Nelson, 2001; Pan, Hackney, & Pan, 2008). The successful implementation of an ERP system requires strategies for change management (Mandal & Gunasekaran, 2002; Motwani, Akbulut, Mohamed, & Greene, 2008). ERP system implementation needs a culture with a strong company identity and a common value that is encourages change. Wood and Caldas (2001) stressed that an ERP implementation project should be looked upon as a change management programme not as an information system project. ERP system implementation requires adopting companies to change the way they do their business and also necessitates the users to change the ways they do their jobs (Davenport, 2000). So, once there is a need for more changes, there will be a need for more employees and top management support (Falkowski, Pedigo, Smith, & Swanson, 1998). An ERP implementation team is needed to properly provide a change management plan (Nah et al., 2001) and be aware of the implications of the ERP project (Bingi et al., 1999). Markus et al. (2000) mentioned that there are many issues associated with change that might ruin ERP implementation, and that these problems are required to be handled in the early stages of an ERP project. Top management should look at organizational issues that may threaten ERP project success like a culture that is resistant to change or a group of managers who do not support the objectives of the ERP implementation project. However, to guarantee ERP implementation success, Markus et al. (2000) recommended that top management must address these problems by integrating them into a change management programme.

Resistance to change is one of the major obstacles usually facing ERP implementation projects. Change management involves the successful balancing of forces in favor of a change over resistance forces (Ngai et al., 2008). In ERP implementation projects,

organization-wide structure change including enterprise, people, and culture change must be managed (Rosario, 2000). Esteves-Sousa and Pastor-Collado (2000) found that an effective change management plan should involve the combination of technology, process, and people. The change management project programme guarantees that the end-user community accepts the new ERP system. Jarrar, Al-Mudimigh, and Zairi (2000) observed that ERP implementation success is often dependent on the end users' readiness to become accustomed to the changes in business processes brought about by ERP system implementation. As a result, an important task in change management is to make a positive user attitude and user acceptance of the ERP project (Abdinnour-Helm, Lengnick-Hall, & Lengnick-Hall, 2003; Holland & Light, 1999; Kumar et al., 2002). This could be realized by informing the users about the need for an ERP system and its subsequent benefits (Mandal & Gunasekaran, 2002; Somers & Nelson, 2001; Ross & Vitale, 2000). User participation in the implementation of the ERP system and new business processes and presenting formal training and education help ERP users to comprehend how the ERP system will influence their jobs (Bingi et al., 1999; Holland et al., 1999; Shanks et al., 2000). Another important issue to build user acceptance could be getting the opinion leaders' support all over the organization (Aladwani, 2001). The ERP team manager is also needed to effectively negotiate among diverse business departments (Parr & Shanks, 2000; Skok & Legge, 2002).

2.2.4.10. User Training and Education

Training and education are critical for complex information systems like ERP, particularly with large-scale changes in business processes and job descriptions (Bradley, 2008; Bueno & Salmeron, 2008; Correa & Cruz, 2005; Ferratt, Ahire, & De, 2006; Zhang et al., 2005). To take full benefit of the ERP system's facilities, all users must be trained.

Many much of the research carried out in different countries and regions has pointed out that ERP system users need education and training (Ngai et al., 2008). Training and educating ERP users are both absolutely essential since ERP software is not easy to use even for highly educated people with excellent IT abilities (Umble et al., 2003). According to Zhang et al. (2003), the main reason for training and educating is to enhance the level of the ERP users' knowledge and proficiency. Nah et al. (2003) recommended that sufficient training can increase the probability of ERP system implementation success, while the lack of appropriate training can discourage ERP system users. Adequate education and training in the ERP system assists the company to build positive feelings towards the system and can aid all ERP users in adjusting to the organizational change. The education and training allow ERP users to realize the general concepts of the ERP system and they ensure user acceptance and also readiness to employ the system. In addition, training increases ease of use and reduces user resistance which, in turn, enhances the likelihood of ERP systems use and success (Bradford & Florin, 2003; Bradley, 2005). On the other hand, lack of user training has often been mentioned as a main reason for ERP implementation failures or problems (Al-Mashari & Al-Mudimigh, 2003). Implementing an ERP system without enough end-user training may possibly have drastic consequences (Somers & Nelson, 2001).

The aim of ERP education and training is to provide employees and management with the overall concepts of the ERP system (Mandal & Gunasekaran, 2002; Yusuf et al., 2004). ERP training and education should be permanent, based on knowledge transfer principles, and handle all features of the ERP system (Davenport, 1998). All of the ERP system users as well as top managers should be completely educated so they comprehend how the ERP system should be incorporated into the overall enterprise operation. Robey, Ross and Boudreau (2002) stressed that the main purpose of ERP training must be the effective

understanding of the different business processes embedded in the ERP system. The training and education programme should commence with the ERP project team, senior management, and finish with the end users. Furthermore, the different users and each level in the project group need diverse training. For instance, the ERP end users need to learn those functions that are associated with their occupations. The ERP project team should have a comprehensive understanding of the system's functionality. The steering committee members are required to obtain a general idea of the system's functionality.

2.2.4.11. Business Plan and Vision

A clear business plan and vision are required to guide the ERP implementation project (Al-Mashari et al., 2006; Loh & Koh, 2004; Mabert et al., 2003; Nah et al., 2001; Ngai et al., 2008; Ramayah, Roy, Arokiasamy, Zbib, & Ahmed, 2007). Al-Mashari et al. (2006) proposed that the main rationales for implementing ERP systems are to handle difficult business processes and to improve efficiency, productivity, and profitability. To guarantee that these goals are achieved, the top management of the ERP adopting company should develop in-depth project requirements which fit within the strategic direction of the organization. Setting a business vision and developing project plans that integrate enterprise goals are very crucial. As such, Markus et al. (2000) claimed that organizations that do not plan their ERP project accurately to get business outcomes at project initiation cannot achieve them by the end of project. A lot of ERP system implementations have failed due to lack of obvious plans (Nah et al., 2003). The most important phase of any ERP project should start with a conceptualization of the goals and feasible methods of realizing these goals. Moreover, the ERP project goals should be clarified so they are operational and specific, to specify the general guidelines of the project (Somers & Nelson 2004).

Given that the ERP system projects usually go beyond the time schedule, clear goals, a business plan, and vision are required to guide the implementation process (Nah et al., 2003). Rosario (2000) and Buckhout et al. (1999) also highlighted that ERP system implementation needs a clear business plan and vision to steer the project direction. Shanks et al. (2000) pointed out that the ERP business plan should summarize the anticipated tangible and strategic benefits, resources required, and costs and risks involved in the implementation of the ERP system. Holland et al. (1999) explained the need for measurable and identifiable benefits or goals, and the need for an obvious business model of how the ERP implementing company should manage behind the ERP project. Such benefits or goals must be clearly described and well understood (Shanks et al., 2000). Achieving stated benefits or goals is crucial to maintaining organizational commitment to ERP system implementation.

A clear vision helps the ERP adopting company to set the priorities correctly and to develop and complete a well-organized business plan (Buckhout et al., 1999). The firm's vision and the strategy that result from this vision should be translated into tangible priorities and after that it should be determined how the ERP system implementation will facilitate the organization to deliver these priorities. Having an understandable list of priorities is an essential subject in ERP system implementation. One of the main problems an ERP project manager faces comes from the expectations of key stakeholders, senior staff, and also board members. Zhang et al. (2003) proposed that the vision/ goals/ justification should be clearly stated in the business plan, including a clear statement of the ERP project mission and goals and reasons for the investment that should be linked to business requirements.

2.2.4.12. Software Analysis, Testing and Troubleshooting

Many prior studies confirmed that software analysis, testing and troubleshooting play a critical role in successful ERP implementation (Al-Mashari et al., 2003; Al-Mashari et al., 2006; Finney & Corbett, 2007; Gargeya & Brady, 2005; Nah et al, 2001; Ngai et al, 2008). ERP systems are required to be incorporated into the adopting company to have the full benefit of implementation. However, the integration of the ERP system is very difficult and should be managed appropriately (Bingi et al., 1999). Additional software may need to be analyzed and developed to combine the ERP systems and the company legacy systems. In addition, testing and troubleshooting of software is needed to make sure that the ERP system operates according to plan. Taube and Gargeya (2005) observed that the ERP adopting organizations, which provide sufficient testing and troubleshooting, experience successful implementation. Validation and Testing of ERP software are very essential to guarantee that the business process configurations are realistic and the ERP system works technically. A significant test of an ERP implementation project is whether the processes represented in the ERP software really match the business processes occurring in the company (Apperlrath & Ritter, 2000).

Troubleshooting for handling ERP system errors is primordially important. Scott and Vesey (2000) suggested being flexible in ERP system implementation and learning from unexpected situations. Likewise, Mandal and Gunasekaran (2002) recommended that the ERP implementing companies should get ready to handle unpredicted emergency conditions. The need for troubleshooting expertise is a continuous requirement of the ERP implementation projects (Al-Mashari et al., 2003; Holland & Light, 1999; Nah et al., 2001). ERP adopting companies have to work closely with ERP consultants and vendors to settle implementation problems (Holland & Light, 1999). Rosario (2000) proposed that quick response, perseverance, endurance, and problem solving capabilities are essential to handle

any ERP implementation troubleshooting. Therefore, practical collaboration with consultants and vendors is required to conduct troubleshooting.

2.2.4.13. Project Champion

The project champion is one of the most important factors in ERP implementation projects (Bradley, 2008; Colmenares, 2004; Garcia-Sanchez & Prez-Bernal, 2007; Guang-hui, Chun-qing, & Yun-xiu, 2006; Remus, 2007; Sedera & Dey, 2006; Shanks et al., 2000). The project champion has assisted a lot of successful ERP implementation projects (Parr & Shanks, 2000). Project champions play a significant role in the ERP system implementation and also in managing organizational change. The success of technological innovations such as ERP systems has often been associated with the attendance of a champion, who carries out the critical functions of change leadership and marketing the ERP system to all of the stakeholders (Somers & Nelson, 2001). Shanks et al. (2000) noted that the project champion should perform as a sponsor for the ERP system who is promoting the new system benefits. The project champion is supposed to be a high-level manager sponsor who has the authority to support the ERP implementation project all over the enterprise (Sumner, 2006). One evident place to look for such a champion role is with the chief information officer, chief executive officer, or vice president in charge of information technology (Willcocks & Sykes, 2000). Project champions should understand the business and organizational environment as well as the ERP system. The project champion should possess strong leadership skills, and technical, business, and managerial abilities (Mandal & Gunasekaran, 2002). Project champions should possess the role of change supporter over the ERP implementation project. Additionally, project champions must try to manage user resistance (Loh & Koh, 2004). Since, ERP team members usually work for long hours and

do overtime, the project champion is supposed to motivate them during the implementation project (Nah et al., 2003).

2.2.4.14. Careful Selection of ERP Software

Another critical factor in the successful implementation of an ERP system is the careful selection of ERP software (Al-Mashari et al., 2003; Aloini et al., 2007; Chen & Liu, 2008; Somers & Nelson, 2004; Pan et al., 2008; Umble et al., 2003; Yusuf, Gunasekaran, & Wu, 2006). The selection of a suitable ERP system is a time-consuming and difficult practice (Al-Fawaz, Al-Salti, & Eldabi, 2008). Wei et al. (2005) claimed that there is no particular ERP software that can offer all the functionalities needed for the business. Different ERP software exists in the IT market with diverse designs but similar functionality. According to Swan, Newell, & Robertson (1999), there are conflicting interests between ERP system vendors who develop their general ERP software to suit a range of business sizes and types and ERP adopting enterprises who want ERP software which matches their exclusive environment. In fact, ERP software developers make assumptions about best business practices and management philosophy, and design their packages to deal with general conditions. However, it should be considered that there may be no typical companies in the real world. A number of the biggest ERP implementation failures have taken place because the system's capabilities are incompatible with the firm's business procedures and processes (Umble & Umble, 2002). As a result, an organization must select an appropriate vendor that is able to supply a flexible ERP system.

Previous scholars attempted to identify significant principles that must be taken into account when choosing ERP software. For instance, Everdingen et al. (2000) emphasized that the ERP software selected should be matched with the majority of the current business processes of the adopting organization. ERP software that is not developed to meet the

particular business requirements of the organization can cause great trouble (Umble & Umble, 2002). In addition, the ERP package must be easy to implement, user-friendly, and flexible. Other research by Sprott (2000) recommended that applicability, adaptability, upgradeability, and integration are critical issues in ERP system selection. Davenport (1998) proposed that the ERP system should match the overall business strategy of the ERP adopting company. According to Bingi et al. (1999), ERP adopting companies must consider "the vendor's market focus, track record with customers, vision of the future, and with whom the vendor is strategically aligned" (p. 13).

2.2.4.15. Use of ERP Consultant

Employing an ERP consultant as part of the implementation project and team has been seen as one of the critical success factors of ERP implementation (Al-Mudimigh et al., 2001; Ferratt et al., 2006; Finney & Corbett, 2007; Gargeya & Brady, 2005; Grabski & Leech, 2007; Motwani et al., 2002; Wang et al., 2008). Since ERP software implementation is extremely complex, the adopting organization will face many problems without the assistance of external knowledge (Robey et al., 2002). Davenport (2000) believed that the consultant's support in an ERP project is much more needed than in other information system projects because ERP implementation involves a broad sort of expertise that comprises technical implementation knowledge, risk management, change management, as well as business process reengineering. Accordingly, competent consultants are necessary during the ERP system implementation (Skok & Legge, 2002; Somers & Nelson, 2001).

Consultants usually play key roles by presenting requirements analyses, suggesting suitable ERP software solutions, and managing the overall ERP implementation project (Somers & Nelson, 2004). Furthermore, Volkoff and Sawyer (2001) stated that ERP consultants carry out a variety of responsibilities in the ERP adopting company, which may

consist of mobilizing diverse proficiencies, providing required and related knowledge, supporting the ERP configuration, deriving value from the ERP system, and resolving potential problems. However, the success or failure of the ERP implementation project depends on the required knowledge transfer between consultants and internal staff and how well the implementing company can manage the consultants (Bingi et al., 1999). A close working relationship between the ERP project team and the consultants can lead to valuable knowledge transfer in both directions (Willcocks & Sykes, 2000). Lastly, Wood and Caldas (2000) recommended that ERP adopting organizations must not entirely rely on consultants because consultants also have limited knowledge of the firms' business operations.

2.2.4.16. Appropriate Business and IT Legacy Systems

Appropriate business and legacy systems have been supported as one of the critical factors in successful ERP implementation (Al-Mashari et al., 2006; Finney & Corbett, 2007; Huang et al., 2004; Nah et al, 2001; Ngai et al., 2008; Sedera & Dey, 2006). According to Holland and Light (1999), legacy systems summarize the current information technology, business processes, and corporate culture and structure. They believed that present legacy systems have to be carefully determined and assessed to identify the scale and nature of potential problems that a company could face through the ERP implementation process. Nah et al. (2003) pointed out that it is essential to assess the existing legacy system since more complex and greater legacy systems need more organizational and technological changes through the transitional phase of the ERP implementation project. They affirmed that an ERP implementation project could be successful if the adopting company overcomes problems of complexity arising from IT and business legacy systems. Moreover, Holland and Light (1999) recommended that while existing systems of company are very complex, then the amount of organizational and

technical changes required is expected to be high, and vice versa. In fact, the problem of legacy systems is that the majority of companies keep the data across a number of separate computer systems in different departments, regions, offices or factories. Every one of these legacy systems will possibly supply important support for a specific business task. Nevertheless, when they are going to be integrated, they demonstrate one of the most serious obstacles to the company's performance and productivity (Davenport, 1998). For that reason, it is very important that a company should move towards the change of legacy system cautiously and, most importantly, with an inclusive plan.

2.2.4.17. User Involvement

User involvement and participation have been highlighted as a significant success factor in ERP implementation projects (Abdinnour-Helm et al., 2003; Aloini et al., 2007; Amoako-Gyampah, 2007; Hsu, Lai, & Weng, 2008; Pan et al., 2008; Sawah et al., 2008). User involvement refers to participation in the ERP implementation project by representatives of the user community. ERP user involvement is necessary because it advances supposed control during the entire ERP system implementation process. User involvement enhances user acceptance and satisfaction by developing reasonable beliefs about the capabilities of the ERP system (Esteves-sousa et al., 2003). User participation allows the ERP project team to be aware of user requirements and, therefore, respond to the user's alarms. Zhang et al. (2003) believed that when a company makes a decision to implement an ERP system, the users can be involved in the definition phase of the firm's ERP system requirements, and also in the implementation of ERP systems. When a user participates in the ERP implementation process, the user can comprehend the new system faster and present his opinions. Using this technique enables the user to deal with the ERP software and can also narrow the gap between the new and old systems. Furthermore, the

user realizes some of the ERP ideas earlier and accordingly the subsequent training will be accepted with no trouble. The qualified users who participate in ERP system implementation can communicate with the newcomers as well. Moreover, involving a number of users in the early stages of ERP adoption will facilitate internal training. In the long run, the ERP user company may not be able to rely on vendors or consultants due to the expensive training and consulting rate. In this case, early involved users can be employed to train other new ERP users (Abdinnour-Helm et al., 2003). Finally, users can be involved in the process of ERP system selection. This kind of user participation is encouraged because it guarantees that the user's needs are met and it increases user commitment to the ERP implementation project.

2.3. ERP Implementation Success

Information system success is one of the most discussed ongoing research issues in the IS field (DeLone & McLean, 1992). The measurement of IS success is important in accepting the effectiveness and value of IS investments as well as IS management achievements (DeLone & McLean, 2003). The meaning of IS implementation success might be different from one condition to another and from one person to another as well. DeLone and McLean (1992) stated that there are almost as many measures of IS success as there are research. Gable et al. (2003) believed that the subject of IS has been investigated for more than 30 years, from the initiation of the field of IS study. After almost three decades, the topic of IS success keeps on attracting researchers. Previous studies have dealt with the clarification of IS failure and success, the antecedents of IS success, and the measurement of IS success. Nevertheless, the question of IS success has come up again with several new sorts of information systems such as the ERP system. Since ERP systems have enterprise-wide impact, academics and practitioners are still struggling with the issue

of determining the constructs which could best represent ERP system success (Wang & Chen, 2006). A number of researchers concluded that research studies on the evaluation of ERP systems success in adopting companies are just beginning to emerge (Chien & Tsaur, 2007; Gable et al., 2008).

Many stakeholders are involved in information system implementation with different definitions of system success. Information system projects have usually been criticized for unsatisfied user requirements and budget overruns. So, from an end user's viewpoint, a successful IS could be one that improves the user's job performance. From an innovator's standpoint, a successful information system is one that attracts a large, reliable, and increasing group of users. From an IS developer's point of view, successful IS implementation may be one that is finished under budget and on time as well as providing an inclusive set of features that are consistent with the users' required specifications. Lastly, from a management outlook, IS implementation success might be one that decreases ambiguity of results and runs accordingly lower risks, and controls limited resources. Based on the earlier discussion, researchers have proposed a great number of information system success criteria. A lot of IS success measures have been empirically tested, consisting of user information satisfaction, system quality, IS usage, quality of decision making, and productivity from a cost/benefit point of view. Saarinen (1996) presented four metrics for evaluating system success. The success measures comprised satisfaction with the IS development procedure, satisfaction with the quality of the information system, satisfaction with IS usage, and the organizational impacts of the IS. Information system success could be measured at different levels. For instance, a number of studies recommended three major levels including the organizational level, the individual level, and the system and process level (Garrity & Sanders, 1998).

One of the most significant and best-known IS success models is the DeLone and

McLean (1992) model. Their success model has been accepted in the field of IS due to its insight and comprehensiveness. DeLone and McLean (1992) suggested an interactive model and taxonomy as the structure for conceptualizing IS success, which is demonstrated in Figure (2.4). According to the DeLone and McLean IS success model, both system quality and information quality affect use and user's satisfaction, which, in turn, influence individual users and the organization. In their IS success model, systems quality evaluates technical success, information quality assesses semantic success and use, user satisfaction, individual impacts, and organizational impacts determine effectiveness success.

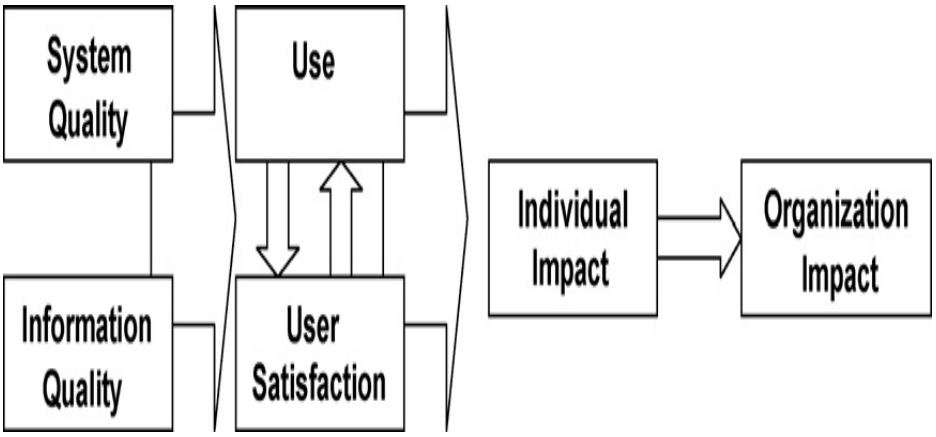

Figure (2.4) Information System Success Model

(Source: DeLone & McLean, 1992)

DeLone and McLean analyzed prior studies and proposed six dimensions to assess the success of information systems, namely system quality, information quality, system use, user satisfaction, individual impact and organizational impact. These six dimensions are described in greater detail as follows: System quality represents system performance such as data accuracy, response time, system efficiency, and so on. Information quality denotes aspects of the quality of the information system itself like relevance, currency,

completeness, and reliability. System use refers to the frequency of IS usage which examines items such as frequency of access to the system, the number of functions used, and the amount of connecting time by users. User satisfaction verifies the satisfaction level of the system users, comprising interface satisfaction, overall satisfaction, etc. Individual impact refers to determining the impact brought about by the information system on users, like changes in the decision model, decision-making, and productivity. Organizational impact requires the evaluation of the changes caused by the IS to the organization, such as decreases in operating costs, savings in labour costs, and growth in profits.

Seddon and Kiew (1994) suggested replacing system use with usefulness because they believed only voluntary system usage can affect user satisfaction. Since system use was deemed more of an attribute of user behaviour than a measure of system success, they revised the DeLone and McLean model by placing system use outside the system success model. Moreover, Seddon (1997) employed theoretical concerns to amend DeLone and McLean's (1992) success model. He distinguished between expected system impacts and actual system impacts, and included perceived usefulness as a new construct of system success. In addition, he found that system use in the DeLone and McLean success model has three likely meanings: a proxy for benefits, behaviour, and an incident in a process leading to individual or organizational impact. Seddon (1997) considered system use as behaviour that reflects an anticipation of net benefits from using the system. In sum, Seddon (1997) proposed a success model for information systems, which included three kinds of constructs, i.e. measures of system and information quality, system use as behaviour, and measures of net benefits from system use. In another study, Rai et al. (2002) constructed their system success model based on DeLone and McLean's (1992) and Seddon's (1997) success models. They looked at perceived usefulness as being associated with individual impacts, such as improved individual productivity. Rai et al. (2002)

concentrated on the five constructs of information quality, system quality, user satisfaction, perceived usefulness, and system use and represented system use and system quality in terms of system dependence and ease of use, respectively.

The main reason for the original DeLone and McLean (1992) success model was to combine prior research on IS success into a more consistent body of knowledge. During the last decade of the twentieth century, the role of information systems improved and changed. Likewise, academic investigation interested in IS success also advanced over the identical period. Therefore, in response to the developments in information system applications, DeLone and McLean (2003) updated their original IS success model and presented a new version, as shown in Figure (2.5).

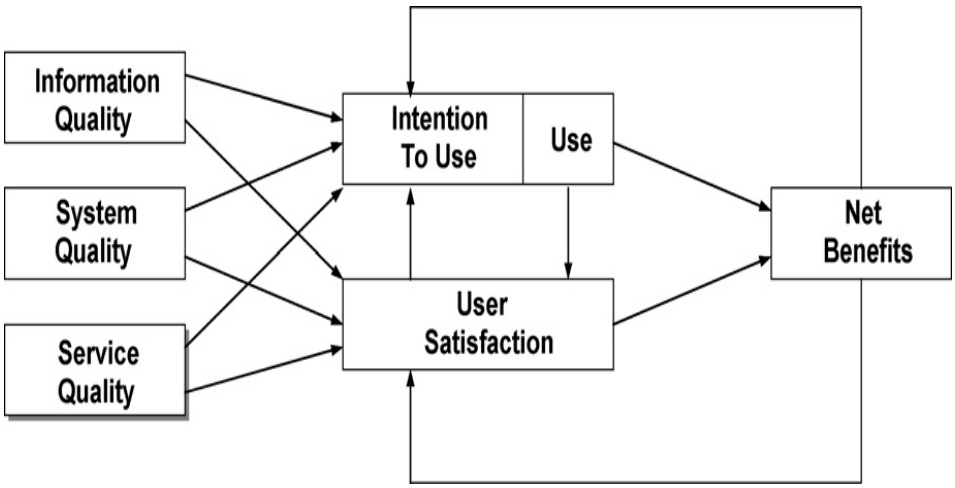

Figure (2.5) Updated DeLone and McLean Success Model

(Source: DeLone & McLean, 2003)

There were some changes in the updated success model in comparison with the former IS success model. Service quality was included in the IS success model and the organizational impact and individual impact were merged into one single new variable named net benefits. DeLone and McLean (2003) believed that an information system is

supposed to present users with information products as well as meeting users' flexible information requirements. So, they added service quality to the new success model to measure the service-level success because system quality focuses more on technology-level measures. Furthermore, DeLone and McLean (2003) recommended that intention to use can be accepted as an alternative measure for IS use in certain contexts. In addition, it is very hard to explain the multi-dimensional characteristics of system use such as voluntary or mandatory use, effective or ineffective use, informed or un-informed use. So, DeLone and McLean (2003) suggested that certain net benefits can take place as a result of intention to use or system use and user satisfaction. DeLone and McLean (2003) emphasized that net benefits are the most critical measures of success since they represent the balance of positive and negative impacts of the IS on enterprise. Although negative net benefits can reduce user satisfaction and intention to use the system, positive net benefits may possibly encourage the intention to use the information system and increase user satisfaction.

2.3.1. Content Analysis of ERP Implementation Success Measures

The definition and measurement of ERP system success are complicated topics (Markus et al., 2000). ERP implementation success depends on the viewpoint from which people evaluate it. ERP implementation consultants and ERP project managers often identify ERP project success in terms of finishing the project within budget and on time. ERP system users usually judge ERP success by having smooth operations with the system. Finally, top managers believe that an ERP system is successful when the company achieves business improvements and other predetermined goals (Somers & Nelson, 2004; Zhang et al., 2005). Previous researchers have utilized diverse criteria to measures ERP implementation success while they have been fragmented in diverse areas. Some of the researchers have employed one, two or more dimensions of the DeLone and McLean (1992; 2003) success

models for their investigations. Other researchers have utilized the Technology Acceptance Model (TAM) for their study. A number of other researchers have applied project management related measures such as time and budget. Several researchers have utilized user satisfaction as a single measure of ERP implementation success. Finally, many of the researchers in the field have used a mixture of measures in their research. Zhang et al. (2005) claimed that the majority of studies cited in the literature have used only one or two surrogates of ERP implementation success and it seems that there are no agreed measures to define ERP implementation success.

Given the great diversity in ERP success measures in the literature, this section underscores every potential reference to ERP success to achieve a deeper understanding of the various success measures of ERP implementation previously recognized. Since the rationale of this section was to reach a depth of understanding of the diverse success measures already recognized by other researchers, 'content analysis' was utilized as a suitable analytical approach. Kelle (2000) stated that content analysis is the comparison of different pieces of data in order to find commonalities, differences or linkages between data. The content analysis method was adopted as described in section (2.2.1) earlier.

There were two main streams in the literature for measuring ERP success. Some prior studies utilized objective organizational measures like company cost and/or profit figures as ERP success measurement items. However, a lot of researchers utilized self-reported subjective measures for ERP success. Wu and Wang (2007) stated that "although it may be more desirable to measure system success in terms of monetary costs and benefits, such measures are often not possible due to the difficulty of quantifying intangible system impacts and also isolating the ERP effect from numerous intervening environmental variables that may influence organizational performance is impossible" (p. 1583). This fact has been confirmed by several other studies (Calisir & Calisir, 2004; Chien & Tsaur, 2007;

DeLone & McLean, 1992; Jacobs & Bendoly, 2003; Kennerley & Neely, 2002). Return on investment (ROI) does not quantify intangible costs and benefits. Traditional ROI estimates report just two sorts of quantifiable paybacks of information systems i.e. new revenue generated and dollars saved. ROI pays no attention to non-dollar based metrics such as faster time to market of new services and products and also improvements in the level of customer satisfaction (Chien & Tsaur, 2007). Traditional models have not considered competitively important benefits like improved sales effectiveness, faster and better decision-making, greater productivity, and organizational flexibility to react to fast changing business (Calisir & Calisir, 2004). On the other hand, after ERP implementation is completed, the anticipated return may not come as soon as desired. According to Stein (1999), the majority of the ERP systems illustrated negative ROI for the first five years that they were in service. Just after the first five years of ERP use, a firm could begin to expect steady returns but not in the conventional form of revenue. Hitt, Wu, and Zhou (2002) also found that for companies that invested in ERP systems, their business performance and productivity suffer somewhat shortly after implementation. However, usual investment analysis criteria and techniques such as the payback period, return on investment, or cost-benefit analysis could not be appropriate for information system success measures due to the unique nature of IS investment. Instead, subjective judgment and surrogate measures complement such evaluation (Saarinen, 1996). So, in this study only non-financial success measures are considered.

In the data collection phase, the search was restricted to only those articles that were published in the last ten years, i.e. between 1999 and 2008. Several articles were ignored due to their being excessively ‘financial’ or ‘non perceptual’ and thus unrelated to the study objective. Moreover, some researchers had employed the same success measure in their different articles. So it was decided to consider just their most recent article. Finally, 52

articles were selected based on the aforesaid criteria. The success measures which have been employed by each of these 52 articles are presented in Appendix (B).

In the first round of content analysis, 52 articles were read one by one to investigate the concept of ERP implementation success. The emphasis was placed on the dependent variable(s) in each article. As the articles were reviewed, success measures emerged. Using the constant comparative method, a list of success measures and a brief description of them were prepared on separate sheets. This provided a 'success measure index'. Finally, an initial list of 18 success measures was identified.

In the second round of content analysis, the 18 success measures and their descriptions were reviewed and checked again. Different categories have been used for success measures in the literature. In fact, some of the success measures were presented in a combined format. For instance, while some researchers employed 'within time and budget' as one measure, others employed 'on time' and 'within budget' as separate success measures. Consequently, it was decided to break down the success measures into subparts to have a clearer success measure. Therefore, new success measures emerged in this part. Finally, the primary list of 18 success measures was re-categorised into 25 success measures.

In the third round of content analysis, comparison between success measures was made and contrasts between the measures were identified. Furthermore, 'related concepts' were considered, which were similar to the main concept and, in some cases, even alike other than by name. An example concerned the terms 'system quality', 'system functionality', and 'system capability', which had a similar meaning in the IS field and which were placed within the same category. As another example, a wide range of terms and phrases such as behavioural intention to use ERP system, Intention to use ERP system, User's attitudes towards ERP, ERP assimilation, Actual ERP Usage, ERP system usage, ERP systems

utilization, System use, and Organizational adoption of ERP systems were classified into one category, named, 'ERP Usage'. Moreover, 'opposite concepts' that were similar or identical to the focal concept but inversely defined were considered. For instance, 'Within budget' had an opposite concept in the literature by the name of 'Cost overrun'. Finally, all 25 success measures were re-arranged into 11 distinct categories of success measures. The final compilation of ERP implementation success measures can be seen in Table (2.12).

Furthermore, the review of the literature illustrated that there have been five main streams for measuring ERP implementation success which are discussed in following paragraphs:

First, some of prior ERP success research concentrated on measures relating to project management success like 'time, budget and predetermined goals' (Fuß, Gmeiner, Schiereck, & Strahringer, 2007; Hong & Kim, 2002; Kamhawi, 2007; Mabert et al., 2003; Peslak, 2006; Sun, Yazdani, & Overend, 2005). Parr and Shanks (2000) believed that successful implementation of an ERP system means finishing the project within the predetermined and projected time schedule. According to Markus and Tanis (2000), business managers tend to focus on project measures such as shortened period to implement because anything that takes more extended time costs more. The majority of ERP implementation projects are initiated with a force from top management to target a faster time and more cost-effective project. However, there have been some critics of the project management related measures. Zhang et al. (2005) believed that even if ERP system implementation exceeds the contracted delivery time and budget, firms may still think their ERP implementation is a success. The project management view of success is normally attributable to the contractor and does not consider success from the perspective of other project elements (Turner, 1999). Jarrar et al. (2000) stated that ERP implementation success is much more than finishing the project on budget and on time. They suggested that ERP

Table (2.12) Compilation of Success Measures for ERP Implementation

No.	ERP Success Measures
1	**Organizational Impact** Business performance improvement / Intended business performance improvement / Organizational business improvement / Organizational improvement / Organizational impact / Organizational performance / Perceived organizational performance / ERP effectiveness / Net benefits / Net value (from business view) / Perceived business value
2	**ERP User Satisfaction** User Satisfaction / ERP end-user satisfaction / ERP user satisfaction / Key-user satisfaction / Overall satisfaction of ERP system / End-User Computing Satisfaction / Users' level of satisfaction with system / Match user's expectations / Meeting users' expectation
3	**ERP Usage** Behavioral intention to use ERP system / User's attitudes towards ERP / Actual ERP Usage / ERP system usage / ERP systems utilization / ERP Usage intention / Intention to use ERP system / System is being used by its intended users / System use / Organizational adoption of ERP systems / ERP assimilation and usage
4	**ERP Project Schedule** On time / Within time / On time project completion / Project completion time (relative to schedule) / Actual scope of implementation with respect to the planned implementation / Actual duration with respect to the assumed duration / Meeting project deadlines / Meeting project time / On schedule / Schedule overrun / Timing of ERP implementation
5	**ERP Project Budget** Within budget / Project cost (relative to budget) / Staying within the expected budget / Staying within the expected cost / Cost overrun / Financial budget with regard to the planned budget / On budget / On budget project completion
6	**ERP Project Goals** Achieving expected strategic business goals / Achieving planned objective / Achievement of project goals / Predetermined corporate goals / Pre-determined goals / Meeting the overall goals of the organization / Degree of expected objectives met / Expected benefits / Achieving the expected level of system performance
7	**System Quality** System Quality / Providing necessary functionality / Obtaining the expected functionality / Expected capability of ERP
8	**Individual Impact** Individual impact / Individual performance / Benefit of use (from user view)
9	**Information Quality** Information Quality
10	**Service Quality** Service quality
11	**Workgroup Impact** Degree of integration among departments / Workgroup impact

implementation success should be measured on a superior level such as impacts of the ERP system on the employees, product, and processes of a company. In summary, the ERP implementation project may seem successful if the budget/ time constraints have been met; yet the ERP system may be an overall failure, or vice versa. So, these conventional measures of ERP project success are simply incomplete and probably could mislead the evaluators when utilized in isolation (Shenhar & Levy, 1997).

Second, a number of ERP implementation success studies have been conducted using the single success measure of 'User Satisfaction' (Calisir & Calisir, 2004; Chen & Liu, 2008; Grabski & Leech, 2007; Holsapple et al., 2005; Law & Ngai, 2007; Somers, Nelson, & Karimi, 2003; Wu & Wang, 2007). User satisfaction is one of the most broadly used elements for evaluating information systems success with a sound uniform instrument (Sedera & Tan, 2005). Somers et al. (2003) adopted the end-user computing satisfaction instrument posited by Doll and Torkzadeh (1988) to determine end-user satisfaction with ERP systems. They found reliable user satisfaction dimensions, including ease of use, content, format, accuracy, and timeliness. The first element assesses the user-friendliness of the ERP system. The remaining four aspects relate to the usefulness of ERP software. The results of Somers et al.'s (2003) study confirmed that the end-user computing satisfaction instrument maintains its stability when applied to users of ERP software.

Third, a number of prior ERP researchers have employed all or some of dimensions of DeLone and McLean's (1992; 2003) success models for their investigations (Bernroider, 2008; Bradford & Florin, 2003; Chien & Tsaur, 2007; Correa & Cruz, 2005; Fan & Fang, 2006; Gable et al, 2003; Häkkinen & Hilmola, 2008; Hsu et al., 2008; Ifinedo, 2008; Yang & Wei, 2006). DeLone and McLean (1992) proposed six interdependent measurements of success: system quality, information quality, use, user satisfaction, individual impact and organizational impact. DeLone and McLean (2003) proposed a new measurement, service

quality and altered their model so that individual impact and organizational impact were combined into the new variable, net benefit. Zhang et al. (2005) argued that the variables of system quality and information quality should be changed significantly considering the particular condition of a mature ERP system implemented in companies. Therefore, care should be taken when using such measures of DeLone and McLean's success models for evaluating ERP implementation success. They believed that ERP systems are very reliable and mature because these software packages have been designed and developed for many years and also used in many companies. Information quality refers to the product of an information system in DeLone and McLean's (1992; 2003) success models. However, in the ERP software, only when the input data are accurate can the end users obtain correct output information. Xu et al. (2002) also confirmed that the integrity of raw input data in information quality affects the ERP system implementation outcome. Besides, given that an ERP system is utilized in companies' daily operations, it is expected that the information output is timely.

Fourth, the Technology Acceptance Model (TAM) was developed by Davis (1986) and tests the users' behaviour towards the information system, based on the perceived ease of use, perceived usefulness, attitude towards use and behavioural intention to use. DeLone and McLean (2003) stated that no system use is completely mandatory. While using an information system may be mandatory at one level, the constant use of the system will possibly be totally voluntary. However, ERP usage is often not voluntary (Chang, Cheung, Cheng, & Yeung, 2008), being mandated by management (Zhang et al., 2005). Whether the system is good or not and whether the user likes it or not, there is no choice. So 'ERP usage' is unsuitable for measuring ERP implementation success (Gable et al., 2003; Ifinedo, 2007; Yu, 2005). In addition, 'Usefulness' should be the first must for any ERP system in that the ERP vendors have to bring their software up to date more frequently to

survive in an environment of extreme competition. Thus, this measure is not applicable to the ERP environment (Zhang et al., 2005). Nonetheless, several researchers have utilized TAM for their ERP implementation studies (Amoako-Gyampah, 2007; Bagchi, Kanungo, & Dasgupta, 2003; Bueno & Salmeron, 2008; Hwang, 2005; Kerimoglu et al., 2008; Kwahk & Lee, 2008; Ramayah & Lo, 2007; Shih, 2006; Uzoka et al., 2008).

Finally, a greater number of prior ERP success researchers have employed a combination of the aforementioned measures in their research (Abdinnour-Helm et al., 2003; Al-Mashari et al., 2003; Bradley, 2008; Chien et al., 2007; Esteves-Sousa et al., 2003; Kim et al., 2005; Kositanurit et al., 2006; Lee & Lee, 2004; Liang, Saraf, Hu, & Xue, 2007; Mandal & Gunasekaran, 2002; Nah et al., 2007; Ramayah et al., 2007; Reinhard & Bergamaschi, 2001; Sawah et al., 2008; Soja, 2006; Stratman & Roth, 2002; Umble et al., 2003; Wang & Chen, 2006; Zhang et al., 2005). As can be seen, these scholars have found that ERP success projects cannot be measured using only one single measure or by following just one of known success model.

2.3.2. Frequency Analysis of ERP Implementation Success Measures

In the last stage of the analysis, success measures were reviewed in terms of frequency. By intensifying the content analysis to consider the frequency of success measures, the researcher could achieve a better understanding of the relative magnitude of the measures. Table (2.13) shows the frequency of the success measures' occurrence in the literature. As can be seen, the most frequent success measures have been 'Organizational Impact', followed by 'ERP User Satisfaction'. Also, 'Workgroup Impact', and 'Service Quality' have been the least frequent success measures.

Table (2.13) Frequency Analysis of ERP Success Measures

No.	ERP Success Measures	Frequency (out of 52 articles)	Frequency (Percentage)
1	Organizational Impact	19	37
2	ERP User Satisfaction	18	35
3	ERP Usage	17	33
4	ERP Project Schedule	12	23
5	ERP Project Budget	12	23
6	ERP Project Goals	12	23
7	System Quality	11	21
8	Individual Impact	7	14
9	Information Quality	6	12
10	Service Quality	4	8
11	Workgroup Impact	2	4

2.3.3. Comparative Analysis of ERP Implementation Success Measures

A significant step in examining a new taxonomy is comparing it with earlier developed taxonomies (Larsen, 2003). Unfortunately, there has not been any taxonomy in the literature relating to ERP success measures. The closest comparable taxonomy for the present taxonomy could be the greatly cited DeLone and McLean (1992) taxonomy, which is from the IS field and which was revised 10 years later in 2003. The similarities and differences were explored by mapping between the taxonomies. The success measures - system quality, information quality, service quality, use, user satisfaction, individual impact, and organizational impact – were common measures in the DeLone and McLean (1992; 2003) taxonomy and the new ERP success taxonomy. Considering the influence of the DeLone and McLean taxonomy, it is no surprise that all their measures map into the proposed ERP success taxonomy. However, the actual mapping (64 percent) is quite

interesting.

The main group of differences - schedule, budget, and goals - relates to the project management aspect of ERP. Whereas between 1.5 to 6.0 percent of firms' annual revenues are spent on ERP implementation (Mabert et al., 2001), more than 90 percent of ERP system implementations have been late and required extra budget amounts (Wang & Chen 2006). In addition, a recent report on ERP implementation projects demonstrated that ERP projects, on average, took 2.5 times longer than planned, were 178 percent over budget, and delivered only 30 percent of the expected benefits (Zhang et al., 2005). As a result, controlling costs, maintaining the planned budget, and reaching the project goals in ERP projects have been vital for adopting companies. Consequently, although there have been some critics of using these kinds of ERP success measures in the literature, the researchers and practitioners still utilize these measures due to their criticality for the ERP adopting companies (Hong & Kim, 2002; Kamhawi, 2007; Mabert et al., 2003; Peslak, 2006; Sun et al., 2005).

The last difference between the taxonomies is 'workgroup impact'. Myers, Kappelman, and Prybutok (1996) proposed that any IS success model should include workgroup impact due to the contributions made by work groups/teams towards organizational productivity. They attached this measurement of success to the DeLone and McLean (1992) success model. Turban et al. (2006) stated that ERP systems provide the ability to manage organizational resources based on business functional integration. Garcia-Sanchez and Perez-Bernal (2007) defined ERP systems as an information system that combines organizational functions and distributes shared benefits to all departments. To be exact, ERP systems are usually purchased to increase efficient cross-functional processes in the adopting company (Akkermans & Helden, 2002; Davenport, 2000; Markus & Tanis, 2000). Essentially, the underlying philosophy of ERP systems underscores the arguments of Myers

et al. (1996). In the field of ERP, only 2 out of 52 prior studies have utilized 'workgroup impact' as a success measure (Ifinedo, 2007; Sawah et al., 2008). As a result, it seems that 'work-group impact' has been overlooked in prior ERP success research and it is required to be explored conceptually and utilized empirically in future research. So, 'work-group impact' was classified as a distinct category in the taxonomy.

2.3.4. Description of ERP Implementation Success Measures

The ERP Implementation Success Measures identified from the content analysis of the literature are described briefly in following paragraphs:

2.3.4.1. Organizational Impact

Organizational impact consists of the impacts of an ERP system implementation on the company's operating cost, customer service level, overall productivity gains, and the realization of particular ERP implementation objectives. Implementing ERP software assists companies with standardized data formats, better customer service and retention, and enhanced management decision making (Davenport, Harris, & Cantrell, 2004). Moreover, Al-Mashari (2003) noted that the general goal of an ERP system is basically to advance business performance by integrating a variety of business processes across the diverse functional departments and beyond enterprise boundaries. This integration allows for well-organized information flow within the firm as well as between the company and its customers and suppliers. Zhang et al. (2005) asserted that the majority of ERP adopter companies set performance objectives of the ERP system projects such as improving inadequate business performance, enhancing responsiveness to customers, decreasing high-cost structures, simplifying ineffective composite business processes, standardizing business process throughout the organization, supporting new corporate strategies, and

expanding business internationally. Chien and Tsaur (2007) classified the impacts of ERP systems into tangible and intangible benefits. Tangible benefits consist of reduction of employees, inventory reduction, improved productivity, faster closing of financial cycles, improvements in order management, enhancement of cash flow management, reduction in procurement costs, reduction in logistics and transportation costs, increase of revenue and profits, improvement in on-time delivery performance, reduction in the need for system maintenance, improved information and processes, internal integration, and improved customer service. At the same time, intangible benefits of the ERP system include improved or new business processes, better visibility of corporate data, improved responsiveness to customers, unexpected reduction in cost, worldwide sharing of information, increased flexibility, enhanced business performance, cost efficiency in staff, inventory, procurement and cash/order management, improvement in productivity, and overall profitability. Several prior researchers utilized organizational impact as a measure of ERP implementation success (Bernroider, 2008; Bradford & Florin, 2003; Bradley, 2008; Correa & Cruz, 2005; Chien & Tsaur, 2007; Fan & Fang, 2006; Ferratt et al., 2006; Hsu et al., 2008; Ifinedo, 2008; Kamhawi, 2007; Mandal & Gunasekaran, 2002; Nah et al., 2007; Ramayah et al., 2007; Reinhard & Bergamaschi, 2001; Sawah et al., 2008; Stratman & Roth, 2002; Umble et al., 2003; Zhang et al., 2005).

2.3.4.2. ERP User Satisfaction

User satisfaction, as a surrogate criterion, measures the success or failure of an information system. According to the literature, an IS implementation can be considered successful only if it is recognized to be satisfactory. User satisfaction has been broadly employed as a measure of IS success by prior researchers due to the three following reasons: development of reliable instruments for measuring user satisfaction, a high degree

of face validity, and theoretical limitation and unavailability of other IS success measures (DeLone & McLean, 1992). An information system that meets the users' requirements fortifies their satisfaction with the system. Delone and McLean (2003) described user satisfaction as the user's attitudes and feelings towards a range of factors associated with the information products and services. In the ERP system environment, user satisfaction refers to the extent to which users perceive that the ERP software accessible to them meets their needs (Somers et al., 2003). An ERP system with no user satisfaction is less likely to be utilized by the user community and to generate valuable outcomes to the company (Wu & Wang, 2006). User satisfaction tools have been used greatly in the information system research (Delone & McLean, 1992). Previous researchers operationalized the user satisfaction measurement in diverse ways; however, its definition remained consistent (Bradford & Florin, 2003). Bailey and Pearson (1983) developed a useful and valid instrument for measuring user satisfaction. Their instrument consisted of 39 items with an inclusive and broad base of satisfaction-related themes. Moreover, Ives, Olson, and Baroudi (1983) created a 13-item short-form tool, based on the Bailey and Pearson study. Their user satisfaction tool included three factor measures: IS department service and personnel, information product, and user involvement and knowledge. Baroudi and Orilowski (1988) verified the three-factor arrangement and supported the analytical effectiveness of the short-form instrument. Furthermore, Doll, Raghunathan, Lim, and Gupta (1995) and Igbaria and Nachman (1990) validated the user satisfaction instrument of Ives et al. (1983) and presented the empirical proof that confirmed the 13-item instrument as a measure of user satisfaction. A lot of previous researchers used the IS instrument for measuring user satisfaction in the context of ERP system implementation (Basoglu, Daim, & Kerimoglu, 2007; Bradford & Florin, 2003; Calisir & Calisir, 2004; Chen & Liu, 2008; Chien & Tsaur, 2007; Fan & Fang, 2006; Ferratt et al., 2006; Holsapple et al., 2005; Hsu et al., 2008;

Kerimoglu et al., 2008; Kim et al., 2005; Law & Ngai, 2007; Nah et al., 2007; Sawah et al., 2008; Soja, 2006; Zhang et al., 2003; Zhang et al., 2005).

2.3.4.3. ERP Usage

Information system use, as a theoretical construct linked to success, has been the subject of substantial studies. DeLone and McLean (1992) mentioned 16 empirical studies that utilized system use as a variable. They recommended likely measures for system use comprising actual versus reported use, duration and amount of use, motivation, and nature of use. DeLone and McLean (2003) maintained the significance of a measure of system use and considered it as intention to use in their restructured model. They tested the relationship between system use and the individual impacts of IS and found that the relationship is significant. Nonetheless, an essential difference about use is its original nature within the particular organizational environment. DeLone and McLean (2003) stated that system use was usually voluntary in previous research. Likewise, Rai et al. (2002) recommended that user perception of system use could not be evidently understandable where "social norms or formal job requirements encourage or mandate system usage" (p. 66). On the contrary, Iivari (2005) tested the IS success model in a mandatory-use condition and found that all the paths from information quality and system quality to use and from use to individual impact are statistically insignificant. This result was attributed to the mandatory nature of the system use. For instance, to employees, system use may be more mandatory than to the executive management. DeLone and McLean (2003) cautioned against the removal of use/ intention to use as a variable that may possibly affect net benefits. However, they recommended that the IS success model needed to reflect the proper level of analysis for the research question. A number of earlier researchers used use or intention to use as a measure of assessing ERP implementation success (Amoako-Gyampah & Salam, 2004;

Amoako-Gyampah, 2007; Bagchi et al., 2003; Bueno & Salmeron, 2008; Chien & Tsaur, 2007; Esteves-Sousa et al., 2003; Fan & Fang, 2006; Hwang, 2005; Kwahk & Lee, 2008; Uzoka et al., 2008; Kwahk, 2006; Ramayah & Lo, 2007; Shih, 2006).

2.3.4.4. ERP Project Schedule

ERP implementation success has been commonly defined in terms of the achievement of a number of predetermined targets comprising time, function, and cost (Markus et al., 2000). Hong and Kim (2002) evaluated ERP project success in terms of the perceived variation from the anticipated project goals like attaining a determined level of system performance, matching the ERP system with particular company objectives, staying within the budget agreed at the beginning, and meeting project deadlines. Markus and Tanis (2000) pointed out that diverse success measures are required at different phases of the ERP implementation life cycle. They proposed that a minimum set of ERP implementation success metrics must consist of project metrics, early operational metrics, and long-term business consequences. In the implementation phase, top managers tend to focus on project measures such as shortened period to implement because anything that takes more extended time costs more (Markus & Tanis, 2000). So, the majority of ERP implementation projects begin with a force from senior management to target a faster time and more cost-effective project. Many of the previous researchers measured ERP project success by checking whether the actual duration of the ERP implementation project was significantly longer than the planned schedule (Bradley, 2008; Chien et al., 2007; Esteves-Sousa et al., 2003; Hong & Kim, 2002; Kamhawi, 2007; Mabert et al., 2003; Peslak, 2006; Reinhard & Bergamaschi, 2001; Soja, 2006; Sun et al., 2005; Wang & Chen, 2006).

2.3.4.5. ERP Project Budget

According to Parr and Shanks (2000), ERP project success basically means completing the implementation within budget and on time. This concept of ERP implementation success is based on the project management study of Markus and Tanis (1999). Markus et al. (2000) proposed cost and time as two important variables under any project performance. Mabert et al. (2001) stated that time and budget control demonstrates the cost-effectiveness of an ERP implementation project. According to their conclusions, companies whose ERP implementation is within/under budget have a tendency to rate the business achievement and project success higher than the over budget companies. In addition, Mabert et al. (2001) recommended that the within budget group of companies not only run the implementation of ERP system better but also manage their business better. Peslak (2006) confirmed that this finding seems logical because time and cost overrun of ERP system implementation reveals the possibility of unfulfilled promises and consequently a likely troubled project. The majority of earlier researchers measured ERP project budget by checking whether the cost of the ERP implementation project was considerably higher than the expected budget (Bradley, 2008; Chien et al., 2007; Esteves-Sousa et al., 2003; Hong & Kim, 2002; Kamhawi, 2007; Mabert et al., 2003; Peslak, 2006; Reinhard & Bergamaschi, 2001; Soja, 2006; Sun et al., 2005; Wang & Chen, 2006).

2.3.4.6. ERP Project Goals

Markus et al. (2000) proposed two types of success measurements for ERP implementation success; first, project success metrics in terms of meeting the project scope, budgets, due dates, and expected performance and second, business value metrics in terms of business enhancements such as cycle time reduction, inventory reduction, time to market reduction, and so on. In addition, Mandal and Gunasekaran (2002) stated that the success of

an ERP implementation project is measured by installed and completed system functionality relative to primary project scope, project completion time relative to timetable, and project cost relative to budget. A number of previous researchers used predetermined corporate goals as a measure for evaluating ERP implementation success (Chien et al., 2007; Esteves-Sousa et al., 2003; Fuß et al., 2007; Hong & Kim, 2002; Kamhawi, 2007; Kim et al., 2005; Mandal & Gunasekaran, 2002; Soja, 2006; Sun et al., 2005; Ramayah et al., 2007; Wang & Chen, 2006; Zhang et al., 2005). They measured ERP project goals using dimensions such as the match between ERP systems and specific objectives, differences between ERP system performance and its anticipated level, the match between ERP systems and user expectations, User attitudes towards ERP, and the realization of project goals.

2.3.4.7. System Quality

System quality assesses the issues related to the information system itself. One of the first studies which used system quality as a measure of information system success was Bailey and Pearson (1983). They developed a system quality scale to measure flexibility, convenience, response time, and integration and connected them to user satisfaction. DeLone and McLean (1992) believed that system quality is present at the technical level, where efficiency and accuracy of the information system are vital. They combined the findings of the previous studies and provided 18 different possible indicators for system quality, including items such as ease of learning and use, data currency, system integration and flexibility, and system efficiency and reliability. Seddon (1997) recommended that a primary concern of information system quality was the existence of bugs in the system and attached other items like quality of documentation, ease of use, and the uniformity of the user interface. Nelson and Todd (2005) claimed that some of the prior researchers used ease

of use as the single metric of system quality. However, they observed that the majority of previous researchers employed a multifaceted set of dimensions to determine system quality. Nelson and Todd (2005) analyzed a large body of previous research and recommended five key indicators for the construct of system quality, i.e. reliability, accessibility, flexibility, integration, and response time. Iivari (2005) empirically examined the DeLone and McLean (1992) success model with accounting and finance systems. He utilized convenience, integration, recoverability, language, response time, and flexibility for evaluating perceived system quality. A number of prior researchers utilized system quality as a measure for evaluating successful ERP implementation (Bernroider, 2008; Chien & Tsaur, 2007; Correa & Cruz, 2005; Ferratt et al., 2006; Häkkinen & Hilmola, 2008; Ifinedo, 2008; Reinhard & Bergamaschi, 2001).

2.3.4.8. Individual Impact

Information system success can be evaluated at three main levels including the organizational level, system level, and individual level (Garrity & Sanders, 1998). Individual impact, in DeLone and McLean's (1992) success model, refers to assessing the impacts of IS on individual users, such as improvements in decision-making and productivity. Fan and Fang (2006) defined the individual impact as the perception of ERP users about improving in their productivity and performance, and efficiency of their tasks. Several previous researchers employed individual impact as a measure for evaluating ERP implementation success (Chien & Tsaur, 2007; Fan & Fang, 2006; Hsu et al., 2008; Ifinedo, 2008; Kositanurit et al., 2006; Zhang et al., 2005). In the context of ERP systems, individual impact is defined as the consequence of the implementation and use of ERP software on the performance of the ERP user (Chien & Tsaur, 2007). Prior researchers proposed different dimensions to measure individual impact including enhancing staff

productivity (Ifinedo, 2008), improving individual participation in the company (Hsu et al., 2008), developing individual creativity and upgrading task performance (Fan & Fang, 2006), enhancing decision quality and effectiveness (Zhang et al., 2005), and saving time for individual duties and tasks (Kositanurit et al., 2006).

2.3.4.9. Information Quality

DeLone and McLean (1992) defined information quality as the quality of the information that the system generates, mainly in the form of reports. They reviewed the previous research and underscored several studies which addressed information quality. DeLone and McLean (1992) reported several potential measures such as information accuracy, reliability, output timeliness, completeness, precision, relevance, and currency. These attributes have been subsequently measured in a number of studies (Iivari, 2005). Rai et al. (2002) described information quality as the extent to which information produced by the system has the features of user's requirements such as accuracy, content, and format. DeLone and McLean (2003), in their ten-year reassessment of the IS success model, recommended a range of measures employed in diverse environments. They explained a possible use with Internet-based systems and e-commerce to confirm the relevance of the IS success model to more innovative systems. DeLone and McLean (2003) suggested that Web content should be dynamic, personalized, complete, secure, relevant, and easy to understand. Nelson and Todd (2005) investigated the prior studies in the IS literature and developed an inclusive set of information quality measures for completeness, accuracy, format, and currency. Some of the previous researchers employed information quality as a measure of assessing ERP implementation success (Chien & Tsaur, 2007; Correa & Cruz, 2005; Ferratt et al., 2006; Häkkinen & Hilmola, 2008; Ifinedo, 2008).

2.3.4.10. Service Quality

DeLone and McLean (2003) added service quality in their updated IS success model, while it was not included in the original model. They stated that "we nevertheless believe that service quality, properly measured, deserves to be added to system quality and information quality as components of information system success" (p. 18). They believed that frequently employed measures of IS success focus on the products rather than the services of the information system. As a result, the IS researchers will possibly measure IS success wrongly if they do not incorporate a measure of service quality in the evaluation model. Finally, DeLone and McLean (2003) recommended a 22-item measurement instrument with measures of reliability, tangibility, responsiveness, empathy, and assurance. A number of earlier researchers used predetermined corporate goals as a measure for evaluating ERP implementation success (Bernroider, 2008; Chien & Tsaur, 2007; Correa & Cruz, 2005; Häkkinen & Hilmola, 2008). In the ERP implementation context, service quality was measured by Chien and Tsaur (2007) in terms of assurance and responsiveness of ERP service providers, reliability of ERP service, and ERP service level. Bernroider (2008) proposed the three measures of system reliability, availability of services, and improved service levels for measuring service quality. Häkkinen and Hilmola (2008) also employed education and application training, available support material, and user support as measures of system quality.

2.3.4.11. Workgroup Impact

ERP systems are typically implemented to improve cross-functional processes within the adopting enterprise (Akkermans & Helden, 2002; Markus & Tanis, 2000). ERP systems are frequently adopted to overcome the weakness of other information systems that ended up dividing the organization into several islands of information (Abdinnour-Helm et al. 2003;

Davenport, 2000). Garcia-Sanchez and Perez-Bernal (2007) defined ERP software as an information system that connects organizational processes and distributes collective benefits to all business units. ERP systems harmonize procedures of the diverse business units within the company and accordingly it is likely that their impacts would be obvious across the different departments, workgroups, and subunits in the organization. Consequently, companies should measure the success of ERP systems at the operational levels as well. Ifinedo (2007) reviewed the literature and conducted several case interviews and included the workgroup impact as an ERP success dimension. He pointed out that any ERP success measurement model must consist of a dimension associated with workgroup impact. Workgroup impact is assessed using several measures such as enhancing organizational-wide communication, improving the effectiveness of sub-units in the company, increasing inter-departmental co-ordination, and enhancing the productivity of work-groups (Ifinedo, 2008; Sawah et al., 2008).

2.4. Research Framework

Sekaran and Bougie (2010) described research framework as a logically developed, described and elaborated network of associations among the variables that are deemed relevant to the problem situation. They added that literature survey, intuition and experience guide the researcher in developing the research framework. In this study, literature was reviewed to underline the important results of previous studies and provide the basis on which the research framework can be developed. Huge numbers of related studies were analyzed in the literature review phase of this study and a comprehensive list of CSFs and ERP success measures were identified. To consider the ERP implementation context in Iran, six key individuals involved in the ERP implementation projects in Iran were consulted as suggested by Sekaran and Bougie (2010).

Based on content analysis of the literature, 17 ERP CSF (independent variables) and 11 ERP success measures (dependent variables) were identified. To consider the ERP implementation context in Iran, six key individuals involved in the ERP implementation projects in Iran were consulted. For choosing these experts, a range of sources were employed to create a list of Iranian ERP experts i.e. websites of the ERP vendor companies, websites of governmental organizations in charge of IT, websites of non-governmental organizations in charge of IT, published articles related to ERP implementation' in Iranian IT/management journals and seminars. According to the aforesaid sources, 11 ERP experts were determined. All 11 ERP experts were telephoned and were asked to join in this research. Finally, six of ERP experts accepted to participate in this study. These people were the elite of ERP implementation project managers, ERP consultants, and ERP vendors' representatives. Hence, the proficiency of the individuals representing the state of the art knowledge in a wide ranges of ERP implementation projects.

The researcher provided the six ERP experts with an alphabetized list of 17 ERP implementation critical success factors and 11 ERP success measures that were gleaned from an exhaustive study of the literature pertaining to this topic and illustrated in Table (2.9) and Table (2.12). The six ERP experts were asked to rank order 17 CSFs and 11 ERP success measures according to their importance to the ERP implementation practice in the context of Iran. The expert judgments were accumulated in a frequency table so that a composite ranked list was determined. Table (2.14) lists the ERP implementation critical success factors and success measures as ranked by the six ERP experts. Detailed analysis of the responses showed that seven different ERP implementation success factors were listed as the most important success factors by the six ERP experts. In addition, two highest frequent success measures were picked up and included in the research framework.

Table (2.14) Rank Order of ERP Implementation CSFs and Success Measures

No.	ERP Critical Success Factors	Frequency	ERP Success Measures	Frequency
1	Project Management	6	Organizational Impact	5
2	System Quality	5	ERP User Satisfaction	4
3	Vendor Support	5	Individual Impact	3
4	Enterprise-wide Communication	5	ERP Project Goals	3
5	ERP Team Composition and Competence	4	Workgroup Impact	3
6	Organizational Culture	4	ERP Usage	3
7	Business Process Reengineering	4	Service Quality	2
8	Top Management Support	3	System Quality	2
9	User Training and Education	3	Information Quality	2
10	Change Management Programme	3	ERP Project Schedule	2
11	Business Plan and Vision	3	ERP Project Budget	2
12	Careful Selection of ERP Software	3		
13	User Involvement	2		
14	Appropriate Legacy Systems	2		
15	Project Champion	2		
16	Use of Consultant	2		
17	Software Analysis and Testing	2		

Prior research has been fragmented. Most of the studies employed just one or two characteristics of CSFs in their research (Zhang et al., 2005). In this research, alternative perspective in viewing successful implementation in the Iranian context was considered. Based on the findings in the literature survey and also considering the experts' judgments about the exclusive environment of ERP implementation in Iran, the final independent and dependent variables were chosen to develop the research framework. The research framework consisted of six independent variables: 'enterprise-wide communication, business process reengineering, ERP project management, ERP team composition and

competence, ERP system quality, and ERP vendor support'. In addition, 'organizational culture' as a main difference between developed and developing nations has been overlooked in prior studies (Al-Mashari et al., 2003; Motwani et al., 2002; Yusuf et al., 2004 ; Zhang et al., 2005). Many problems that have led to the failure of ERP implementation have occurred when trying to adopt Western-developed IT applications in many organizations in developing countries (Al-Mashari & Zairi, 2000; Al-Mashari et al., 2006; Rasmy et al., 2005; Soh et al., 2000; Zhang et al., 2005). Therefore, organizational culture was considered as one of variables in this study. Based on the findings of research conducted in another developing countries i.e. Malaysia (Nah et al., 2007; Ramayah et al., 2007) and South Korea (Hong & Kim, 2002), organizational culture was considered as a moderator variable which moderates the effects of critical success factors on ERP implementation success.

Moreover, using the best measure for evaluating ERP implementation success has been the major concern for researchers. According to the content analysis conducted in the literature review, ERP implementation success was defined based on two dimensions, i.e. organizational impact and user satisfaction. It evaluates optimal success from the business and user perspectives. These criteria are also in line with the prior studies conducted in ERP implementation success (Bradford & Florin, 2003; Hsu et al., 2008; Kim et al. 2005; Nah et al., 2007; Sawah et al., 2008; Zhang et al., 2005). The theoretical bases for this study include DeLone and McLean's (2003) success model combined as well as prior ERP implementation literature as the basis for critical success factors. Consequently, based on content analysis of the literature and expert judgment of several ERP experts, the research framework of this study is presented in Figure (2.6).

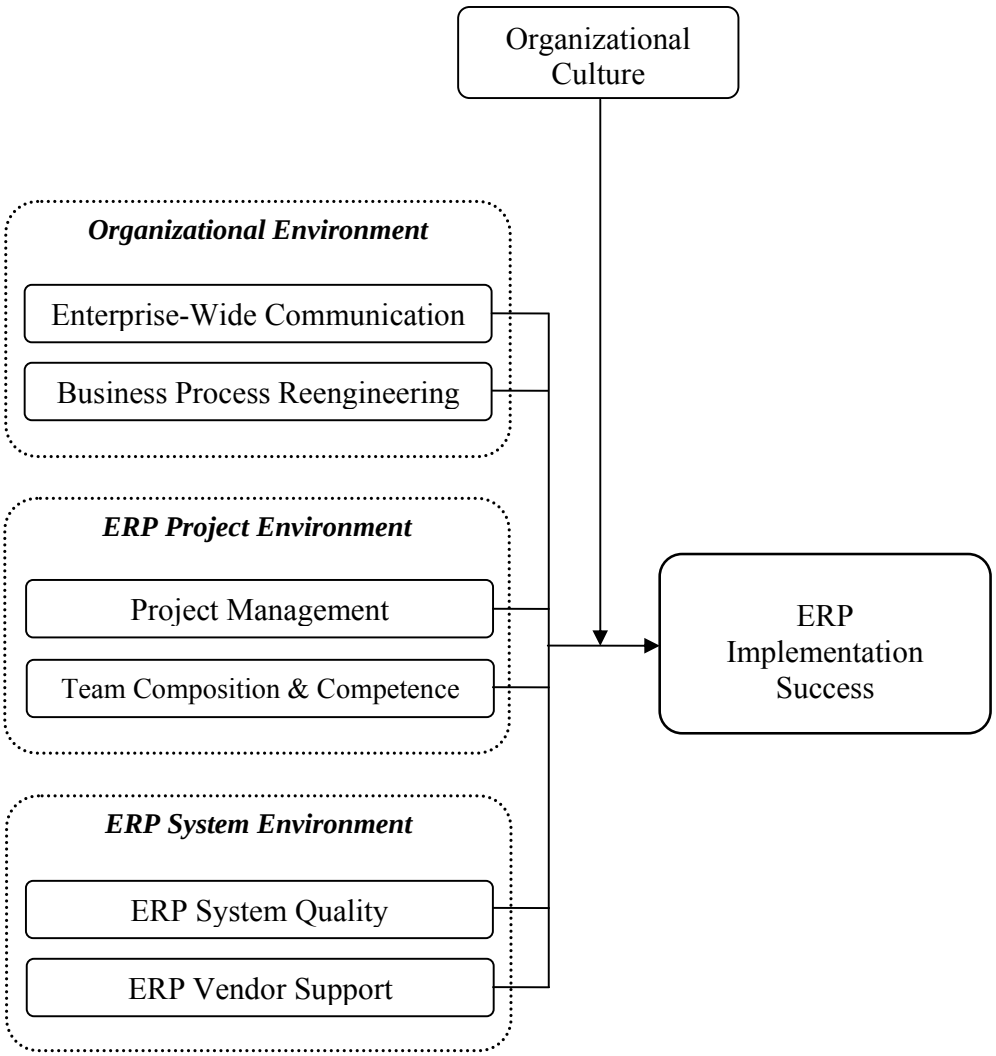

Figure (2.6) Research Framework for ERP Implementation Success

2.5. Summary

This chapter provided a broad picture of the ERP system concept and definitions. In addition, the anatomy of ERP systems was demonstrated and its relationship with its antecedent information systems was presented. After that, the benefits of ERP systems for adopting firms were offered. Moreover, the costs of ERP implementation and the size of the ERP market were explained. Then, the ERP project life cycle and diverse approaches of ERP system implementation were described. The second section of this chapter reviewed

the related research found in the literature and discussed the critical factors that contribute to ERP implementation success. Content analysis was utilized to analyze the literature and 17 critical factors for successful ERP implementation were identified. Moreover, frequency analysis was employed to illustrate the relative importance of each ERP implementation CSFs. After that, comparative analysis was carried out to compare the outcomes of content analysis with the findings of prior studies. Lastly, each of the ERP implementation CSFs was explained in detail. The third section of this chapter addressed issues related to the dependent variable of ERP implementation success. Using content analysis, frequency analysis and comparative analysis, 11 measures for ERP implementation success were identified and discussed. In addition, each success measure of the ERP implementation was clarified.

The following chapter details the research design of the study. The target population and sampling method selected for this study are described. Next, based on an analysis of the prior research and objectives of this study, an ERP implementation success model is outlined. The operational definitions, the measurement of variables and hypotheses development are also included in this chapter. Moreover, a survey questionnaire is developed and the structure and content of the questionnaire are illustrated. Furthermore, the validity and reliability assessment of the questionnaire through expert judgment and pilot test are described. In addition, the process of distributing and collecting the questionnaire is explained. Finally, the data analysis techniques used are discussed.