CHAPTER 1

BACKGROUND OF THE STUDY

1.1 Background

Developments in information and communication technology (ICT) have greatly influenced supply chain management. Many organizations have invested large sums of money on supply chain management systems to improve supply chain efficiency and obtain competitive advantage (Wei & Chen, 2008). Among the supply chain management systems are electronic business (e-Business) and electronic commerce (e-Commerce. Both e-business and e-commerce provide opportunities for improved business processes that are characterized by greater efficiency and responsiveness, and reduced reliance on paper transactions. This ultimately leads to lower costs and savings in time (Lou & Alshawi, 2009).

In the e-Business environment, the most prominent business-to-business (B2B) application that has received worldwide attention is electronic procurement (e-Procurement) (Benjamin & Elsie, 2003; Hawking & Stein, 2004; Pani & Agrahari, 2007). This application streamlines the corporate purchasing process by eliminating traditional paper-based documents such as purchase orders and requisition forms (Thompson, Sijie, & Kee-Hung, 2009). The other aspect of the e-Procurement system is that it enables enterprise users to gain direct access to the supply system by conducting purchasing electronically. E-Purchasing is a major component of e-Procurement (Local Government UK, 2004). It refers to actions taken by the organization to integrate Internet-based technologies to manage the upstream portion of the supply chain in order to reduce costs and time and increase productivity (Giunipero & Sawchuk, 2000).

E-Purchasing is reported to have saved costs ranging from 4-8% of the total purchasing value (Thorsen. Torbjorn, 2007). Other studies have shown that it saved millions of dollars in large enterprise transactions, reduced the supplier base, promoted paperless transactions, and enhanced spending transparency and accountability (Ariba, 2005; Ramboll, 2005). Skanska, one of the largest construction companies in Sweden, has extensively used e-Purchasing to reduce material cost and enhance productivity (Ramboll, 2005). A survey conducted among construction enterprises showed that adoption of e-Purchasing to execute purchasing processes was at 34% in US and 16% in Italy (Costantino & Pietroforte, 2006). A similar survey in the UK showed that 89% of the respondents adopted e-Purchasing as a component of e-Procurement, and that 56% of e-Purchasing adoption was undertaken by private main contractors (Stephenson & Chia,2006). Other studies have estimated that 50% of business transactions in 2005 was based on e-Purchasing (Costantino & Pietroforte, 2006).

Although e-Purchasing has been adopted widely by enterprises in some countries, its implementation poses many challenges particularly in the construction industry (Cuthbert, Hamzic, & Archer, 2003; Davila, Gupta, & Palmer, 2002). According to Stephenson and Chia (2006), the use of e-Purchasing solutions and applications in this industry is still in its infancy stage. The challenges faced during implementation often render the system a failure to meet the stated organizational objectives. As stated by Clark (2000) and Monk (2000), the failure of B2B e-business has been between 68-80% within the first year of its implementation.

Forrester Research found that over 30% of e-Procurement initiatives that included e-Purchasing was unable to meet enterprise objectives (Spend Matters., 2005). Between 2001 and 2005, 75-85% of all e-Procurement initiatives that included e-Purchasing

failed to achieve the promised results in terms of saving money (Hansen, 2006). ICG Commerce (2009) reported the case of a public trading company investing several million dollars on e-Purchasing solution in 1999 and how until 2009 the software has not been able to deliver the expected returns. Another case involves a manufacturer of steel products that rolled out e-Purchasing only to discover that it was not able to derive any substantial savings from the system (ICG Commerce., 2009). According to Abery (2002), some multinational businesses have suspended or even abandoned their e-Purchasing initiatives after failing to generate any quantifiable benefits. The high percentage of e-Purchasing failures reported have led researchers to investigate the reasons for their failures (Allen, 2003; Hansen, 2006; ICG Commerce., 2009; McCall, 2011)

1.2 Problem Statement

Several studies have revealed the reasons for the failure of e-Purchasing implementation. One of the major problems is the lack of understanding on the part of the organization on what it takes to be successful (Allen, 2003; Serour & Sellers, 2004). Often, organizations tend to focus more on the technological aspects for a solution to the problem of the system not living up to its expectation (Allen, 2003). However, technology is only a tool and technology by itself is of no value unless it is coupled and utilized with other organizational elements in the most effective manner (Serour & Sellers, 2004). Success in business requires the fulfilment of organizational factors, such as people and process requirements, coupled with the support of technological resources (Allen, 2003; Berez, Mulvin, & Felenbok, 2002; Serour & Sellers, 2004). The structure of the organization, existing processes, and people skill sets and behaviours are some of the other considerations that also need attention (Ghiya & Powers, 2005).

It is the high rate of enterprise system implementation failure that propels the undertaking of this study into the critical success factors of enterprise-wide system implementation (Chung, Skibniewski, & Kwak, 2009; Nah, Lau, & Kuang, 2001; Xue, Liang, Boulton, & Snyder, 2005). For such an implementation to work, managers are required to evaluate the progress of the projects carefully and to understand clearly the factors that lead to successful initiatives (Mukherjee, 2003). According to Mose, Muranga, and Magutu (2013) for any e-Procurement initiative to be successful, there are a number of factors that an organization must critically consider. Al-Omoush (2008) pointed-out that the organization needs to identify and understand the critical success factors to ensure that the promised benefits of the supply chain management system can be realized and failures be avoided. It is the investigation into these critical success factors that forms the basis of this study.

1.3 Current State of Critical Success Factors of E-Purchasing Implementation Success Investigation

Previous studies have shown that little attention was given to the investigation of the critical success factors (CSFs) of e-Purchasing implementation (Aggestam & Soderstrom, 2006; Birks, Bond, & Radford, 2001; CGEC, 2002b; ECOM Group, 2002; Vaidya, Sajeev, & Callender, 2006). Due to this reason, there is no strong construct involving the CSFs (Vaidya et al., 2006). In order to address the issues relating to this study, two aspects of the current limitations will be highlighted:

a) Lack of a comprehensive list of implementation CSFs

An organization has to consider many different factors before, during and after implementation of an electronic business system such as e-Purchasing (Linus, Emma, David, & Max, 2010). Such an implementation involves careful planning, execution

and enhancement (Parr, 2000). Each stage of the total process involves different activities and requirements and must be executed carefully so that the whole process becomes efficient (Linus et al., 2010; Parr, 2000). An important pre-requisite that has to be considered before and during implementation is the CSFs since they determine whether the implementation will be successful or not (Parr, 2000). However, referring to table 1.1 below, the current list of CSFs garnered from previous studies is limited. It does not include the factors that are pertinent to e-Purchasing implementation process from planning to the enhancement stage. Other factors such as business plan (Jennex, Amoroso, & Adelakun, 2004), project team (J. Li & Huang, 2004), stakeholder involvement (Chad, Yu-An, Geoffrey, Ying-Chieh, & Mei-Lien, 2010), and vendor support (Chad, Yu-An, Geoffrey, Ying-Chieh, & Mei-Lien, 2010) are equally critical and they influence the successful implementation of e-Purchasing.

Table 1.1: Lists of CSFs by previous researchers.

Item	Researchers	Critical Success Factors (CSFs)
1	Linus et al. (2010)	Suggested 9 CSFS namely; i) Well defined strategy ii) Change management iii) Training and education iv) Reengineering process v) Identify useful measures vi) Manage expectations vii) Supplier integration viii) Well defined steering group x) Top management support
2	Munkhbat. Luvsanbyamba and Chung (2009)	Suggested 4 dimensions of CSFs ; Inter-organizational, Technological, Organizational and E-Marketplaces. -CSFs for Organizational (Inter-organizational & Organizational) include; i) Trust; ii) E-Business readiness; iii) Top management support

Table 1.1, continued

3	Rebecca Angeles and Nath Ravi (2007)	Suggested 3 CSFs include; i) Consolidates its suppliers & contracts ii) End-user behavior and business process reengineering iii) Selection of system solution and IT infrastructure
4	Vaidya et al. (2006)	Suggested 3 dimensions of CSFs; System & Technology, Organization & Management, and Practice & Process. -CSFs for organizational (Organization & Management + Practice & Process) include; i) Top management support ii) User uptake and training iii) Business case/ project management iv) Supplier adoption v) Change management vi) Business process reengineering vii) Performance measurement viii)Implementation Strategy
5	Rebecca and Ravinder (2005)	Suggested 3 CSFs; i) Rationalization of suppliers ii) Redesigning of business process iii Careful technology plans for preferred suppliers iv) Selection of system solution

b) Lack of CSFs in the construction industry context

Figure 1.1 and Table 1.2 show studies on CSFs of e-Purchasing implementation over the years in various industries. To date, there is no study done to investigate the CSFs of e-Purchasing implementation in the construction industry.

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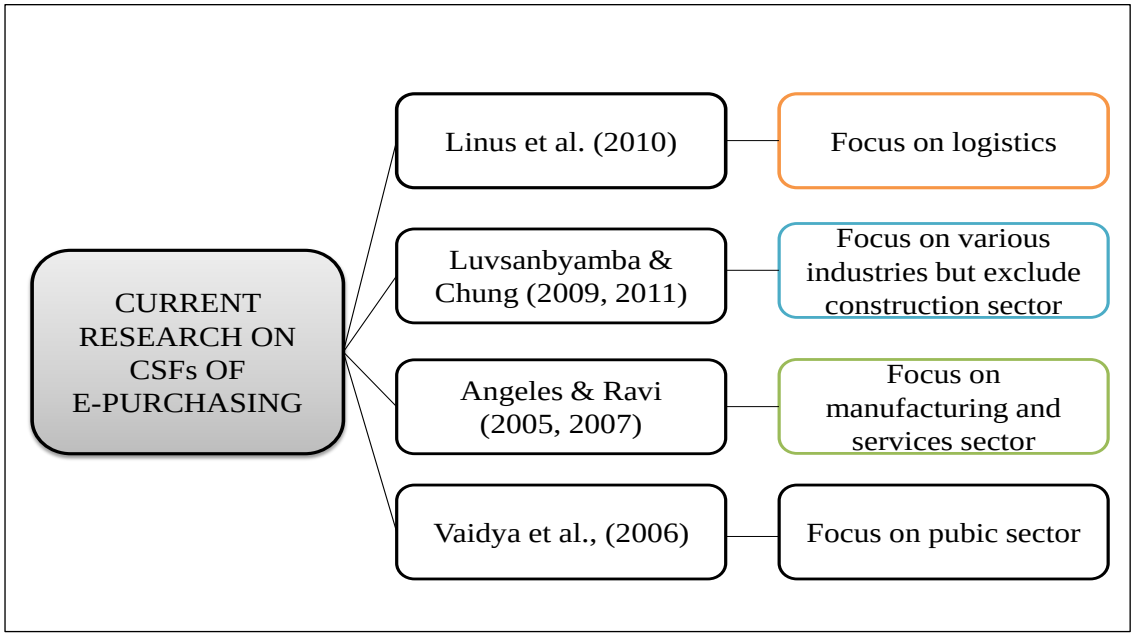

Figure 1.1: Current State of CSFs Research of E-Purchasing in Multiple Industries

Table 1.2: Previous Studies on CSFs of e-Purchasing Across Industrial Sectors

Item	Researcher	Themes/ Description	Research Method	Industry Sector	Country Scope
1	Linus et al., (2010)	Studies e-Purchasing CSFs for indirect material/MRO	Questionnaire survey	Logistic	Sweden
2	Luvsanbyamba and Chung (2009, 2011)	Studies e-Marketplaces CSFs	• Questionnaire survey • Empirical testing relationship	Various but excluding construction industry	Korea
3	Angeles and Ravi (2007)	Studies e-Purchasing CSFs for indirect goods	Questionnaire survey	• Manufacturing • Services	US
4	Vaidya et al., (2006)	Studies CSFs of e-Purchasing implementation	Literature review survey	Public Sector	Australia
5	Angeles and Ravi (2005)	Studies e-Purchasing CSFs for indirect goods	• Questionnaire survey • Interview	• Manufacturing • Services	US

A few studies have attempted to discuss the implementation of e-Purchasing in the construction industry but within a limited scope. For example, Aik (2005) investigated e-Purchasing implementation with emphasis on factors affecting the implementation and the barriers of implementation. Stephenson and Chia (2006) examined the e-Procurement technologies used by construction organisations, the reasons for using them, the benefits perceived, the barriers to their implementation, and the suggestions by the industry of the requirements for a best practice approach.

Aggestam and Soderstrom (2006) pointed out that organizational critical success factors (CSFs) are part of the CSFs that will need to be well managed. These factors affect the overall success and challenges of e-Purchasing implementation (Walker & Harland, 2008). Forrester Research related the failure of e-Purchasing implementation to issues with organizational factors such as change and people management (Spend Matters., 2005). People issues are pertinent because users are generally apprehensive about being replaced by automated systems (Yen & Ng, 2002). Users' reluctance to embrace changes to the business process is a major barrier to the implementation of systems (Day, Fein, & Ruppersberger, 2003). Other studies also support the idea that organizational issues such as employee training, management support, and well defined steering group have an impact on successful e-Purchasing implementation (Linus et al., 2010).

Based on the evaluation of existing literature, a knowledge gap exists on the subject of organizational CSFs of e-Purchasing implementation in the construction industry. This study aims to fill this knowledge gap.

1.4 Research Objectives

The aim of this research is to establish organizational CSFs that are responsible for e-Purchasing implementation success in construction organizations in order to assist managers make appropriate plans and preparations before embarking on any system initiative.

In order to achieve this aim, the study underlines several objectives as follows:

1.4.1 To explore the level of e-Purchasing adoption in construction organizations.

1.4.2 To identify the organizational CSFs of e-Purchasing implementation in general.

1.4.3 To determine the organizational CSFs specific to construction organizations.

1.4.4 To investigate the underlying structure of the organizational CSFs of e-Purchasing implementation success.

1.4.5 To examine the presence of a relationship between the organizational CSFs identified and e-Purchasing implementation success measured in terms of project management success and user satisfaction.

1.5 Research Methodology Brief

The research methodology adopted by this study is as outlined below:

This study began with the identification of industry practices related to e-Purchasing system through preliminary investigation. The preliminary investigation took three months to complete starting January 2011. The purpose was to solicit as much information as possible on construction industry practices related to the subject of study. The findings from this preliminary investigation were used for practical understanding of the research topic.

The next step involved a review of existing literature on the subject of study and the purpose was to acquaint the researcher with the various interpretations of CSFs espoused by earlier researchers, the Resource Based Theory (RBT), and the concepts of CSFs that would guide this study on e-Purchasing implementation success. These factors were then rationalized into an organizational perspective. The result of this process was the development of the initial set of organizational CSFs of e-Purchasing implementation success.

The first phase of mixed methods analysis began thereafter with the collection of data through a series of face to face interviews with industry experts. This task was carried out to explore in detail "what" and "how" success factors identified are critical for the successful implementation of an e-Purchasing system. The interview process was based on open-ended questions.

The second phase of the research methodology involved the development of a survey instrument for quantitative data collection purposes. The researcher decided on the use of a questionnaire, and it was developed based on interview findings and existing constructs. Content validation assessment was performed with academic experts to examine the degree to which elements of the questionnaire were relevant to and representative of the targeted constructs. Before embarking on the actual distribution of the questionnaire to the sample, a pilot test was conducted to evaluate the reliability and validity of the questions used. This involved the participation of thirty respondents from the sample frame. Using purposive sampling, the actual survey was then performed among targeted respondents by distributing the questionnaires through postal mail, e-mail and online inputs. Returned/filled questionnaires were analysed using appropriate statistical methods by the SPSS version 20 software.

The final part of the research methodology was the writing-up process. This involved discussing the findings from data analysis and drawing conclusions. A full explanation of the research methodology will be described in Chapter 4.

1.6 Significance of the Study

Literature is replete with studies on e-Purchasing implementation success in such sectors as Logistics (Linus et al., 2010), Manufacturing and Services (Rebecca Angeles & Nath Ravi, 2007), the Public Sector (Vaidya et al., 2006) and multiple industries (Munkhbat Luvsanbyamba & Chung, 2011). However, in regards to the construction industry, very little research has been carried out. Due to this reason, the present study was undertaken. E-Purchasing is one of the most important elements in construction supply chain management nowadays. Hence, it is important to fill this gap in the literature. Different industries have different sets of characteristics. This study aims to uncover the unique set of e-Purchasing implementation CSFs pertaining to the construction industry. These factors must exist in order to boost the competitive positions of the construction organizations through system initiative. This study will help the research and business communities to better understand the impact of these factors on the successful implementation of e-Purchasing in construction organizations.

1.7 Thesis Outline

The thesis is divided into eight chapters as follows:

Chapter 1: Introduction

This chapter discusses the background of the study which includes the research problems, research objective, research methodology, and thesis outline.

Chapter 2: Literature Review

This chapter discusses in depth the literature on e-Purchasing application in construction organizations. The other areas covered are overviews of the purchasing process, enterprise purchasing system applications, the advantages of using e-Purchasing system and the barriers of e-Purchasing implementation.

Chapter 3: Organizational CSFs of E-Purchasing Implementation

This chapter discusses in detail the theoretical basis for developing a theoretical framework for the research topic. It highlights the underpinning theory, definition of e-Purchasing success, success criteria, the concepts of critical success factors, and organizational factors for successful implementation of e-Purchasing. At the end of the chapter, a framework of organizational critical success factors is drawn up.

Chapter 4: Research Methodology

This chapter describes the research methodology adopted to gather data, which is a mixed methods approach that entails both qualitative and quantitative means. The research approach, methods and strategies, sampling method and data analysis are intensively explained in this chapter.

Chapter 5: Qualitative Data Analysis and Results

This chapter reports the findings of the qualitative study of the data collected. All information gathered through the interviews with selected participants from various backgrounds is discussed in detail. A summary of the findings from the interviews is provided.

Chapter 6: Quantitative Data Analysis and Results

This chapter reports the empirical findings from quantitative analysis of the data gathered through questionnaire survey.

Chapter 7: Discussion of the Findings

This chapter provides a discussion of the results achieved and the explanation of the findings organised according to objectives.

Chapter 8: Conclusion and Recommendations

The final chapter provides the conclusion with an explanation of the findings, generalization based on specific populations and implications of the study. Limitations of the study and recommendations for future research are also highlighted.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter reviews existing literature on Supply Chain Management (SCM), the application systems associated with it, and Electronic Purchasing or e-Purchasing solution. It prefaces with a brief introduction on SCM and the definitions of SCM as given by various researchers. This is followed by an overview of SCM application systems and a detail discussion of e-Purchasing system.

E-Purchasing offers organizations in all industries with practical solutions to enhance the efficiency and effectiveness of their supply chain management process. The discussion on e-Purchasing literature in this chapter is aimed at eliciting a basic understanding of the system operation as well as identifying organizational barriers that prevent its use in practice.

2.2 Supply Chain Management (SCM): Overview

As a concept, Supply Chain Management (SCM) started and flourished within the automotive manufacturing industry (Saad, Jones, & James, 2002; Tey, Yusof, Ismail, & Wai, 2012; Vrijhoef & Koskela, 1999). It has since gained the attention and acceptance of many industries, including the construction industry (Raizi, Skitmore, & Cheung, 2009).

SCM involves coordinating and integrating activities and processes among different business functions for the benefit of the entire supply chain (Hejazi, Arkan, & Rezvan, 2009). This integration of multiple functions, activities, processes and organizations

under the traditional procurement practice is cumbersome if not well-nigh impossible. Manual tracking of purchase orders and paper-based ordering process prove to be fast obsolete in the present business environment (Lancioni et al., 2003).

SCM covers a wide range of different types of Information Technology (IT) systems (Kollberg & Dreyer, 2006) recognized to facilitate the SCM process (Deraman, Beksin, Alashwal, Abdullah, & Abdullah, 2012; Eng, 2006). They provide a source of competitive advantage (Apulu & Latham, 2011), improve productivity (Maqsood, Walker, & Finegan, 2003) and are vital for successful execution SCM strategy (Mahdari, Mohebbi, & Namjae, 2010). SCM promotes competition between supply chains, not merely single entities (Gier, Marianne, & Goran, 2006), and this has the effect of motivating all parties to be competitive and productive (Jones & Saad, 2003).

Different researchers have defined SCM in different ways. Table 2.1 below shows some of the different definitions given by authors. These definitions indicate that there's a wide difference in opinion among researchers on SCM. Consensus on a precise definition of SCM is similarly lacking among academicians, consultants and practitioners (Xue et al., 2007)

Table 2.1: Definitions of Supply Chain Management

Authors	Definitions
Jones and Riley (1985), James et al., (2010)	An integrative approach to dealing with the planning and control of the materials flow from suppliers to end-user.
Ellram (1991), Misra et al., (2010)	A network of firms interacting to deliver product or services to the end customer, linking flows from raw material supply to final delivery.
Christopher (1998), Stadtler (2005), Penlope (2007)	Network of organizations that are involved, through upstream and downstream linkages, in the different processes and activities that produce value in the form of products and services in the hands of the ultimate consumer.

Table 2.1, continued

Kopczak (1997), Xu (2011)	The set of entities, including suppliers, logistics service providers, manufacturers, distributors and resellers, through which materials, products and information flows.
Mentzer (2004), Song and Panayides (2008)	The systematic, strategic coordination of the traditional business functions within a particular company and across businesses within the supply chain, for the purposes of improving the long-term performance of the individual companies and the supply chain as a whole.

The above definitions come from different bodies of literature and none of them are in any way specifically related to the construction industry. Researchers are of the view that SCM should be defined differently for different industries (Petrovic-Lazarevic, Margaret, & Russell, 2006). Since this study is of the construction industry, it is pertinent to find a specific definition of SCM for this industry. Initial effort to define construction industry supply chain management has been carried out by Vrijhoef (1998) who defined it as '*the establishment, co-ordination and maintenance of an optimised supply chain that operates effectively, fulfilling all its preconditions and goals optimally, and involving all its stakeholders'*. Table 2.2 shows the different definitions given to construction industry SCM.

Table 2.2: Definitions of Construction Industry SCM

Authors	Definitions
Muya et al., (1999), Titus and Brochner (2005)	A network of multiple organisations and relationships, which includes the flow of information, flow of materials, services or products; and flow of funds between owner, designer, general contractors and suppliers.
Arbulu and Tommelein (2002), Arbulu and Ballard (2004), Thipparat (2011)	Construction supply chains are networks of interrelated processes designed to satisfy end customer needs.
Love et al., (2004), El Ghazali et al., (2011)	The network of installations/resources and activities that provides added value to the final customer, in the functions of project design, contract management, acquisition/provision of materials and services, production and delivery of raw materials and management of the installation/resources.

Table 2.2, continued

Li et al., (2007)	The integration of construction business network from original suppliers to end users that provide materials, products, services, hence add value for construction clients and other stakeholders
Hatmoko and Scott (2010)	A system where suppliers, contractors, clients and their agents work together in coordination to install and utilise information in order to produce, deliver materials, plant, temporary works, equipment and labour and/or other resources for construction projects.
Abdullah et al.,(2010)	The process of strategic management of information flow, activities, tasks and processes, involving various networks of organizations and linkages (upstream and downstream) involved in the delivery of quality construction products and services through the firms, and to the customer, in an efficient manner.

It is abundantly clear from literature that adoption and implementation of total SCM-related strategies is way ahead in the services and manufacturing industries, where their benefits are well understood (Cetinkaya, 2011; Chakraborty & Dobrzykowski, 2013; Zigiaris, 2000). This is not the case with project-based organizations, where acceptance and use of SCM strategies are still shown to be lagging behind (Abdullah et al., 2010; Bankwall, Bygballe, Dubois, & Jahre, 2010; Chan & Greenwood, 2006). Among the reasons cited for this relative backwardness are; i) the elusiveness of strategy in general (Bakir & Bakir, 2006), ii) the inappropriateness of theoretical models and concepts of SCM for the construction industry (Bankwall et al., 2010), iii) strategies that require developing closer relationships and integration of processes are difficult to realise in practices (Briscoe & Dainty, 2005), and iv) the challenges faced in integrating networks and players due to diverse and dispersed group of trading partners (Green at el., 2005; Shukor, Mohammad, & Mahmub, 2011).

Procurement is one of the key functions of supply chain management (Mishra, 2011). It involves all activities that are vital to acquiring goods or services that will enable an organization produce a product or complete a project for its client (Mathenge, 2012).

The study by Morris & Pinto (2007) highlighted inefficiencies in procurement management practices and long cycle time in the construction industry.

Improving the procurement operation from upstream to downstream of the supply chain is necessary and vital for project-based industries. Literature indicates several SCM strategies that are related to procurement, for example, strategic supplier partnership, closer customer relationship, information sharing, collaboration and innovation. These strategies help industry practitioners to overcome issues in the supply chains (Perez-Franco, Singh, & Sheffi, 2010; Vrijhoef & Koskela, 2000), improve profits and optimize value (Morris & Pinto, 2007).

The development of SCM has seen the proliferation of a wide range of system application software packages. A review of these packages developed to enhance the efficiency and effectiveness of the SCM process was conducted by this researcher and a summary of the findings is shown in Table 2.3.

Table 2.3: SCM Systems Applications

Item	Applications	Functions	Impacts to SCM
1	Electronic Data Interchange (EDI)	-Facilitates transactions and information exchanges -Enables the transfer of data in a standard format such as invoices and purchase orders between organizations.	-Enhances supplier delivery performance (Lee, Padmanabhan, & Whang, 1997; Yu, Yan, & Cheng, 2001) -Enables real time sharing of information (Prashant, Venkitaswamy, & Anbudayashankar, 2010)
2	Supplier Relationship Management (SRM)	-Assists in planning, execution, and optimisation of use of the supply chain. -Enables management of information flow between suppliers and purchasing organizations (buyers). -Integrates supplier information in the buyer's procurement	-Reduces cost, improves procurement and real time visibility across the supply chain (Wisner & Tan, 2000)

Table 2.3, continued

		process	
3 i)	E-Commerce E-Procurement	-Conducts business in a paperless environment. -Enables transactions across space between the buyer and seller in the supply chain involving, projects, parts, components, materials, or plant -An example of e-commerce application is e-procurement and e-marketplaces. -Business-to-business (B2B) buying and selling of goods and services using the Internet as an enabler. -Examples of e-procurement applications are e-Tendering, E-Purchasing and e-Bidding.	-Improves efficiency and reliability of business process (Ribeiro & Lopes, 2001) -Increases information visibility, market structure and relationship management throughout the supply chain (Golicic, Davis, McCarthy, & Mentzer, 2002) -Enhances supplier relationship, lowers cost of purchasing, provides process transparency and reduces maverick buying (Majdalaweih & Bateman, 2008)
4	Enterprise Resource Planning	-An enterprise-wide business automation solution. -Integrates all departmental and functional information flows across the company onto a single computer system.	-Improves efficiency, quality productivity and profitability (Gattiker, Huang, & Schwarz, 2007) -Improves enterprise wide information dissemination (Allen, Kern, & Havenhand, 2002)
5	Supplier Portal	-Web-based technology that allows organizations in a supply chain to access information and application for manufacturer and suppliers alike.	-Improves supply chain visibility, provides real-time inventory information and consolidates supplier relationship (Ivanova, 2004)
6	Radio frequency identification (RFID) system	-Manages resources in scattered locations along the entire supply chain. -Allows the information to flow in real time from various sources. -Enables the mobility of critical elements - activities, people, information, documents and communication.	-Improves process efficiency, enables smoothing of information workflow and increases information visibility throughout the supply chain (Angeles, 2005)

SCM system applications share a common goal of helping an organization achieve agility and responsiveness in meeting the demands of their customers using a fast, efficient, and low cost network (Wang, 2012). The above system applications enable organizations to manage effectively their supply chains through supply chain integration.

The following section discusses in detail the e-Purchasing system, which is a component of the SCM system and the main focus of this study. It begins with an overview of the development of the purchasing process from the traditional method to electronic transactions.

2.3 An Overview Of Purchasing Process

Purchasing is a major SCM activity (Kulkari, Ganapathi, & Kannan, 2011). The objective of the purchasing function is to buy the right materials in the right quantity for delivery at the right time (Lysons & Farrington, 2006). Purchasing of construction materials needs to be in line with defined procedures and processes. There exists a significant difference between traditional purchasing and by means of electronic transactions.

Traditional purchasing process is paper based, where documents are used to create other documents. Hence, staff and resources are utilized to perform day to day documentation activities, leaving little precious time to focus on strategic and tactical activities (Ali, 2010). Basically, traditional purchasing process involves several steps as indicated in Figure 2.1. The process starts with the determination of materials needed, followed by the following major tasks in order: material requisition → issue purchase requisition → get purchase approval → issue purchase order → receive delivery order (DO) → issue goods received note (GRN) → receive supplier's invoice → pay by the buying organization.

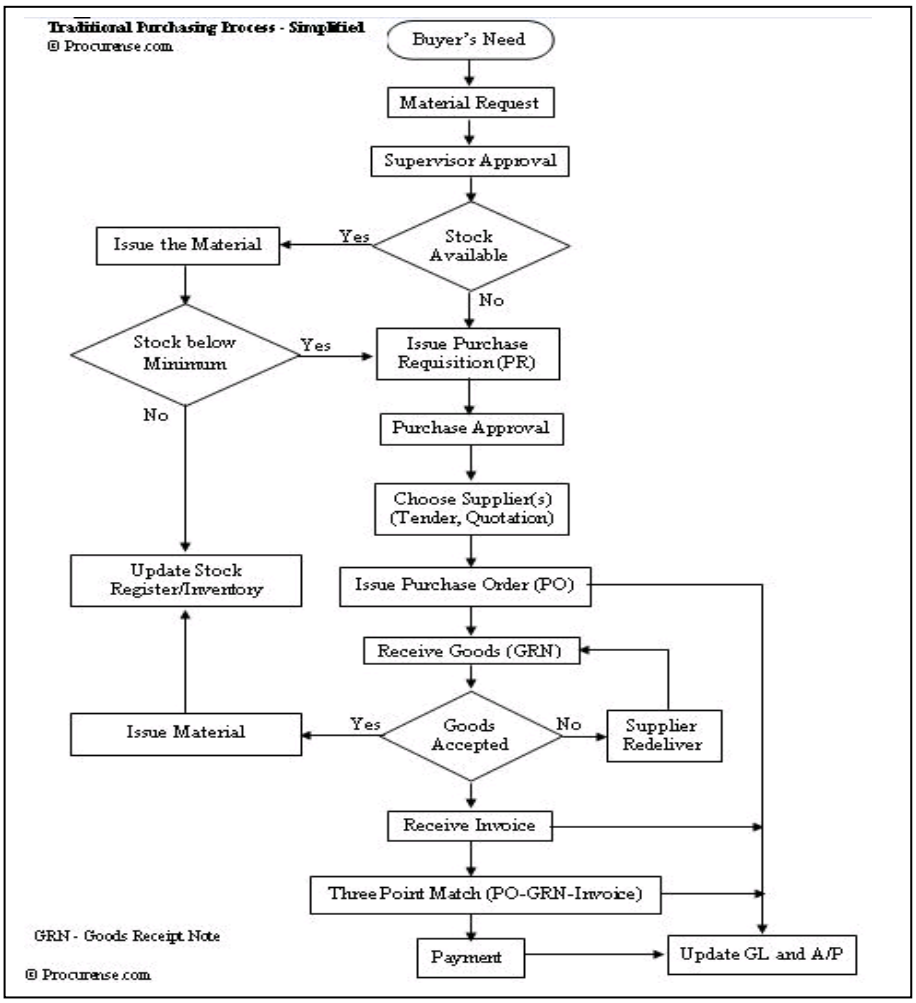

Figure 2.1: Traditional purchasing process flow (Ali, 2010)

In comparison to the traditional process outlined above, the e-Purchasing system entails little or no hardcopy documents. As depicted in Figure 2.2, e-Purchasing supports the same processes of traditional (manual) purchasing but they are executed electronically (Local Government UK, 2004).

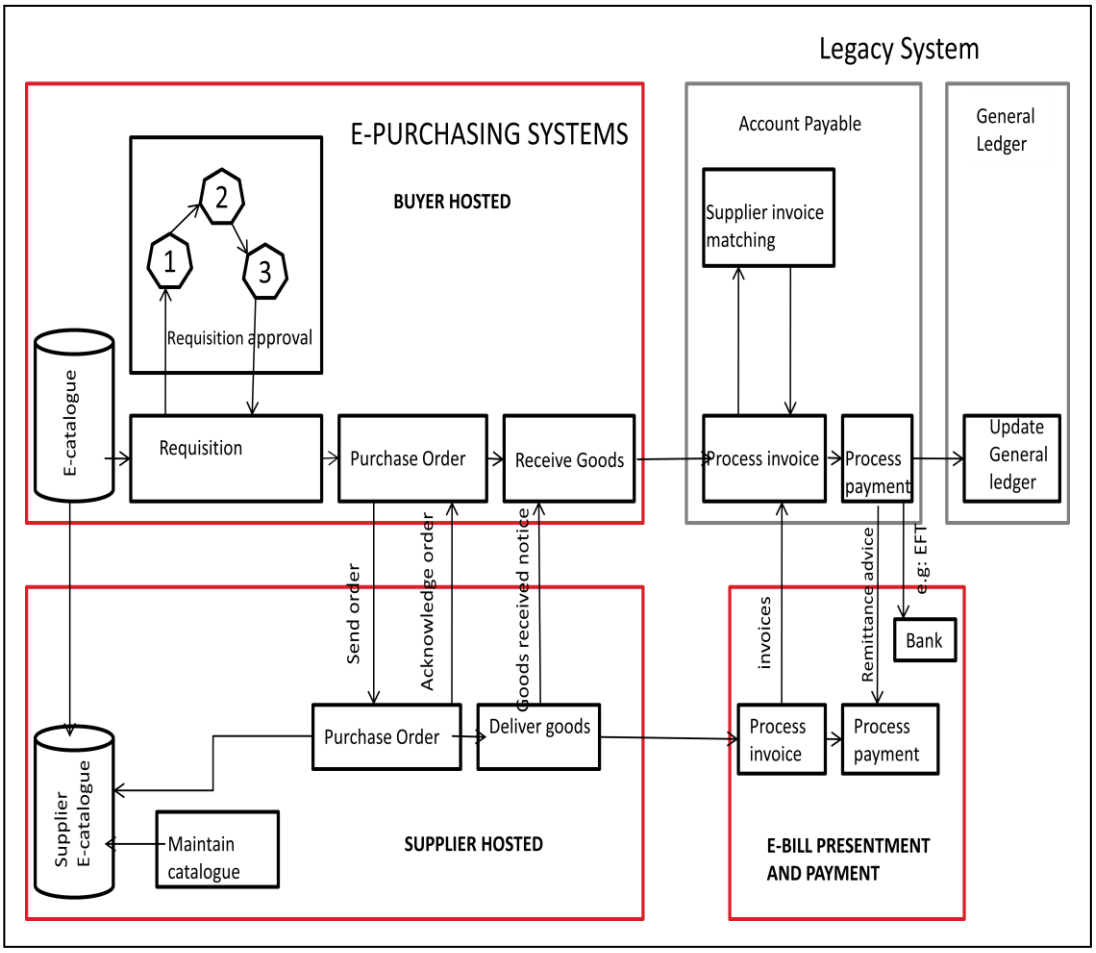

Figure 2.2: Process Flow of a Typical E-Purchasing System, as Adapted from AOT Consulting (2003)

The process begins with online material requisition and approval → automated purchase order generation and approval → automated goods received notes generation → automated processing of invoices → automated settlement (PO, receipts and invoices automatically matched), and ends with electronic payment (via EFT or electronic funds transfer). Some enterprises configure the e-Purchasing system to fit in with their unique requirements. An example of a bespoke automated purchasing process flow is indicated by Figure 2.3.

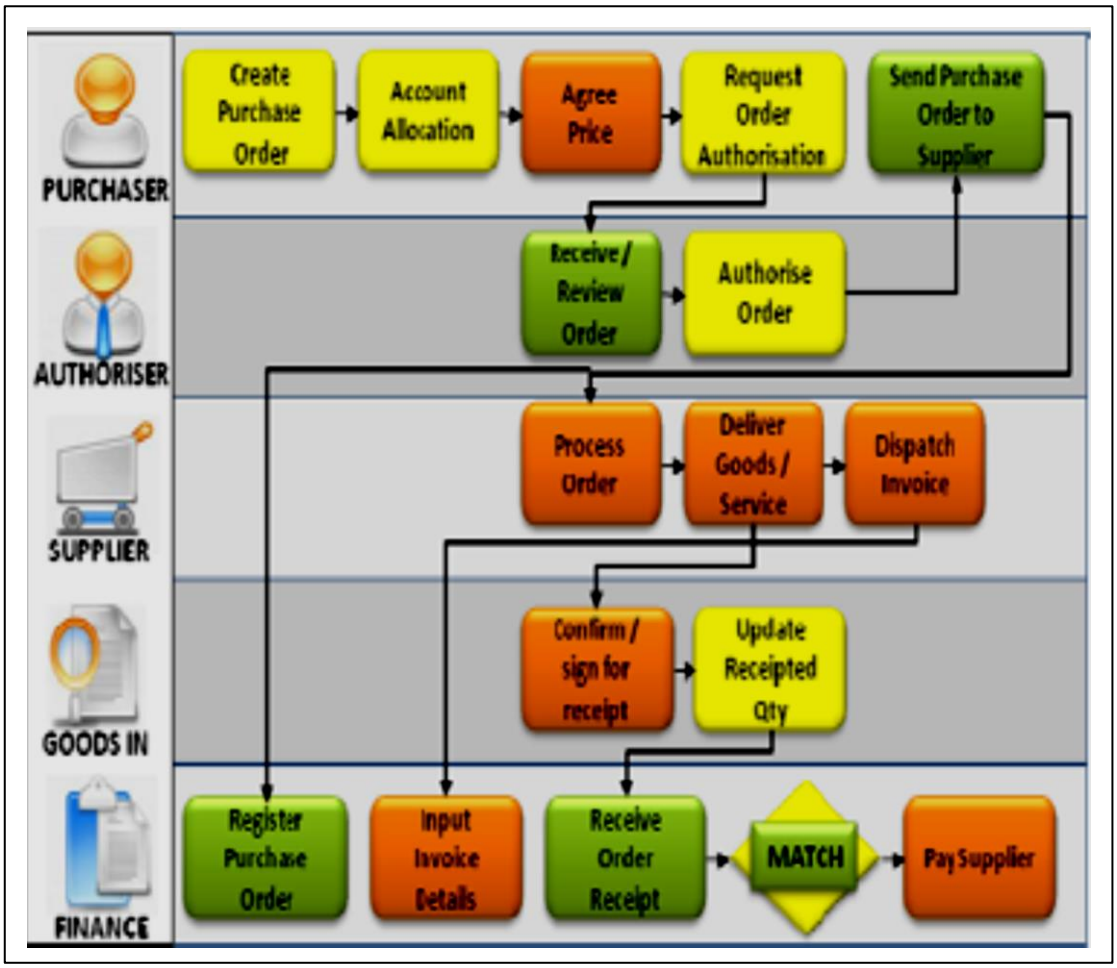

Figure 2.3: Automated purchasing process flow using enterprise bespoke e-Purchasing system

2.4 E-Purchasing System

The e-Purchasing system has gained popularity over the last decade and has been adopted by all major industries in all the countries in the world (Done, Liao, & Maedler, 2011). According to research firm Forrester, it was estimated that the global market demand for e-Purchasing software product would reach almost USD four (4) billions in 2010 (Bartels, 2010). Studies by McKinsey revealed that eighty-five (85) per cent of companies are interested in investing in new application software to automate the purchasing process (Gupta & Browning, 2007; Hensley, Irani, & Satpathy, 2003).

The e-Purchasing system not only automates the individual purchasing functions but also seamlessly links them starting from the creation of the purchase requisition through to payment to suppliers. The term e-Purchasing encompasses back office ordering systems, e-marketplaces and supplier websites (Local Government UK, 2004).

2.4.1 E-Purchasing Definition

There are not many definitions of e-Purchasing in literature. Authors who have attempted at a definition did so with varying results. Table 2.4 below lists some of these definitions.

Table 2.4: E-Purchasing Definitions

Author(s)	Definitions
Giunipero and Sawchuk (2000)	Comprises of actions taken by the organization to integrate Internet-based technologies into its role of managing the upstream portion of the supply chain in order to reduce costs and time and increase productivity.
Boer et al., (2001), Heijboer and Telgen (2002)	The process of creating purchase requisitions by means of an electronic catalogue and using a software system based on Internet technology.
CIPS (2009), Amravati and Amravati (2011)	The combined use of ICT through electronic means to enhance internal and external purchasing and supply chain management processes, and provide tools and solutions that will facilitate improved purchasing and supply management.
Hokey and William (1999), Min and Galle (2003)	B2B purchasing practice that utilises e-commerce to identify potential sources of supply, to purchase goods, transfer payment and to interact with suppliers.
Done et al., (2011)	The information technologies that automate supply chain processes and associated finance processes in a comprehensive manner (purchase-to-pay).
Cole and Ward (2004), Amravati and Amravati (2011)	The technology solutions that address the requisition to pay processes in the procurement life cycle and includes market places and catalogues, e-Procurement solutions, purchase order processing, account payable, supplier's own websites, and purchasing cards.
Panayiotou, et al.(2004)	The use of IT to facilitate B2B activities of purchase and payment of goods and services

Taking into consideration the above definitions, this study has defined e-Purchasing as the application of IT tools together with Internet-based technologies to effect electronic

and automated execution of an organization's purchasing activities in order to achieve supply chain integration with its trading partners.

2.4.2 The Level of E-Purchasing Adoption in Organizations

Wang, Chang and Heng (2004) have identified, in general, five categories of e-Purchasing adoption in organizations ranging from early adopters to full e-Purchasing adopters as indicated in Table 2.5.

Table 2.5: Categories of e-Purchasing Adoption in Organizations

Categories	Description/Characteristics
CATEGORY 1: **Essential Functions**	-IT adoption that focuses on specific tasks, such as, documentation using basic software packages.
CATEGORY 2: **Single Department/Operation Process**	- IT adoption that focuses on particular function or process (e.g. accounting information system).
CATEGORY 3: **Cross Departments/Multi-Process Integration**	-IT adoption that allows organizations to integrate processes across several functions or department
CATEGORY 4: **Enterprise Integration Process**	- IT adoption that allows organizations to integrate business processes across the entire organization (e.g. ERP System)
CATEGORY 5: **B2B Integration/ Collaboration Business**	-IT system that spans organizations and allow communication, collaboration, and integration among multiple supply chain members, including suppliers and customers.

The categorization of e-Purchasing adoption above is based on integrative capability of organizations (Pearcy & Giunipero, 2008). The more integrated the system, the better will be the supply chain performance. Previous researchers have stressed that the integration of key business processes such as procurement is essential to effective supply chain management (Lambert, Cooper, & Pagh, 1998; Pearcy, Parker, & Giunipero, 2008). In this respect, IT systems such as e-Purchasing plays a vital role

(Biniazi, Ghahremani, Alipour, Soffi, & Akhavan, 2011; Cagliano, Caniato, & Spina, 2003; Sanders, 2005).

Other researchers chose to categorize e-Purchasing adoption by organizations as low adopters, intermediate adopters and advanced (best in class) adopters (Caniato, Golini, Luzzini, & Ronchi, 2010). In their studies, these authors used percentage of technology facilitation as the yardstick to classify the mentioned categories, as follows:

- Low Adopters (< 33 per cent technology facilitation)
- Intermediate Adopters (between 33 – 66 per cent technology facilitation)
- Advanced Adopters (above 66 per cent technology facilitation)

2.4.3 Types of E-Purchasing System Applications

An e-Purchasing system is not a single application but consists of many different functionalities. The level of adoption of the system is by choice and dictated by the peculiar needs of an organization. Large organizations may opt for the complete suite of functionalities while smaller ones would just make do with what is most practical for their needs. Some of the more well-known web-based procurement software providers are Ariba, Commerce One, Oracle, SAP, IFCA, and JD Edwards. A list of e-Purchasing system applications or functionalities is shown in Table 2.6.

Table 2.6: Types of e-Purchasing Application

E-Purchasing Application	Description
E-Mail	Facilitates communication within and between organizations. It is an internet application that combines the use of telephone and traditional mail with the advantage of relatively instant communication. The feature that is most commonly used among organizations is the ability to attach documents to the e-mail, thereby saving the need to copy and mail or fax documents (Oz, 2002)

Table 2.6, continued

Extranet	A private (company-owned) network that uses Internet technology and the public telecommunication systems to securely share part of a business's information or operations with suppliers, partners, or other businesses (Turban et al., 2008). This network is accessible to authorized outsiders.
Electronic Data Interchange (EDI)	Traditional approach for electronic cooperation between business partners. A structured, standardised data format is used to exchange common business documents between trading partners. This application supports the exchange of repetitive and routine business transactions (Watson et al., 2000)
Supplier Website/Portal	This is the most basic e-tool. It refers to websites of companies that provide the goods and services that the buyers seek to procure. The websites offer background information of companies, product lists, and price lists. In some cases, the websites are e-commerce enabled, and the buyers may purchase the goods and services online.
Web-Based Enterprise Resource Planning (ERP)	Web-based ERP module creates and approves purchase requisitions, places purchase orders and records the goods and services receipts using a software system based on Internet technology (Walker et al., 2002)
E-Purchasing Software	Any Internet-based software application that enables employees to purchase goods from approved electronic catalogues in accordance with company buying rules, while capturing necessary purchasing data in the process (Davila et al., 2003). E-Purchasing software investment may take several forms, including purchase of a software package from a third party technology provider (e.g., Ariba, SAP)
E-Marketplaces	Websites that bring multiple buyers and sellers together in one central virtual marketplace and enable them to buy and sell from each other at dynamic prices (Davila et al., 2003). This application is often administered by a third-party IT vendor.

2.4.4 Overview of Enterprise Purchasing System Application

This section reviews the salient features of the SQL Enterprise Purchasing Software. This software has several tools and functions that enable the integration of two business processes, namely Purchasing and Accounting. It is used to execute purchase requisitions and purchase orders; receive invoices, execute payments and do accounting entries. The tools and functions of the system are as shown in Figure 2.4.

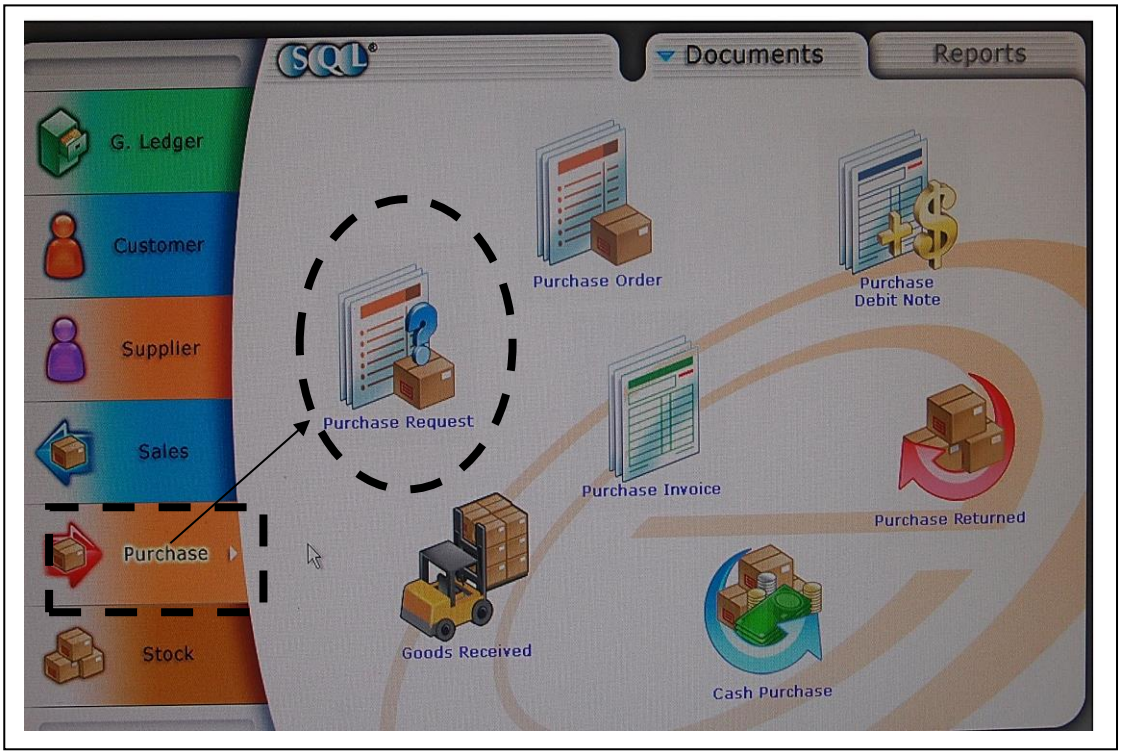

Figure 2.4: SQL Interface – Tools and Functions

Figure 2.5 shows the requisition interface where the Requisition Form is automatically generated after the user reformats a template inside the system. The form is provided through the Purchase Function (see Figure 2.4). Normally the user would use this tool whenever a new quotation for a new material/product is required as opposed to existing materials. The user can also request information on the new product by using the Supplier Function (see Figure 2.4), in which case the system will automatically connect with the authorized supplier's SQL system database using extranet platform.

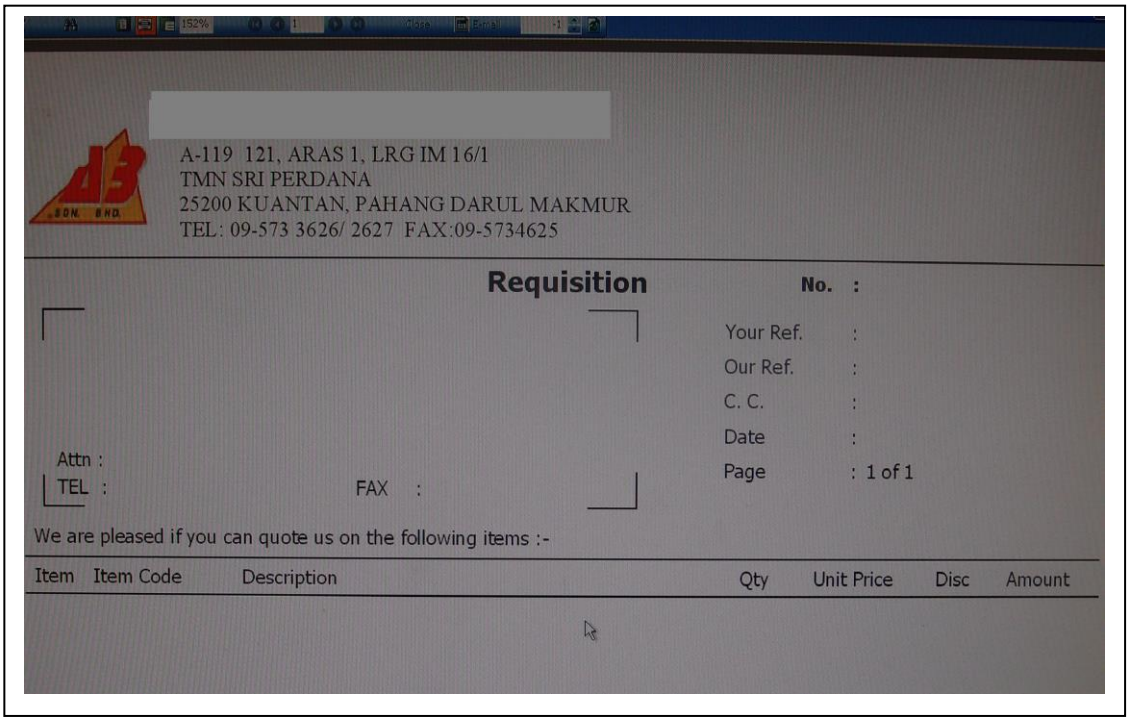

Figure 2.5: SQL Interface – Requisition Form

The purchasing transaction process starts with the creation of the Purchase Order. Like the traditional manual paper-based method, the basic task is to type the list of materials needed. This is accomplished by keying the material part numbers on the form displayed on the computer screen. Unlike the traditional method, however, the unit prices of the materials are not manually sourced from filed documents but by letting the system retrieve the prices from the previous database (see Figure 2.7) or from the requisition process outlined earlier. For large organizations with many projects on-hand, this automation saves time and resources. Precious resources can be diverted to more productive use rather than spend time to manually retrieve unit prices from filed documents.

Figure 2.6 below shows the Purchase Order Form after primary material part numbers were keyed-in into the system by the user and prices sourced automatically from the price database.

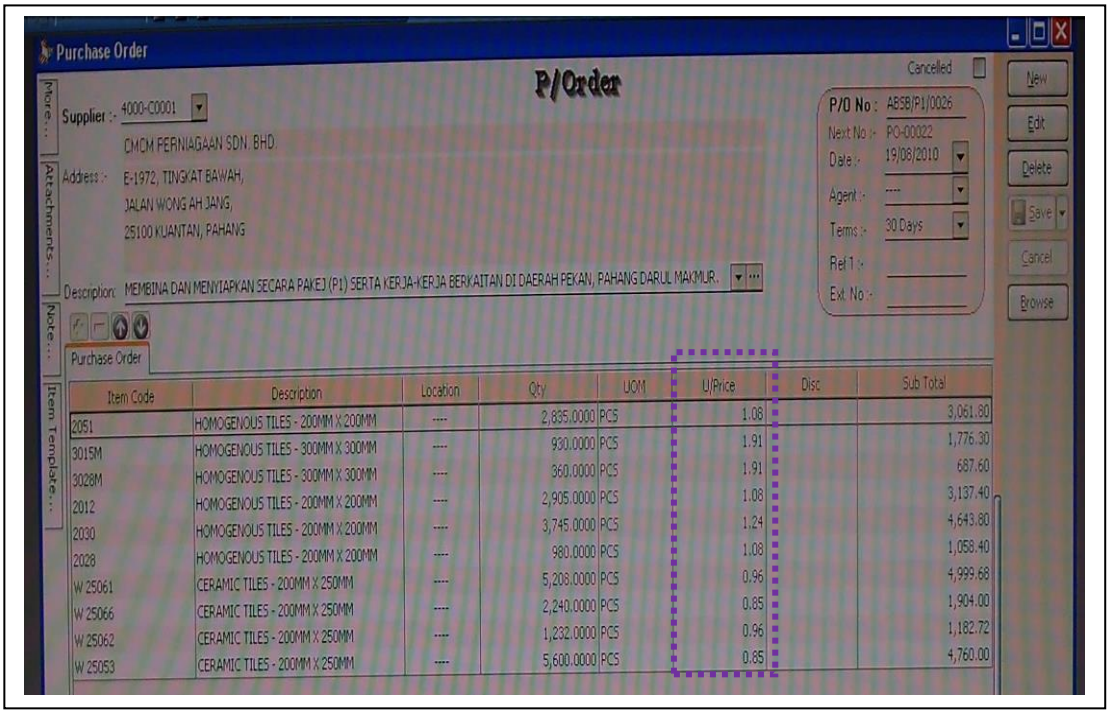

Figure 2.6: SQL Interface - Purchase Order Form

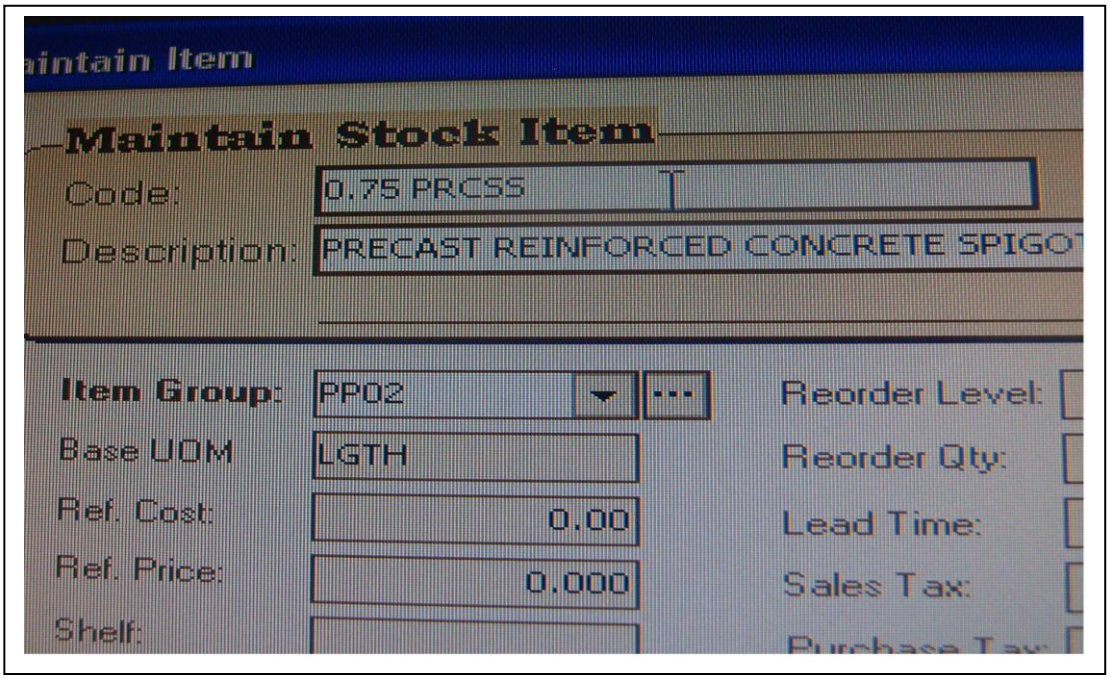

Figure 2.7: SQL Interface- Maintain Stock Item (Price Database)

After the PO has been generated, the document can be saved in a format that is readable by Microsoft Office Application and can be forwarded to the required supplier through e-mail.

Besides catering to the purchasing function, the SQL system can also generate accounting transactions in the general ledger and make payments upon receipt of the supplier's invoice. There are many tools in the General Ledger Function, such as, Journal Entry, Maintain Budget, Stock Value and Bank Reconciliation. Figure 2.8 indicates the General Ledger Function and its tools. This function is security password enabled in order to allow only authorized individuals have access to it. Normally this would be people from the Accounts Department. The SQL system is also compatible to be integrated with legacy systems.

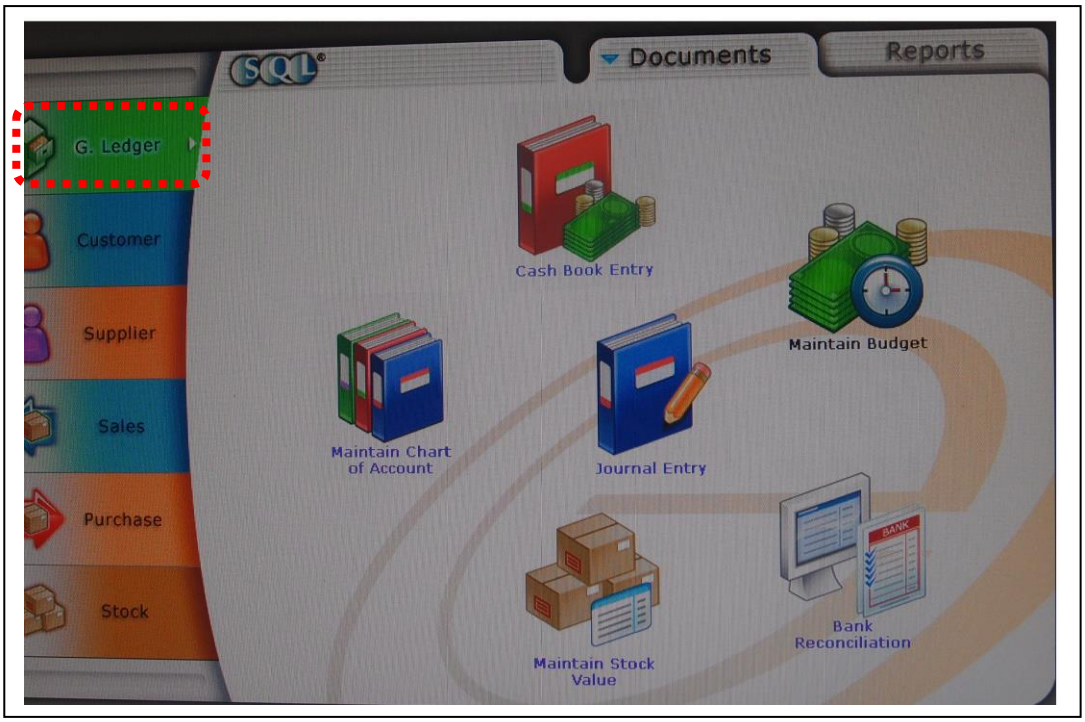

Figure 2.8: SQL Interface – General Ledger Tools

Large organizations typically adopt enterprise-wide purchasing software solutions. This type of solutions has powerful features and functions that enable the automation of the entire purchasing process from requisition to payment. Known as P2P or Procure-to-Pay, these solutions are comprehensive, web-based and enterprise wide. They integrate internal purchasing with external trading partners (suppliers) and are very compatible when it comes to interfacing with organization legacy systems, such as the ERP.

2.4.5 The Advantages of Using E-Purchasing System

The literature is replete with examples of how the e-Purchasing system can be of benefit to both buyer and supplier organizations (Eei, Hussain, & Mustaffa, 2012; Isikdag, Underwood, Ezcan, & Arslan, 2011; Kauffman & Mohtadi, 2004; Local Government UK, 2004; Phillips & Piotrowicz, 2006). The implementation of e-Purchasing can be seen as an effort by organizations to reduce procurement related cost and time and increase the quality of its services; minimise business risks; and increase overall business competition (Cascapera, 2007; Thai, 2001; Trkman & McCormack, 2010). This study has identified many benefits derived from the implementation of e-Purchasing system by organizations, especially those related to the construction industry. These benefits are in the form of both tangibles and intangibles.

a) Tangible benefits

Tangible benefits are quantifiable benefits that can be translated to bottom-line savings (Irani & Love, 2002; Local Government UK, 2004). They are as follows;

i) Cost savings

Global competition puts pricing and productivity pressures on organizations, forcing them to develop new IT strategies to achieve improvements in costs and output (Aberdeen Group., 2001; Afsharipour, Afshari, & Sahaf, 2006; Hemmatfar, Salehi, &

Bayat, 2010). Automating the procurement process is one of the major initiatives taken in that direction.

Researchers have reported that organizations using the e-Purchasing system are able to save up to 42% in purchasing transaction cost allied with less paperwork, less mistakes, and more efficient purchasing (Davila et al., 2003; Singh & Punia, 2011). Transaction costs include the time spent by users searching for suppliers, communicating with trading partners regarding transaction details, and processing paper documents (Cascapera, 2007). The e-Purchasing system can improve the purchase transaction process by providing the user with an integrated electronic system module that can work quickly and easily when used, for example, the e-Catalogue module.

Cost savings accruing from the use of e-Purchasing system come not only from transaction improvements but also administration improvements related to redundancy of manual communications, such as phone, fax, and paper invoices (Aberdeen Group., 2005a; Eei et al., 2012).

ii) Process efficiencies

The traditional purchasing process is characterized by large amounts of information and communication. It is therefore an ideal candidate for automation through IT. Teo et al., (2009) have expressed that the e-Purchasing system is a powerful business tool that can revolutionize the buying function of an organization by streamlining and automating the labour-intensive purchasing routines. The implementation of the e-Purchasing system by organizations can improve the purchasing process by eliminating inefficiencies that cost time and money (Gunasekaran et al., 2009; Majdalaweih & Bateman, 2008). The overall purchasing process cycle time from materials requisition to payment can now be

shortened drastically (Dawn & Larry, 2008; Dooley & Purchase, 2006; Guo & Chen, 2010). A driver for process efficiency is the integration of e-Purchasing with legacy systems such as ERP. By using the e-Purchasing system, the re-entry of purchase order data is no longer required and invoices can be automatically matched with orders and goods received notes (GRNs) without need for manual intervention.

b) Intangible Benefits

Intangible benefits are those that are not easily quantifiable (Eei et al., 2012) and they include the following:

i) Transparency and visibility of spending

Centralised tracking of transactions by the e-Purchasing system allows full reporting on requisitions made, items purchased, orders processed and payments made. This advantage makes the transaction process transparent and the spending visible (Cascapera, 2007; Ho, Tai, Wu, & Jou, 2008; Vinit, Kittipong, & Upasana, 2006).

ii) Diverts resources to strategic activities

Through the automation of manual intensive and repetitive tasks, the e-Purchasing system channels resources in the organization to more value-added or strategic activities (CIPS, 2009; Ho et al., 2008; Local Government UK, 2004), such as the development of user competencies, the bolstering of supplier relationship and the engagement in negotiations.

iii) Adds value to the procurement function

E-Purchasing generates accurate, timely and detailed information (CIPS, 2009) that can assist in improving sourcing, supplier management, scheduling, demand management, supplier performance as well as in reducing stock holding. High quality information on

purchasing activities, such as what has been purchased, when to purchase, which suppliers and how much the quantity of materials is, helps the Procurement Officer in negotiating with suppliers, resulting in more favourable agreements and the consolidation of spending (Cascapera, 2007).

iv) Strengthens trading partner relationship

There are multiple benefits to organizations involved in strategic supplier relationships. When a relationship is formed and established between a buying organization and its trading partners, this relationship has to be sustained and nurtured. This is achieved through continuous exchange of strategic and tactical information, often facilitated by way of inter-organizational system (IOS) applications that promote inter-organizational coordination (Golicic et al., 2002; Mentzer et al., 2001; Wu, Zsidisin, & Ross, 2007). As mentioned earlier, e-Purchasing system transmits transactional information between buyer organization and its trading partners and this is one of the key factors that lead to closer relationship between them (Narasimhan & Nair, 2005).

v) Better communication

E-Purchasing allows speedy flow of electronic documentation throughout the supply chain, thereby facilitating prompt price returns and improving supplier visibility Hawking & Stein, 2004). Communication not only becomes quicker but also more widely spread out, reaching trading partners at every region of the world in a matter of seconds.

vi) Gaining competitive advantage

Competitive advantage is the single key element that gives an organization an edge over competitors. Clyde and Meenu (2000) noted that competitive advantage is one of the

major factors that will determine the future survival and success of an organization. The implementation of e-Purchasing system makes geographical boundaries irrelevant; purchasing activities can be conducted 24 hours a day, 7 days a week and 365 days year. This has a direct bearing on the organization's ability to increase profits and secure a distinct advantage over competitors. Wong and Sloan (2004) and Robert et al., (2007) have pointed out that gaining competitive advantage through reduced procurement cost and increased profitability is one of the most important perceived benefits of electronic solutions, like the e-Purchasing system.

2.4.6 The Barriers of e-Purchasing Implementation

Despite the great potential benefits an organization can derive from e-Purchasing, implementing the system is not without its set of challenges and these have to be known and taken into consideration (CIPS, 2009).

Issues encountered in implementing e-Purchasing by organizations can be classified under 3 categories: technical, organizational and market. These issues cause concern for organizations in the construction industry to adopt the system (Stephenson & Chia, 2006). Due to scope limitation, this study only concerns itself with the organizational issues.

According to Eadie et al. (2007), organizational issues relate to organizational skills and culture, top management support, existence of knowledgeable and skilled personnel and supplier relationship. Due to these obstacles, the study found that only 48% of contractors surveyed were able to conduct B2B applications effectively (Eadie et al., 2007). A detailed discussion of organizational issues derived from literature follows:

a) Lack of top management support

Top management support is defined as the degree to which the organization's leadership understands the importance of supply chains and IT investments, the requirements of implementation, and their involvement in these efforts (Jitpaiboon, Vonderembse, Ragu-Nathan, & Asree, 2010; Ragu-Nathan, Apigian, Ragu-Nathan, & Tu, 2004). Moving from the traditional process to e-Purchasing requires not only a full understanding of the functions and requirements of the system but also total commitment and participation of top management in the implementation effort.

Lack of top management support is manifested in a number of situations. Firstly, it is reflected in little interaction between the organization and the project although the project is part of the organization (Madanayake, Gregor, & Hayes, 2009). Sometimes top management fails to see the connection that the project has with the goals of the organization and as a result they fail to provide the necessary support (Jitpaiboon et al., 2010). It is important that top management views e-Purchasing implementation as a transformation in the way the company does business. Secondly, lack of top management support is evident in failure to anticipate the changes that may be necessitated by the e-Purchasing system (Law, 2009). Thirdly, top management often tends to delegate the implementation process to lower management levels, and this can lead to their being out of touch with critical events or their lack of understanding of the scope, size, and technical aspects of the project (Ligus, 2009). Lastly, top management support is lacking when it does not encourage the participation of users in the implementation process, and when it blames users for their lack of interest in the system (Shah et al., 2011).

Lack of top management support and commitment to new system implementation has been cited as among the top barriers and reasons for failure of IT-related projects (Eadie et al., 2007; Hawking & Stein, 2004; Khaparde, 2012). Previous researchers have suggested that for successful implementation of e-Purchasing, top management should be committed to finance the project (Lam, 2005), allocate sufficient resources to the implementation effort (Forcht, Kieschnick, Aldridge, & Shorter, 2007; Rahim, 2008), actively get involved in mandating and coordinating the implementation effort (Cooper & Zmud, 1990; Elbanna, 2012), provide guidance to ensure the achievement of project goals (Young & Jordan, 2008), change their behaviour towards the project (Collier, Fishwick, & Floyd, 2004), and be mindful in delivering their support and involvement (Madanayake et al., 2009).

b) Resistance to change

Implementing e-Purchasing will inevitably involve users who would be most directly affected by the changes that it brings about. Studies have shown that the main resistance to organizational change comes from users working in the organization itself (Chan & Swatmen, 2002; Kim & Kankanhalli, 2009). It is a natural tendency for users to be very comfortable with the status quo and be fearful of changes. Some users may even become frustrated by having to learn a new software system and dislike having to take time out of their schedule for training.

Resistance to change has been highlighted as a barrier that causes a slowdown in the full adoption of e-Purchasing and it causes organizations to fall short of deriving the full benefit of the system (CIPS, 2009; Croom & Brandon-Jones, 2007; Eadie et al., 2007; Gunasekaran & Ngai, 2008). E-Purchasing changes the current mode of operation within and between functions. Organizations that have successfully implemented

e-Purchasing typically approach the implementation as an exercise in change management (ICG Commerce., 2009; Law, 2009). Therefore, it is pertinent for the success of e-Purchasing that the organisation is determined to undergo changes.

c) Lack of user training

The introduction of any new system in an organization is always an upsetting experience to users. Hence it is critical that the organization prepares the users by conducting proper training. Proper training will alleviate whatever fears the users have of the system and they will then be more willing to take full advantage of the system's capabilities. Previous studies have shown that most of the IT project failures stem from lack of preparedness caused by improper training (Chan et al., 2006; Isikdag et al., 2011). Lack of proper training can frustrate e-Purchasing users. Dixit and Prakash (2011) reported that almost half of the training that is provided to users is not carried-up in the proper way due to reasons such as lack of computer literacy and the unwillingness to accept responsibility to train other people. Other studies reveal that many enterprise system training erroneously focus on transactional training that fails to accomplish several key goals (Kimberling, 2009). Kimberling (2009) suggested that systems implementation training needs to emphasize 6 fundamental points. These are: i) focus on business processes, not on system transactions; ii) relate new business processes to the existing environment; iii) leverage on a multitude of tools for e-Purchasing training; iv) train the trainer; v) allocate plenty of time for e-Purchasing implementation training; vi) reinforce training with more comprehensive organizational change management activities.

Proper training will decrease the level of resistance to change and increase the competency in system use. This, in turn, will enhance the success possibility of

e-Purchasing. From the foregoing explanation, it is evident that education and training programs are essential for the successful implementation of IT projects within the organization (Gunasekaran & Ngai, 2004).

d) Lack of trading partners (suppliers) readiness

According to Kumar and Senapathi (2012), the primary reason for e-Purchasing failure is lack of readiness on the part of trading partners (in this case suppliers). Not all trading partners are ready or capable to participate in B2B application (Min & Galle, 2003; Tanner, Wolfle, Schubert, & Quade, 2007). Some trading partners lack IT know-how (Bouchbout & Alimazighi, 2009); others are unwilling to adopt e-Purchasing, thinking that it is too complex or tedious. Also, there will be situations where suppliers are unable to keep up with the technology requirements of the buyer's e-Purchasing initiative (Angeles & Ravi, 2005). Many suppliers are unwilling to participate in e-Purchasing because they are unclear of the benefits to be gained from the system (Kumar & Senapathi, 2012; Vaidya et al., 2006) or they regard the system as a ploy for the buyer organization (contractor) to force down the prices (ECOM Group, 2002). It is imperative that trading partners are ready to participate in e-Purchasing and provide the pre-requisite infrastructure and business requirement for electronic business transaction (Behkamal et al., 2007).

e) Insufficiency of financial resources

The implementation of e-Purchasing entails new systems infrastructure that needs financial investment (Vivekanand et al.,2011). Consequently, most of e-Purchasing initiatives are undertaken by large organizations that are capable of making significant cost investment (Ramboll, 2005). Smaller organizations may not afford to make that kind of commitment (Davila et al., 2002; Khanapuri, Nayak, Soni, Sharma, & Soni,

2011; Min & Galle, 2003; Sampaio, 2009). Lin et al., (2010) reported from their case studies that many organizations simply do not have the financial wherewithal to adopt, implement, and maintain their B2B systems, thus resulting in partial use or outright failure. Clearly, lack of financial resources is one of the major barriers to e-Purchasing implementation success (Eei et al., 2012).

f) Lack of clear policy and strategic procurement planning

Studies have highlighted that lack of clear policy hinders the optimal use of e-Purchasing. Asiimwe (2012), for instance, claimed that establishing clear policies is paramount to guide practices. New initiatives such as e-Purchasing must be treated as an integral part of the corporate strategy to sustain its competitive advantage.

Strategic planning generally refers to the defining of the organization's go-forward plan for the future and the accompanying desired outcomes. Evans (2010) asserted that the majority of organizations do not fully operationalize their procurement strategy to get maximum benefit.

2.5 Summary of Literature Review

Through literature review, a model representing the progression of study from supply chain management (SCM) to e-Purchasing system implementation to organizational critical success factors (CSFs) was obtained. Illustrated using the onion model, it is shown in Figure 2.9. The model illustrates that this study is part of supply chain management perspective.

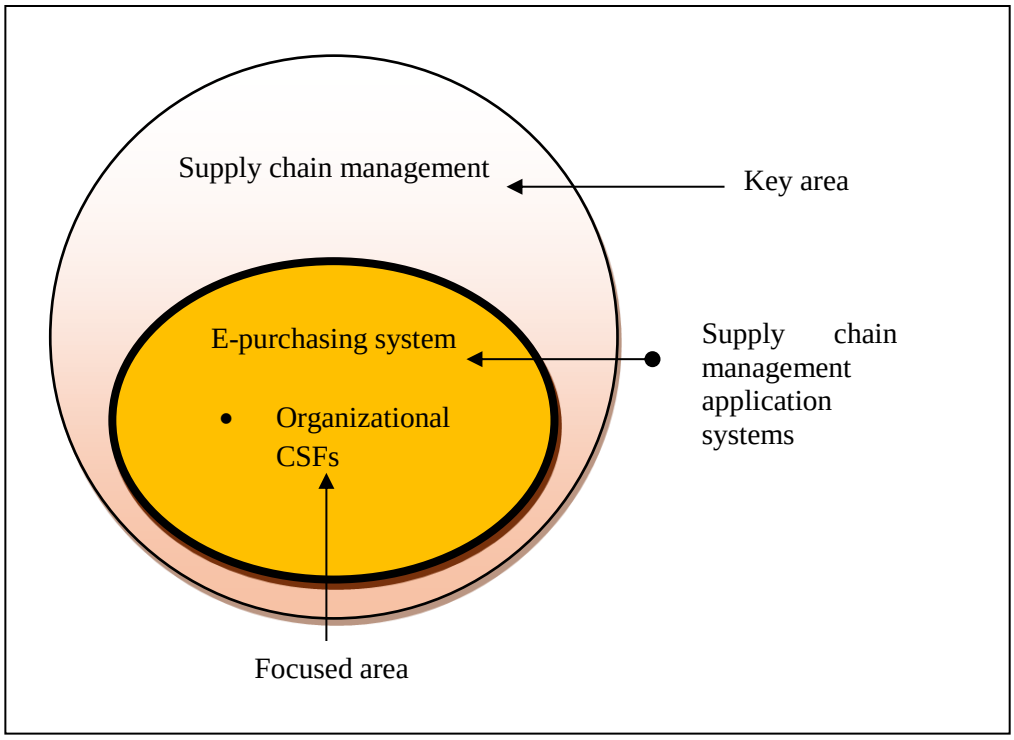

Figure 2.9: Onions Model (Developed For This Study)

Both supply chain management and e-Purchasing system are interrelated. This is so because SCM, as a concept, implies coordination and integration of activities, processes, individuals and the entire organizations of the supply chain for the purpose of improving long-term organizational performance. This coordination and integration of multiple functions, processes and organizations would be too complex and too difficult to achieve without the support of information technology and IT applications, such as e-Purchasing. Hence, the development of SCM theories and concepts can only find fruition in practical application systems, and one of such system applications is e-Purchasing. E-Purchasing has been around for some time and has been recognized as a great tool for effective and efficient SCM, achieving agility and responsiveness, and allowing collaboration between firms through supply chain integration.

The literature highlights great benefits that organizations can derive from e-Purchasing. These benefits covering both tangible and intangible aspects include cost reduction,

process improvement, improved purchasing cycle time, strengthened trading partner relationship, and competitive advantage. However, studies have also shown that implementing e-Purchasing is a daunting effort fraught with challenges. Organizations have been known to fail in their attempts to introduce e-Purchasing. One of the causes of this failure is related to organizational barriers. By organizational barriers, the literature cites lack of top management support, resistance to change, lack of user training programme, lack of trading partner readiness, insufficiency of financial resources, and lack of clear policy and strategic procurement planning. These organizational barriers present challenges to full adoption of e-Purchasing and may underpin the reluctance of some organizations to adopt new innovation to business processes based on technology facilitation.

2.6 Concluding Remark

This chapter highlights the salient points derived from a review of extant literature on the subject of study. It starts with a discussion on the principles of supply chain management as a basis or foundation for the study of SCM application systems. This is then followed by an overview of the various SCM application systems currently in use by organizations. An overview of the purchasing process ensues before a comprehensive explanation is made of e-Purchasing implementation. The latter covers the various definitions of e-Purchasing as given by various authors; levels of e-Purchasing adoption; types of application systems; system benefits; and finally, organizational issues and implementation barriers. The subsequent chapter will discuss the development of the theoretical framework of e-Purchasing implementation success in relation to organizational factors, which is the main focus of this study.

CHAPTER 3

THEORETICAL BACKGROUND

Organizational Critical Success Factors (CSFs) Of E-Purchasing Implementation in Construction Organizations

3.1 Introduction

There are two main areas of research that serve as the theoretical foundations of this study. They are the Resource-Based Theory (RBT) and e-Purchasing system implementation success. RBT is employed to relate certain organizational factors to strategies taken by organizations to improve their effectiveness and competitiveness. Successful implementation of e-Purchasing system is characterized by two factors: project management success and user satisfaction. Although it is difficult to evaluate objectively the success of IT system implementation (Camp et al., 2004; Ives & Olson, 194; Weill & Baroudi, 2004), these two factors have been shown by various studies to be commonly used as substitute measures of success (Baraudi, Olson & Ives, 1986; DeLone & McLean, 2003; Eakin, 2003; Olson, 2004; Rosacker, 2005; Sharkey, Scott & Acton, 2006). Research in aforementioned areas is briefly reviewed below.

3.2 The Principle of Resource-Based Theory (RBT)

The RBT is founded on the premise that organizations can achieve sustainable competitive advantage by possessing rare resources or by undertaking strategic initiatives. It helps managers understand that assets can be put to use to improve business process performance (Caldeira & Ward, 2001). Strategies can then be formulated to optimize the use of the available resources and capabilities, leading to improved efficiency and effectiveness (Barney, 1991; Pesic, 2007).

The resources in an organization may include both tangible and intangible assets such as capabilities, organizational processes, information and knowledge (Barney, 1991). Prahalad and Hamel (1990) highlighted that the RBT considers collective learning in an organization as an indispensable action to accumulate new skills and develop business capabilities. The theory also accepts attributes related to past experience, organizational culture and competencies as critical success factors of an organization (Campbell & Luchs, 1997; Hamel & Prahalad, 1996).

Olalla (1999) stressed that the RBT has elevated human resource management as a vital source of competitive advantage for an organization. It emphasizes the understanding that internal resources and capabilities are important considerations in order to secure competitive positions (Olalla, 1999). Human resources may generate functional and cultural capabilities due to experience, abilities, values and integration in the organization. According to Hall (1993), competitive advantage is derived from one or more of functional capabilities (such as knowledge, skills and experience of employees) and cultural capabilities (such as attitudes, values, beliefs and habits). Other studies emphasized the importance of leadership (Peppard & Ward, 1999), relationship building, and the business model to achieve business advantage through information technology (IT) (Caldeira & Ward, 2001).

The foregoing discussion highlights the importance of intangible resources in the RBT. Intangible resources are part of the organizational dimension and this dimension can be associated with organizational variables that affect organizational structure (Teo et al., 1997; Vadapalli & Ramamurthy, 1997).

Organizational variables are one of the factors that influences the successful implementation of IT system solutions in organizations (Ang et al., 2001 ; Tallon et al.,2000; King & Sabherwal, 1992; Grover,1993; Miller, 2001; Hussien, Selamat, Anom, Karim, & Mamat, 2007).

This study is about the implementation of e-Purchasing in construction organizations and the organizational factors that determine its success. These factors have a direct bearing on the long term survivability, competitiveness and superior performance of the organizations. Since the RBT deals with resource conditions and other organizational factors that have a bearing on competitive advantage, it is ideally suited to be the underpinning theory of this study.

3.3 E-Purchasing Success

According to Cullen and Taylor (2009), it is pertinent to clarify what it means by success as it relates to e-Procurement initiatives since without such clarification it would not be feasible to identify the factors that are critical to their implementation. However, there is no general consensus among researchers as to what constitutes the most ideal or proper measures of IT system success. Generally speaking, it means different things to different people (Eteves-Sousa & Pastor-Collado, 2000; Markus et al., 1999). Nonetheless, IT system implementation and the measurement of its success has been the focal point of substantial amount of research (Bradford & Florin, 2003; B. Wong & Tein, 2003).

Success is a multidimensional concept in nature and involves interrelated variables (Martinsons & Chong, 1999; Seddon et al., 1999). This multidimensionality of success can be assessed at various levels such as the technical, individual, or organizational, by

using a number of criteria such as financial, economic, or behavioural (Molla & Licker, 2001). In regards to the organizational dimension, success refers to any good outcome that the organization can possibly derive from its enterprise-wide systems (Markus & Tanis, 2000b). Organizations that are highly confident in the success of their systems normally have a formal or clear definition of what constitutes success and this definition is widely understood and accepted. It would draw a clear distinction between project management success and business success and would have a clear focus on delivering benefit (Reich, Gemino, & Sauer, 2008).

Success, however, is a dynamic concept that can vary over time and highly dependent on business conditions (Maheshwari, 2002; Phang & Patrecia, 2005). More importantly, success cannot be attributed to a single factor (Zviran & Erlich, 2003). There is a complex relationship of interdependency existing between the information system and its environment, organization, users and management (Zviran & Erlich, 2003). Some researchers postulated that the criteria for project management success should not be confined to the dimensions mentioned above but should also encompass other variables such as the satisfaction of the project stakeholders' expectations (Baccarini, 1999; Schwalbe, 2004).

Based on the literature, it is evident that the success of e-Purchasing implementation can be viewed from many perspectives (Petter, DeLone, & McLeon, 2008; Rasmy, Assem, & Sondoss, 2005). This study, however, suggests that successful implementation of e-Purchasing is measured by project management success and user satisfaction. Many researchers previously used project management success as a criterion for measuring the success of the implementation of enterprise systems (Eakin, 2003; Espinosa, Delone, & Lee, 2006; Markus & Tanis, 2000b). For user satisfaction, it has been discussed

rigorously by previous researchers as important factor in measuring the success of IT system implementation (Delone & McLean, 1992; Jang, 2010; Muylle, Moenaert, & Despontin, 2004; Vaidya et al., 2006; Zviran & Erlich, 2003), and believed as one of the key factors that affects information system success management (Holsapple, Wang, & Wu, 2005; Kassim, Jailani, Hairuddin, & Zamzuri, 2012; Powers & Dickson, 1973). Both of these variables will be discussed in the following subsections.

3.3.1 Project Management Success

Project management implementation success refers to the achievement of planning, budgetary, and functional goals (Finch, 2003; Olson, 2004; Pinto & Slevin, 1987). According to Gonzalez Artigas (2007), when the best practices of project management are adhered to, the success rate of IT projects increases dramatically. This is because project management is a key activity in most modern organizations (Belout & Gauvreau, 2004) and the success of project management has often been associated with the final outcomes of the project (Munns & Bjeirmi, 1996).

Baccarini (1999) defined project management success as meeting the individual goals of cost and budget, deadlines, and quality. It indicates the degree of efficiency of project execution (Pinkerton, 2003). These three criteria of cost, deadlines and quality are repeatedly mentioned in literature as valid measures of project management success (Blaney, 1989; Duncan, 1987; Globerson & Zwikael, 2002; Thomsett, 2002)

Adopted from Enterprise Resource Planning (ERP) literature, project management success metrics refer to performance of the enterprise system project against planned schedule, budget and functional scope (Markus & Tanis, 2000a). These are the classic performance measures applied to project management success (Markus & Tanis, 2000a;

Rasmy et al., 2005). In the context of enterprise systems, an implementation is considered successful if it meets the initial project requirements for going live, such as meeting deadlines, continuing operating within the budget and achieving system performance as expected (Robey et al., 2000). Specific to e-Purchasing system, Eakin (2003) identified on-time delivery, budget compliance, and the delivery of expected business benefits as being the key ingredients of success. Other researchers like Espinosa et al.,(2006) have similarly argued in favour of these tree factors. Due to the above reasons, project management success is used as a variable of e-Purchasing implementation success in this study.

3.3.2 User satisfaction

User satisfaction has been found to be not only an important factor in measuring the success of IT system implementation (Delone and McLean, 1992; Jang, 2010; Muylle, Moenaert, & Despontin, 2004; Vaidya et al., 2006; Zviran & Erlich, 2003), but also one of the key factors that affects information system success management (Holsapple et al., 2005; Powers & Dickson, 1973). The concept of IT system user satisfaction can be traced to the work of Cyert and March (1963), who proposed that an information system that meets the needs of its users would reinforce the overall satisfaction of the organization with the system (Ives et al., 1983)

Bailey and Pearson (1983) referred to user satisfaction as "*the sum of one's positive and negative reactions to a set of factors*", whereas Ives et al., (1983) defined user satisfaction as the extent to which users believe the IT system meets their information requirement. A system that yields no user satisfaction is less likely to be used and hence less likely to produce beneficial results to the user community and the organization (Wu & Wang, 2007). Baraudi et al., (1986) contended that user satisfaction leads to

system use and therefore should be the preferred measure of IT system success. Gelderman (1998) provided empirical evidence that user satisfaction is the most appropriate measure of IT system success.

Due to the preponderant use of user satisfaction as a criteria of IT system success, it was decided that it be also used as the dependent variable for this study. In the context of the e-Purchasing system, it is contended that if the system meets user requirements, user satisfaction with it will definitely increase. Conversely, if the system fails to provide the needed information and functionalities, users will become dissatisfied.

3.4 An Overviews of Critical Success Factors (CSFs)

Success, as a concept, has been widely discussed in various disciplines around the globe and many types of measurements are used to express it. In the literature, one of the most profound concepts of success is Critical Success Factors (CSFs). The CSFs methodology has its origins in the Management Information System (MIS) industry. The idea of applying CSFs to business problems was first mooted by Daniel (1961) but significantly developed by Rockart (1986) in his study of CSFs and competitiveness (Andraw, Roger, George, & David, 1998; Ang et al., 2001; Grover, 1993; King & Sabherwal, 1992; Rasmy et al., 2005; Tallon, Kraemer, & Gurbaxani, 2000). The idea of CSFs is instinctively attractive since it focuses attention to important organizational issues, as opposed to only a few technical or related technological issues (Pathak et al., 2010). Basically, CSFs are the focus areas, meaning those few things that must go well before any success or competitive advantage can be attained for the organization (Horsti et al., 2005). CSFs can be events, circumstances, conditions or activities, whose significant influences require special attention (Dickinson et al., 1984).

There are several definitions of CSFs. One of the most frequently cited definitions refers to them as the *"limited number of areas in which results, if they are satisfactory, will ensure successful competitive performance for organization"* (Rockart, 1979, p. 85). CSFs also refer to areas of performance that are key to the accomplishment of a stated mission (Caralli, 2004). In addition, as cited by Kuzic and Kuzic (2004), CSFs are associated with characteristics, conditions or variables (Bruno & Leidecker, 1984), and a small number of easily identifiable operations (Hossain, 1999) that have significant impact on the success of an organization. Kangi and Tambi (1999) suggested that for CSFs to be more effective, they have to represent managerial areas that require continual attention to, leading to high performance.

Many studies have examined CSFs in the context of specific industries (Angeles & Ravi, 2007; Chen, 1999; Chuen, 2010; Jamil & Ahmad, 2009; Li & Li, 2005). Jiang et al., (1996) and Cleland (1999) stated that each industry has a unique set of common CSFs. Liu (2004) and Hartman and Ashrafi (2004) expressed that a set of critical success factors that have been identified for a particular project may not be applicable to another because of differences in environment, types of stakeholders and priority of organizational goals.

The CSF approach has been recognized as contributing greatly to knowledge and industry practices. Henderson et al.,(1987) and Rockart (1979) expressed that it is a simple approach that enables management to focus on important parts of business operation activities that have the biggest impact to initiative implementation success. The literature is replete with information on the contribution of CSFs to research knowledge and industry practices, particularly in: i) focusing management attention on the critical areas of business (Rockhart, Boyton & Zmud, 1984; 1979); ii) focusing

management on major issues or concerns that the organization faces (Pathak et al., 2010); iii) sharpening management understanding of business priority areas (Boyton & Zmud, 1984); iv) providing a method of establishing guidelines for monitoring and controlling of activities (Ferguson & Dickinson, 1982; Vaidya et al., 2006); v) associating it with other approaches to develop a corporate strategy (Munro, 1983; Munro & Wheeler, 1980); vi) assisting management to organize responsibilities and efforts to ensure the success of the system (Esichaikul & Chavananon, 2001), and vii) assisting the project manager and other stakeholders to predict the possibility of project success, and as a guideline for corrective action (Rasmy et al., 2005). In long term planning, organizing the CSFs will assist management in controlling factors that will contribute to the success of information systems and organization.

Resource based theory (RBT) argued that organizations must possess unique resources that are valuable, rare, difficult to imitate, and non-substitutable by the competitor, in short 'VRIN', in order for them to have a competitive edge over competitors. These resource characteristics should be inherent in tangible as well as intangible assets and capabilities. When information system resources (tangible and intangible) are properly combined with other complementary organizational factors (associated with organizational CSFs), they fulfil the necessary 'VRIN' conditions and will thus be able to become a source of sustainable competitive advantage.

Organizational CSFs is a dimension of CSFs. It demands management to focus on organizational issues (Pathak et al., 2010) needing attention and proper management (Aggestam & Soderstrom, 2006). These same issues would contribute to information system and organizational success (Pathak et al., 2010). It is the focus of this study.

Details on organizational critical success factors for e-Purchasing implementation are discussed in the following sub-section.

3.5 Organizational CSFs for E-Purchasing Implementation Success

Organizational factors emphasize the role of individuals and both the internal and external characteristics of an organization as drivers of organizational innovativeness (Oliveria & Martins, 2011). Teo et al., (1997) and Vadapalli and Ramamurthy (1997) noted that the organizational structure may need to be adjusted in line with changing environment if factors tied to the structure are to be effective. Rockart (1986) pointed out that organizational factors play an important role in, and significantly influence, system implementation and use. As pointed elsewhere in literature, other researchers have also come to the same conclusion as Rockart. According to them, organizational factors have a direct bearing on information system implementation success (Aguita-Obra & Padilla-Melendez, 2006; Ang, Davies, & Finlay, 2001; Hussien, Selamat, Anom, Karim, & Mamat, 2007; Hwang, Lin, & Lin, 2012; Tallon, Kraemer, & Gurbaxani, 2000). Table 3.1 below lists twenty six (26) organizational CSFs obtained from literature that are associated with e-Purchasing implementation in multiple industries around the world.

Table 3.1: Organizational Critical Success Factors by Various Authors

Item	CSFs	Author(s)
1	Organizational policy and strategic plan	Vaidya et al.(2006), Linus et al.(2010), Esichaikul and Chavananon (2001), Kuzic and Kuzic (2004), Maheshwari (2002), Giunipero and Sawchuk (2000), Behkamal et al.(2007), Alwabel and Zairi (2005), Khan et al.(2010),

Table 3.1, continued

		Li and Huang (2004), Coopers (2001)
2	Project Plan/Schedule	Jennex et al.(2004), Gunasekaran and Ngai (2008), Li and Huang (2004)
3	Project Team	Kao and Durocher (2007), Li and Huang (2004)
4	Appropriate business model	Esichaikul and Chavananon (2001), Sehwail and Ingalls (2005), Laosethakul(2005)
5	Top management support and commitment	Bouchbout and Alimazighi (2009), Vaidya et al.(2006), Gunasekaran and Ngai (2008), Linus et al.(2010), Kuzic and Kuzic (2004), Robertson (2005), Jamil and Ahmad (2009), Chad et al.(2010), Luvsanbyamba and Chung (2009), Alwabel and Zairi (2005), Li and Huang (2004), Chan et al.(2006), Aberdeen Group (2005a), Maheshwari (2002), Laosethakuln (2005), Cata (2003), Yu-Hui (2008)
6	Effective and knowledgeable project manager	Kuzic and Kuzic (2004), Li and Huang (2004), Maheshwari (2002)
7	Stakeholder involvement	Chad et al.(2010)
8	Roles and responsibility definition of team members	Li and Huang (2004), Maheshwari (2002)
9	Experience with new technology	Robertson (2005), Alwabel and Zairi (2005), Khan et al.(2010)
10	Organizational commitment	Chan and Swatman (1999), Kao and Durocher (2007), Chad et al.(2010),
11	Appropriate organizational structure	Jennex et al.(2004), Kuzic and Kuzic (2004), Alwabel and Zairi (2005), Giunipero and Sawchuk (2000), Coopers (2001)
12	Change management	Vaidya et al.(2006), Li and Huang (2004), Chan et al.(2006), Aberdeen Group (2005a), Coopers (2001)
13	Close collaboration with trading partners	Gunasekaran and Ngai (2008), Maheshwari (2002)

Table 3.1, continued

14	Relationship building with trading partners	Robertson (2005), Kao and Durocher (2007), Laosethakul (2005)
15	Promotion of systems through communication within organization	Jamil and Ahmad (2009), Turban et al.(2004)
16	Organizational culture (attitude towards innovation)	Kao and Durocher (2007), Chad et al.,(2010), Alwabel and Zairi (2005), Maheshwari (2002), Giunipero and Sawchuk (2000)
17	Business process reengineering	Jennex et al.(2004), Angeles and Ravi (2007), Angeles and Ravi (2005), Vaidya et al., (2006), Gunasekaran and Ngai (2008), Linus et al.,(2010), Kao and Durocher (2007), Li & Huang (2004), Chan et al., (2006),Aberdeen Group (2005a), Cata (2003)
18	Training and education program	Behkamal et al.(2007), Chan and Swatman (1999), Esichaikul and Chavananon (2001), Vaidya et al.(2006), Gunasekaran and Ngai (2008), Linus et al.(2010), Kao and Durocher (2007), Li and Huang (2004), Chan et al.,(2006), Giunipero and Sawchuk (2000), Coopers (2001)
19	Good quality employees	Li and Huang (2004) Laosethakuln (2005), Giunipero and Sawchuk (2000)
20	Adequate financial resources	Bouchbout and Alimazighi (2009), Kuzic and Kuzic (2004), Kao and Durocher (2007), Alwabel and Zairi (2005), Lin et al.(2010), Li and Huang (2004)
21	Performance measurement	Vaidya et al.(2006), Linus et al.(2010), Kuzic and Kuzic (2004), Alwabel and Zairi (2005), Aberdeen Group (2005a), Laosethakul (2005), Giunipero and Sawchuk (2000)
22	Regular monitoring and evaluation of performance	Li and Huang (2004)
23	Readiness of trading partners	Behkamal et al.(2007), Esichaikul and Chavananon (2001), Bouchbout and Alimazighi (2009), Angeles and Ravi (2005), Li and Huang (2004), Vaidya et al.,(2006)

Table 3.1, continued

24	Trust with trading partners	Behkamal et al.(2007), Jennex et al.(2004), Luvsanbyamba and Chung (2009), Laosethakul (2005)
25	Communication with trading partners	Gunasekaran and Ngai (2008), Linus et al.(2010), Giunipero and Sawchuk (2000)
26	Vendor/IT Consultant support	Chad et al.(2010), Rahim (2008)

3.5.1 Organizational policy and strategic plan

The creation of policy and strategic business plan/schedule prior to the development of e-Purchasing solution is an important CSF (Neef, 2001). Porter (2001) found policy and strategic plan as having a direct impact on business-to-business (B2B) initiative success. Organizational policy and strategic plan refers to the establishment of a framework and the strategizing of the accomplishment of the stakeholders' interest and project objectives into an end-result (Lewis, 2001). Strategy sets the boundaries and future direction of the project implementation (Longman & Mullins, 2004) and it is the prime mover of any B2B initiative (Maheshwari, 2002).

3.5.2 Project plan and schedule

Creating and successfully executing a project plan is an essential task of most if not all businesses (Thornton & Marche, 2003) This is equally true in the case of a B2B project such as e-Purchasing, where well-defined project plan and schedule will determine the viability, acceptance and ultimately success of the project (Li & Huang, 2004). The project plan must, as a minimum, specify the objectives, tasks, resources, responsibilities, schedules and deliverables (Thornton and Marche, 2003).

3.5.3 Project Team

Having a project team is important because it is responsible for creating detailed project plan, assigning responsibilities, and determining the time frame for the entire project (Lin et al., 2003). The project team members must consist of both business and technical people to ensure that the initiative is handled holistically and takes into consideration technical and business considerations (Li & Huang, 2004). In addition, the organization must ensure that key persons representing the units in the organization that are most affected by the implementation are part of the team (Li & Huang, 2004).

3.5.4 Appropriate business model

A business model is an architectural model of product, service and information flows including a description of the various business actors and their roles (Hedman & Kalling, 2003; Timmer, 1998). Therefore, an organization needs to understand the different types of business models and how well they suit the specific needs of its industry before choosing a particular model for adoption (Esichaikul & Chavananon, 2001; Kearney, 2000). Additionally, different business models may be applicable and suitable at different times (Monlealegre et al., 2004). Hence, choosing the appropriate electronic business model is critical to the success of any B2B initiative implementation (Brunn, Jensen, & Skovgaard, 2002; Kearney, 2000, cited from Loasethakul, 2005).

3.5.5 Top management support and commitment

Top management support and commitment to an initiative is expressed through defining the strategy; promoting the project to employees (Bhatti, 2005); providing leadership and resources (Chad et al., 2010); and encouraging employees to participate (Hedman, 2010). Top management support and commitment is critical to the success of any IT investment in B2B transaction (Chan et al., 2006; Lin et al., 2006; Lin & Huang, 2006;

Swatman, 1993). Studies have shown that IT project implementation that is not supported by top management support and commitment is bound to fail (Alwabel & Zairi, 2005).

3.5.6 Effective and knowledgeable Project Leader/Project Manager

The Project Leader or Project Manager is responsible for overall project management and the reporting of progress to the Steering Committee (Sritharan, 2004). They must be knowledgeable of the procurement process; and possess political presence, organizational familiarity and personal intelligence to manage the projects (Neef, 2001). The Project Leader or Project Manager is the most critical resource for the successful implementation of e-business solutions (Mousseau, 1998).

3.5.7 Stakeholder involvement

Existing literature shows that there is a direct relationship between stakeholder involvement and success of any IT system implementation (Lin & Shoa, 2000; Davidson, 2002). Specific to e-Purchasing initiative, the literature says that both stakeholder involvement and understanding are required (Aberdeen Group., 2005b; Audit Commision., 2006). This is so because the stakeholder or stakeholders will provide the insights as to the needs and requirements of the business processes (Russell et al., 2004). It is important for the stakeholders to be intimately involved in the early stages of the implementation process in order to ensure that the thrust and direction of the initiative is on the right things and on the right course (Aggestam & Soderstrom, 2006).

3.5.8 Roles and responsibility definition of team members

Role definition of team members is extremely important to ensure that efforts are not duplicated or neglected (Farrah et al., 2007), accountability of each and every team member is clearly spelled out (Li & Huang, 2004; Anil & Thomasson, 1991), and measurement and grading of expectations and achievement is communicated clearly (Frese & Sauter, 2003). Li and Huang (2004) mentioned that in order to succeed the B2B system must be driven by a specific team that includes both business unit and IT managers.

3.5.9 Experience with new technology

Organizations need to be technologically up-to-date in the environment of rapid technological changes and the ever increasing use of IT-based business applications (Kinder, 2000). Keeping abreast with new technologies and gaining experience in them will enrich the organization with new knowledge acquirement, thereby making it more competitive (Khan et al., 2010) and apt to handle new system implementation (Allen et al., 2002). Conversely, organizations that have little experience with new business application technology will face an uphill task when the time comes to implement such a system (Kinder, 2002).

3.5.10 Organizational commitment

Organizational commitment is defined as the relative strength of an individual's identification and involvement with the organization that employs him/her (Chima, 2007; Stup, 2006). It is a measure of an employee's willingness to adopt the aims, goals and values of the organization and having high faith in them (Atak, 2011).

Organizational commitment has been identified in many IT implementations as a major factor influencing the success of B2B initiatives (Chan & Swatman, 1999; Mose et al., 2013). This is because organizational commitment drives the achievement of organizational objectives (Dick & Metcalfe, 2001; Oberholster & Taylor, 2001), contributes to the progress of system implementation (Esichaikul & Chavananon, 2001) and effects organizational learning (Atak, 2011). Atak (2011) suggested that to increase organizational commitment, the organization needs to empower the employees, increase motivation, encourage group work, provide incentives and awards, provide employees with access to organizational knowledge and encourage employee participation in decision making.

3.5.11 Appropriate organizational structure

An organizational structure consists of activities such as task allocation, coordination and supervision (Pugh, 1990) and involves all necessary resources and skills to drive the implementation of new initiatives (Hussein & Nihad, 2009). The traditional model of a hierarchical organizational structure is ineffective in fast changing market places that are characterized by keen competition (Kanter et al., 1992). Hence, to implement e-Purchasing, it is imperative that there exists an organizational structure that is based on automated processes and purged of all functional duplications (Huang & Welsh, 2002).

3.5.12 Change management

Change management is an organizational process aimed at helping employees accept and embrace changes in their current business environment (Hiatt & Creasey, 2003). Change management involves effectively balancing forces in favour of change over forces of resistance (Stebel, 1992). Change management is required to support changes

in business processes (Vaidya et al., 2006). According to the World Bank (2003), lack of change management in an organization can lead to project failure. In line with this, it has been suggested that organizations need to develop and execute change management if they want to fully and successfully adapt to e-Purchasing system (Walker & Rowlinson, 2007). A successful exercise of change management in an organization can be achieved through consultation, communication and issue resolution (OGC, 2002).

3.5.13 Close collaboration with trading partners/suppliers

Collaboration is defined as a process of decision making among independent organizations involved in joint ownership of decisions and collective responsibility for outcomes (Gray, 1991). Collaboration emphasizes clear partnership between the trading partners (Eid et al., 2002a). Through close collaboration with trading partners, business relationship can yield greater benefits (Business Link., 2007), improve business performance (SAP, 2007), and speed-up decision making (Business Link., 2007; SAP, 2007). For the successful implementation of B2B applications such as e-Purchasing, a vital success ingredient is keen collaboration among trading partners (McNicholas & Brennan, 2008). Lack of such collaboration has been identified as one of the causes of failures of inter-firm relationship (Parung, Bititci, & MacBryde, 2004).

3.5.14 Relationship building with trading partners/suppliers

Relationship building with trading partners refers to the development of resource for long-term competitive advantage through linkage of information system and the mutual sharing of organizational and informational resources (Morgan & Hunt, 1999). It makes an organization more competitive and offers the best means to access valuable and vital resources (Morgan & Hunt, 1999).

3.5.15 Promotion of systems through communication within the organization

It is important to constantly promote a new system implementation within the organization throughout the entire change process (Thorsen Torbjorn, 2008). This can be accomplished through various communication channels such as project specific newsletters, monthly bulletin, intranet sites, site meetings and posters (Nah et al., 2003; Thorsen Torbjorn, 2008).

3.5.16 Organizational culture (attitude towards innovation)

Organizational culture is described as the characteristics, the way and the values through which work is done in organizations (Saltzman & Luthans, 2001). Characteristics and values, in turn, encompass empowerment, the dissemination of knowledge and information within the organization, and the practice of good organizational values (Saltzman & Luthans, 2001). A positive organizational culture is one that encourages a willingness to accept new technology innovation (Nah et al., 2001). Implementing a new technology, such as e-Purchasing, entails a common culture of open communication and information sharing and innovative behaviour pervading in the organization (Motwani et al., 2005). Many scholars have shown that organizational cultural factors have a significant impact on the success of B2B implementation (Eid et al., 2002a; Nah et al., 2001; Saltzman & Luthans, 2001).

3.5.17 Business process reengineering

Business process reengineering (BPR) is a radical redesign of the organization's current culture, structure, and process (Lin et al., 2003). Organizations need to reengineer the business processes as they influence the behaviour of employees to follow the new systems and enforce new procedures that they intend to implement (Angeles & Ravi, 2007). Reengineering looks into rationalizing the flow of transactions and information

between trading partners (Angeles & Ravi, 2007). Roles and responsibilities may also change significantly with the new processes (Birks et al., 2001).

3.5.18 Training and education programs

Training and education programs are more widely recognized as critical success factors for the implementation of new IT systems in organizations (Lin et al., 2003). Panayiotou et al.,(2004) noted that adequate training of employees is critical in order to take advantage of new system functionalities. Since e-Purchasing involves the use of new technology and changes in traditional purchasing processes, training of employees in the use of e-Purchasing system tools is a pre-requisite for any successful implementation (Gunasekaran & Ngai, 2008; World Bank, 2003). Employees need to comprehend the operational functionalities and be comfortable with the new system (CGEC, 2002b). Training will also enhance the personal value of individuals (Wong, 2005) and equips them with the latest updates and solutions (Rajakumar, 2001).

3.5.19 Good quality employees

Employing qualified employees creates a positive image for the organization (Belsheba, 2009). Qualities ranging from personal attributes to professional skills, experiences and qualifications are crucial to set the pace for organizations (Belsheba, 2009). Organizations that intend to implement e-Purchasing must be willing to dedicate their best employees to the project in order to derive success from the implementation (Bingi et al., 1999).

3.5.20 Adequate financial resources

Snider at el., (2009) defined financial support in terms of adequate funding for consulting and training. Money has to be spent on extensive training, providing on-

going user support, and launching a communication campaign explaining the merits of an innovation. Money is also a yardstick or performance standard (Klein & Knight, 2005). An adequate financial resource is pertinent for any system implementation; failing to commit the required financial resources would often result in schedule and cost overruns (Nidal, 2008). Thus, the availability of adequate financial resources is critical for technology innovation implementation such as e-Purchasing (Klein & Knight, 2005).

3.5.21 Vendor/ IT Consultant support

An organization is encouraged to get advice from its vendor or IT consultant (Lin et al., 2003) since the latter plays an important role in the successful implementation of B2B initiatives, such as e-Purchasing (Chad et al., 2010). The support of the vendor is indispensable in respect to; i) providing qualified consultant's advice on the robustness and reliability of the system (Lin et al., 2003; Rahim, 2008); ii) participation in the implementation process (Lin et al., 2003); iii) fullest cooperation with customer in customized training of employees (Rahim, 2008); and iv) technical and emergency maintenance (Lin et al., 2003; Rahim, 2008).

3.5.22 Readiness of trading partners

By readiness of trading partners, it is meant readiness in terms of available financial resources, IT know-how (Bouchbout & Alimazighi, 2009), infrastructure and business (Esichaikul & Chavananon, 2001). AOT Consulting (2003) claimed that the degree of success of an e-Purchasing initiative is highly dependent on the level of e-readiness of trading partners. Other researchers have similarly expressed the same opinion (Chang & Chen, 2005; Chwelos et al., 2001; Esichaikul & Chavananon, 2005).

3.5.23 Trust between trading partners

Trust here refers to the belief that supply chain partners will consistently act in a manner tacitly expected of them (Alain et al., 2009). When there is such a belief, organizations would be more willing to invest in technology and information sharing with their business partners (Luvsanbyamba & Chung, 2009). Conversely, without a trusting relationship between trading partners, it is very difficult to implement inter-organizational systems, such as e-Purchasing (Luvsanbyamba & Chung, 2009). Therefore, this factor is vital to the success of system implementation (Behkamal et al., 2007).

3.5.24 Communication between trading partners

Communication is *a process by which people create and send signals that are received, interpreted, and responded to by other people* (Galanes et al., 2004, p. 50). Trading partners need to collaborate, share, collate and integrate significant amounts of information to realize project objectives (Emmitt, 2010; Emmitt & Gorse, 2006) and these can be achieve through effective communication channels. Poor communication between trading partners can jeopardize IT project implementation (Ceric, 2010; Zerjav & Ceric, 2009) . Hence, communication is one of the critical factors for enterprise-wide system implementation success (Holland & Light, 1999).

3.5.25 Performance measurement

Performance is defined as the degree to which an operation fulfils the underlined performance objectives (Slack et al., 2001) and predetermined goals (Wickramasinghe & Gunawardene, 2010). Establishing performance measurement is very important in IT system implementation (Vaidya et al., 2006). There are many types and methods of performance measurement: organizational, business, operating, financial, non-financial

and quality (Salaheldin, 2008) . In respect to IT project implementation, progress of performance should be actively monitored for compliance to a set of milestones and targets (Al-Mashari & Al-Mudimigh, 2003; Nah et al., 2001) over the life of the project.

3.5.26 Regular monitoring and evaluation of performance

Progress of the IT project shall be monitored actively using a set of milestones and targets (Nah et al., 2001) for efficient and effective control (Al-Mashari & Al-Mudimigh, 2003) until implementation is completed (Nah et al., 2001). Monitoring and evaluation of performance is a critical success factor for e-Purchasing implementation (Al-Mashar & Al-Mudimigh, 2003).

3.6 Summary of Theoretical Framework of Organizational CSFs for E-Purchasing Implementation Success

In the literature, there are many theories related to enterprise level adoption of IT solutions. However, three theories emerged as being more prominent: Diffusion of Innovation (DOI), Technological, Organizational and Environmental (TOE) and Resource-Based Theory (RBT). This study uses the RBT as the underpinning theory since the subject of organizational characteristics best comes within its purview. The study looks at two aspects of e-Purchasing implementation success, namely management success and user satisfaction since they have been shown by many scholars to be the most appropriate criteria or measurement of implementation success. This study also addresses the concept of Critical Success Factors (CSFs) and relates the organizational characteristics that, from the RBT standpoint, constitute valuable intangible assets for e-Purchasing implementation success.

Taking into consideration the arguments of the RBT, the two criteria of success and the hosts of CSFs gleaned from earlier studies, an initial framework of e-Purchasing implementation success was developed. This is shown as Figure 3.1. This framework becomes the foundation of this study, which is to identify the organizational CSFs that are responsible for e-Purchasing implementation success in the construction industry.

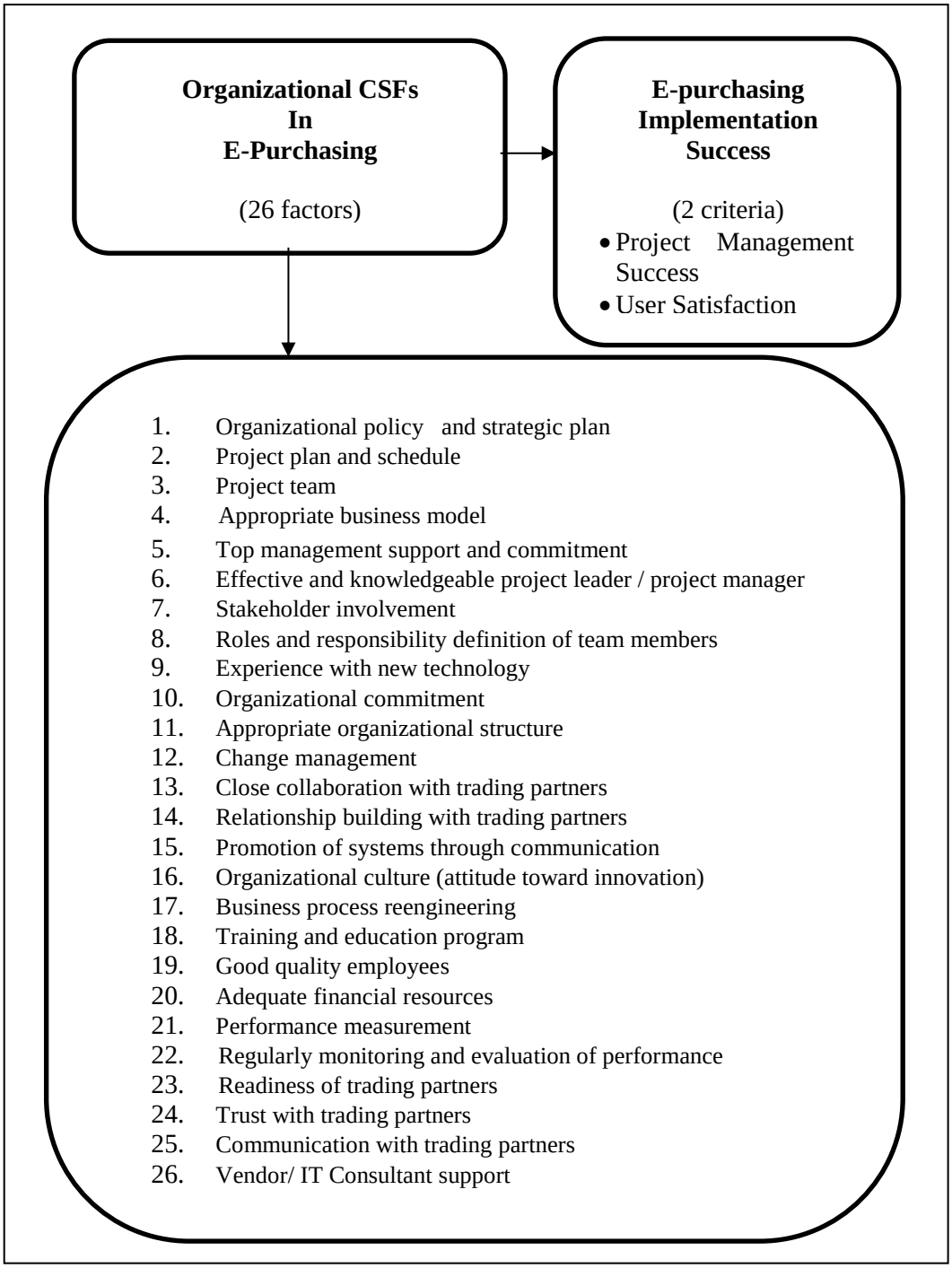

Figure 3.1: Initial Framework for the Organizational CSFs of e-Purchasing Implementation Success.

This study is undertaken because there is a gap in knowledge relating to CSFs of e-Purchasing implementation success in construction organizations (refer to Table 1.2). The above theoretical framework will guide further investigation of this phenomenon using a mixed methods research methodology.

3.7 Concluding Remark

This chapter details the theoretical basis for CSFs study of e-purchasing implementation in the context of construction organizations. The content of the chapter basically highlights the Resource-Based Theory as the basis for treating organizational characteristics that are responsible for e-Purchasing implementation success as CSFs. In addition, two indicators of success are also discussed in this chapter, namely project implementation success and user satisfaction. From here, the study identifies or develops two variables: an independent variable, referring to organizational CSFs; and a dependent variable, referring to e-Purchasing success. In addition, a theoretical framework that encapsulates the twenty-six organizational CSFs gleaned from previous studies and the two success indicators is also drawn up and shown. Subsequent chapters will discuss in greater detail the factors and indicators that support the framework.

CHAPTER 4

RESEARCH METHODOLOGY

4.1 Introduction

This research employs a mixed methods approach to data collection and analysis, beginning with an exploratory qualitative study and followed by a quantitative study along the lines proposed by earlier researchers (Creswell, 2008; Creswell & Clark, 2007). A mixed methods research is a procedure that collects and analyzes both qualitative and quantitative data in a single, or a series of studies, based on priority and sequence of information (Creswell, 2008; Creswell & Clark, 2007; Tashakkori & Teddlie, 1998). The exploratory study, as the name suggests, is carried out to explore a phenomenon (Creswell et al., 2003), and it is carried out to identify important and unknown underlying variables for quantitative study (Creswell & Clark, 2007). It is also employed to generalize sample results to a population (Creswell, 2008).

There are three phases involved in data collection and analysis; first, a preliminary study conducted through telephone and face-to-face questionnaire surveys; second, a qualitative study via face-to-face interview; and third, a quantitative study involving online, electronic and postage mail survey questionnaire data collection process. A mixed methods approach is one of several research methodologies adopted by researchers.

4.2 Reviews of Previous Research Methods to Identify Critical Success Factors (CSFs)

According to Esteves (2004), there is a wide array of research methods used by previous researchers to identify CSFs. They are shown in the table below.

Table 4.1: Research Methods Used For CSF Identification, Adapted From Esteves (2004)

Item	Research Method	Author(s)	Industry
1	Focus group	Kock et al., (1999), Esichaikul and Chavananon (2001), Lu, Hwang, and Chang (2010), Myles (2008), Janom and Zakaria (2009)	Non-construction industry
2	Case studies	Holland, Light, and Gibson (1999), Sumner (1999), Alwabel and Zairi (2005), Eid et al. (2002b), Kao and Durocher (2007), Chad et al. (2010), Wang and Huang (2004), Yeoh and Koronios (2010), Myles (2008)	
3	Delphi technique	Attirawong and McCarthy (2001) Yeoh and Koronios (2010), Hung, Chang, and Ting (2010), Li and Huang (2004)	
4	Literature review	Esteves and Pastor (2000), Behkamal et al. (2007), Vaidya et al.(2006), Bouchbout and Alimazighi (2009),Ngai et al., (2008), Atchariyachanvanich and Okada (2001), Vazifehdust et al., (2012), Sudhakar (2012)	

Table 4.1, continued

5	Questionnaire survey	Angeles and Ravi (2007), Linus et al.,(2010), Ngai et al., (2004), Jamil and Ahmad (2009), Zhao et al. (2008), Nakaratanam (2008), Luvsanbyamba and Chung (2011), Kuzic and Kuzic (2004), Chong et al., (2011a), Li and Zhigao (2010)	Non-construction industry
6	Mixed method	Jennex et al., (2004), Xu and Quaddus (2010), Huang et al., (2005), Sung and Gibson (2009), Abdullah (2010), Arasa and Achuora, 2012)	
7	Mixed method	Lee and Yu (2011), Ugwu and Kumaraswamy (2007), Tatari (2009), Chung et al., (2008), Won and Lee (2010),	Construction industry

Table 4.1 above shows the two methods used for conducting research on CSFs, namely, either singly qualitative or quantitative, or mixed. In making the choice between the two, researchers have their own peculiar reasons or justifications. For this study, a mixed methods approach is necessary since literature on organizational CSFs is mostly dominated by non-construction industry perspective. It is, therefore, inadequate to draw meaningful conclusions for the construction industry. The information that literature review provides has to be corroborated by an exploratory study using face-to-face interviews with construction industry experts for validation and for the purpose of uncovering new factors. A questionnaire survey involving the chosen population would then follow. The combination of the results of both the qualitative and the quantitative analysis would yield the most accurate picture on the subject of study. It is apparent from Table 4.1 that it is also the view of the previous researchers on construction industry CSFs that this is the best approach to use. Consequently, this researcher has decided to follow suit.

4.3 Research Design, Method and Process

According to Oppenheim (1999), research design refers to the basic plan or strategy of research, the logic behind it, and its possibility and validity to draw general conclusions. It consists of a plan for conducting research that contains specifications of elements to be investigated and the procedure to follow (Sekaran, 2000). Other authors define it as the overall plan of a research project, incorporating a number of activities and choices (Ghauri, Tan, & Jink, 1995; Miller, 1991).

As mentioned earlier, this study involves a two-phased data collection process (refer Figure 4.1) or mixed methods design (Creswell & Clark, 2007). Research begins with a qualitative exploration of the problem or subject of study, followed by a quantitative research to further understand the matter at hand (Creswell & Clark, 2007). Qualitative exploration helps to identify themes, develop taxonomies, test existing theories, and assist in developing a quantitative instrument (Creswell & Clark, 2007; Kutner, Steiner, Corbett, Jahnigen, & Barton, 1999). The researcher can initially explore views by listening to participants rather than approach a topic with a predetermined set of variables/ factors (Creswell, 2008). Moreover, exploration of this nature will help to gather more in-depth information on individual organizations involved in the study (Abdullah, 2009). Qualitative exploration enables us to answer typical questions of "how" and "why" and understand the phenomenon that otherwise would be difficult to investigate and answer by quantitative survey method. It provides information on relevant themes related to e-Purchasing implementation. Together with the literature review, it helps to formulate the outline of the issues to investigate and reaffirm.

A quantitative study, on the other hand, avails the researcher with the opportunity to gather information from a large number of samples and allows the generalization of the

results to a population (Cavana, Delahaye, & Sekaran, 2001; Creswell, 2008). This method is a good way to investigate the attitudes, thoughts, and behaviours of a large group of sample. Wong (2007) emphasized that a quantitative survey is ideal for the purpose of generating theoretical and managerial insights that are applicable to a population through the collection and analysis of data from a large sample size.

The combination of both methods is expected to improve the validity of the research findings (Mathison, 1998). Furthermore, using them together could provide a more complete picture of the study than by using either methods alone (Abdullah, 2009; Creswell & Clark, 2007). In summary, a mixed methods approach provides a holistic, detailed and comprehensive research design to investigate organizational CSFs of e-Purchasing implementation by construction organizations.

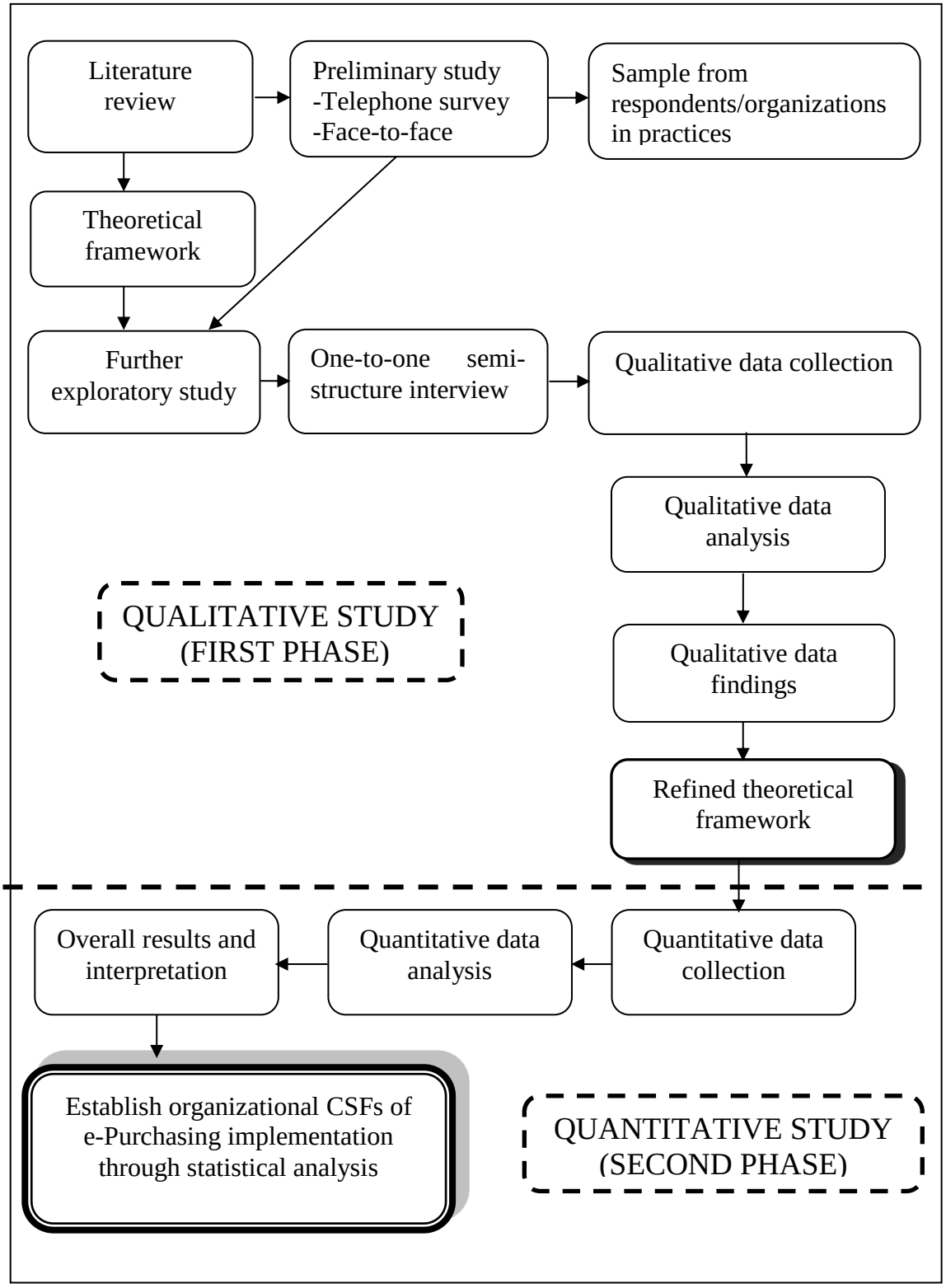

Figure 4.1: Research Design and Research Process, Adapted and Modified From Abdullah (2010) and Shelbourn et al., (2007).

To elaborate on the research methodology adopted by this study, a detailed description of the tasks involved is illustrated in Figure 4.2.

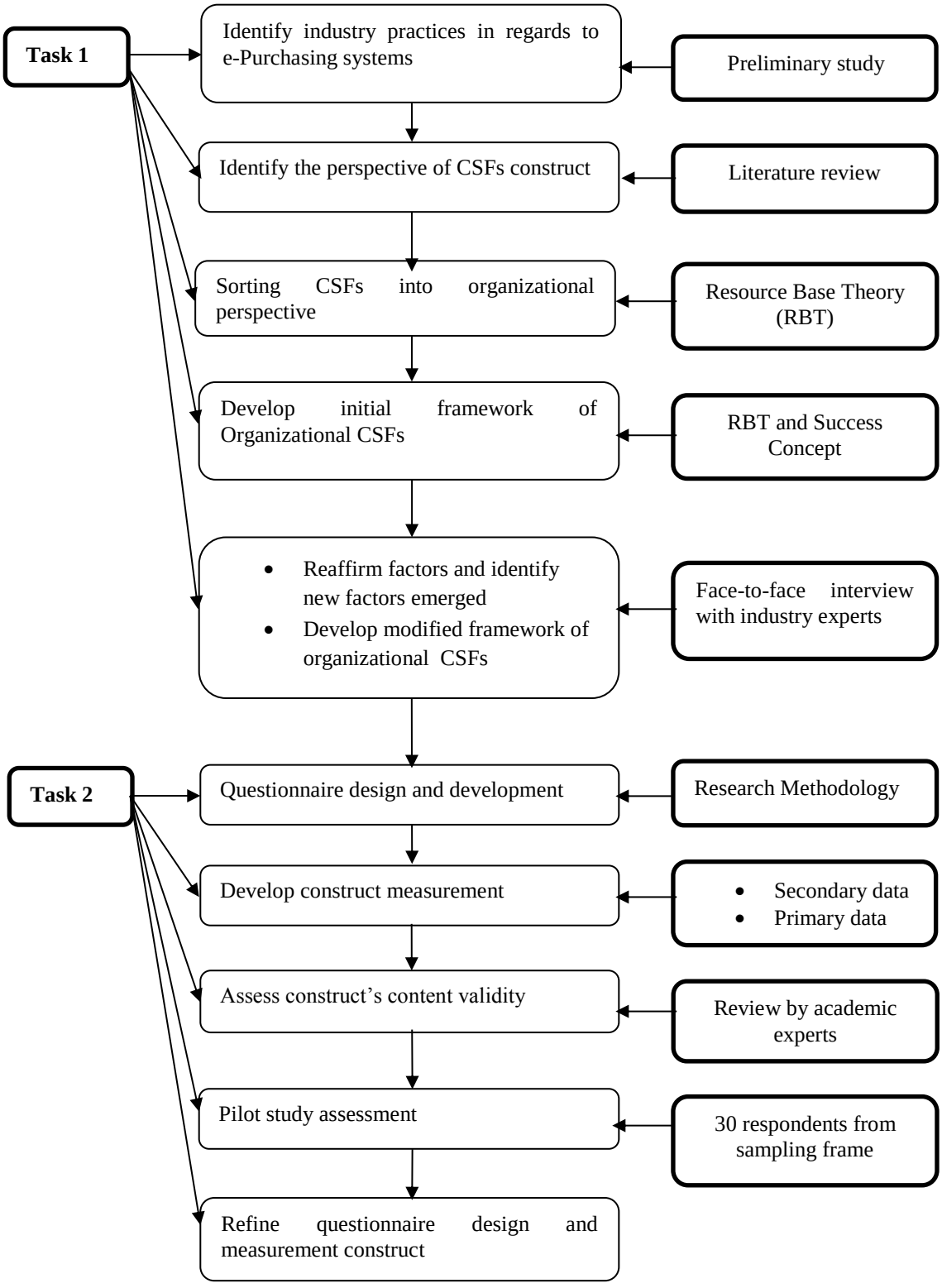

Figure 4.2: The Process Used in the Development, Validation and Interpretation of the Instrument, Adapted From Rahim (2011)

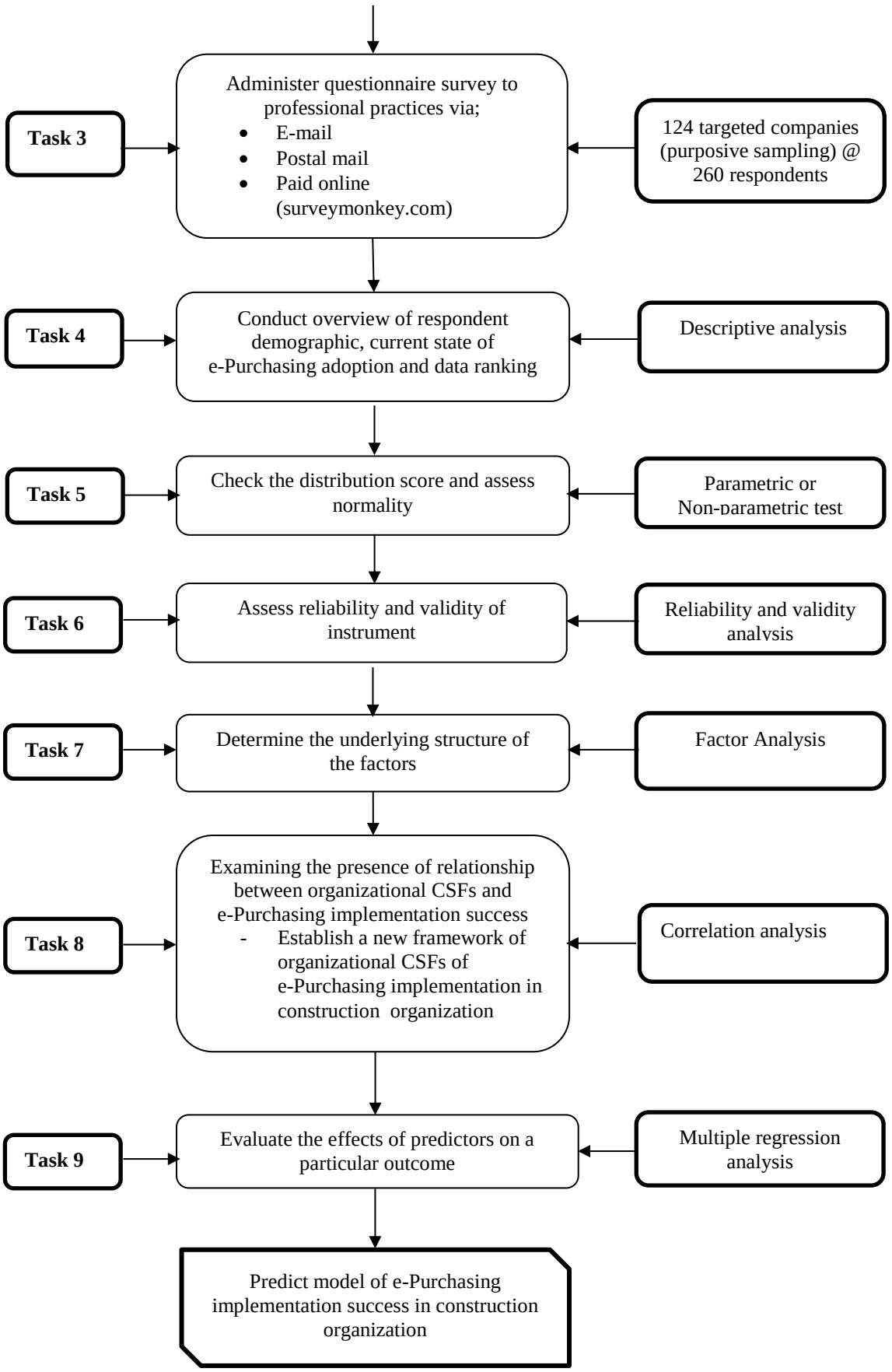

Figure 4.2, continued

Task 1 involves firstly looking at construction industry e-Purchasing practices. This is then followed by identifying the CSFs in multidimensional context and industries through literature review and extracting those factors that are related to organization. To rationalize the extraction, the Resource Base Theory (RBT) is used. Once this is done, an initial framework of organizational CSFs that is underpinned by the RBT theory and success is drawn up. The framework is reaffirmed through face-to-face interviews with industry experts. The interviews help to modify the initial framework by adding a new construct.

In **Task 2**, the questionnaire design is developed for use during the data collection phase. The measurement of the constructs is developed by adopting and adapting that used in previous studies. This applies to all constructs obtained from literature review and the new construct from the face-to-face interviews. The preliminary version of the completed questionnaire is then assessed by academic experts for construct content validity. In order to check the accuracy and reliability of the questionnaire, a pilot survey of 30 respondents selected from the sampling frame is done. Findings from both assessments modify the questionnaire design and the constructs measurements.

Task 3 involves administering the questionnaire survey to specific respondents using purposive sampling method. Three ways of distributing the instrument is used, namely electronic mail, postal mail and online. Datasets collected are evaluated by the Statistical Package for Social Sciences (SPSS) software.

A descriptive analysis of datasets to highlight an overview of the respondents' demographics, the current state of e-Purchasing implementation by construction organizations and datasets ranking is performed as part of **Task 4**. Checking the

distribution score and assessing normality follows in Task 5. In **Task 6**, the reliability and validity of the instrument used in this study is assessed before further analysis is performed.

Factor analysis to determine the underlying structure of the factors is undertaken in **Task 7**. The purpose of this analysis is to derive a small number of variable sets that retain as much of the information in the original variables as possible. **Task 8**, correlation analysis, is carried out to check the presence of relationships between independent variables and dependent variables. This task looks at the relationship of each set of variables represented by the correlation coefficient. High correlation coefficient indicates strong relationship existing between the variables. The findings from this analysis provide a new framework of organizational CSFs of e-Purchasing implementation in the construction sector.

In **Task 9**, the effects of predictors on a particular outcome are evaluated using multiple regression analysis. In addition, the predictors that have the most significant effect on the dependent variable are determined. Findings from this analysis help to devise a statistical prediction model for the successful implementation of e-Purchasing in construction organizations that can be applied to specific populations.

4.4 The Theoretical Framework

In this study, the researcher has developed a theoretical framework of critical success factors of e-Purchasing implementation in construction organizations from an organizational perspective. The theoretical foundation of this study is based upon the theory of Resource Based Theory (RBT) and IT/IS success concept. According to Sekaran (1984), a theoretical framework is a logical sense of the relationships of the

variables and the factors that are deemed relevant or important to the problem and it provides definition of relationships between all the variables. The purpose of developing a theoretical framework is to serve as a basis and guide for the research, to determine variables to measure, and to identify statistical relationships. The theoretical framework for this study is shown in Figure 3.1 (Chapter 3). This framework is created by synthesizing all the organizational critical success factors (CSFs) found during the literature review discussed Chapter 3.

4.5 Preliminary Investigation

Although review of the existing literature reveals that there is plenty of information on B2B applications, there is very little information on organizational CSFs of e-Purchasing implementation in the construction business. Hence, this study is exploratory in nature (Neuman, 2006). Due to this fact, it is pertinent that a preliminary investigation is first carried out of the IT systems and procurement processes as well as related matters existing in the industry of interest. Naoum (1998) claimed that such a preliminary study prior to the actual field work is a best practice.

For duration of three months starting January 2011, a preliminary study was carried out. Its purpose was to solicit more information on construction industry practices related to the subject of study. This includes knowing the business background, organization structure, types of IT/IS used for purchasing transaction process, capability of systems, system benefits and problems, and future plans. Based on structured questionnaire, interviews were done involving five large construction companies, represented by their senior managers such as Contract Manager, IT Manager and Senior Officer. This preliminary investigation was a pre-requisite before the main studies (both qualitative and quantitative) were conducted. The findings from this preliminary investigation were

used for practical understanding of the main study and as a basic preparation for the qualitative study in the next stage. All the interview questions used in this part of the study are shown in **Appendix A.**

4.6 Qualitative Study- First Phase

A preliminary qualitative study is normally conducted to discover underlying themes or phenomena that are initially unexplainable due to limited literature on the primary specific issues (Creswell, 2008). In this study, the purpose of the qualitative study was to reaffirm the organizational CSFs and identify new emerging factors that influence the successful implementation of e-Purchasing system in construction organizations. It was the first main step to reaffirm the factors that were earlier extracted from literature (Abdullah, 2010).

4.6.1 Sampling Design

Sampling design refers to the actions taken to determine the following: the targeted population, parameters of interest, sampling frame, the appropriate sampling method and the required sample size of the sample (Cooper & Schindler, 2008). In this qualitative study, the targeted population comprised of the parties involved in e-Procurement activities within the state of Kuala Lumpur and Selangor. The parameters of interest were the interviewees from the construction industry who possessed an IT background and who were credible to answer the interview questions.

The sample for this study was selected using purposive sampling technique targeting individuals with specific experience, criteria, characteristics or knowledge that would allow the underlying themes, or phenomena, be best understood (Ahmad & Usop, 2011; Cavana et al., 2001; Creswell, 2008). In this instance, the chief characteristics were

exposure to e-Procurement, experience and involvement in the planning and implementation of e-Procurement processes, active participation in system development, experience in business process improvement and developing systems, and coming from both public and private sectors.

The unit of analysis (Cavana et al., 2001; Creswell, 2008) of the sample was the individual who was a senior manager in an organization. Sampling frame referred to the organization that was specifically involved in e-Procurement, such as purchasing, contracting and IT.

According to Creswell (2008), for semi-structured interviews it is rather difficult to decide the right number of respondents. However, the number of respondents to be interviewed can be derived once data saturation is achieved (Glaser & Strauss, 1967). This can be determined by observing the situation whereby the data collected from the respondents do not provide any new information but just repetitive information (Neuman, 2006). Thus, once this stage is reached, the number of respondents required for the interview is sufficient.

As shown in Table 4.2, ten (10) industry experts were selected from the population to validate the identified organizational CSFs and to identify other possible factors from the construction industry perspective. On average, the experts had 17 years of industry practice, and at least 6 years of involvement with e-Procurement systems. Theoretical saturation was established in the tenth interview.

Table 4.2: Sample Size for Study

Item	Position	Industry /Sector	Work Experience	Experience with E-Procurement Systems
1	Academician	Education	20	5
2	Senior Procurement Manager	Construction	30	5
3	IT Manager	Construction	6	3
4	General Manager (Contract & Purchasing)	Construction	20	3
5	Contract Manager	Construction	14	5
6	Principle Senior Assistant Director	Public Work Department	28	10
7	General Manager	IT Business Solution Provider	15	12
8	Head of Business Solutions	Construction / Business IT Solution	17	5
9	IT Manager	IT Solution Provider	15	5
10	Assistant Manager	Construction IT Provider	5	5

4.6.2 Interview Protocol

An interview protocol is a form designed by the researcher that comprises instructions on the conduct of the interview, the questions to ask, and the space to take notes of the responses from interviewees (Creswell, 2008). It is a systematic way of ensuring that all questions are asked and responses recorded. The interview questions used in this part of the study are in shown **Appendix B**.

4.6.3 Conducting and Recording Interview

According to Cavana et al. (2001) and Cooper and Schindler (2008), face-to-face interviews allow the interviewer to adapt the questions asked, clarify any doubts that arise and rephrase questions that are not clearly understood. For this study, a series of face-to-face interviews with construction industry experts were conducted between July 2011 to December 2011 at the respondents' premises. Each round of interview that covered all the questions lasted between forty (40) minutes to one (1) hour.

In a qualitative study, the responses are recorded, then transcribed and typewritten for data analysis in the computer database (Cavana et al., 2001; Creswell, 2008). The process of recording data is done formally and informally (Creswell, 2008). For this study, the interview process was tape recorded. Notes were also taken as back-up in case the tape recording failed.

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4.6.4 Data Analysis

Qualitative data analysis is conducted to better understand the phenomenon by seeking to understand "*the underlying themes, patterns and relationship*" (Cavana et al., 2001, p. 169). The focus must be on those patterns of interaction and events that are generally common to what the researcher is studying (Babbie, 1995).

For this study, a content analysis procedure was followed and applied. Using this method, the researcher first converted the tape recorded data into text data. This was done manually since the sample of ten (10) respondents was a small number to manage. Creswell (2008, p. 246) suggested that computer software be used to transcribe text of two hundred and fifty (250) transcripts. The transcribed data is then coded as part of content analysis. The coded data is classified into themes and further reclassified to reduce the number of themes until they sufficiently describe the phenomenon (Creswell, 2008). In this study, after content analysis was conducted, fourteen (14) themes (CSFs) emerged. This was a reduction from the 26 themes extracted from literature review. A modification was then made to the theoretical framework. See Figure 4.4. The full findings of the content analysis are discussed in chapter 5.

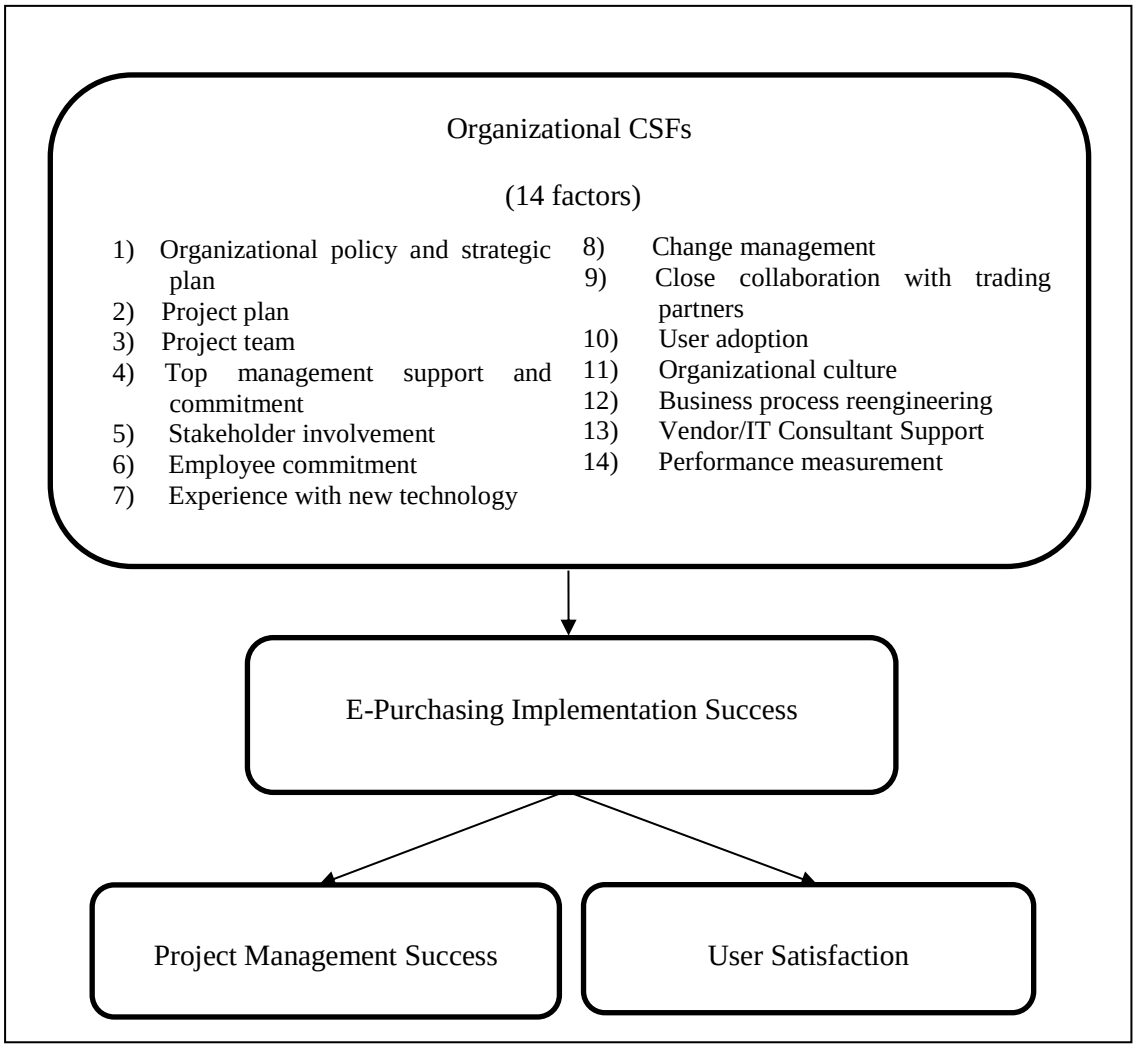

Figure 4.3: Modified Theoretical Framework of Organizational CSFs for Successful Implementation of e-Purchasing Systems

4.7 Quantitative Study – Second Phase

A quantitative study is "*an inquiry approach useful for describing trends and explaining the relationship among variables*" (Creswell, 2008, p. 645), and an attempt to conduct a "*precise measurement of something*" (Cooper & Schindler, 2008, p. 164). This "*something*" refers to the variables of the study, in this case the set of CSFs. The quantitative study is part of the exploratory mixed methods approach taken by this researcher and it was conducted after the qualitative study was done. It allowed the researcher to gather data from a larger number of samples and generalize results to a

population (Creswell, 2008). Data were collected via a survey questionnaire from construction organizations that meet the criteria set.

4.7.1 Sampling Design

The sample selected for any quantitative study should be representative of the population in order for generalizations to be made and conclusions to be drawn. For this study, the researcher employs non-probability sampling rather than a random one to garner the sample of Malaysian construction industry organizations (Class G7). There are many types of non-probability sample methods but for this study the researcher decided to use purposive sampling. This technique requires that the researcher decide in advance the individuals to contact and to send the survey questionnaire. It is the preferred method since the objective is to find a sample that reflects the entire population of Class G Seven (Class G7) construction companies with criteria that had to be met. Sample design for this study is summarized and indicated in Table 4.3.

Table 4.3: Sample Design of Research

Item	Sample design	Description
1	Unit analysis	Individual
2	Target sample companies (based on purposive sampling)	W.P, Putrajaya (2) Kuala Lumpur (41) Selangor (67) Johor (3) Perak (1) Pulau Pinang (2) Kedah (1) Pahang (1) Melaka (1) Sarawak (2) 124
3	Sampling frame	Organization Department/Unit that comprises of; -IT department/unit -Contract department -Purchasing department/unit

Table 4.3, continued

4	Target individual	-IT Manager -Contract Manager -Purchasing Manager
5	Total population (specific to G7 contractors on civil engineering works)	2,181 (registered with Pusat Khidmat Kontraktor until 15th November 2011)
6	Target respondents	264

The questionnaire was targeted at specific organizations and individuals considered best suited to answer the questions in the survey instrument.

4.7.2 Criteria Set for Selection of Construction Companies

As mentioned earlier, the survey questionnaire was distributed to the targeted companies based on purposive sampling. A set of selection criteria was used to select companies for the survey to ensure their appropriateness and good response rate, which are important considerations in an empirical study. The selection criteria elements are;

a) Size of companies

Review of existing literature revealed that large organizations dominate the worldwide adoption of e-Purchasing system by virtue of their having more resources and combined effort (Thompson et al., 2009). Examples of these large organizations are shown in Table 4.4 below.

Table 4.4: Large Organization that Adopted e-Purchasing Systems

Companies	Country
Sunway Group	Malaysia
Foster Wheeler Group	Switzerland
Bechtel Corporation	USA
Al-Futtaim Group	United Arab Emirates
Skanska	Sweden

Based on this fact, a scan was made of large G7 Malaysian construction companies registered with Construction Industry Development Board (CIDB) and Class A

contractors registered with Pusat Khidmat Kontraktor (PKK). As of 31st July 2012, 4,413 companies were registered under G7. Of this number, only 2,181 contractors were registered as civil engineering contractors (PKK, 2012). Referring to CIDB's online website database, an investigation was made on a thousand (1000) contractor company profiles out of the total population (2,181). Of this number in turn, only one hundred and twenty-four (124) contractor companies met the purposive sampling selection criteria and were subsequently selected as sample.

The one hundred and twenty-four (124) companies were divided into several categories. Bank Negara Malaysia categorizes companies as large if their respective turnover is more than RM 25 million (SME, 2005). Table 4.5 below shows the number of large companies that were invited to participate. They were in turn classified into two categories: one, companies that were listed on the Main Board of Bursa Malaysia (formerly known as Kuala Lumpur Stock Exchange), and two, companies that had subsidiaries or were part of groups of companies.

Table 4.5: Numbers of Large Companies Invited to Participate

Characteristics indicator	Nos. of companies
Companies listed on Main Board Bursa Malaysia (1st and 2nd Board)	39
Subsidiaries/ Groups of companies	37

b) Well established companies

The selection of companies was also based on any recognition that they had received from established institutions, such as prestigious management awards and MS ISO certifications. From the sample, seven (7) companies were recipients of prestigious awards of excellence from CIDB, Small and Medium Industries Association of Malaysia (SMI Malaysia) and The Brand Laureate for their leadership, strategic

management and innovation. Examples of awards are MCI Excellence Awards that include G7 Contractors Award and Special Award for Innovation.

c) Consistency of project on-hand (3 year continuously and upwards)

The third criterion used to choose the companies was the potentiality of their using e-Purchasing system. To determine this potentiality, the companies were evaluated for the existence of continuous projects for three (3) consecutive years at a total value of more than RM 30 million of construction costs. The use of this yardstick came about as a result of the input given by respondents during the preliminary interviews that they would use e-Purchasing if they were guaranteed of receiving projects continuously from clients.

The limit of RM 30 million upwards was been chosen because this amount indicates a fairly large amount of materials being purchased to construct the end products. This figure took into account the deductions for Prime Cost (PC) Sum works and Provisional Sum (PS) works. If the cost of the projects selected was less than RM 30 million, the final amount after the said deductions would be considerably less and this will affect the amount of material purchases. The preliminary study has shown that organizations would be less interested to adopt an e-Purchasing solution if their purchases of raw materials is small, or if they do not consistently get new projects, or the projects are not so complicated, and the time frame is flexible. Under these circumstances, it would be easier and more convenient if they utilize a manual process to do the purchasing transactions. Based on this criterion, forty-one (41) companies met the criteria. A summary of the companies that fulfilled the set criteria is shown in Table 4.6

Table 4.6: Summary of Number of Companies that Met the Requirement Sets

Items	Characteristics indicator	Nos. of companies
1	Companies listed on Main Board Bursa Malaysia (1^{st} and 2^{nd} Board)	39
2	Subsidiaries/ Groups of companies	37
3	Well established companies/ prestigious awards	7
4	Consistent project-on hands	41
	Total	**124**

4.7.3 Questionnaire Design

The purpose of the survey questionnaire is to elicit pertinent data on the constructs or variables of study, namely the organizational CSFs mentioned earlier. The questionnaire is made up of six (6) sections as described below;

a) **Section A** - this covers the personal information and demographic status of the respondents and the aim is to identify their backgrounds profile.

b) **Section B** - this covers business information of the respondents' organizations, such as number of employees, turnover per year, ratio of IT spending to total expenditure, types of business activities and organization status.

c) **Section C** - this covers information that would indicate the possibility of respondent organizations adopting e-Purchasing, such as percentage of purchasing activities conducted electronically, types of technology applications used, capability of existing systems and their linkages, how the respondents rate the systems, and the reasons why the systems are rated as such.

d) **Section D** - this covers information on the level of computer literacy of respondents. The aim of this section is to measure their level of computer knowledge, complexity of routine computer-based tasks, and respondents' confidence level on embarking on new systems.

e) **Section E** - encompasses the fourteen (14) variables of organizational factors derived from the modified framework of organizational CSFs and the total of fifty-eight (58) indicators/ instruments used to measures these variables. The aim of this section is to solicit the perception of respondents on the specified factors.

f) **Section F** – in this section, there are two (2) variables of e-Purchasing implementation success and eight (8) indicators/ instruments to measure them. The purpose of this section is to solicit the perception of respondents on the specified factors.

4.7.4 Instruments

The survey questionnaire was derived from the modified framework of organizational CSFs and the successful implementation of e-Purchasing. This framework, in turn, was the culmination of the empirical findings derived from previous literature and the preliminary qualitative study with selected industry experts.

Constructs are variables that cannot be measured directly. They require indicators or scale items as described by Hair et al., (2006), Tabachnick and Fidel (2007), and Abdullah (2010). The indicators for each of the 14 constructs are shown in the following sub-section and as **Appendix C.**

Table 4.7 shows a summary of initial variables and the number of indicators in respect of each construct. The number of indicators is the original number before undergoing changes as a result of statistical data analysis.

Table 4.7: Summary of Initial Variables and Indicators

Items	Variables (Factors)	Number of Indicators	Total
A	**Independent Variables**		
	Organizational CSFs		**58**
1	Organizational Policy and Strategic Plan	5	
2	Project Plan	4	
3	Project Team	5	
4	Top Management Support and Commitment	9	
5	Stakeholder Involvement	3	
6	Employee Commitment	5	
7	Experience with New Technology	3	
8	Change Management	3	
9	Close Collaboration with Trading Partners	6	
10	User Adoption	3	
11	Organizational Culture	3	
12	Business Process Reengineering	3	
13	Vendor/ Consultant IT Support	3	
14	Performance Measurement	3	
B	**Dependent Variables**		**8**
B1	Project Management Success	4	
B2	User Satisfaction	4	
	Total number of Indicators		**66**

The scales used to measure the indicators of the constructs are the Likert scales of 1 (strongly disagree) to 5 (strongly agree).

a) Indicators of the Organizational CSFs Construct

Fifty-eight (58) indicators were identified to measure the fourteen (14) organizational CSFs. These fourteen (14) independent variables are: organizational policy and strategic plan, project plan, project team, top management support and commitment, stakeholder involvement, employee commitment, experience with new technology, change management, close collaboration with trading partners, user adoption, organizational culture, business process reengineering, vendor/ consultant IT support and performance measurement. As mentioned earlier, the fifty-eight (58) indicators were extracted from

literature reviews as well as the preliminary qualitative study. Table 4.8 lists these indicators. They are measured from a scale of 1 (Strongly Disagree) to 5 (Strongly Agree).

Table 4.8: Indicators for the Organizational CSFs Construct

Items	Indicators	Sources	Research Coding
1	**Organizational Policy and Strategic Plan**		
a	The organization has clear mission, vision, strategies, objectives and direction	Adam, 2009	F1
b	Incorporates e-purchasing policy into existing procurement policy	Al-Moalla and Li (2010)	F2
c	Availability of a strategic plan which sets deadlines, responsibilities and financing	Al-Moalla and Li (2010)	F3
d	Alignment of e-Purchasing strategy with IT strategy	Chan (2010)	F4
e	Decides on an appropriate e-purchasing business model	Qualitative study	F5
2	**Project Plan**		
a	Project plans are consistent with information system plan	Chan (2010)	F6
b	Organization provides a detailed project plan (time schedule, milestones and resources requirement)	Culler (2009); Rosacker (2005); Dezdar and Ainin (2011)	F7
c	Project scopes are defined clearly	Dezdar and Ainin (2011)	F8
d	Project activities are properly coordinated and monitored	Dezdar and Ainin (2011)	F9
3	**Project Team**		
a	Has strong domain knowledge of business process and technical aspect	Ehie and Madsen (2005); Bhatti and Jayraman (2010); Dezdar and Ainin (2011)	F10
b	Roles and responsibilities are properly defined and delegated	Bhatti and Jayraman (2010); Dezdar and Ainin (2011)	F11
c	Various cross-functional team members were selected	Bhatti and Jayraman (2010); Dezdar and Ainin (2011)	F12
d	An experienced and reputable PM	Dezdar and Ainin (2011)	F13

Table 4.8, continued

e	Use of effective project management techniques to control implementation process	Adam (2009); Mehta (2010)	F14
4	**Top Management Support and Commitment**		
a	Steering committee provides directions and guidance of implementation process	Qualitative study	F15
b	Commitment to enforce employees	Hwang (2011)	F16
c	Willingness to spend time and resources on the system implementation	Snider (2004); Jafari et al., (2006); Bhatti and Jayraman (2010); Hwang (2011)	F17
d	Offers leadership in organization's e-purchasing efforts	Zeelie (2002); Jafari et al., (2006)	F18
e	Provides adequate training and education program for employees	Jitpaiboon (2005); Ehie and Madsen (2005)	F19
f	Provides an appropriate organizational structure to support the implementation	Qualitative study	F20
g	Provides pro-active communication channel	Qualitative study	F21
h	Promotes the implementation of the system	Qualitative study	F22
i	Offers a reward system to encourage ideas and innovation	Adam (2009)	F23
5	**Stakeholder Involvement**		
a	Stakeholder early involvement	Zeelie (2002)	F24
b	Identifies at which level each stakeholder can or should be involved	Qualitative study	F25
c	Stakeholders provide information and set requirements	Qualitative study	F26
6	**Employee Commitment**		
a	Commitment to the organization's objectives	Silverthorne (2004)	F27
b	Loyalty to the organization	Silverthorne (2004); Stup (2006)	F28
c	Employee cooperation	Silverthorne (2004)	F29
d	Good quality of work outcomes	Silverthorne (2004); Stup (2006)	F30
e	Positive attitude towards e-purchasing implementation process	Cata (2003)	F31

Table 4.8, continued

7	**Experience with New Technology**		
a	The organization needs to have experiences in dealing with technologies application	Jawad (1995); Cata (2003	F32
b	Organization's experience provides a base of knowledge for guiding current initiatives	Robey et al., (2000)	F33
c	Organization's experience enables it employ new information technologies effectively	Robey et al., (2000)	F34
8	**Change Management**		
a	Recognizes change management programme	Al-Moalla and Li (2010)	F35
b	Willingness of organization to change	Lin et al. (2003); Mehta (2010)	F36
c	Well managed process of change	Motwani et al., (2005)	F37
9	**Close Collaboration with Trading Partners**		
a	Encourages the organization to build long-term relationship with trading partners	Qualitative study	F38
b	Mutual understanding of needs and capabilities	Jawad (1995)	F39
c	Partnership agreement	Qualitative study	F40
d	Readiness of trading partners to involve in terms of infrastructure and business	Esichaikul and Chavananon (2001)	F41
e	Relationship of trust with trading partners	Chan (2010)	F42
f	Communication with trading partners	Schatanus et al., (2007)	F43
10	**User Adoption**		
a	Users' knowledge and skills	Qualitative study	F44
b	Appropriate training sessions	Qualitative study	F45
c	Previous experience in using IT applications	Jawad (1995)	F46
11	**Organizational Culture**		
a	Encourages innovation and learning processes	Maheshwari (2002)	F47
b	Encourages sharing of knowledge and information	Maheshwari (2002)	F48
c	Allows work cultural transformation towards a new initiatives implementation	Qualitative study	F49

Table 4.8, continued

12	**Business Process Reengineering**		
a	Designs and documents important business processes	Mehta (2010); Hwang (2011); Dezdar and Ainin (2011)	F50
b	Changes the process according to organizational needs	Gunasekaran (2008); Mehta (2010)	F51
c	Simplifies processes and eliminates redundancy of activities	Qualitative study	F52
13	**Vendor/ Consultant IT Support**		
a	Owns business and technical knowledge	Jafari et al., (2006); Bhatti and Jayraman (2010)	F53
b	Able to recommend an appropriate e-purchasing system	Bhatti and Jayraman (2010)	F54
c	Supports the project team during the implementation process	Bhatti and Jayraman (2010)	F55
14	**Performance Measurement**		
a	Creates performance measures for new system initiatives	Ehie and Madsen (2005)	F56
b	Establishes appropriate milestone (i.e., what to achieve by what date)	Ehie and Madsen (2005)	F57
c	Conducts post-implementation review	Nah et al., (2001); Al-Mashari et al., (2003);	F58

b) Indicators for E-Purchasing Implementation Success Construct.

Two (2) indicators were used to measure the dependent variable, which is e-Purchasing system implementation success. They are project management success and user satisfaction.

Project management success was adopted and adapted from previous research by Chung (2007), Lind and Culler (2009), and Rosacker (2005). Four criteria were used to measure project management success, namely on time completion, meeting the budget, organization need congruency, and user acceptance. To measure this construct, the Likert scales of 1 (strongly disagree); 2 (disagree); 3 (neutral); 4 (agree) and, 5 (strongly agree), as suggested by Rosacker (2005), were used.

As for user satisfaction indicator, it was adopted and adapted from the research by Chung (2007), Mohamad et al.,(2009), and Dezdar and Ainin(2011). Similarly, four criteria were used to measure this construct. They are information quality, information sufficiency, user-friendly, and system benefit and efficiency. The construct was measured using the Likert scales of 1 (strongly disagree); 2 (disagree); 3 (neutral); 4 (agree) and, 5 (strongly agree), which is a modification of those used by Mohamad et al., (2009) and Dezdar and Ainin (2011). A summary of the two indicators and their measurement criteria is listed in Table 4.9 below.

Table 4.9: Indicators for E-Purchasing Implementation Success Construct.

Items	Indicators	Sources	Research Coding
1	**Project Management Success**		
A	The E-Purchasing implementation project was completed on time	Chung (2007); Lind and Culler (2009),	I1
B	The E-Purchasing implementation project was completed within allocated budget	Chung (2007); Lind and Culler (2009)	I2
C	The scope of E-Purchasing system is well matched with organization's need	Chung (2007)	I3
D	The E-Purchasing system is accepted by users	Lind and Culler (2009); Rosacker (2005)	I4
2	**User Satisfaction**		
A	User is satisfied with information quality of the E-Purchasing system	Chung (2007)	I5
B	The E-Purchasing system provides sufficient information	Mohamad, Hussin and Hussein (2009)	I6
C	The E-Purchasing system is user-friendly	Mohamad, Hussin and Hussein (2009)	I7
d	The E-Purchasing system is beneficial for tasks of users and improves employee work efficiency	Dezdar and Ainin (2011)	I8

4.7.5 Content Validation Assessment (CVA)

Content Validation Assessment (CVA) is a process to determine the degree to which elements of an assessment instrument are relevant to and representative of the targeted

construct for a particular assessment purpose (Gajewski et al., 2012; Haynes, Richard, & Kubany, 1995). The term elements refers to among other things the individual items, the response formats, and the instructions (Haynes et al., 1995), whereas the term construct refers to the concept, attribute, or variable that is the target of measurement (Haynes et al., 1995). It is conducted before the survey questionnaire validation process and its purpose is to minimise potential error variance associated with an assessment instrument and to increase the probability of obtaining supportive construct validity indices (Haynes et al., 1995; Sangoseni, Hellman, & Hill, 2013).

For this study, CVA was conducted with 5 academicians with status of Associate Professor and Professor from public and private universities in Malaysia through face-to-face interviews between March to April 2012. The selection of these experts was through expert sampling, as frequently recommended by prior researchers (Haynes et al., 1995). The interview process was tape recorded and the process lasted between forty-five (45) minutes to one (1) hour each at the academicians' offices. Details of the academician experts involved in CVA are shown in Table 4.10.

Table 4.10: Information of Expert in Content Validation Assessment (CVA)

Persons	Positions	Universities	Expertise
1	Professor	School of Housing, Building and Planning (HPB), Universiti Sains Malaysia	Project Management
2	Professor	School of Management, Universiti Sains Malaysia	e-Commerce/ e-Procurement,
3	Assoc. Professor	College of Information Technology, Universiti Tenaga Malaysia (Uniten)	ICT for Construction, Strategic Information System Planning.
4	Assoc. Professor	Universiti Kebangsaan Malaysia (UKM).	B2B e-Commerce Readiness, Business and IT Alignment
5	Assoc. Professor	The University of Nottingham Malaysia Campus	e-Procurement System

Content validation can be executed via a multi-methods approach, or singly, either quantitative or qualitative. In this study, the CVA was conducted qualitatively using the CVA forms shown in **Appendix D**. These forms mirror those used by Haynes et al., (1995) but appropriately modified to suit this study. Basically the elements involved in the assessment, such as the wording of questions, instructions to respondents, item content, the structure of questions, the response formats, the response scales, and the order of questions can all affect the obtained data. The assessment by experts is essential to ensure that the questionnaire is capable to collect the information needed and meet the analytic objectives of the survey.

4.7.6 Modification of the Questionnaire

Based on the feedback from the CVA experts, there was a need to modify the questionnaire due to the following reasons: vague or ambiguous phrases, unclear question category, mismatch between the question category and the answer options, and unclear purpose of question. The alterations made to the affected sections of the survey questionnaire are indicated in Table 4.11.

Table 4.11: Alterations of Survey Questionnaire

Items	Existing design / Comments	Alterations
1	**Section A : Personal Information** -The information on the profile of respondents was reduced by removing information that was not important. -Some of the questions were bias and not relevant to the study. Only questions relevant to the study need to retained	 -A question asking for gender type was removed.
2	**Section B: Business Information** -One of the questions was vague and required rephrasing to ensure it will be fully understood by the respondents. -Information on organization's infrastructure capability is important since e-Purchasing is about internet connectivity.	 -The question "Category (ies) that best describe your organization's activities" was rephrased as "Category (ies) that best describe your organization's activities. (You can select as many as applicable)" - A new question was inserting to questionnaire survey to ask for "quality of internet connectivity in organization".
3	**Section C: Electronic Purchasing Process Adoption** -The information in the questionnaire should at least reflect the application of technology in practice. -The information in the questionnaire need to use generic terms -There were many instances where the questions were too elaborate and complicated.	 -One of the answers was revised by combining the statements "phone/fax machines" and "productivity software (such as word processing and spread sheet)" instead of separate answers by "phone", "fax machines", "word processing", "spread sheet". -The questions and answers were rephrased to ensure the respondents could answer them easily. -The question "which type(s) of e-Purchasing system activities is/are currently being employed in your organization" was replaced by the question "which activities are currently being

Table 4.11, continued

		conducted electronically using the specific system? (You can select as many as applicable)." -The answer was replaced to simplify the terms in the statement "material requisition", "purchasing order", "purchasing approval", "suppliers acknowledge order", "material delivery note", "invoices", "payment", and "others".
	-One of the questions was bias and not relevant to the study.	-The question "which IT Vendors are involved in developing e-Purchasing system in your organization? (You can indicate one or more of the following)" was deleted. In lieu, the question "how did you acquire the e-Purchasing system in your organization? (You can select as many as applicable)" was used.
	-One of the questions used a passive sentence.	-The question was modified to read "Your e-Purchasing System initiative is rated by you as;"
4	**Section D: Level of Computer Literacy** -Most of the response scales used were not appropriate to measure the constructs	-Modification/refinement of the response scales was made to the answers of the questions. -From 4 likert scale to 5 likert scale; (i) -"none user" was deleted -"basic user" was retained -"moderate user" was retained -"frequent user" as new scale -"proficient user → "expert user" -"extremely expert" as new scale

Table 4.11, continued

		(ii) -"not complex" was retained -"low complexity" → slightly complex -"moderate complexity" was retained -"extremely complexity" → very complex -"extremely complex" as new scale (iii) -"no confident" was retained -"low confident"→ slightly confident -"moderate confident" was refined as moderately confident -"highly confident" → very confident -"extremely confident" as new scale
5	**Section E : Critical Success Factors for E-Purchasing Implementation** -Some of the variable terms were wrongly worded and needed refinement -Some of the variables/ indicators were vague and needed elaboration -Some of the indicators were not sufficient to measure the constructs	 -Refined variable from "organizational policy and strategy plan" to "organizational policy and strategic plan" -Refined variable from "reengineering business process" to "business process reengineering" -Refined the wordings of one of the indicators as "provide pro-active communication channel (i.e., e-mail, sms, facebook and etc.)" -Refined one of the variable's description as "stakeholder involvement (i.e., representative of top management, key person of departments, end-users and suppliers) -Additional items/indicators to measure the constructs were identified;

Table 4.11, continued

	-One of the variables had double meanings and needed to be rephrased	Variables; -Experience with new technology (added with two new indicators) -Change management (added with one indicator) -Performance measurement (added with one indicator) -Refined variable description from "Vendor/Consultant support" to "Vendor/ IT Consultant support".
6	**Section F: Identify E-Purchasing Implementation Success** -This section was added to the existing questionnaire layout (five sections) after some modifications were made.	- A new question format was inserting to questionnaire survey to measure e-Purchasing implementation success

Although the survey questionnaire was modified and redesigned, the number of pages remained seven (7). These changes were necessary to avoid potential errors during data collection.

4.7.7 Pilot Study

After changes to the survey instrument were made, a pilot study was conducted. The pilot study is a preliminary study before the actual main data collection commences. Neuman (2006) and Hutt & Speh (2001) stressed that it is vital to perform the pilot study. Pilot studies are important to (i) examine the reliability, validity, accuracy, integrity and clarity of the questionnaires (ii) identify any omission of important factors, and (iii) examine any needs to integrate or remove certain factors from the questionnaire.

For this research, a pilot study was conducted involving thirty (30) respondents from the sample. Phone calls were made to the contractors asking them whether they were willing to participate in the pilot study or not. Out of 45 respondents contacted, only 30 respondents agreed to participate and most of them also agreed to answer the survey questionnaire face-to-face. They consisted of a managing director, general managers, project managers, contract managers and senior officers. Hut and Speh (2001) contended that a pilot study involving 10 to 50 respondents is sufficient to discover major flaws in the questionnaire. Feedbacks from the respondents were gathered through face-to-face interviews and via e-mail. The respondents were selected from the states of Selangor, Pahang and the national territory of Kuala Lumpur.

The findings of the pilot study, and the interpretation on the appropriateness and adequateness of the content and clarity of the items in the questionnaire are discussed in Chapter 6.

4.7.8 Data Collection

Primary quantitative data collection was done via survey questionnaire. As mentioned by Fraenkel and Wallen (2000), this method is the most efficient manner to garner a great deal of information from a large sample of individuals. In fact, data collection from surveys can reveal facts and features of any company clearly and comprehensively (Hutt & Speh, 2001). Moreover, questionnaires have been popular and widely used in Information Systems (IS) research for decades (Sivo et al., 2006). The survey instrument was mailed to the respondents electronically and through post, and was also made available online. These methods of data collection were chosen because they i) are relatively easier to administer and cheaper as compared to others (Hussey & Hussey, 1997), ii) can reach a large number of people and this is especially true in the case of

e-mail and web-based questionnaires (Sivo et al., 2006), and iii) are less intimidating than face-to-face interviews, thus making respondents more at ease to provide candid or sensitive answers (Sivo et al., 2006).

Data collection took four and half (4 ½) months to complete covering July to November 2012. The questionnaire was distributed twice. The first round covered the period 18thJuly 2012 to 10thAugust 2012 and the second, the period 30thAugust to 2ndNovember 2012. It was done this way to ensure that the process of monitoring and controlling the targeted respondents was easier and systematic.

For the online survey, this study used the services of SurveyMonkey (https://www.surveymonkey.com/), a provider of commercial online survey. The survey form was created using the provided system design template and then uploaded and hosted at **https://www.surveymonkey/s/9YZ6FL6**. By making online survey available, the respondents have a choice to either fill manually the questionnaires sent to them or do that on the web. The researcher can easily access and monitor every survey form that has been completed by the respondents. In addition, he can also use the various tools provided by the provider to analyse the received data.

Through electronic mail (e-mail), the questionnaire was sent to the targeted respondents based on the sampling criteria identified earlier (see **Appendix E-** survey forms). Each e-mail consisted of i) the questionnaire in MS word format, ii) the questionnaire in PDF format, and iii) a cover letter from the university explaining the research objectives and instructions on how the survey was to be completed, that is by using one of the three forms including the web version, whose web location was also informed in the e-mail.

The respondents were reminded to give their feedback on the survey within 2 weeks from the time they received the survey questionnaire.

Some respondents preferred that the questionnaire be posted to them. In this case, the instrument together with the instruction letter and a postal paid reply envelope were posted to them. According to Hatmoko (2008) , Dillman (1991) and Yammarino et al., (1991), personalization of the cover letter to specific individuals, self-return envelopes and defining a deadline can increase the possibility of getting a higher response rate. For this study, in order to get quality responses and follow the characteristics of the research design, the questionnaire was sent to the key informants within the companies, and they included the general manager, contract manager, IT manager, purchasing manager and senior officer. A deadline was also mentioned in the cover letter to remind and encourage the respondents to complete the survey within the (2) weeks' time limit from the time they received the questionnaire.

In some cases, the respondents requested to answer the survey through phone. These happened when the respondents claimed that they had limited time but were interested to participate. For these instances, the researcher contacted the concerned respondents through their personal contact numbers and enquired their availability. On average, the phone conversations took forty-five (45) minutes each with the researcher reading the questions first and the respondents responding accordingly. Table 4.12 summarizes the survey methods used by this study. The table shows the breakdown of the number of respondents who completed the questionnaire based on the various collection approaches. From the table, it can be seen that the mailing method, which included electronic mail (e-mail) and postage mail produced a high return rate of 65.36%, followed by on-line survey (22.83%), hand distribution (6.30%), and through phone

communication (5.51%). The unusable 3.15% was due to incomplete filling of many sections of the questionnaire by the respondents.

Table 4.12: Summary of Data Collection

Items	Description of Method		Percentage (%)
1	Targeted number of organizations participating	124	
2	Actual number of organizations participated	81	65.32
3	Total number of questionnaires distributed		
	i) E-mail	144	54.55
	ii) Postage mailed	111	42.05
	iii) By hand	9	3.40
		264	
4	Total number of questionnaires returned		
	i) E-mail	66	51.97
	ii) Postage mailed	17	13.39
	iii) On-line survey	29	22.83
	iv) By phone communication	7	5.51
	v) By hand	8	6.30
		127	100.00
5	Number of questionnaires unusable	4	3.15
6	Number of questionnaires examined for this study (valid questionnaire)	123	96.85
7	Response rate	123/264 = 0.4659	46.59

4.7.9 The Response Rate

Out of the 264 questionnaires distributed, a total of 127 were returned, and of this number only 123 valid questionnaires were completed properly for use in the analysis. The unreturned questionnaires were due to company prohibiting participation in the survey, changes to company addresses, and companies being no longer active in construction activity. The response rate of 46.59% exceeds the normal range of 20%-30% for construction industry research (Akintoye, 2000; Hoonakker, Carayon, & Loushine, 2010; Karim, Marosszeky, & Kumaraswamy, 2005; Quazi, Chang, & Chan, 2002; Stanley & Sattineni, 2012). The higher than normal response rate happened

because a specific approach to questionnaire monitoring and tracking was undertaken, as explained in the following sub-section. In comparison, recent studies of the construction industry have yielded relatively lower response rate percentages. For example, Hasmori, Ismail, and Said (2012)- 36%; Soon Han, Yusof, Ismail, & Kim Hai (2012) - 38%, and Hasmori, Kamruzzaman, Said, and Ghani (2012) - 36.2%.

4.7.10 Follow-up Reminders

Follow-ups with the targeted respondents on their participation in the questionnaire survey were made through telephone calls and electronic mails (e-mail). This was to ensure that i) a high response rate was attained, ii) the respondents were reminded of the time limit and, iii) the importance of this study and the respondents' responses was re-emphasized.

This was done through a monitoring and tracking schedule purposely set-up to ensure systematic follow-ups. Table 4.13 illustrates how the process of monitoring the respondents was carried out.

Table 4.13: Example of the Monitoring and Tracking Schedule Developed For This Study

Item	Contractors	Person in-charge	Status of Feedback	Follow-up (1st time)	Follow-up (2d time)	Follow-up (3rd time)	Final Status
1	Organization 1 (Ref: 1)	R1-General Mgr. (Contract) R2-Purchasing Mgr. R3- IT Mgr.	Contact on 18/7/2012 to acknowledge. R1 & R2 – request to send them by postal mail. Send a postal mail for R1 & R2 on 26/7/2012	Follow-up call to check and remind on 31/7/2012	Follow-up call to remind and deadline on 8/8/2012	Follow-up call to remind and express importance of their responses on 15/8/2012	R1: Received feedback via e-mail on 29/8/2012

Table 4.13, continued

			R3-request to send him by an e-mail Forward an e-mail for R3 on 18/7/2012				R2: Received feedback via e-mail on 8/8/2012 R3: Received feedback immediately via e-mail on 18/7/2012
2	Organization 2 (Ref:14)	R1-Contract Mgr. R2-Puchasing Mgr.	Contact on 18/7/2012 to acknowledge. Request to send them an e-mail. Forward an e-mail for R1 and R2 on 19/7/2012	Follow-up call to check and remind on deadline on 31/7/2012	Follow-up call to remind and express importance of their responses on 8/8/2012		R1 and R2 : Received feedback via e-mail on 9/8/2012
		R3-IT Mgr.	Contact on 1/8/2012 to acknowledge. Request to send him an e-mail. Forward an e-mail on 1/8/2012	Follow-up call to check and remind on deadline on 8/8/2012	Follow-up call to remind and express importance of their responses on 15/8/2012		R3: Received feedback via e-mail on 29/8/2012

Using this monitoring system, undelivered mails could be detected fast and further actions could be taken following respondents refusal to participate in the survey. A token of appreciation, as suggested by earlier researchers (Jarvenpaa & Staples, 2001; Ravichandran & Rai, 1999; Segars & Grover, 1998; Tan & Teo, 2000), was given to respondents who completed face-to-face interviews based on hand carried questionnaires.

Although the follow-ups and reminders made the process of obtaining feedback from respondents more time consuming (4 ½ months), the overall result was quite positive.

The use of the follow-up process was in line with the suggestion by Sivo et al., (2006). More will be said on the response rate in Chapter 6.

4.7.11 Statistical Methods Used in Data Analysis

In order to satisfy the research objectives, there needs to be a compatible match between the way the survey instruments was designed and the type(s) of statistical methods used for data analysis. Consequently, two (2) statistical methods, namely descriptive statistics and inferential statistics, were chosen. SPSS (Statistical Package for Social Sciences) version 20, one of the most widely used and comprehensive statistical programs in the social sciences (Bryman & Cramer, 1993) was used to conduct these analyses.

The two (2) statistical methods used to analyse the questionnaire survey are explained below;

a) Descriptive Statistics

Descriptive statistics provide initial insights into the dataset through summarizing information in a way that highlights its important numerical features (Antonius, 2003). The intention is to better describe and create better understanding of the dataset (Maheshwari, 2002). They were used in this study to better understand the demographic and variable characteristics pertaining to personal information (Section A), business information (Section B), e-Purchasing process adoption (Section C), level of computer literacy (Section D), critical success factors variables (Section E), and e-Purchasing implementation success (Section E) of the survey questionnaire. By using descriptive statistics, this study can analyse the patterns of the dataset by summarising it in the forms of central tendency (mode, mean, median), frequency distribution, and dispersion (range, variance, standard deviation).

b) Inferential Statistics

Inferential statistics is a statistical technique that allows the researcher to analyze multiple variables at the same time, and makes predictions about the populations from which the samples were drawn (Creswell, 2008). Inferential statistics are frequently used to answer cause-and-effect questions. This study employed several inferential statistical techniques that include tests for reliability and validity, factor analysis, correlation analysis and multiple regression analysis.

i) Reliability and Validity

Reliability is one of the most critical elements in assessing the quality of the construct measures (Churchill, 1995), and it is a necessary condition for scale validity (Bhatti, 2005). Reliability analysis was performed in this study to measure the internal consistency of the independent and dependent variables of the survey instrument .This internal consistency was assessed by calculating Cronbach's alpha values using the SPSS statistical software. Acceptable reliability is when the α value is greater than 0.3. If the α value is greater than 0.7, the data set is considered as highly reliable (Leech, Barrett, & Morgan, 2005; Wong & Cheung, 2005; Yang & Ou, 2008).

Validity refers to *"the extent to which a test measures what it claims to measure"* (Gregory, 1992). This study assessed two types of validity, namely content validity and construct validity. Content validity refers to how representative and comprehensive the instruments are in creating the scale (Hong & Kim, 2002) and item content domain (Bhatti, 2005). For this study, content validity was carried out through a review with academic experts during content validation assessment. After the assessment, the items were modified to fit the context studied as discussed in Chapter 4. Construct validity is established by relating a measuring instrument to the general theoretical framework in

order to determine whether the instrument is tied to the theoretical framework it is employing (Hong & Kim, 2002; Thanasegaran, 2009) and whether the instrument measures the construct as it is intended to measure (Bhatti, 2005). Both convergent validity and discriminant validity (Nachmias & Nachmias, 2000) were used in this study to obtain evidence of construct validity of the instrument. Construct validity was evaluated by performing correlation and factors analysis.

To determine convergent validity, this study evaluated the value of corrected item-total correlation (Bakuwa, Chasimpha, & Masamba, 2013) based on the output generated from the reliability analysis. According to Leech et at (2005), if the correlation is 0.4 or above, it is considered high and will make a good component of the summated rating scale. If it is less than 0.3, it is too small and should be considered to be deleted (Yusoff, 2011). Ho (2006) noted that an item-total correlation of 0.33 indicates approximately 10% of the variance in the scale are accounted for by that item and it can be used for the decision of retaining the item or not.

Discriminant validity is assessed by factor analysis, which will be explained in the following section. A good discriminant validity is confirmed when items for each variables loaded onto single factors with loadings of greater than 0.4 (Huynh & Lin, 2013; Nunnally, 1978).

ii) Factors Analysis

Factor Analysis is applied mainly to reduce the number of variables, identify relationship between variables, and to classify or group these variables (Bandara, 2007; Mallur, Hiregoudar, & Soragaon, 2012; Williams & Monge, 2001). Factor Analysis was applied in this study to determine the underlying factor or the dimensional composition

of the instrument that fits the organizational CSFs of e-Purchasing framework. In other words, this analysis was used to identify a relatively small number of factor groups that can be used to represent relationships among sets of many inter-related variables.

Before performing factor analysis, there are certain prerequisite measures to assess the ability of datasets. The Kaiser-Meyer-Olkin (KMO) test is used to measure sampling adequacy and the index obtained would indicate the appropriateness of factor analysis (Field, 2009). According to Field (2005), KMO values of below 0.60 are at the threshold of acceptability; values between 0.70-0.80 (good); values exceeding 0.80 (very good); values greater than 0.90 (excellent). The KMO value should be greater than 0.50 for satisfactory factor analysis. Hu (2012) suggested that a value that is below 0.5 hints that factor analysis may not be appropriate. In the case of Bartlet's test of sphericity (BTS), which measures the presence of correlations among the variables (Hair, Black, & Babin, 2009), any p-value < 0.05 indicates that the dataset is statistically significant for the purpose of factor analysis (Chong, Shafaghi, & Tan, 2011b). According to another researcher, the BTS value should ideally be less than 0.001 (Robert Ho, 2006).

This study used SPSS software version 20 to conduct factor analysis. Principle component analysis method was chosen to perform the factor analysis because it is capable of reducing multiple variables to a lesser number of underlying factors (Famakin, Aje, & Ogunsemi, 2012; Ho, 2006; Sadegh, Khalil, & Ali, 2012). The factors are formed by grouping the variables that have correlation with each other (Sadegh, Khalil, & Ali, 2012).

The next step in the process is to extract the factors from the factor analysis output. The Total Variance Explained table is referred to in order to see the actual components that are extracted. This table shows whether the majority of the variance of the dataset has been explained by the extracted factors (Field, 2009; Morgan, Leech, Gloeckner, & Barret, 2004; Pallant, 2007). For this study the number of components to be extracted was determined by two factors, namely using Kaiser's criterion and percentage total variance explained (Aczel, 1993; Famakin, Aje, & Ogunsemi, 2012; Swierczek, 2009). For Kaiser's criteria, the eigenvalue of the factor should be greater than or equal to 1.0 (Field, 2009; Iacobucci & Churchill, 2010; Lee & Yu, 2011), if it is to be extracted. On the other hand, for percentage total variance explained, this study used the cumulative percentage of variance of at least 70% (Chandra & Kumar, 2011; Jolliffe, 2002; Owoseni, Tamarautobou, & Asiwaju-Bello, 2013; Suhr, 2005), as the number of components to retain or to be extracted. This parameter set is highlighted in the Total Variance Explained table. However, for criteria that are based on scree plot test, they are more difficult to interpret, ambiguous and subjective, and it was suggested that the scree plot test be used when sample size is greater than 200 (Field, 2009; Lehman, O'Rourke, Hatcher, & Stepanski, 2005). Hence, this study refused to use the scree plot test as selection criteria. After rotation, it is necessary to check the meaningfulness of the factors extracted. Only meaningful factors should be retained for further rotation.

The next step in factor analysis is rotation of the extracted factors. Its aim is to achieve a simpler and more meaningful pattern for constructs. In the current study, oblique method was used. The reason for selecting oblique rotation method is to follow the suggestion by Pallant (2007) and Fabrigar (1999), who recommended the use of this method when the components matrix correlation is above 0.30 or when a correlation between the variables is present after performing factor analysis. Moreover, by using a

direct oblimin rotation it can increase interpretability of datasets (Salt, 2002) and produce better simple structure of components (Conway, 2003). The number of factor analysis runs depend on the results. The higher factor loadings are generally indicative of the most important components (Tabachnick & Fidel, 2007). This study followed the suggestion by Maccallum, Widaman, Zhang, and Hong (1999); Field (2009); Morgan et al. (2004) and Steven (1995) to interpret factor loadings with an absolute value greater than 0.4 as cut-off (ignoring the +ve or –ve sign). Low loading variables, cross-loading variables, or theoretical or intuitive non-meaningful factors might be reduced until a clean and interpretable result is obtained (Ho, 2006). According to Bose (2009), a cross loading is a complex structure that occurs when one variable loads on more than one component. If a variable has a complex structure, it should be removed from the analysis (Amin & Ramayah, 2010; Bose, 2009; Piaw, 2009). A complex structure may load on more than one factor, and make interpretation of the output difficult (Sheridan & Ong, 2011). Thus, this study decided to remove these cross loading items as suggested by King and Teo (1996); Teo, Ranganathan, and Dhaliwal (2006).

The last step in factor analysis is naming the factors. Based on the rotated loadings, the variables are clustered into groups of components. Appropriate names are given to each factor by considering the factor loads (Emin, Emel, Ercan, & Gamze, 2007; Sadegh et al., 2012).

iii) Correlation Analysis

Generally speaking, correlation refers to the technique of determining the degree to which one variable is related to another or the nature of association between two variables (Stevens, 1996). There are three commonly used methods for ascertaining the strength of association between two variables, namely the Pearson correlation method,

the Spearman rank correlation method and the Chi square test of independence method (Memon, Rahman, Abdullah, & Azis, 2010). If data collected in a study is non-parametric and consist of ordinal variables, the powerful method of examining the relationship between pairs of variables is by using Spearman's Rank Order Correlation (Bryman & Cramer 2002). Chapter 5 shows how this study confirmed its data as non-parametric and decided on Spearman's Rank Order Correlation as an appropriate method.

For this study, correlation analysis was used to examine the presence of relationship between the organizational CSFs of e-Purchasing and e-Purchasing implementation success. The results of this analysis would provide a new organizational CSFs framework of e-Purchasing implementation success that shows the relationship strength between two set of variables (organizational CSFs and e-Purchasing implementation success). They would also refine the components of organizational CSFs obtained from factor analysis.

Correlation coefficient was used in this study to examine the strength of correlation based on the following conditions; small correlation (r_s = 0.1- 0.29); moderate correlation (r_s = 0.3- 0.49), and strong correlation (r_s = 0.5- 1.0) (Cohen, 1998; Pallant, 2007). Meanwhile, zero coefficient value represents no correlation at all (Cohen, 1998). However, the r-value should be greater than or equal to 0.7 for the next step of multiple regression analysis (Yildirim, 2007).

iv) Multiple Regression Analysis

Multiple regression analysis was performed to investigate which of the CSFs (hereinafter referred to as predictor variables) contribute the most to e-Purchasing

implementation success. This study involved fifty two (52) predictor variables and two (2) dependent variables, as mentioned before.

SPSS software version 20 was used to carry out regression analysis to compute the relative strength of relationship between organizational CSFs and e-Purchasing implementation success (as measured by project management success and user satisfaction). The output from the various analyses is intended to generate information about the model as a whole and the relative contribution of each of the predictor variables that makes up the model. By doing that, this study would be able to explain how well a statistically generated model is able to predict a particular outcome.

To find the best model of e-Purchasing implementation success as viewed from the perspectives of project management success and user satisfaction, stepwise multiple regression was used. Argyrous (2005) and Cramer and Ebrary (2003) contended that stepwise multiple regression technique is the best method to explain the dependent variables through per cent variance accounted for.

The stepwise multiple regression method relies purely on mathematical criterion to generate a model that best predicts the outcome variables (Field, 2009; Pallant, 2007). It was chosen by this study to get the best model with maximum R^2 and standardized beta coefficient. The R^2 measures the proportion of the total variance on the dependent variables (e-Purchasing implementation success) that is accounted for by the set of predictor variables (organizational CSFs items) and will be used as an important measure of effect size (Cohen, 1992). R^2 that is above 0.37 value is considered high (Cohen, 1992). The R^2 explains how well the model fits the dataset. The coefficient values (standardized beta coefficient) provide insights into how each predictor

contributes to explaining the e-Purchasing implementation success. The final analysis using multiple regressions has led to the refinement of the factors that significantly contribute to e-Purchasing implementation success in construction organizations.

After completing the multiple regression analysis, the next step is to check the validity of the regression model generated to ensure that the model satisfies the goodness-of-fit and is appropriate to use as a prediction models. This study determined the criteria used to check the validity of the prediction model by looking at model coefficient, normality of dataset, standard residual and Cook's Distance.

Model coefficient refers to an assessment of the predicted model coefficient and associated variance inflation factors (VIF). The VIF indicate whether a predictor's variable has strong linear relationship with another predictor's variable. The tolerance value is the reciprocal of the corresponding VIF. The cut-off points for determining the presence of multicollinearity are tolerance value greater than 0.1 and VIF value of less than 10 (Pallant, 2007; Salkind, 2007). If the predictor's variable has tolerance value of greater than 0.1 and VIF value of less than 10 it indicates that no multicollinearity is present and the predicted regression model is valid and satisfies goodness-of-fit.

The next diagnosis is looking at the data sets normality. Hair et al., (1998) and Field (2009) suggested that the simplest diagnostic check for normality is by looking at histogram and normal P-P Plot of regression standardized residuals. The histogram will show a bell-shaped and symmetrical standardized residual, and for normal probability (P-P) plot, it will show the points as tending to cluster around a straight line that indicates that the model does not violate the normal distribution. These diagnostic

patterns are an indication of a situation in which the assumption of normality has been met (Norusis, 1994) for both predicted regression models.

What follows next is looking at standard residual and Cook's Distance value. The observed dataset does not fit the predicted model well if the standardized residual value does not fall within the suggested range of ± 3.0 (Pallant, 2007). In such a case, Cook's Distance would be used to assess the influence of outliers in the regression model. Tabachnick and Fidell (2007) claimed that the value of Cook's Distance that is larger than 1.0 will influence the model. This is tantamount to saying that if the value of Cook's Distance is less than 1.0, it means that there is no outlier presence and therefore one can conclude that the predicted model has achieved goodness-of-fit.

4.8 Summary of Chapter

This chapter describes the methodology adopted by this study. The rationale behind the adoption of both qualitative and quantitative methods, as well as the development of the instrument used to gather data in support of both methodologies is explained. The development of the initial theoretical framework based on literature review, the eventual affirmation of the framework through qualitative study, the population and sampling procedure, the development of the survey questionnaire, the data collection process, and the process of dataset analysis using SPSS software version 20 that emphasizes on descriptive and inferential statistics are also discussed. The findings from the analysis of both qualitative and quantitative data are discussed in detail in chapters 5 and 6 respectively.

CHAPTER 5

RESULTS AND DATA ANALYSIS OF QUALITATIVE DATA

5.1 Introduction

This chapter presents the findings of the interview conducted with industry experts. The interview process was part of the qualitative methods chosen to explore the organizational CSFs responsible for successful implementation of e-Purchasing in construction organizations. Data from this qualitative study was analysed manually through content analysis and the purpose was specifically to identify which of the 26 factors identified from the literature were truly critical in the opinion of the experts and whether any other factors should be included in the list of critical factors. This list would then be used as the basis for the development of the research instrument for the empirical study. Ten interviewee experts, representing various fields of the construction industry, were involved in the open-ended questionnaire survey.

5.2 Methodology

The qualitative study involved a two-pronged process. The first stage involved the review of thirty-two (32) publications from the years 1999 to 2013 ranging from peer reviews to journals and theses. The end product of this stage was greater theoretical awareness and understanding of the phenomenon under study. For the second stage, ten (10) industry experts were interviewed between August 2011 to December 2012 to validate the identified organizational CSFs and to explore other possible factors from the construction industry perspective. Theoretical saturation was established in the tenth interview. The selection of interviewees was based on purposive sampling. Interviewees were chosen based on their knowledge of and experience with e-Procurement, the

phenomenon under study (Cavana et al., 2001; Cooper, 2008; Creswell, 2009). Content analysis of the interview was conducted manually where the researcher went through the whole text in order to make sense of the inputs given.

5.3 Interviewee Profile

Table 4.1 below indicates the profile of the experts. On average, they had 17 years of experience in industry practices, and at least 6 years involvement in e-Procurement systems. The job titles of the experts include Associate Professor, Procurement Manager, IT Manager, Contract Manager, and Business Solution Manager.

Table 5.1: Interviewee Profile

Item	Position	Industry /Sector	Years of Work Experience	Years of Experience with E-Procurement Systems
1	Associate Professor	Education	20	5
2	Senior Procurement Manager	Construction	30	5
3	IT Manager	Construction	6	3
4	General Manager (Contract & Purchasing)	Construction	20	3
5	Contract Manager	Construction	14	5
6	Principle Senior Assistant Director	Public Work Department	28	10
7	General Manager	IT Business Solution Provider	15	12
8	Head of Business Solutions	Construction / Business IT Solution	17	5
9	IT Manager	IT Solution Provider	15	5
10	Assistant Manager	Construction IT Provider	5	5

5.4 Results and Findings

Table 5.2 below summarizes the views of the interviewees on the twenty-six (26) organizational CSFs derived from literature that exist in construction industry practices.

Table 5.2: Summary of Interview Findings (Based On 10 Interviewees)

Item	Organization CSFs (a total of 26 factors derived from literature)	Findings from Interviews	Suggestion of New Factors/ Refinement to Existing Factors (a total of 14 factors exist)
1	Organizational policy and strategy plan	a) Policy and strategy relate to the procedure used to guide decisions. They define the direction on how, what, where and when things are to be done. b) They involve organizational rules and planning for organizations to move forward to achieve particular objectives. Strategic plan has specific (long/short) term plan. c) Procurement department has their own rules, direction and plan to achieve particular objective that are incorporated into overall company policy and strategic plan. d) They compel everybody to comply to whatever is stated in the policy and strategic plan e) It is difficult for management to implement a particular system without having policy and strategy plan. They have to follow a manual system until the policy and strategic plan are in place. All 10 interviewees were unanimous in agreeing that organizational policy and strategic plan are critical to the successful implementation of e-Purchasing.	**Organizational Policy and Strategic Plan**
2	Appropriate business model	a) When an organization decides to follow a certain business model, it needs a strategic plan that outlines the resources required and the time frame for everyone to observe. b) A business model should be aligned with the organization's needs and determine the service charges to trading partners c) A business model is related to the organizational strategies that create a win-win situation between the two parties	

Table 5.2, continued

		d) A business model describes how a company generates income to reduce the cost of purchasing, gets better quality materials at lower price and reduces time. Six (6) out of 10 interviewees perceived that an appropriate business model is important and they considered this factor as part of organizational policy and strategic plan.	
3	Business Plan and Schedule	a) Business process is part of business activity and it needs to be supported by business plan and schedule. b) Implementation of new IT systems must be delivered on time as it involves huge investments and must meet the business plan. c) Any IT project must have planning and scheduling to ensure that the project is running on time and within the budget. d) Scheduling involves listing the activities required, the time to complete and deliver and the persons in charged. All 10 interviewees were of the opinion that project plan is critical to the successful implementation of e-Purchasing.	**Project Plan**
4	Steering committee (SC) and project team (PT)	a) The project team consists of a Project Manager, Team Leader and project team members. b) The project team is the key department involved directly in the e-Purchasing system implementation. c) New IT project requires a person to monitor it in order to ensure that the project is completed successfully. d) The responsible person can help to resolve any kind of problems raised during the implementation process. e) The role of the project team is to verify the data provided by the system, get involved in training, and train other users who are not part of the project team. f) A best practice is to maintain a small number of project team members to avoid conflict. All 10 interviewees agreed that project team is critical to successful e-Purchasing implementation and they considered this factor as part of project team factor.	**Project Team**

Table 5.2, continued

5	Effective and knowledgeable project manager (PM)	a) The Project Manager guides others to use the system. b) The Project Manager possesses competency in the fields of technical and business management. c) The Project Manager is able to manage the process from beginning to end and ensure that the project runs smoothly. d) The Project Manager is able to resolve the issues of the implementation process and provide quick decisions. e) A good project manager knows how to focus on the issues at hand and resolves within the time period to avoid delays. The majority of interviewees agreed that effective and knowledgeable project manager is critical to the successful implementation of e-Purchasing and they considered this factor as part of project team factor.	
6	Defines roles and responsibility of team members	a) Assigning roles and responsibilities of team members clearly and in accordance with the scope of work is important to avoid the project from becoming difficult to control. b) Clear roles and responsibilities of the project team in the early stages of system implementation is important to avoid conflict of duties and unnecessary time spent. The majority of interviewees agreed that the definition of roles and responsibility of team members is critical to successful e-Purchasing implementation and they considered this factor as part of project team factor.	
7	• Top Management Support	a) Top management gives the green light to implement the system. b) Top management fully supports by providing the objectives and the direction of initiatives to be carried out. c) Top management provides financial and change management support. d) Top management reinforces employee participation in the new IT system through regulation. All the interviewees agreed that top management support and commitment is critical to e-Purchasing implementation success.	**Top Management Support and Commitment**

Table 5.2, continued

	• Steering Committee	a) The function of the Steering Committee is as a representative of the management to oversee the project, make policy decisions, and provide directions and guidance relating to the project. b) The Steering Committee defines the scope of the project and ensures the availability of resources. Most of the interviewees agreed that the steering committee is important for the successful implementation of e-Purchasing and they considered this factor as part of top management support and commitment factor.
8	Appropriate organizational structure	a) It is necessary for management to provide a matrix structure since it is an important tool to support the IT system implementation. b) Management needs to restructure existing employee task structure to support new system implementation process. c) Management needs to reassign the people's task to suit with the new process and its requirement. d) The duty of top management is to provide a proper matrix structure to people involved in IT systems implementation process. The majority of interviewees agreed that an appropriate organizational structure is important for the successful implementation of e-Purchasing and they considered this factor as part of top management support and commitment factor.
9	Promotion of system through communication within organization	a) Promotion means trying to buy-in employees to the system. b) Promotion is necessary to make sure people know, learn and see something positive. c) Management uses various communication channels to promote the new IT system and explains what is going on in the organization so that the people understand the initiative and direction of the company. d) Management needs to notify the rest of the people in the organization on the benefits of the project and the timeline so that they are fully aware of the project undertaken by the company.

Table 5.2, continued

		The majority of the interviewees agreed that promotion of the system through communication channels within the organization is essential for the successful implementation of e-Purchasing and they considered this factor as part of top management support and commitment factor.	
10	Training and education program	a) Implementing a new IT system requires training and hands on test during piloting. b) Management should ensure that the users are provided with sufficient training to help them understand the system and use it properly. c) Top management needs to work together with vendors to provide software training. All interviewees agreed that training and education programs are essential to the successful implementation of e-Purchasing and they considered them as part of top management support and commitment factor.	
11	Adequate financial resources	a) Top management must be willing to spend enough money to finance the whole process of new IT system implementation. b) A steering committee is required to properly plan the financial requirements of business processes and objectives. All interviewees agreed that adequate financial resources are essential to the successful implementation of e-Purchasing and they considered this as part of top management support and commitment factor.	
12	Stakeholder involvement	a) Stakeholders are the key individuals holding ownership of the entire project. b) Stakeholders must participate in the entire implementation process, define the requirements of the system and see that the new system is being implemented successfully. c) Stakeholders are involved in the early stages of the implementation process at the tactical level. d) The stakeholders' position and action can influence business process changes. All interviewees agreed that stakeholder involvement is essential to the successful implementation of e-Purchasing.	**Stakeholder Involvement**

Table 5.2, continued

13	Organizational commitment	a) The entire organization must commit itself to the system if it wants the system to be implemented properly. b) Employee commitment will drive the success of the implementation process. c) Employee commitment must be in placed in order to derive optimal output from the system implemented. All interviewees agreed that organizational commitment is vital to the successful implementation of e-Purchasing. Commitment here refers to the employees.	**Employee Commitment**
14	Experience with new technology	a) Organization's experience dealing with new technology can help in terms of "how" to use and "how" to implement the new system. b) Organization's experience dealing with new technology makes it easier for the organization to align technology and business process needs. c) Organization's experience dealing with new technology can influence the effectiveness of the system. d) Organization's experience dealing with new technology avoids it from solely depending on the vendor. The majority of interviewees agreed that experience with new technology is vital to the successful implementation of e-Purchasing.	**Experience with New Technology**
15	Change management	a) If the new IT system requires changes to be made, then change management is a priority. b) New processes require people to be trained and their performance measured and compared with what was done previously. c) When a new IT system starts to be implemented, the existing procedures and processes need to change accordingly. d) If the new IT system requires changes, avoid too many changes to the people and processes. e) Whatever new things are introduced, the employees need to change the way they work and the process flows. The majority of interviewees agreed that change management is important for the successful implementation of e-Purchasing.	**Change Management**

Table 5.2, continued

16	Close collaboration with trading partners	a) e-Purchasing need to work with suppliers. Without them, part of the project will not work. b) e-Purchasing requires long-term commitment and on-going relationships between business partners. c) During discussions with trading partners, avoid being autocratic in decision-making. d) If the trading partner does not know the system, it will affect the delivery of the system. All interviewees agreed that close collaboration with trading partners is necessary to ensure successful implementation of e-Purchasing.	**Close Collaboration with Trading Partners**
17	Relationship building with trading partners	a) Friendship is important in doing business between trading partners. b) A good relationship with trading partners to ensure they will entertain and committed to our business c) To maintain long-term business we need to build long-term relationships between trading partners. d) Establishing long-term relationships with trading partners will promise a good return on investment. The majority of interviewees agreed that relationship building with trading partners is important for the successful implementation of e-Purchasing. They claim that this factor is part of developing close cooperation with trading partners.	
18	Readiness of trading partners	a) Trading partners must be as knowledgeable as internal people and they must be willing to use the system. b) Imposing pre-requisite before starting electronic relationships will ensure that trading partners are ready to use the new electronic system. c) Trading partners would be willing to follow if the company maintains good relationship and reputation with them. d) An enterprise-wide system requires the willingness of trading partners to provide similar system connectivity. The majority of interviewees agreed that readiness of trading partners is important for the successful implementation of e-Purchasing. They claimed that this factor is part of developing close collaboration with trading partners.	

Table 5.2, continued

19	Trust between trading partners	a) Trading partners must be able to share documents and keep confidential data in good care. b) Trust creates a strong foundation for effective collaboration. c) Building trust between trading partners takes a long time. d) Having a good relationship with trading partners makes the organization trustworthy and more willing to be followed. e) To enable information sharing between trading partners, it requires the presence of trust. The majority of interviewees agreed that trust between trading partners is important for the successful implementation of e-Purchasing. They claimed that this factor is part of close collaboration with trading partners factor.	
20	Communication between trading partners	a) Communications builds trust between partners and ensure that they understand what we want and we understand what they want. b) Communication with trading partners will ensure that the direction of the company, the business process requirements and benefits of the new system are clearly spelled out. c) Regular communication will ensure that trading partners are more willing to participate. The majority of interviewees agreed that communication between trading partners is important for the successful implementation of e-Purchasing. They claimed that this factor is part of close collaboration with trading partners.	
21	Good quality of employees	a) Optimal use of system is dependent on the level of users' adoption of the system. b) Good quality people understand the workings of the system easier. c) Good quality employees save the company on regular training programs. d) Good quality users perform their duties effectively with minimal supervision. e) Users' knowledge, skills and experience in computer literacy will determine how fast they can accept and adapt to the technology change	**User Adoption**

Table 5.2, continued

		All interviewees agreed that good quality employees are important for the successful implementation of e-Purchasing. They claimed that this factor should be recognized as user adoption.	
22	Organizational Culture	a) Existing culture must change in tandem with the needs of the new system. b) Any new system implementation will face with some degree of resistance from people who refuse to learn new things or adapt to new changes. c) Everyone needs to accept that change and innovation are an integral part of business process improvement. d) There is a need to have an environment that allows the transformation of the culture within the organization from top to bottom. All interviewees agreed that an adaptive organizational culture is important for the successful implementation of e-Purchasing.	**Organizational Culture**
23	Reengineering the business process	a) A business process must be subjected to proper business process re-engineering to determine if it is effective. b) Business process change is the simplification of the processes and the elimination of repetitive and redundant activities to meet the needs of computerized processes. All interviewees agreed that business process reengineering is necessary for the successful implementation of e-Purchasing.	**Business Process Reengineering**
24	Vendor/Consultant support	a) Vendors/Consultants are the people who provide the systems and the infrastructure. b) If a system needs to adapt, be upgraded or encounters problems, vendors must be able to attend to these issues. c) Vendors are the people who provide support to team members during the implementation process. All interviewees agreed that the vendor/ IT consultant support is important for the successful implementation of e-Purchasing.	**Vendor/ IT Consultant Support**

Table 5.2, continued

25	Performance measurement	a) Performance indicators are important to assess how well the new system is able to provide the desired output within the stipulated time. b) There should be some kind of measures to compare current and previous performance resulting from a new system implementation. c) Establishing a scorecard is a way to evaluate the performance of the system. All interviewees agreed that performance measurement is required for the successful implementation of e-Purchasing.	**Performance Measurement**
26	Regularly monitoring and evaluation of performance	a) Every new project requires frequent monitoring. b) The frequency of monitoring and evaluation of a new system's performance is dependent on the progress of the project. c) At the early stage of project implementation, we need to regularly check and monitor the performance of the system to avoid implementation schedule delay. d) There needs to be a specific time frame to monitor and evaluate the output of the system. All interviewees agreed that regular monitoring and evaluation of system performance is important for the successful implementation of e-Purchasing. They indicated that this factor should be part of performance measurement factor.	

5.5 DISCUSSION OF FINDINGS

Table 5.2 shows that the number of organizational CSFs (referring to the 26 factors) was reduced through content analysis. This was because there were overlapping in the initial scoping of CSFs from literature. The final tally of CSFs came down to only fourteen (14) as shown in Figure 5.1 below. This reduced tally includes a new factor discovered during the interviews, namely 'user adoption'. Figure 5.2 shows a refined construct of organizational CSFs of e-Purchasing implementation success in construction organizations.

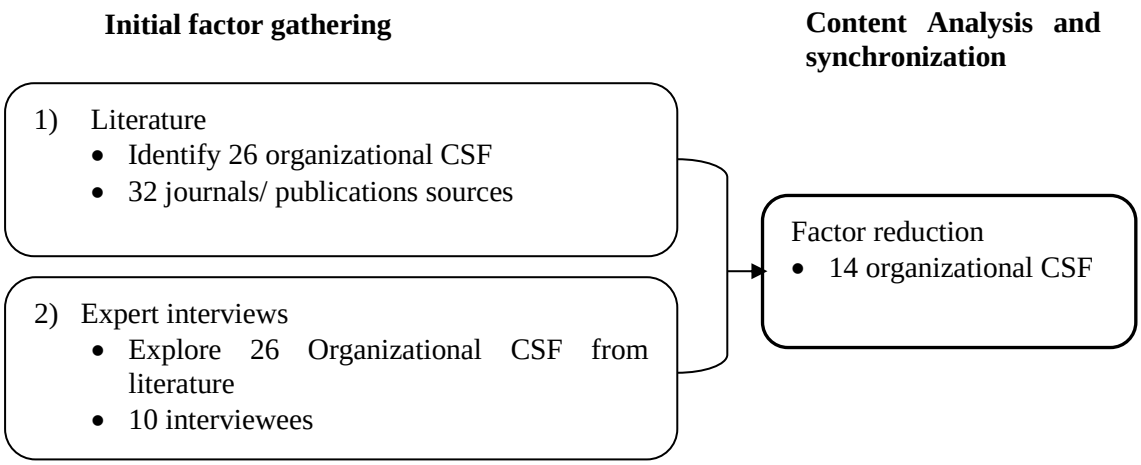

Figure 5.1: Factor Gathering and Data Collection Process

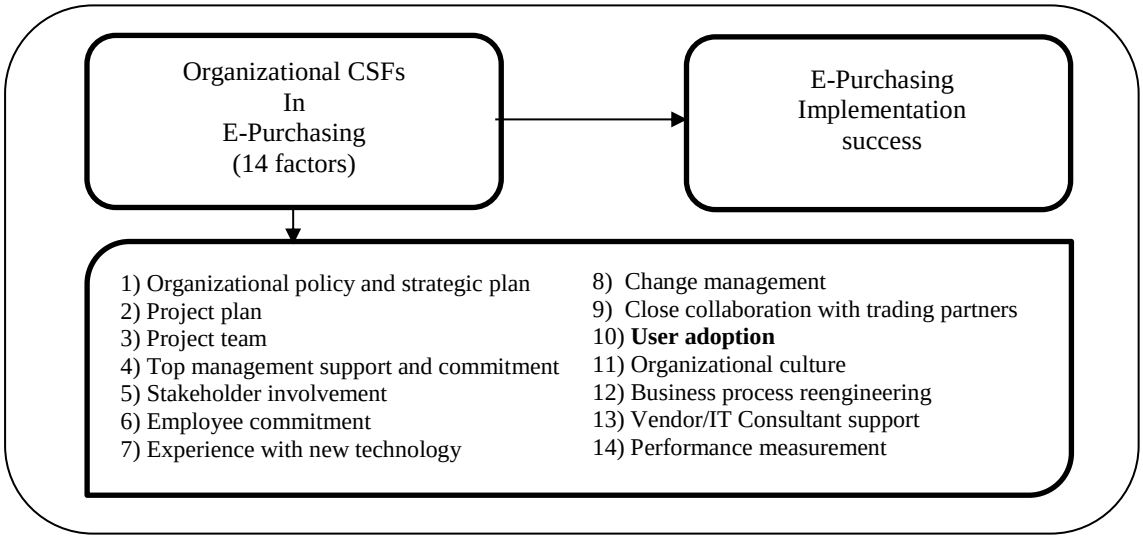

Figure 5.2: Refine Organizational CSFs of E-Purchasing Implementation Success

The organizational CSFs in the refined list are discussed below:

5.5.1 Organizational Policy and Strategic Plan

The setting of organizational policy and the definition of a strategic plan prior to the development of an e-Purchasing solution is an important CSF (Neef, 2001). According to Porter (2001), the success of any business-to-business (B2B) initiative is highly dependent on this. It refers to the establishment of a framework and the strategizing of the accomplishment of the stakeholders' interest and project objectives into an end-result (Lewis, 2001). It sets the parameters and future direction of the project

implementation (Longman & Mullins, 2004) and is a critical pre-requisite of any B2B initiative (Maheshwari, 2002). It is the finding of this study that policies and strategies are important to e-Purchasing implementation success because they spell out in no uncertain terms the mission, the strategic plan, the business policy and model, and the direction related to the system undertaking.

5.5.2 Project Plan

An important pre-requisite of any systems undertaking is the creation and successful execution of a project plan (Thornton & Marche, 2003). This is equally true for any B2B initiative like e-Purchasing, where well-defined project plan and schedule will have a direct bearing on the success of the project (Li & Huang, 2004). The project plan must, as a minimum, specify the objectives, tasks, resources, responsibility, schedule and deliverables (Thornton & Marche, 2003). This study shows that the implementation of e-Purchasing must be executed according to the prescribed time period and that the deliverables must comply to the project plan. It is important that organizations properly plan and monitor their e-Purchasing initiatives in order to realize the expected results.

5.5.3 Project Team

It is important that a project is handled not by an arbitrary grouping of affected parties but by a team that is commonly dedicated to the execution of its implementation. A project team of this nature is responsible for creating detailed project plan, assigning responsibilities and determining the key milestones for the entire duration of the project (Lin et al., 2003). The project team members must consist of both business and technical people to ensure that the initiative is successful (Li & Huang, 2004). In addition, the organization must ensure that key persons representing the units in the organization that are most affected by the implementation are roped in (Li & Huang,

2004). The results of this study show that having a project team is critical. The role of the team is to carry out important tasks that have been set and to give full commitment to the initiative undertaken by the organization.

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5.5.4 Top Management Support And Commitment

The role of top management in the success of any project implementation has been copiously noted in literature. Bhatti (2005), for instance, noted that top management support and commitment to an initiative is expressed through providing leadership and resources, defining the strategy, and promoting the project to the employees, while Hedman (2010) added the role of encouraging employees to participate. In an IT investment in B2B transaction, top management support and commitment is equally critical to its success (Lin & Huang, 2007; Chad Lin, Huang, & Tseng, 2007). This study shows that an IT project implementation like e-Purchasing can only succeed if it receives the fullest support from top management. Top management needs to support and give their commitment to the initiative by providing direction, guidance, resources, and suitable organizational structure; promoting the system implementation throughout the entire organization; and encouraging employees to actively participate.

5.5.5 Stakeholder Involvement

There is a direct relationship between stakeholder involvement and success of any IT system implementation (Davindson, 2002; Lin & Shoa, 2000). Specific to e-Purchasing initiative, the literature says that both stakeholder involvement and understanding are required (Aberdeen Group., 2005b; Audit Commision., 2006). The primary reason for this is the fact that stakeholders are the very people who will be defining the needs and requirements that come out of the business process changes (Russell et al., 2004). As this study reveals, stakeholders are persons that will be using the e-Purchasing system.

Hence, it is crucial that they be involved at all phases of the system implementation by providing key information and requirements.

5.5.6 Employee Commitment

In many IT implementations, employee commitment is a major success factor (Chan & Swatman, 1999). This commitment is expressed in quality output and performance (Stup, 2006), loyalty to the organization (Stup, 2006), positive attitude towards the implementation process (Cata, 2003), and cooperation (Silverthorne, 2004). The findings of earlier studies on this are repeated in this study, where it was found that successful implementation of e-Purchasing does require the commitment of the users. On its own, e-Purchasing cannot yield any competitive advantage to the organization. It is only when the system is complemented with astute users who are able to exploit fully its capabilities that it can unleash its full potential.

5.5.7 Experience With New Technology

Being technologically savvy gives organizations a key advantage. In today's environment of rapid technological changes and the ever increasing use of IT-based business applications, organizations need to be technologically up-to-date (Kinder, 2000). Keeping abreast with new technologies and gaining experience in them will enrich the organization with new knowledge acquirement, thereby making it more competitive (Khan et al., 2010). Having adequate experience with new technologies will help organizations implement any B2B solution without much problems (Ageshin, 2001). This study reveals that technology-savvy organizations have an easier time adapting to new IT-based business solutions such as e-Purchasing and that they are also able to use the new system more effectively.

5.5.8 Change Management

Change management is required to support changes in business processes (Vaidya et al.,2006). It is an organizational process aimed at helping employees accept and embrace changes in their current business environment (Hiatt & Creasey, 2003). According to the World Bank (2003), lack of change management in an organization can lead to project failure. In line with this, it has been suggested that organizations develop and execute change management if they want to fully and successfully adapt to e-Purchasing (Walker & Rowlinson, 2007). This study shows that implementing new systems and technologies requires the organization to make changes to its business processes and work practices. The changes involved should be dealt with effectively through the change management program. Improper execution of this program will spell disaster for the project.

5.5.9 Close Collaboration with Trading Partners

E-Purchasing is an IT solution that requires the active participation of business partners in order to derive its full benefits. Hence, close collaboration between the organization implementing e-Purchasing and its partners, such as suppliers, is of crucial importance. Collaboration here refers to the decision making process among independent organizations involved in joint ownership of decisions and collective responsibility for outcomes (Gray, 1991). Close collaboration with trading partners yields improved business performance (SAP, 2007) and faster decision making (Business Link., 2007; SAP, 2007). It is a vital ingredient for any successful implementation of B2B applications such as e-Purchasing (McNichols & Brennan, 2008). This was attested to by the construction industry experts interviewed. To them, for the organization to sustain long term business benefits from the system, it must continue to seek keen participation, support, and contribution from the trading partners.

5.5.10 User Adoption

Experts interviewed included user adoption as a CSF of e-Purchasing implementation in construction organizations. The importance of user adoption for successful implementation of B2B initiatives has been widely cited (Zahay & Hardfield, 2004; Brandon-Jones & Croom, 2005; Malta, 2010). Technology itself does not ensure successful adoption; it also depends on users making use of the new process and system (Vaidya et al., 2006). Users can only realize the benefits of e-Purchasing once they fully understand its functionalities (CGEC, 2002a). Hence, training and skill development on the use of e-Purchasing tools is needed (ECOM Group, 2002; World Bank, 2003). This study indicates that user knowledge and skill influence the level of system adoption in construction organizations.

5.5.11 Organizational Culture

Organizational culture is described as the characteristics, the way and the values through which work is done in organizations (Saltzman & Luthans, 2001). Characteristics and values encompass empowerment, sharing of information, knowledge and organizational values, resulting in competitive advantage for organizations (Saltzman & Luthans, 2001). A positive organizational culture is one that encourages a willingness to accept new technological innovation (Nah, et al., 2001). Implementing a new technology, such as e-Purchasing, needs a common culture of open communication, information sharing and innovative behaviour pervading in the organization (Motwani et al., 2005). Many scholars have shown that organizational cultural factors have a significant impact on the success of B2B implementations (Eid et al.,2002; Nah et al., 2001; Saltzman and Luthans, 2001). This study reveals that when an organization implements a new system, the entire people in the organization must be mobilized to accept the needed changes. In addition, people must be willing to allow

innovation dictate the adaptations required of the business processes so as to be in line with the requirements of the system. Such a positive organizational culture will contribute to e-Purchasing implementation success.

5.5.12 Reengineering the Business Process

Business process reengineering (or BPR) is a radical redesign of the organization's current culture, structure, and process (Lin et al., 2003). It looks into rationalizing the flow of transactions and information exchanges between trading partners (Angeles & Ravi, 2007). It enforces new procedures that the organization intends to implement (Angeles & Ravi, 2007) and redefines roles and responsibilities in line with the processes (Birks et al., 2001). The act of reengineering the business process is pertinent since it will influence the behaviour of employees using the new system. The results show that reengineering the business process is a critical requirement, more so when the existing processes are incompatible with the computerized solution and new organizational needs. Through BPR, manual processes would be simplified, redundancies removed and overlapping processes eliminated, thus making the new process flow more efficient and suitable for automation.

5.5.13 Vendor/IT Consultant Support

An organization is encouraged to get advice from its vendor or consultant (Lin et al., 2003) since he or she plays an important role in the successful implementation of B2B initiatives (Chad et al., 2010). The support of the vendor is indispensable in respect to; i) providing qualified consultant advise on the robustness and reliability of system (Lin et al., 2003; Rahim, 2008); ii) participation in the implementation process (Lin et al., 2003); iii) cooperation with the customer in customized training of employees (Rahim, 2008); and iv) technical and emergency maintenance (Lin et al., 2003; Rahim, 2008).

The results indicate that construction industry implementation of e-Purchasing not only requires the support of people and resources internal to the organization, but also external to it. The IT vendor, in addition to providing the system and infrastructure, also designs the system to meet most of the current and future needs of the construction organization.

5.5.14 Performance Measurement

Performance is defined as the degree to which an operation fulfils the underlined performance objectives (Slack et al., 2001) and predetermined goals (Wickramasinghe & Gunawardene, 2010). Establishing performance measurements is very important in IT system implementation (Vaidya et al., 2006).

There are many types and methods of performance measurement: organizational, business, operating, financial, non-financial and quality (Salaheldin, 2008). In respect to IT project implementation, progress of performance should be actively monitored for compliance to a set of milestones and targets (Al-Mashari & Al-Mudimigh, 2003; Nah, Lau, & Kuang, 2001) over the life of the project. The results indicate that performance measurement is being used by the construction organization during e-Purchasing implementation to periodically monitor key progress milestones to project delivery schedule.

5.6 Summary

Twenty-six (26) organizational CSFs were identified based on a review of procurement and B2B enterprise literature as having direct impact on e-Purchasing implementation success across industries (see Table 1). These factors were distilled down to fourteen (14) main factors as a result of the exploratory study done with construction industry experts (see Figure 2). Based on this distillation, a new framework for the study of organizational CSFs in respect of construction industry e-Purchasing implementation was drafted. This new framework formed the basis for the preparation of the survey questionnaire used for empirical study as discussed in Chapter 4.

CHAPTER 6

QUANTITATIVE DATA ANALYSIS AND RESULTS

6.1 Introduction

This chapter discusses the results and data analysis of both the quantitative pilot study and the main survey study. Data from these studies was analysed using IBM SPSS version 20 statistical software. Data analysis of the pilot study is to determine the validity and reliability of the survey questionnaire by measuring the consistency of the survey instrument. It indicates whether the actual survey questionnaire instrument needs to be revised or not. To accomplish this, the draft questionnaire is first distributed to 30 respondents comprising of G-7 contractor organizations selected from the CIDB directory.

Data analysis on the main study dataset is to establish the organizational CSFs of e-Purchasing and examines the relationship between these factors and e-Purchasing implementation success as measured by project management success and user satisfaction. A further analysis is done to determine the predictors that most contribute to the success of e-Purchasing implementation in construction organizations.

6.2 Data Collection Results of Pilot Study

A pilot study is carried out before the main survey. The purpose is to examine whether the preliminary survey questionnaire is sufficiently developed after adjustments have been made based on the suggestions of experts from content validation assessment. It also examines how well the survey is designed to facilitate proper answering by respondents. The contents of the main survey questionnaire are then modified based on the results of the pilot survey.

This section explains the results and data analysis of the pilot study. The analysis of the pilot study involves examining the respondents' demography and the reliability of the questionnaire instrument through reliability test. Reliability is one of the most critical elements in assessing the quality of the construct measures and it is a necessary condition for scale validity.

6.2.1 Respondent Demography

The 30 respondents who participated in the pilot study are from the city of Kuala Lumpur and the states of Selangor and Pahang. These locations were chosen because they coincided with the locations of participants in the actual main survey. Selangor (53.3%) and Kuala Lumpur (33.3%) account for the majority of the respondents given that these two locations are the focal points for large construction companies to run their businesses.

The respondents' educational levels comprise of bachelor degree (53.3%), certificate/diploma (36.7%), and master degree (3%). This suggests that the respondents are well educated and therefore possess the necessary capability, skill and knowledge to give informed input and feedback.

The respondents' positions in their organizations range from the strategic to the operational. They include the posts of Managing Director (3.3%), General Manager (3.3%), Project Manager (5%), Contract Manager (20%), and Senior Officer (56.7%). They play important roles in the organizations that they serve and are involved directly in purchasing and system implementation. Hence, the quality of agreement received from this study is considered good and appropriate.

The respondents' experience in the construction industry is between 6-10 years (30.0%), 11-15 years (30.0%), 16-20 years (13.3%) and 21-25 years (13.3%). The minimum years of construction experience are less than 5 years (13.3%). Almost fifty-seven per cent (56.6%) of the respondents has more than 10 years of experience in the construction industry. Only 10% of the respondents has more than 5 years of experience in construction related e-Purchasing environment. This suggests that adoption of e-Purchasing in the construction industry is still in its infancy. Although the majority of respondents have only fair experience in Construction e-Purchasing, 26.6% of the respondents have more than 5 years of experience with general e-Purchasing systems, which are more or less similar to Construction e-Purchasing in terms of system flows and functions. A summarised profile of the respondents is shown in Table 6.1.

Table 6.1: Profile of Respondent (General Information)

Profile Description	Category	Number	Percentage (%)
Respondents location	Kuala Lumpur	10	33.3
	Selangor	16	53.3
	Pahang	4	13.3
	Total	30	100.0
Level of education	Certificate/Diploma	11	36.7
	Bachelor degree	16	53.3
	Master degree	3	10.0
	Total	30	100.0
Position	Managing Director	1	3.3
	General Manager	1	3.3
	Project Manager	5	16.7
	Contract Manager	6	20.0
	Senior Officer	17	56.7
	Total	30	100.0

Table 6.1, continued

Years' experience in construction	Less than 5	4	13.3
	6 - 10	9	30.0
	11 - 15	9	30.0
	16 - 20	4	13.3
	21 – 25	4	13.3
	Total	30	100.0
Years' experience in e-Procurement/ e-Purchasing in general	1 - 5	22	73.3
	6 - 10	7	23.3
	11 – 15	1	3.3
	Total	30	100.0
Years' experience in construction e-Purchasing	1 - 5	27	90.0
	6 -10	1	3.3
	11 -15	1	3.3
	more 15	1	3.3
	Total	30	100.0

6.2.2 Validating Internal Consistency of Questionnaire Instruments

Reliability testing on the data gained from the pilot study is done in order to validate the internal consistency of the questionnaire instrument. Cronbach's alpha is the most widely used measure of reliability. It indicates the extent to which a set of test items can be treated as measuring a single variable. Cronbach's alpha will generally increase when the correlations between the items increase. For this reason, items in each variable should be highly correlated to have higher internal consistency. The accepted reliability is when α value is greater than 0.3. If the α value is greater than 0.7, the data set is considered as highly reliable (Leech, Barrett, & Morgan, 2005; Wong & Cheung, 2005; Yang & Ou, 2008) and suggested as required before an instrument is to be used (George & Mallery, 2007; Kaplan & Saccuzzo, 1993). Some items may be removed from the construct scales if their removal results in increases in the reliability estimate.

Average inter-item correlation is normally used to determine the internal consistency of questions where each question should be highly correlated to the other. For the pilot

study, both Cronbach's alpha value and average inter-item correlation (r-value) are used to verify the internal consistency of the questionnaire instrument. The recommended r-value is 0.45 and above (Kleefstra, Kool, Zandbelt, & Haes, 2012). If the r-value is on the low side (0.3 or 0.4), more items must be added (Iacobucci & Duhachek, 2003), while if the r-value is too high (≥0.9), it indicates a redundancy of items (Carneiro, Rocha, & Silva, 2011).

Table 6.2 shows the results of the α-values and r-values for each variable in the questionnaire instrument. The results indicate that all variables have values above the threshold of 0.70 for Cronbach's value and above 0.45 for mean inter-item correlation, suggesting that the instrument is valid and reliable. Thus, all items in the survey questionnaire are retained and are used in the actual main survey.

Table 6.2: Reliability of Questionnaire Instrument – Pilot Study

Factor	No. of Indicators	Cronbach's Alpha	Mean Inter-Item Correlation (r-value)
Organizational policy and strategic plan	5	0.853	0.544
Project plan	4	0.880	0.647
Project team	3	0.923	0.707
Top management support and commitment	9	0.968	0.771
Stakeholder involvement	3	0.941	0.840
Employee commitment	5	0.903	0.658
Experience with new technology	3	0.899	0.753
Change management	3	0.951	0.869
Close collaboration with trading partners	6	0.927	0.691
User adoption	3	0.905	0.763
Organizational culture	3	0.956	0.884

Table 6.2, continued

Business process reengineering	3	0.943	0.852
Vendor/ Consultant IT support	3	0.920	0.792
Performance measurement	3	0.936	0.836
Project management success	4	0.957	0.852
User satisfaction	4	0.962	0.866

6.2.3 Discussion of Pilot Study

The preliminary survey questionnaire instrument was designed based on the theoretical framework, and most items in the survey were primarily adapted from relevant earlier research. Initially the survey questionnaire contents were modified based on the suggestions by experts during content validation assessment. The pilot study was conducted to further assess the internal consistency of the instrument and the scales used before embarking with the actual main survey. Data analysis using correlation and reliability tests was done to evaluate the internal consistency of the survey items and scales. The analysis indicated that the survey questionnaire had good internal consistency (α-value > 0.8) and the number of items was sufficient (r-value> 0.5). These values show that the respondents have answered the questionnaire properly. Thus, the preliminary survey questionnaire instrument was found to be valid and could be used in the actual main survey.

6.3 Data Collection Results of Main Survey

This section discusses data analysis and results of the main survey, whose dataset was obtained from the questionnaire shown in **Appendix E**. The questionnaire was distributed to specific respondents through various methods. Two types of data analysis were used, namely descriptive statistics and inferential statistics.

6.3.1 Descriptive Statistics

Descriptive statistics provides initial insights into the data set, thereby allowing better understanding of the data. This is accomplished through such methods as frequency and percentage distributions. The results are shown in the form of figures and tables. Figures 6.1 to 6.5 and Tables 6.1 to 6.6 present the analysis for this study.

i) **Respondents Demography**

The demography of the respondents covers respondent profile and organization information, as indicated in Figures 6.1, 6.2 and 6.4. The respondent distribution spread throughout the states of Malaysia with the exception of the states of Perlis, Penang, Terengganu, Kelantan, Negeri Sembilan, Labuan and Sabah is shown in Figure 6.1a. The state of Penang was not chosen because the three targeted companies that fulfilled the selection criteria declined to respond to the invitation to participate because of company policy. As for the states of Perlis, Terengganu, Kelantan, Negeri Sembilan, Labuan and Sabah, no companies from these states meet the selection criteria. The two states that contribute the most number of respondents are Selangor (58.5%) and Kuala Lumpur (27.6%). This is quite expected since these two locations are the focus of large companies.

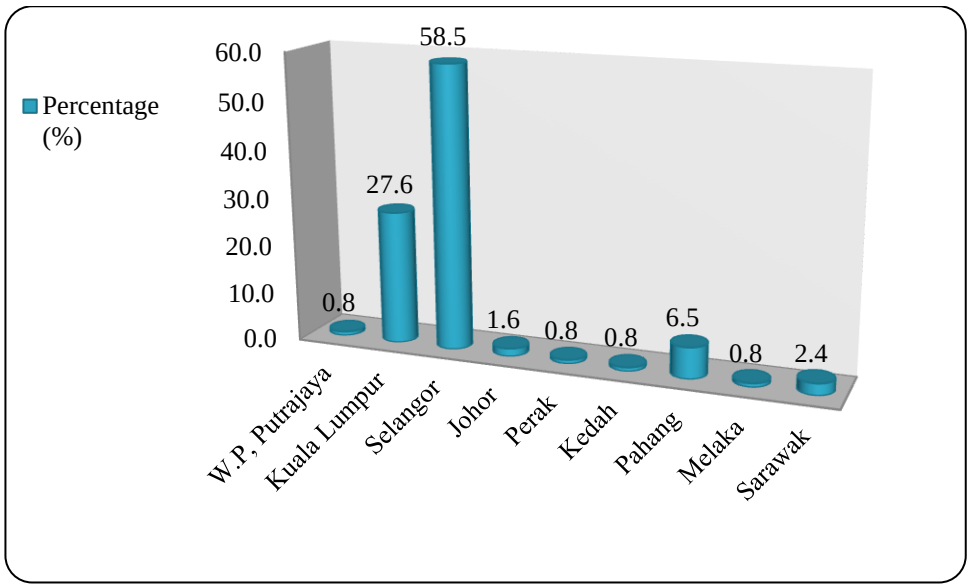


Figure 6.1a: Respondent Location

Respondent educational background is fairly uniformly distributed between bachelor degree (60.2%), certificate/diploma (31.7%), master degree (4.9%) and professional qualification (3.2%), as shown in Figure 6.1b. This suggests that the respondents are fairly well educated and hence are capable, skilled and knowledgeable on the subject referred.

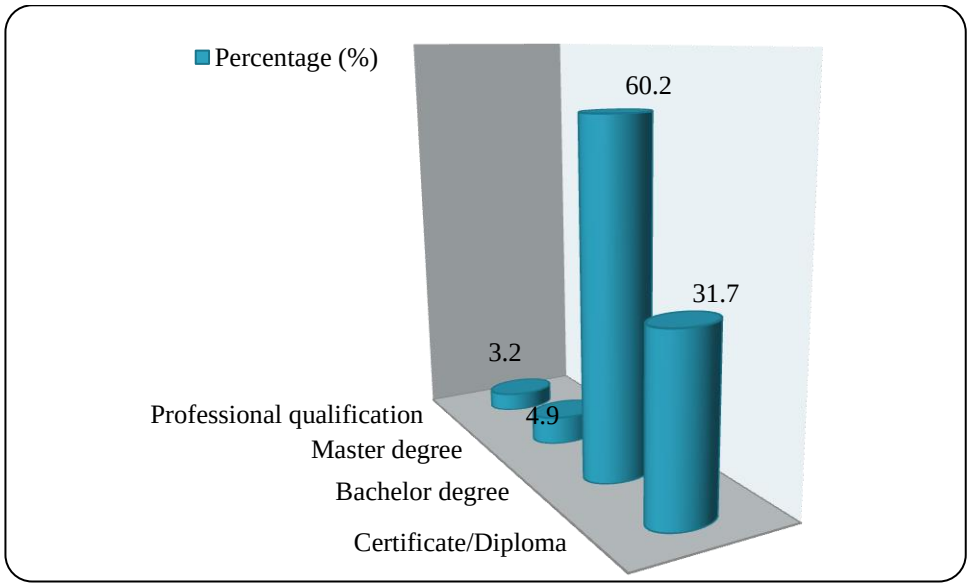


Figure 6.1b: Respondent Educational Status

The respondents' designations in the organizations are uniformly diverse, covering strategic, tactical and operational responsibilities. They comprise Managing Directors (0.8%), General Managers (9.8%), Project Managers (2.4%), IT Managers (16.3%), Procurement Managers (0.8%), Contract Managers (22.8%), Purchasing Managers (8.9%), Senior Officers (18.7%) and others (19.5%), as shown in Figure 6.1c. These people play an important role in the organizations and are involved directly in the purchasing process and system implementation. The Managing Directors and General Manager are involved in policy making; the IT managers, in system's technical requirements; the Contract Managers, Procurement Managers and Purchasing Managers, in setting the requirements of the purchasing process flow; and Senior Officers and others, as key system users. Since the respondents are involved in the purchasing process in one way or other, they are deemed capable to understand the questions in the questionnaire instruments and justified to participate in the study.

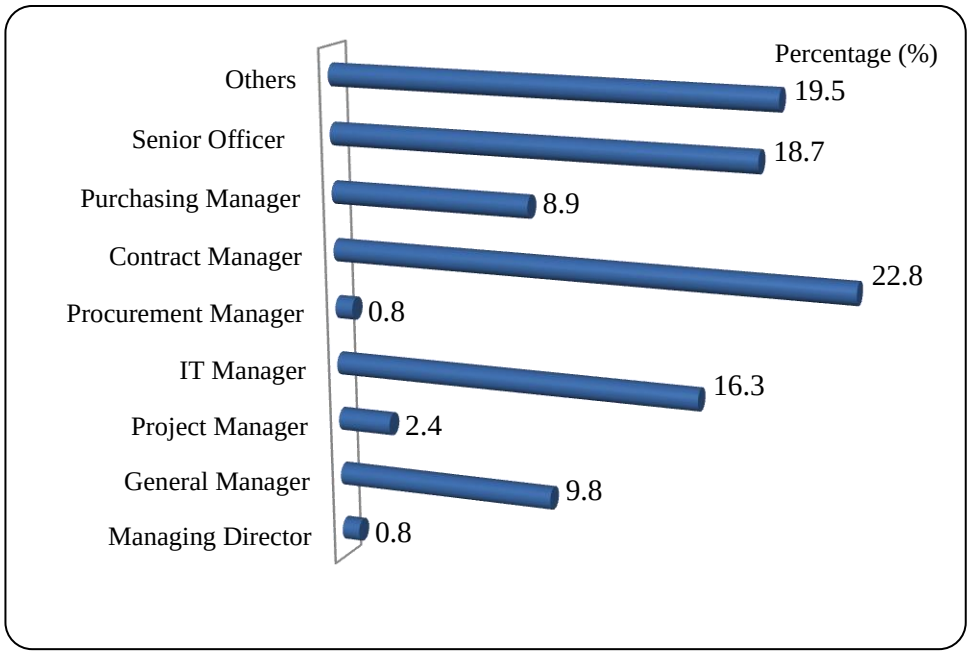
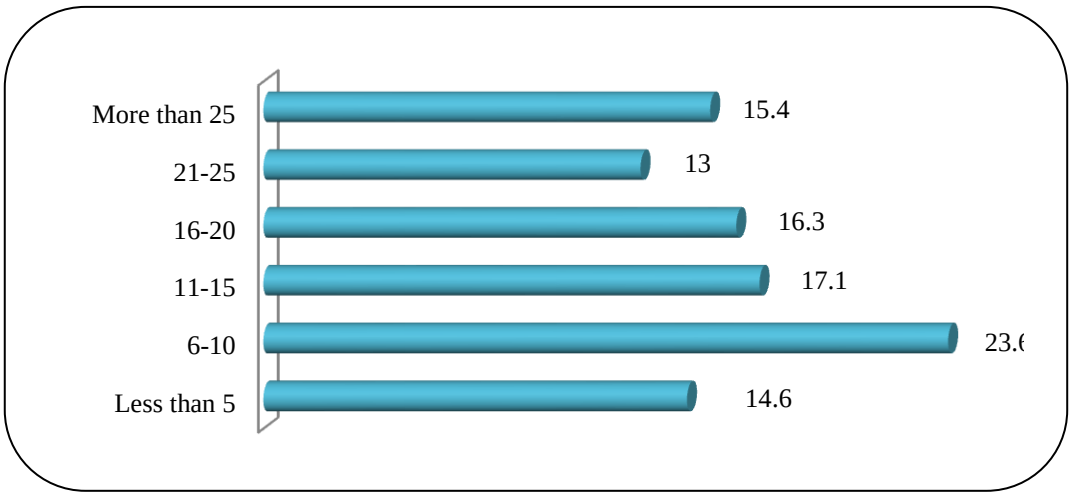


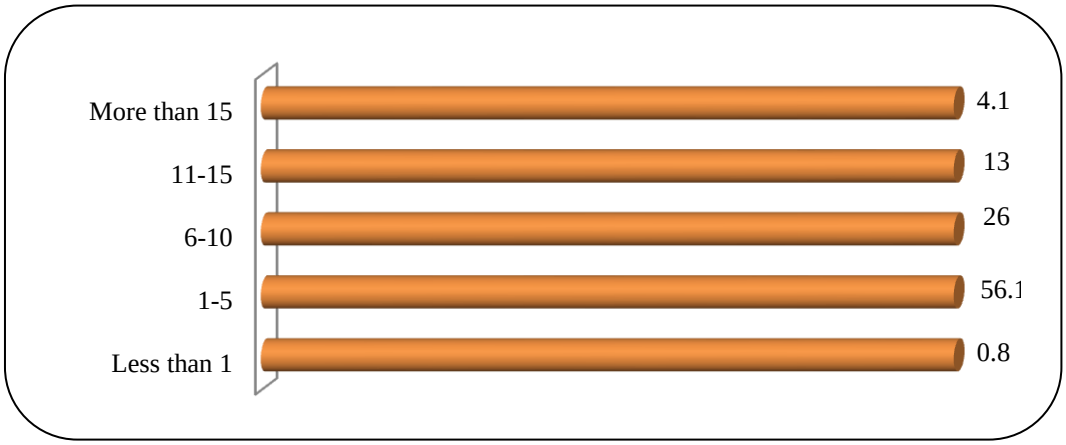
Figure 6.1c: Respondent Position in Organization

Figure 6.2 shows the respondents' years of working experience. The first bar chart illustrates that the years of working experience in the construction industry is almost equally distributed. Respondents with experience between 6-10 years contribute the highest percentage at 23.6 %, followed by those between 11-15 years (17.1%) and more than 25 years (15.4%). The minimum number of years of construction experience is 5 years (14.6%). From these readings, 61.8% of the respondents have more than 10 years of working experience in the construction sector. Specific to experience in construction purchasing, the majority of respondents (73.2%) have 1-5 years of experience. Only 1.6% has less than 1 year. A quarter of the respondents (25.2%) have more than 5 years of experience with e-Purchasing system, suggesting that the system is relatively new in usage among construction organizations. Although the majority of respondent have only fair experience with Construction e-Purchasing, 43.1% of the them have more than 5 years' experience with general e-Purchasing system, which is more or less similar to Construction e-Purchasing in terms of system flow and functions.



i) Respondent Experience in Construction (in percentage)

ii) Respondent Experience in e-Procurement/e-Purchasing in General (in percentage)



iii) Respondent Experience in Construction e-Purchasing (in percentage)

Figure 6.2: Respondent Working Experience (Years)

Table 6.3 presents the profile of organizations that participated in this study. It shows number of employees, sales turn-over per year, percentage of spending on IT, and degree of Internet connectivity. Although the respondents were selected from the same group of contractor classification that is from the Class A category, they nonetheless vary significantly in the number of employees. About fifteen percent (14.6%) of the respondents has between 1-50 employees, 27.6% between 51-100 employees, 30.9% between 101-300 employees, and 26.8% has more than 300 employees. This difference reflects the size of the organizations, with larger organizations having more employees due to greater number of activities that has to be undertaken.

Annual sales turnover likewise vary in relation to the size of organizations. Turnover of below RM 50 Million accounts for 13% of the respondents; between RM 51 – RM 100 Million, 27.6%; between RM 101– RM 200 Million, 17.9%; and more than RM 200 Million, 41.5%. The average annual turnover is RM 5.33 Million.

Table 6.3 also highlights annual percentage of organization's spending on IT. The majority of respondents (69.9%) claimed that their organization`s spent less than 2% of their annual turnover on IT expenditure. A small number of respondents (29.3% and 0.8%) spent between 3 - 5% and more than 5 % respectively on IT. The implementation of e-Purchasing system requires an organization to provide good IT infrastructure.

The breakdown of Internet connectivity quality is, very good (12.2%), good (65%) and moderate (22.8%). This indicates that, on overall, the respondents have good Internet connectivity, which is an important component of IT infrastructure in order to execute electronic transaction processes.

Table 6.3: Profile of Respondent (Organization Information)

Profile Description	Category	Frequency	Percentage (%)
Numbers of employees	1-50	18	14.6
	51-100	34	27.6
	101-150	20	16.3
	151-200	7	5.7
	201-250	9	7.3
	251-300	2	1.6
	More 300	33	26.8
	Total	123	100.0
Organization turnover per year (RM Millions)	5-15	3	2.4
	16-50	13	10.6
	51-100	34	27.6
	101-150	15	12.2
	151-200	7	5.7
	More 200	51	41.5
	Total	123	100.0
Percentage of IT spending to total (per year)	0-2	86	69.9
	3-5	36	29.3
	6-8	1	0.8
		123	100.0
Quality of Internet connectivity	Very good	15	12.2
	Good	80	65.0
	Moderate	28	22.8
	Total	123	100.0

ii) Current State of e-Purchasing System Adoption in Construction Organizations

Figures 6.3, 6.4, 6.5 and Tables 6.4 and 6.5 summarize the current status of e-Purchasing system adoption in construction organizations as represented by the sample. The Figures and Tables highlight the current level of e-Purchasing adoption, proportion of purchasing activity that is conducted electronically, state of technology

and software used to facilitate purchasing activity, types of purchasing activity that are carried out electronically, and most frequently executed electronic purchasing activity.

The levels of e-Purchasing adoption can be classified into 4 stages as shown in Figure 6.3: Planning Stage (15.4%), Early Stage (4.9%), Moderate Stage (43.1%) and Advance Stage (36.6%). As indicated by these percentages, the majority of the respondents (almost 80%) have adopted e-Purchasing system to quite an extent to facilitate their procurement operations.

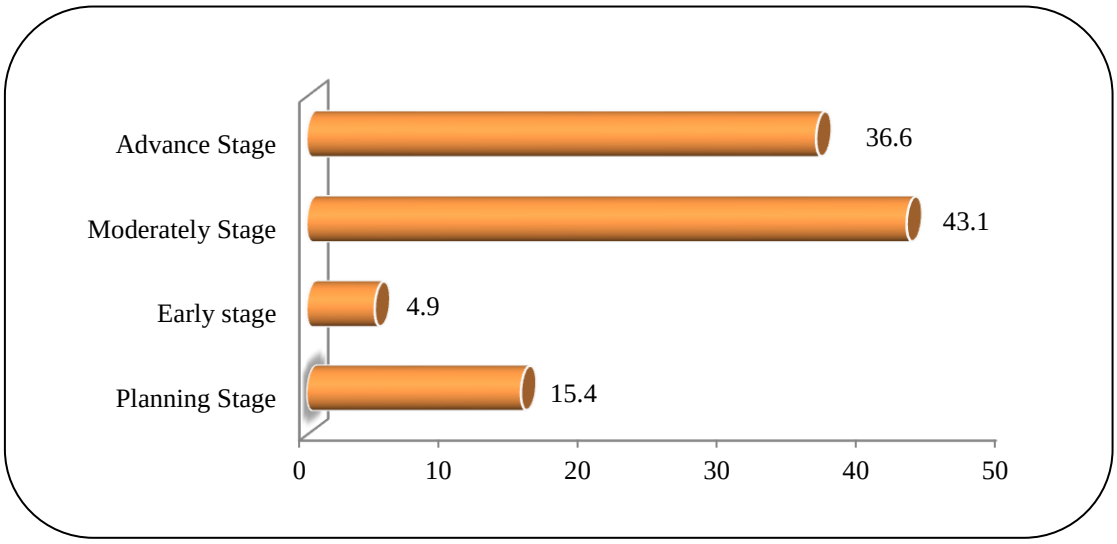


Figure 6.3: Current Levels of e-Purchasing Adoption in Respondents' Organizations (in percentage)

Figure 6.4 shows the extent of computerization of the purchasing activities by the respondents' organizations. It appears that the majority (76.4%) of the organizations have adopted the e-Purchasing system to facilitate the purchasing processes by electronic means. A mere 16.3% of the organizations are still using a largely manual process with a bit of technology application to facilitate the purchasing function. However, these organizations have plans to fully utilize the e-Purchasing functionalities to execute the purchasing processes.

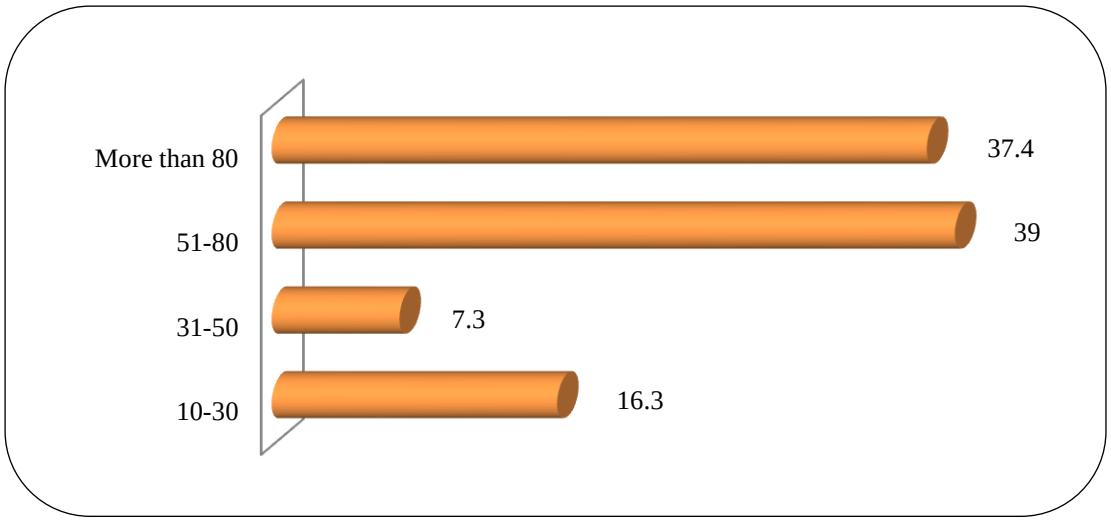


Figure 6.4: Percentage of Purchasing Activities Conducted Electronically (in percentage)

The amounts and types of technologies and software used to support the e-Purchasing System vary in tandem with the various stages of e-Purchasing adoption. As indicated in Table 6.4, there are eight categories of technology and software usage. Of these categories, the most prominent one (45.5%) is where respondents use a combination of phone-fax machines, e-mail, productivity software, purchasing software and suppliers portal to meet their purchasing needs. Less than 1% of the organizations use the full suite of systems and technologies that includes phone-fax machines, e-mails, productivity software, purchasing software, enterprise resource planning (ERP) system, supplier's portal and others. Based on the results, 86.1% of the organizations have an appropriate level of technology and software usage to facilitate electronic purchasing processes.

Table 6.4: Types of Technologies and Software Applications Used

Profile Description	Category	Frequency	Percentage (%)
State of technology and software application used to facilitate purchasing processes	1) phone-fax, e-mail & productivity software	17	13.8
	2) phone-fax, e-mail, productivity software & purchasing software	2	1.6
	3) phone-fax, e-mail, productivity software & suppliers portal	11	8.9
	4) phone-fax, e-mail, productivity software, purchasing software & suppliers portal	56	45.5
	5) phone-fax, e-mail, productivity software, ERP& suppliers portal	13	10.6
	6) phone-fax, e-mail, productivity software, purchasing software, ERP & suppliers portal	17	13.8
	7) phone-fax, e-mail, productivity software, purchasing software, suppliers portal & others	6	4.9
	8) phone-fax, e-mail, productivity software, purchasing software, ERP, suppliers portal & others	1	0.8
	Total	123	100.0

Table 6.5 shows the different combinations of purchasing activities executed electronically by the organizations. Based on the inputs of the respondents, there are twenty-seven (27) combinations being practiced by the organizations. Optimal utilization of e-Purchasing would mean that the organization adopts a complete front to back application of the system beginning with the process of materials requisition and ending with payments to suppliers for the purchases made.

Table 6.5: Purchasing Activities Done Electronically

Profile Description	Purchasing Activities	Frequency	Percentage (%)
Types of purchasing activities done electronically	1) Purchase order	4	3.3
	2) Purchase order & purchase approval	3	2.4
	3) Purchase order & payment	11	8.9
	4) Purchase order, supplier acknowledgement & payment	2	1.6
	5) Material requisition, purchase order & payment	12	9.8
	6) Purchase order, invoices & payment	3	2.4
	7) Material requisition, purchase order & invoices	2	1.6
	8) Purchase order, payment & others	1	0.8
	9) Material requisition, purchase order, supplier acknowledgement & delivery order	1	0.8
	10) Material requisition, purchase order, invoices & payment	18	14.6
	11) Purchase order, delivery order, invoices& payment	3	2.4
	12) Material requisition, purchase order, purchase approval & payment	3	2.4
	13) Material requisition, purchase order, delivery order & invoices	2	1.6
	14) Material requisition, purchase order, delivery order & payment	1	0.8
	15) Material requisition, purchase order, supplier acknowledge & payment	1	0.8
	16) Material requisition, purchase order, supplier acknowledgement, invoices & payment	8	6.5
	17) Purchase order, purchase approval, delivery order, invoices & payment	2	1.6
	18) Material requisition, purchase order, delivery order, invoices & payment	12	9.8
	19) Material requisition, purchase order, purchase approval, invoices & payment	14	11.4
	20) Material requisition, purchase order, purchase approval, invoices & others	2	1.6
	21) Material requisition, purchase order, purchase approval, delivery order & invoices	2	1.6
	22) Material requisition, purchase order, supplier acknowledgement, delivery order & payment	1	0.8
	23) Material requisition, purchase order, purchase approval, supplier acknowledgement, delivery order & payment	2	1.6
	24) Material requisition, purchase order, purchase approval, delivery order, invoices & payment	3	2.4

Table 6.5, continued

	25) Material requisition, purchase order, purchase approval, supplier acknowledge, invoices & payment	2	1.6
	26) Material requisition, purchase order, purchase approval, supplier acknowledgement, delivery order, invoices & payment	7	5.7
	27) Material requisition, purchase order, purchase approval, supplier acknowledgement, invoices, payment & others	1	0.8
	Total	123	100.0

Extracting from this table, the five most frequently (based on high percentage) computerized purchasing activities are as indicated in Figure 6.5.

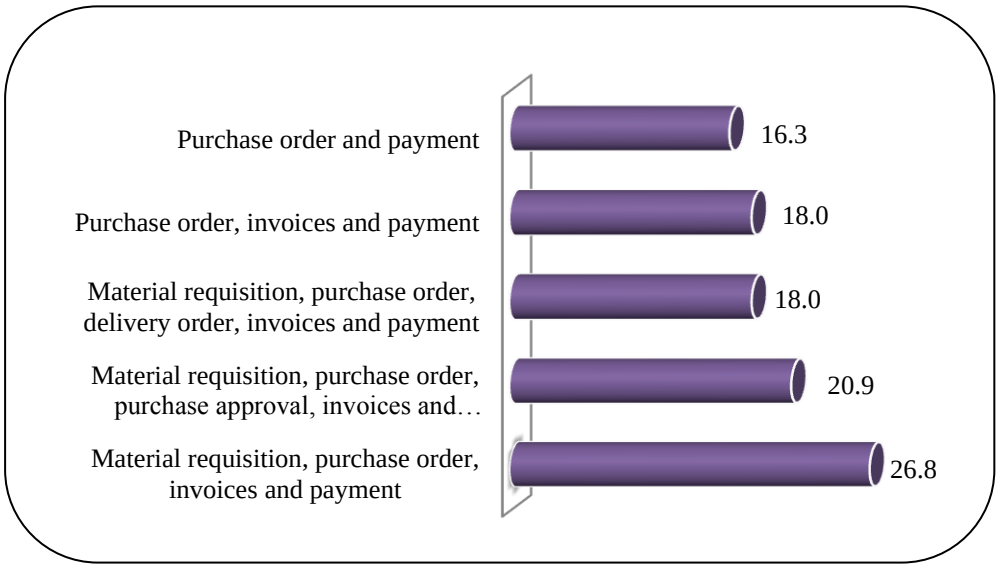


Figure 6.5: The 5 Most Frequently Computerized Purchasing Activities (in percentage)

Systems connectivity is an important feature of the e-Purchasing System, particularly in relation to inter-firm connectivity. The greater the inter-firm connectivity, the greater is the benefit that an organization can reap from its e-Purchasing set-up. Buyers can have access to stock information stored on Sellers' databases, for instance. Other information can also be shared to mutual benefit, thus promoting greater electronic business (e-business) relationships, leading to lower transaction costs and better quality services.

Table 6.6 indicates the types of e-Purchasing System connectivity present in the respondents' organizations. Essentially there are three types of connectivity: stand-alone system with no connectivity (16.3%); limited to internal connectivity (17.9%); and internal and external connectivity (enterprise-wide) (65.8%). These results reveal that most of the e-Purchasing Systems used by the organizations are capable of connecting and integrating not only internally (intra-firm) but externally as well (inter-firms). Moreover, to reap the full benefits of enterprise-wide e-Purchasing System, a full-scale integration of processes, systems and technology is considered necessary.

Table 6.6: System Capability – Connectivity

Profile Description	Types of Connectivity	Frequency	Percentage (%)
Capability of e-Purchasing System connectivity	1) Stand alone	20	16.3
	2) Internally	22	17.9
	3) Internally & suppliers	2	1.6
	4) Internally & manufacturers	2	1.6
	5) Internally & others	36	29.3
	6) Internally, suppliers & others	22	17.9
	7) Internally, suppliers & manufacturers	7	5.7
	8) Internally, manufacturers & others	2	1.6
	9) Internally, suppliers, manufacturers & others	4	3.3
	10) Internally, suppliers, government agencies & others	1	0.8
	11) Internally, suppliers, manufacturers, government agencies & others	5	4.1
	Total	123	100.0

6.3.2 Discussion on e-Purchasing Adoption

From the descriptive analysis, it is clear that the current state of e-Purchasing adoption in construction organizations can be divided into 4 phases, namely the planning stage, early stage, moderate stage and the advance stage. Every stage is different in terms of

the extent and type of technologies involved, the software systems used, and the processes automated or computerized.

This study reveals that a good majority of the respondents have adopted the e-Purchasing System to facilitate the procurement operation. Seventy six percent (76.4%) of them have transacted more than half (50%) of their purchasing processes by electronic means. More than forty-five percent (45.5%) utilizes combinations of phone-fax machines, e-mail, productivity software, purchasing software and supplier portal. Less than 1% uses a fuller suite of equipments and systems that include phone-fax machines, e-mails, productivity software, ERP systems, supplier portal and others. The study also finds that 86.1% of the organizations have an appropriate level of technology and software usage to facilitate electronic purchasing processes. In terms of system capability, 65.8% of the respondents are utilizing enterprise-wide systems that are capable of both intra and inter-firms connectivity.

6.3.3 Data Ranking

The need for ranking typically applies when there is a huge data set and the need to find similar indicators or common themes and trends for the research (Rahim, 2011). For this study, data ranking refers to the ranking of the organizational CSFs responsible for the successful implementation of e-Purchasing System in the construction sector as identified by respondents. They are ranked according to their perceived significance in contributing to the successful implementation of the system. The output of the data ranking exercise can further support the finding of inferential statistic.

In this study, the SPSS version 20 and Microsoft Excel were used for doing the ranking analysis. The method of evaluation and ranking is based on statistical analysis as

suggested by previous researchers (Field, 2005; Morgan et al., 2004; Punch, 2005), such as:-

- The weighted mean rating
    - indicates the importance of each indicator
- Standard deviation
- Coefficient of variation
    - the ratio of standard deviation as a percentage (%) of the mean
    - is used to compare the relative variability of various responses
    - the lower the variation coefficient, the better is the variability
- Severity index
    - ranking of the indictors according to their significance
    - the higher the percentage (%), the more significant is the factor

i) Ranking of Critical Success Factors (CSFs)

For the purpose of this chapter, the statistical ranking results for all 58 indicators are described based on groupings of factors.

a) Organizational policy and strategic planning

Organizational policy and strategic planning consists of 5 items (indicators). The results as indicated in Table 6.7 show that the weighted mean ratings for the 5 items range from 3.92 to 4.23, and their severity indexes vary from 78.37% to 84.55%. The F1 item is shown to be the highest ranked indicator under the Organizational Policy and Strategic Plan factor, with the weighted mean of 4.23 and severity index of 84.55%. It has an overall ranking of 2nd out of the 58 indicators. In contrast, the F2 item is the lowest ranked indicator under the Organizational Policy and Strategic Plan group, with the weighted mean rating of 3.92, severity index of 78.37% and overall ranking of 51 out of

58. This group has the overall mean of 4.05 or 81% of criticality as viewed by the respondents.

Table 6.7: Organizational Policy and Strategic Plan Ranking

CSF Items (Indicators)	Weighted mean rating	Standard deviation	Coefficient of variation (%)	Severity index (%)	Ranking within group	Overall ranking
Existence of clear mission, strategies, objectives and direction (F1)	4.23	0.687	16.24	84.55	1	2
Incorporation of e-Purchasing policy into existing procurement policy (F2)	3.92	0.685	17.47	78.37	5	51
Availability of strategic plan (F3)	4.11	0.672	16.35	82.28	2	15
Alignment of e-Purchasing strategy with IT strategy (F4)	4.00	0.665	16.63	80.00	3	40
Decision on appropriate e-Purchasing business model (F5)	3.98	0.701	17.61	79.67	4	41

b) Project Planning

The Project planning factor consists of 4 items. As indicated in Table 6.8, the weighted means for the items range from 4.04 to 4.07, and their severity indexes vary from 80.81% to 81.46%. The F8 item is the highest ranked indicators, with the weighted mean rating of 4.07 and the severity index of 81.46%. It has an overall ranking of 26th out of the 58 indicators. The F6 item is the lowest ranked indicator under this group, with the weighted mean ranting of 4.04, severity index of 80.81% and overall ranking of 34th out of 58. The Project planning factor has the overall mean of 4.06 or 81.2% of criticality as viewed by the respondents.

Table 6.8: Ranking of Organizational CSFs for Project Plan

CSF Items (Indicators)	Weighted mean rating	Standard deviation	Coefficient of variation (%)	Severity index (%)	Ranking within group	Overall ranking
Project plan consistent with IS plan (F6)	4.04	0.619	15.32	80.81	4	34
Availability of detail project plan (F7)	4.05	0.638	15.75	80.98	3	33
Clear definition of project scope (F8)	4.07	0.660	16.22	81.46	1	26
Project activity properly coordinated and monitored (F9)	4.07	0.642	15.77	81.30	2	28

c) Project Team

Project team comprises of 5 indicators. Table 6.9 shows that the weighted mean ratings for the indicators range from 3.95 to 4.06 and the severity indexes vary from 79.02% to 81.14%. The F11 item is the highest ranked indicator under Project Team factor with the weighted mean rating of 4.06 and severity index of 81.14%. It has an overall ranking of 30th out of 58 indicators. The lowest ranked indicator under this group is the F12 item, with weighted mean at 3.95, severity index at 79.02% and overall ranking at 48th out of 58. This group has the overall mean of 4.02 or 80.4% of criticality as viewed by the respondents.

Table 6.9: Project Team

CSF Items (Indicators)	Weighted mean rating	Standard deviation	Coefficient of variation (%)	Severity index (%)	Ranking within group	Overall ranking
Strong domain knowledge (F10)	4.05	0.605	14.94	80.98	2	31
Roles and responsibilities properly defined and delegated (F11)	4.06	0.591	14.56	81.14	1	30
Cross-functional team members selected (F12)	3.95	0.570	14.43	79.02	5	48
Experienced and reputable Project Manager (F13)	4.04	0.658	16.29	80.81	3	35
Use effective project management techniques (F14)	4.01	0.621	15.49	80.16	4	39

d) Top Management Support and Commitment

Top management support and commitment comprises of 9 indicators. Table 6.10 shows that the weighted mean ratings range from 3.97 to 4.20, and the severity indexes vary from 79.35% to 83.90%. F15 is the highest ranked indicator under this factor, with weighted mean of 4.20 and severity index of 83.90%. It has an overall ranking of 6th out of 58. F18 records the lowest weighted mean at 3.97 and severity index at 79.35%. It has an overall ranking of 45th out of 58. This group has overall mean of 4.08 or 81.69% of criticality as viewed by the respondents.

Table 6.10: Top Management Support and Commitment

CSF Items (Indicators)	Weighted mean rating	Standard deviation	Coefficient of variation (%)	Severity index (%)	Ranking within group	Overall ranking
Steering committee provides directions and guidance (F15)	4.20	0.649	15.45	83.90	1	6
Reinforces commitment of employees (F16)	3.97	0.701	17.66	79.35	8	44
Willingness to spend resources (F17)	4.07	0.686	16.86	81.30	6	29
Offers leadership (18)	3.97	0.718	18.09	79.35	9	45
Provides adequate training and education programs (F19)	4.14	0.669	16.16	82.76	4	12
Provides appropriate organizational structure (F20)	4.10	0.645	15.73	81.95	5	19
Provides pro-active communication channel (F21)	4.02	0.671	16.69	80.33	7	38
Promotes the implementation (F22)	4.15	0.641	15.45	83.09	2	10
Implements reward system (F23)	4.14	0.631	15.24	82.76	3	11

e) Stakeholder Involvement

Stakeholder involvement comprises of 3 items. The results shown in Table 6.11 indicate that the weighted mean ratings range from 3.85 to 3.90, and the severity indexes vary from 77.07% to 78.05%. F24 emerged as the highest ranked indicator under this factor with weighted mean at 3.90 and severity index at 78.05%. It has an overall ranking of 52nd out of 58. The lowest ranked indicator is F26 with weighted mean of 3.85, severity

index of 77.07% and overall ranking of 56th out of 58. Stakeholder involvement factor has an overall mean of 3.87 or 77.4% of criticality as viewed by the respondents.

Table 6.11: Stakeholder Involvement

CSF Items (Indicators)	Weighted mean rating	Standard deviation	Coefficient of variation (%)	Severity index (%)	Ranking within group	Overall ranking
Early involvement (F24)	3.90	0.713	18.28	78.05	1	52
Defines the level each stakeholder can get involved (F25)	3.85	0.661	17.17	77.07	2	55
Provide information and set requirements (F26)	3.85	0.686	17.82	77.07	3	56

f) Employee Commitment

Employee commitment consists of 5 items. The results, as indicated in Table 6.12, show that the weighted mean ratings range from 4.11 to 4.24, and the severity indexes vary from 82.28% to 84.72%. The F30 item is the highest ranked indicator under this factor, with weighted mean at 4.24 and severity index at 84.72%. It has an overall ranking of 1st out of 58. F28 is the lowest ranked indicator with weighted mean of 4.11, severity index of 82.28% and overall ranking of 16th out of 58. Employee commitment factor has overall mean of 4.17, which indicates that 83.40% of all the indicators representing the group factor are critical as viewed by the respondents. This group is dominated by indicators having high overall ranking.

Table 6.12: Employee Commitment

CSF Items (Indicators)	Weighted mean rating	Standard deviation	Coefficient of variation (%)	Severity index (%)	Ranking within group	Overall ranking
Commitment to organization's objectives (F27)	4.20	0.652	15.52	84.07	3	8
Loyalty to organization (F28)	4.11	0.680	16.55	82.28	5	16
Employee cooperation (F29)	4.20	0.627	14.93	84.07	2	5
Good quality outcomes (F30)	4.24	0.615	14.50	84.72	1	1
Positive attitude towards e-Purchasing (F31)	4.12	0.696	16.89	82.44	4	14

g) Experience with New Technology

Experience with new technology factor consists of 3 items. The results shown in Table 6.13 indicate that the weighted mean ratings range from 3.96 to 3.98, and the severity indexes vary from 79.19% to 79.51%. F34 is the highest ranked indicator under this factor, with weighted mean at 3.98 and severity index at 79.51%. It has an overall ranking of 42nd out of 58. F33 is the lowest ranked indicator with weighted mean at 3.96, severity index at 79.19% and overall ranking at 47th out of 58. This factor has an overall mean of 3.97, which indicates that 79.4% of all the indicators are viewed as critical by the respondents.

Table 6.13: Experience with New Technology

CSF Items (Indicators)	Weighted mean rating	Standard deviation	Coefficient of variation (%)	Severity index (%)	Ranking within group	Overall ranking
Organization's experience with technology application (F32)	3.96	0.549	13.86	79.19	2	46
Organization's experience become a base of knowledge for guiding current initiatives (F33)	3.96	0.549	13.86	79.19	3	47
Organization's experience enables effective implementation of IT systems (F34)	3.98	0.607	15.25	79.51	1	42

h) Change Management

The change management factor consists of 3 items. As indicated in Table 6.14, the weighted mean ratings range from 3.72 to 3.89, and the severity indexes vary from 74.47% to 77.89%. F37 is the highest ranked indicator under change management factor, with weighted mean at 3.89 and severity index at 77.89%. It has an overall ranking of 53rd out of 58. F35 is the lowest ranked indicator with weighted mean at 3.72, severity index at 74.47%, and overall ranking at 58th out of 58. This factor has an overall mean of 3.83 and is considered the least critical factor compared to the other factors.

Table 6.14: Change Management

CSF Items (Indicators)	Weighted mean rating	Standard deviation	Coefficient of variation (%)	Severity index (%)	Ranking within group	Overall ranking
Have change management programs (F35)	3.72	0.678	18.23	74.47	3	58
Willingness of the organization to change (F36)	3.88	0.738	19.02	77.56	2	54
Well managed process of change (F37)	3.89	0.675	17.35	77.89	1	53

i) Close Collaboration with Trading Partners

Close collaboration with trading partners consists of 6 items. . As indicated in Table 6.15, the weighted mean ratings range from 3.93 to 4.05, and the severity indexes vary from 78.54% to 80.98%. F38 is the highest ranked indicator with weighted mean at 4.05 and severity index at 80.98%. It has an overall ranking of 32nd out of 58. F40 is the lowest ranked indicator with weighted mean at 3.93, severity index at 78.54% and overall ranking at 50th out of 58. This group factor has the overall mean of 3.99 or 78.8% of criticality as perceived by respondents.

Table 6.15: Close Collaboration with Trading Partners

CSF Items (Indicators)	Weighted mean rating	Standard deviation	Coefficient of variation (%)	Severity index (%)	Ranking within group	Overall ranking
Encourages organization build long term relationship (F38)	4.05	0.625	15.43	80.98	1	32
Mutual understanding of needs (F39)	3.98	0.614	15.43	79.51	4	43
Partnership agreement (F40)	3.93	0.624	15.88	78.54	6	50
Readiness of trading partners (F41)	3.93	0.657	16.72	78.70	5	49
Relationship of trust (F42)	4.02	0.607	15.10	80.49	3	37
Communication (F43)	4.03	0.572	14.19	80.65	2	36

j) User Adoption

User adoption factor consists of 3 items. The results, as indicated in Table 6.15, show weighted mean ratings ranging from 3.81 to 4.09, and severity indexes varying from 76.26% to 81.79%. The F44 item is the highest ranked indicator under the user adoption factor, with weighted mean at 4.09 and severity index at 81.79%. It has an overall ranking of 21st out of 58. F46 is the lowest ranked indicator under this factor with weighted mean at 3.81, severity index at 76.26% and overall ranking at 57th out of 58. This factor has an overall mean of 4.00 or 80% of criticality as viewed by the respondents.

Table 6.16: User Adoption

CSF Items (Indicators)	Weighted mean rating	Standard deviation	Coefficient of variation (%)	Severity index (%)	Ranking within group	Overall ranking
User's knowledge and skills (F44)	4.09	0.690	16.87	81.79	1	21
Appropriate training sessions (F45)	4.09	0.724	17.70	81.79	2	23
Previous experience using IT application (F46)	3.81	0.605	15.88	76.26	3	57

k) Organizational Culture

Organizational culture factor consists of 3 items. As indicated in Table 6.17, the weighted mean ranges between 4.15 to 4.17, and the severity indexes vary from 83.09% to 83.41%. F48 emerged as the highest ranked indicator under this factor, with weighted mean at 4.17, severity index at 83.41%, and overall ranking at 7th out of 58. F47 is the lowest ranked indicator, with weighted mean at 4.15, severity index at 83.09%, and overall ranking of 9th out of 58. This factor has the overall weighted mean of 4.16 or 83.20% of criticality. It is the 2nd highest ranked factor out of the group of fourteen factors.

Table 6.17: Organizational Culture

CSF Items (Indicators)	Weighted mean rating	Standard deviation	Coefficient of variation (%)	Severity index (%)	Ranking within group	Overall ranking
Encourages innovation and learning processes (F47)	4.15	0.587	14.14	83.09	3	9
Encourages sharing of knowledge and information (F48)	4.17	0.636	15.25	83.41	1	7
Allows work cultural transformation (F49)	4.16	0.658	15.82	83.25	2	8

l) Business Process Reengineering

Business process reengineering factor consists of 3 items. As indicated in Table 6.18, the weighted mean ratings range from 4.07 to 4.11, and the severity indexes vary from 81.30% to 82.11%. F52 is the highest ranked indicator in this factor, with weighted mean at 4.11 and severity index at 82.11%. It has an overall ranking of 17th out of 58. F51 is the lowest ranked indicator, with weighted mean at 4.07, severity index at 81.30% and overall ranking of 27th out of 58. This factor has an overall weighted mean of 4.08 or 81.6% of criticality as opined by the respondents.

Table 6.18: Business Process Reengineering

CSF Items (Indicators)	Weighted mean rating	Standard deviation	Coefficient of variation (%)	Severity index (%)	Ranking within group	Overall ranking
Designs and documents important business processes (F50)	4.07	0.575	14.13	81.46	2	24
Changes the process according organization needs (F51)	4.07	0.583	14.32	81.30	3	27
Simplifies processes and eliminates redundant activities (F52)	4.11	0.612	14.89	82.11	1	17

m) Vendor/ IT Consultant Support

The vendor factor consists of 3 items. The results, as indicated in Table 6.19, show that the weighted mean ratings range from 4.11 to 4.20, and the severity indexes vary from 82.11% to 84.07%. F55 is the highest ranked indicator under the vendor factor with weighted mean at 4.20 and severity index at 84.07%. It has an overall ranking of 4th out of 58. In contrast, F54 is the lowest ranked indicator under this factor, with weighted mean at 4.11, severity index at 82.11% and overall ranking at 18th out of 58. The vendor factor has an overall mean of 4.14 or 82.20% of criticality as decided by respondents.

Table 6.19: Vendor/IT Consultant Support

CSF Items (Indicators)	Weighted mean rating	Standard deviation	Coefficient of variation (%)	Severity index (%)	Ranking within group	Overall ranking
Own business and technical knowledge (F53)	4.12	0.635	15.41	82.44	2	13
Recommends appropriate e-Purchasing system (F54)	4.11	0.651	15.84	82.11	3	18
Supports during implementation process (F55)	4.20	0.614	14.62	84.07	1	4

n) Performance Measurement

Performance measurement factor consists of 3 items. As indicated in Table 6.20, the weighted mean ratings range from 4.07 to 4.09, and the severity indexes vary from 81.46% to 81.79%. F58 is the highest ranked indicator under the performance measurement factor, with weighted mean at 4.09 and severity index at 81.79%. It has an overall ranking of 20th out of 58. F56 is the lowest ranked indicator under this factor, with weighted mean at 4.07, severity index at 81.46% and overall ranking at 25th out of 58. This performance measurement factor has an overall mean of 4.08 or 81.60% of criticality as perceived by respondents.

Table 6.20: Performance Measurement

CSF Items (Indicators)	Weighted mean rating	Standard deviation	Coefficient of variation (%)	Severity index (%)	Ranking within group	Overall ranking
Creates performance measures (F56)	4.07	0.616	15.14	81.46	3	25
Establishes appropriate milestones (F57)	4.08	0.609	14.93	81.63	2	23
Conducts post-implementation review (F58)	4.09	0.627	15.33	81.79	1	20

ii) Ranking of e-Purchasing Implementation Success

In measuring e-Purchasing implementation success, two factors were considered, namely project management success and user satisfaction. Each of these factors has, in turn, four indicators, and they are discussed below.

a) Project Management Success

Project management success is defined by 4 indicators. The results, as laid out in Table 6.21, show that the weighted mean ratings range from 3.80 to 3.89 and the severity indexes vary from 75.93% to 77.72%. I3 is the highest ranked indicator under this factor, with weighted mean at 3.89 and severity index at 77.72%. It has an overall

ranking of 1st out of 8. On the other hand, I2 is the lowest ranked indicator, with weighted mean at 3.80, severity index at 75.93% and overall ranking of 6th out of 8. Project management success has overall mean of 3.83, and considered as 76.6% appropriate as success criteria by the respondents.

Table 6.21: Ranking of Project Management Indicators for e-Purchasing Implementation Success

CSF Items (Indicators)	Weighted mean rating	Standard deviation	Coefficient of variation (%)	Severity index (%)	Ranking within group	Overall ranking
Project was completed on time (I1)	3.80	0.582	15.32	76.10	3	5
Project was completed within allocated budget (I2)	3.80	0.543	14.29	75.93	4	6
Project scope is well matched with organization's need (I3)	3.89	0.651	16.74	77.72	1	1
The system is accepted by users (I4)	3.82	0.597	15.63	76.42	2	3

b) User Satisfaction

User satisfaction is measured by 4 items. In Table 6.22, the results show that weighted mean ratings for these items range from 3.77 to 3.88, and the severity indexes vary from 75.45% to 77.56%. Item I8 is shown as the highest ranked indicator, with weighted mean at 3.88 and severity index at 77.56%. It has an overall ranking of 2nd out of 8. I6 is considered the lowest ranked indicator of this dimension, with weighted mean at 3.77, severity index at 75.45% and overall ranking at the last place. User satisfaction, as criteria of e-Purchasing implementation success, has an overall mean of 3.82 and considered as 76.4% appropriate as success criteria by the respondents.

Table 6.22: Ranking of User Satisfaction Indicators for e-Purchasing Implementation Success

CSF Items (Indicators)	Weighted mean rating	Standard deviation	Coefficient of variation (%)	Severity index (%)	Ranking within group	Overall ranking
User satisfied with information quality (I5)	3.80	0.609	16.03	75.93	3	7
The system provides sufficient information (I6)	3.77	0.608	16.13	75.45	4	8
The system is user-friendly (I7)	3.82	0.649	16.99	76.42	2	4
The system is beneficial for users and improves employee work efficiency (I8)	3.88	0.672	17.32	77.56	1	2

6.3.4 Discussion on Data Ranking

The above mentioned ranking exercise of indicators that are grouped together in fourteen major factors is to find out the organizational CSFs that have the greatest impact on the successful implementation of e-Purchasing systems.

The process starts with the selection of the factors and followed by the ranking. The latter is accomplished by the use of weighted mean rating, standard deviation, percentage coefficient of variation, and percentage of severity index. The output from the ranking shows that a number of indicators are highly ranked within a factor and are also highly ranked in the total population of indicators. There are also factors that are highly ranked within a factor but are lowly ranked in the overall ranking of indicators. Employee commitment to deliver good quality outcome is a highly ranked indicator in the employee commitment factor as well as in the overall ranking. Conversely, well managed process of change indicator has a high ranking position in the change management factor but low in the overall ranking. The summary of the Organizational CSFs ranking is indicated in Table 6.23.

Table 6.23: Summary Ranking of Organizational CSFs

CSFs	Overall ranking
Employee commitment to deliver good quality outcomes	1
Clear mission, strategies, objectives and direction	2
Commitment to organization's objectives	3
Supports during implementation process	4
Employee cooperation	5
Steering committee provides directions and guidance	6
Encourages sharing of knowledge and information	7
Allows work cultural transformation	8
Encourages innovation and learning processes	9
Promotes the implementation	10
Implements reward system	11
Provides adequate training and education program	12
Vendor own business and technical knowledge	13
Positive attitude towards e-Purchasing	14
Availability strategic plan	15
Loyalty to organization	16
Simplifies processes and eliminates redundancy activities	17
Recommends appropriate e-Purchasing system	18
Provides appropriate organizational structure	19
Conducts post-implementation review	20
User's knowledge and skills	21
Appropriate training sessions	22
Establishes appropriate milestones	23
Designs and documents important business processes	24
Creates performance measures	25
Clear definition of project scope	26
Changes the process according organization needs	27
Project activity properly coordinated and monitored	28
Willingness to spend resources	29

Table 6.23, continued

Roles and responsibilities properly define and delegated	30
Project team own strong domain knowledge	31
Encourages organization build long term relationship	32
Availability of detail project	33
Project plan consistent with IS plan	34
Experienced and reputable Project Manager	35
Communication with trading partners	36
Relationship of trust with trading partners	37
Provides pro-active communication channel	38
Use effective project management techniques	39
Alignment e-Purchasing strategy with IT strategy	40
Decision on an appropriate e-purchasing business model	41
Organization's experience enables effective implementation of IT systems	42
Mutual understanding of needs with trading partners	43
Reinforces commitment employees	44
Offers leadership	45
Organization experience with technology application	46
Organizations experience a base of knowledge for guiding	47
Cross-functional team members selected	48
Readiness of trading partners	49
Partnership agreement with trading partners	50
Incorporation of e-Purchasing policy into existing procurement policy	51
Stakeholder early involvement	52
Well managed process of change	53
Willingness of the organization to change	54
Defines the level each stakeholder can get involved	55
Stakeholder provide information and set requirements	56
User's previous experience using IT application	57
Have change management programs	58

Figure 6.6 below gives a visual representation of the score given to the 58 indicators by respondents using the radar diagram. From the analysis, the ranking of the top five factors are as follows in descending order: employee commitment, organizational culture, vendor support, top management support and commitment, and project planning.

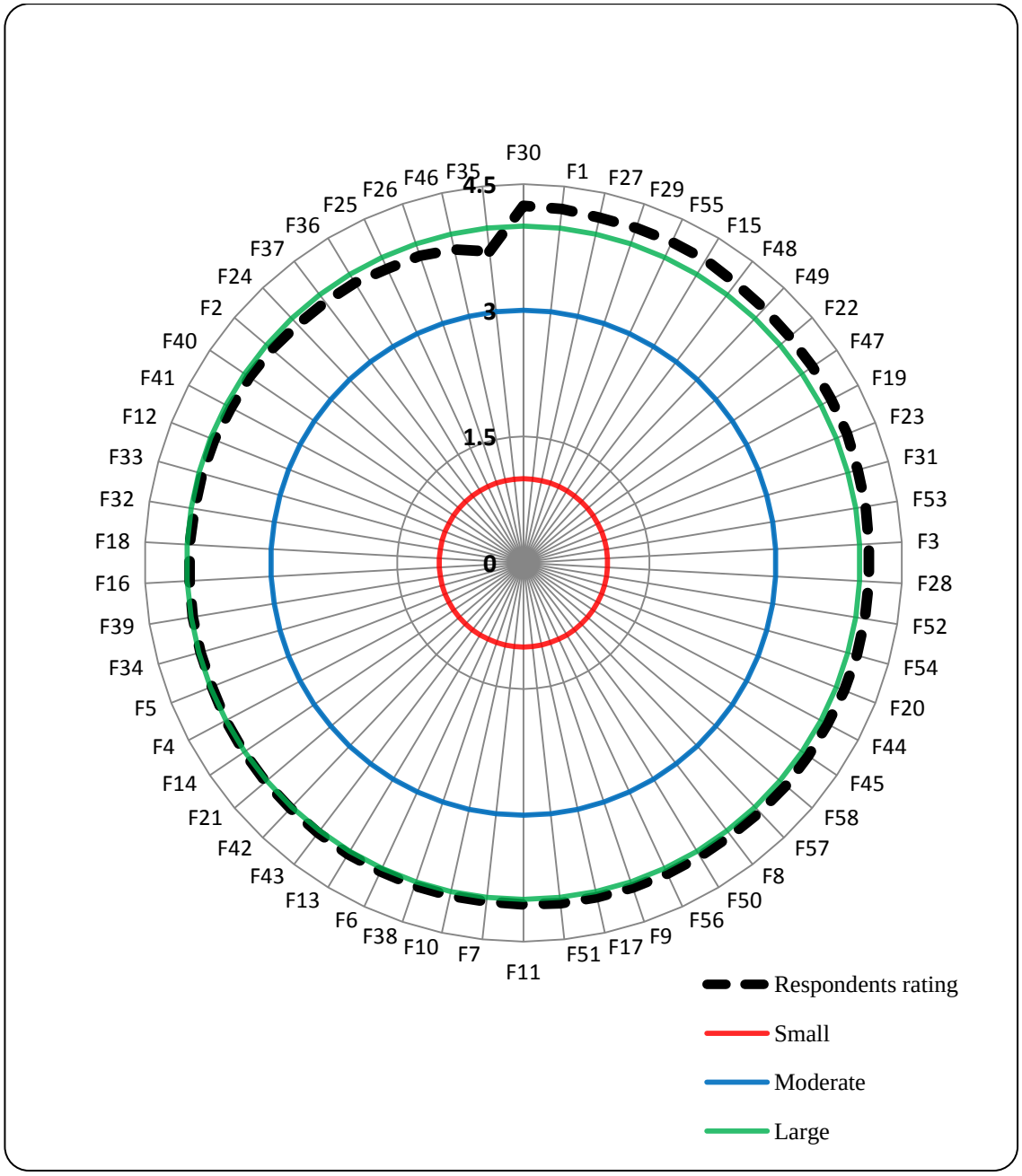


Figure 6.6: Radar Diagram Illustrating Mean Score of Organizational CSFs As Viewed By the Respondents

6.4 Checking the Distribution of Score – Normality of Data Set

A normality test was performed to the dataset to determine whether it produces a normally distributed population or not before subjecting it to further analysis. The valid dataset consisted of 123 items, and this is considered small for a quantitative study, where typically it should be above 150 (Creswell, 2008). As the datasets was larger than 50, Kolmogrov-Smirnov's (K-S) test was applied (Hair et al., 2006) to test for data normality among variables.

Table 6.24 and Table 6.25 summarize the K-S test results that are represented by the p-values. Both tables show a p-value of 0.000 at a significant value ($p<0.05$), indicating a deviation from normality (Field, 2009). Therefore, the dataset was considered as significantly non-normal. Since the dataset was non-normal, a non-parametric test that does not rely upon the assumption of normality was decided for subsequent analysis (DePuy & Pappas, 2004; Kang & Harring, 2012; Neidden & Brasel, 2007; Som, 2008).

Table 6.24: Summary P-value of K-S test for Organizational CSFs

Item	Grouping Factors	Kolmogorov-Smirnov Statistic (p-value)
1	Organizational Policy and Strategic Plan	0.000
2	Project Planning	0.000
3	Project Team	0.000
4	Top Management Support and Commitment	0.000
5	Stakeholder Involvement	0.000
6	Employee Commitment	0.000
7	Experience with New Technology	0.000
8	Change management	0.000
9	Close Collaboration with Trading Partners	0.000
10	User Adoption	0.000
11	Organizational Culture	0.000
12	Business Process Reengineering	0.000
13	Vendor/ IT Consultant Support	0.000
14	Performance Measurement	0.000

Table 6.25: Summary P-value of K-S test for E-Purchasing Success

Item	Group Factors	Kolmogorov-Smirnov Statistic (p-value)
1	Project Management Success	0.000
2	User Satisfaction	0.000

The above two tables indicate that the main components of the study, organizational CSFs and e-Purchasing implementation success, are significantly non-normal. Hence a non-parametric test to evaluate the significance of the relationship between organizational CSFs and e-Purchasing implementation success was decided upon.

6.5 Detail Analysis of Quantitative Data

Various tests were carried on the quantitative data and they are discussed below. The discussion is broken up into four-sections: the first section deals with the test for reliability and validity; the second, on factor analysis; the third, pertaining to correlation analysis; and the final section, on regression analysis.

6.5.1 Reliability and Validity of Instrument

Reliability analysis is performed to measure the internal consistency of the instrument. Internal consistency and reliability is assessed by calculating Cronbach's alpha values. Reliability is established when α value is greater than 0.3. If the α value is greater than 0.7, the data set is considered as highly reliable (Leech et al., 2005; Wong & Cheung, 2005; Yang & Ou, 2008). Using SPSS, this study calculated the Cronbach's alpha values using the alpha "if item deleted" option. Table 6.26 and 6.27 show the results of the α values for each independent and dependent variable. The results indicate that all variables have values above the threshold of 0.70, indicating thereby that the items possess reasonable internal consistency and reliability.

Table 6.26: The Cronbach's Value for Independent Variable

Variable	No. of Item	Cronbach's α
Organizational policy and strategic plan	5	0.886
Project planning	4	0.895
Project team	3	0.914
Top management support and commitment	9	0.946
Stakeholder involvement	3	0.887
Employee commitment	5	0.937
Experience with new technology	3	0.918
Change management	3	0.935
Close collaboration with trading partners	6	0.908
User adoption	3	0.779
Organizational culture	3	0.923
Business process reengineering	3	0.902
Vendor/ IT Consultant support	3	0.905
Performance measurement	3	0.926

Table 6.27: The Cronbach's Value for Dependent Variable

Variable	No. of Item	Cronbach's α
Project management success	4	0.913
User satisfaction	4	0.895

In order to establish instrument validity, both content and construct validity tests should be carried out. Content validity refers to how representative and comprehensive the instruments is in creating the scale (Hong & Kim, 2002). For this study, a separate content validity test is unnecessary since the instrument was established through a review with academic experts during content validation assessment in qualitative study. As highlighted previously in chapter 4, after the assessment was carried out, the items were modified to fit the context of the study. As far as construct validity is concerned, it

is established by relating a measuring instrument to the general theoretical framework. This is done in order to determine whether the instrument is tied to the theoretical employed (Hong & Kim, 2002) and whether the instrument measures the construct as it is intended to measure (Bhatti, 2005). Both tests for convergent validity and discriminant validity (Nachmias & Nachmias, 2000) were used in this study to obtain evidence of construct validity of the instrument.

To determine convergent validity, this study evaluated the value of the corrected item-total correlation (Bakuwa et al., 2013), which was based on the output generated from the reliability analysis. According to Leech et at (2005), if the correlation is 0.4 or above, it is considered as high and will make a good component of the summated rating scale. If it is less than 0.3, it is too small and should be considered for deletion (Yusoff, 2011). Ho (2006) noted that an item-total correlation of 0.33 indicates approximately 10% of the variance in the scale are accounted for by that item and it can be used for the decision of retaining the item or not.

Table 6.28 and Table 6.29 show that the corrected item-total correlation for all the variables is greater than 0.4. This suggests that the instrument is convergently valid. F33 has a corrected item-total correlation value of 0.903 (greater than 0.9), and this indicates that the item is repetitious (Chuen, 2010). However, for the purpose of this study, this item is retained and used for further analysis. The rationale for this action is that if the item is deleted it would not improve the new Cronbach's Alpha value (original α-value = 0.918; revised α-value after item deleted = 0.828). As a consequence, no items were removed from the analysis.

Table 6.28: Convergent Validity of Instrument – Independent Variable

CSFs Item	No. of Item	Convergent validity (Corrected Item-Total Correlation)
Organizational policy and strategic plan	5	
F1		0.580
F2		0.761
F3		0.732
F4		0.792
F5		0.765
Project planning	4	
F6		0.778
F7		0.766
F8		0.788
F9		0.739
Project team	5	
F10		0.756
F11		0.765
F12		0.785
F13		0.766
F14		0.841
Top management support and commitment	9	
F15		0.806
F16		0.826
F17		0.804
F18		0.769
F19		0.843
F20		0.752
F21		0.781
F22		0.803
F23		0.716
Stakeholder involvement	3	
F24		0.791
F25		0.793
F26		0.759
Employee commitment	5	
F27		0.817
F28		0.845
F29		0.882
F30		0.838
F31		0.785
Experience with new technology	3	
F32		0.786
F33		**0.903**
F34		0.824
Change management	3	
F35		0.839
F36		0.877
F37		0.884
Close collaboration with trading partners	6	
F38		0.706
F39		0.833
F40		0.719
F41		0.606
F42		0.818
F43		0.807

Table 6.28, continued

CSFs Item	No. of Item	Convergent validity (Corrected Item-Total Correlation)
User adoption	3	
F44		0.678
F45		0.733
F46		0.463
Organizational culture	3	
F47		0.866
F48		0.842
F49		0.826
Business process reengineering	3	
F50		0.784
F51		0.852
F52		0.781
Vendor/ IT consultant support	3	
F53		0.808
F54		0.816
F55		0.812
Performance measurement	3	
F56		0.840
F57		0.863
F58		0.843

Table 6.29: Convergent Validity of Instrument – Dependent Variable

Indicators	No. of Item	Convergent validity (Corrected Item-Total Correlation)
Project Management Success	4	
SI1		0.803
SI2		0.782
SI3		0.827
SI4		0.808
User Satisfaction	4	
SI5		0.817
SI6		0.789
SI7		0.844
SI8		0.637

Discriminant validity is assessed by using factor analysis and this will be explained in the following section. A good discriminant validity is confirmed when items for each variable load onto single factors with loadings of greater than 0.4 (Huynh & Lin, 2013; Nunnally, 1978). Based on the results of the reliability and validity analyses, this study concludes that all the instrument items used in this study are reliable and appropriate to use in factor analysis.

6.5.2 Factor Analysis for the Organizational CSFs

In this study, the purpose of factor analysis is to determine the underlying structure of the factors, and to create a meaningful factor framework for the 58 organizational CSFs. In other words, this analysis is used to identify a relatively small number of factor groups that can be used to represent relationships among sets of many inter-related variables.

i) Prerequisite of Factor Analysis

The first concern of factor analysis is sample adequacy and multicollinearity of the datasets. To analyse for sample adequacy, two tests are involved, namely Bartlett's test of sphericity (BTS) and Kaiser-Meyer-Olkin (KMO) test. For this study, the two tests were conducted using SPSS. Bartlett's test of sphericity is a statistical test for the overall significance of all correlations within a correlation matrix (Hair, Black, & Babin, 2009). The BTS value should be less than 0.001 (Robert Ho, 2006).

Kaiser-Meyer-Olkin (KMO) test, on other hand, measures sampling adequacy (Field, 2005). According to Field (2005), KMO value of 0.60 is at the threshold of acceptability; between 0.70-0.80 (good); exceeding 0.80 (very good); greater than 0.90 (excellent). The KMO value should be greater than 0.50 for satisfactory factor analysis. Hu (2012) suggested that any value that is below 0.5 hints that factor analysis may not be appropriate.

Table 6.30 and 6.31 show the BTS and KMO values of the dataset. The KMO values range between 0.624 and 0.915. This means that the dataset satisfies the criteria for performing factor analysis on the identified statements.

Table 6.30: KMO and BTS of Independent Variable

Variable	Bartlett's Test		KMO (>0.6)
	Chi-square (χ^2)	Sig. (<0.001)	
Organizational policy and strategic plan	346.289	0.000	0.836
Project planning	282.560	0.000	0.837
Project team	409.821	0.000	0.880
Top management support and commitment	927.973	0.000	0.915
Stakeholder involvement	204.347	0.000	0.745
Employee commitment	524.545	0.000	0.895
Experience with new technology	288.427	0.000	0.709
Change management	311.678	0.000	0.762
Close collaboration with trading partners	484.644	0.000	0.848
User adoption	125.338	0.000	0.624
Organizational culture	278.107	0.000	0.759
Business process reengineering	232.864	0.000	0.735
Vendor/ IT Consultant support	233.921	0.000	0.756
Performance measurement	281.064	0.000	0.763

Table 6.31: KMO and BTS of Dependent Variable

Variable	Bartlett's Test		KMO (>0.6)
	Chi-square (χ^2)	Sig. (<0.001)	
Project management	330.983	0.000	0.856
User satisfaction	332.727	0.000	0.786

Table 6.32 shows that the overall values of KMO test for independent and dependent constructs are 0.874 and 0.884 respectively, which indicate very good sampling adequacy (Field, 2005).

Table 6.32: Overall Value of KMO and Bartlett's Test

Variable	Bartlett's Test		KMO (>0.6)
	Chi-square (χ^2)	Sig. (<0.001)	
Independent construct	7874.075	0.000	0.874
Dependent construct	838.447	0.000	0.884

Before factor analysis can be conducted, the items under study (referring to the 58 CSFs) should correlate well with each other. In cases when the correlation coefficient is greater than 0.8, there potentially exists the problem of multicollinearity. Multicollinearity occurs when the items are too highly correlated. Field (2005), for instance, suggested that multicollinearity exists when a correlation coefficient value reads r >0.8, and for Tabachnick & Fidel (2007), any value that is r >0.9. Hence, it is important to scrutinize for items having correlation coefficient of greater than 0.8 and determinant value of greater than 0.0001 (Field, 2005). Since multicollinearity implies that items are redundant, eliminating such highly correlated is normally suggested before proceeding with factor analysis.

In this study, all of correlation matrix values relating to the independent and the dependent variables as shown in **Appendix 6-1**, and **6-2** show r values of less than 0.9, suggesting thereby that there is no threat of multicollinearity. In addition, the presence of multicollinearity can be also checked through the determinant value of the correlation matrix. Any value greater than the recommended 0.00001 says no multicollinearity. As indicated in Table 6.33, the values for the independent variable items are above this value, hence multicollinearity is not present. Due to this, no items were removed at this stage and all the items were used in factor analysis.

Table 6.33: Determinant Value for Independent Variable

Variable	Correlation Matrix (Determinant value) > 0.00001
Organizational policy and strategic plan	0.055
Project planning	0.250
Project team	0.249
Top management support and commitment	0.000
Stakeholder involvement	0.183
Employee commitment	0.012
Experience with new technology	0.091
Change management	0.075
Close collaboration with trading partners	0.017
User adoption	0.352
Organizational culture	0.099
Business process reengineering	0.142
Vendor/ IT Consultant support	0.143
Performance measurement	0.096

ii) Assessment for Factor Analysis

Assessment of the organizational CSFs commences once the above prerequisites are completed. As mentioned above, no items were deleted from the original data set of 58 organizational CSFs. Hence, all the 58 items are used in assessment.

SPSS principal component factor analysis is used to analyse dataset validity. From the output of factor analysis, the correlation matrix shows that almost all of the inter-item correlations are above 0.3, the Kaiser-Meyer-Oklin measure of sampling adequacy is 0.874, that is above 0.6 as suggested by Pallant (2007), and the Bartlett's test of sphericity is significant as indicated in Table 6.34. According to the above criteria, the dataset is good and enough items are predicted by each factor. Therefore, these results indicate factorability of the data sets.

Table 6.34: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.874
Bartlett's Test of Sphericity	Approx. Chi-Square	7789.924
	Df	1653
	Sig.	0.000

Appendix 6-3 shows the output of communalities. This table gives information about how much of the variance in each item is explained. As a guideline, a low value that is less than 0.30 (Pallant, 2007) or below than 0.50 (Field, 2009; Hair et al., 2006) indicates that the item does not fit well with other items in its components (Pallant, 2007). The values of the communalities observed range between 0.596 to 0.866, exceeding the suggested threshold of 0.50. Hence, no items in the construct are removed and they proceed for further analysis.

The next output from factor analysis is the Total Variance Table (refer **Appendix 6-4**). The table shows the actual components that were extracted. Based on this table and looking at "Extraction Sums of Squared Loadings", only 10 components satisfy cut-off criterion (extraction method) with eigenvalues greater than 1. These 10 components contribute 76.34% of the total variance of the data set. This means that the majority of the variance of data set is explained by these extracted factors (Field, 2009; Morgan et al., 2004; Pallant, 2007). Therefore, the 10 components can be considered as the component factors that represent others in the study.

The number of components to be extracted, whether 10 components or less, is determined by two factors, namely Kaiser's criterion, which refers to eigenvalues of 1 or more, and percentage total variance explained. The scree plot curve is not used because of the difficultly to interpret, the ambiguity and subjectivity of the results it

produces, and the fact that previous researchers suggested the use of the scree plot only when the sample size is greater than 200 (Field, 2009; Lehman et al., 2005).

Based on the two criteria, the number of components extracted is reduced to 8 (refer Table 6.35). These 8 components meet the eigenvalue criterion of more than 1 (Morgan et al., 2004; Pallant, 2007), and the cumulative proportion of variance explained of more than 70% (Lehman et al., 2005; Suhr, 2005). Moreover, these 8 components consist of items that could spontaneously be organized to represent the factor groupings themselves. Therefore, based on this reason a maximum of 8 components are recommended, as these components contribute the most to the explanation of the variance in the data set (Pallant, 2007).

Table 6.35: Total Variance Explained For Organizational Critical Success Factors

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	27.277	47.030	47.030	27.277	47.030	47.030
2	3.235	5.578	52.608	3.235	5.578	52.608
3	2.425	4.181	56.789	2.425	4.181	56.789
4	2.326	4.011	60.800	2.326	4.011	60.800
5	1.864	3.214	64.013	1.864	3.214	64.013
6	1.689	2.912	66.925	1.689	2.912	66.925
7	1.488	2.565	69.490	1.488	2.565	69.490
8	1.462	2.520	72.010	**1.462**	2.520	**72.010**

Extraction Method: Principal Component Analysis.

After the 8 components are determined, the next procedure is to interpret the result of extraction by rotating these components (Piaw, 2009; Tabachnick & Fidel, 2007). For this purpose, the oblique rotation method is used. The reason for this selection is to

follow the suggestion made by Pallant (2007) and Fabrigar (1999) in using the direct oblimin rotation when the components matrix is correlated above 0.30 or when a correlation between the variables is expected. Besides, a direct oblimin rotation can increase interpretability of datasets (Salt, 2002) and produce a better simple structure (Conway, 2003).

In the oblimin rotation method an analysis of the Eight-Factor Solution with Direct Oblimin Rotation is used. The output of this analysis is factor loadings. For this study, Pattern Matrix table is used to show the factor loadings of each of the constructs since it provides easier interpretation. This table is shown in **Appendix 6-5**. It shows the relative contribution that a variable (item construct) makes to a component. The higher the factor loading the more important is the component (Tabachnick & Fidel, 2007). Factor loading cut-off value for this study is based on the suggestions of Maccallum et al. (1999); Field (2009); Morgan et al. (2004) and Steven (1995), that is an absolute value of greater than 0.4 (ignoring the +ve or –ve sign) that explain about 16% of the variance in the variable. Therefore, in **Appendix 6-5**, only the factor loadings 0.4 and above are shown. The item constructs "implements a reward system to encourage ideas and innovation" and "provides adequate training sessions" are not in the table because their loading scores are below 0.4. Another 2 items that are not selected to be part of the final 8 components of organizational CSFs, namely "promotes the implementation of the e-Purchasing systems" and "decision on an appropriate e-Purchasing business model", are excluded on the grounds of cross loading. According to Bose (2009), a cross loading is a complex structure that occurs when one variable loads on more than one component. If a variable has a complex structure, it should be removed from the analysis (Bose, 2009; Piaw, 2009). A complex structure may have loadings on more than one factor, and this makes interpretation of the output difficult (Sheridan & Ong,

2011). Thus, this study decides to remove these cross loading items following the suggestions of King and Teo (1996); Lavagnon, Amadou, and Denis (2012); Teo, Ranganathan, and Dhaliwal (2006).

Table 6.36 shows the structure of the factors with the names of the factors being subjectively inferred from the nature of the grouped items, as is commonly done with such results. By applying factor analysis this study is able to provide a structural framework of the 8 components of organizational factors that consists of 54 CSF items for e-Purchasing implementation success.

Table 6.36: Components for the Organizational Critical Success Factors

Component	Eigenvalues	Percentage of Variance	Cumulative Percentage of Variance	Pattern Loading	Organizational CSFs
Group Factor 1 **Organizational Commitment And Relationship Development**	27.277	47.030	47.030	0.602	Relationship of trust with trading partners
				0.593	Employee cooperation
				0.585	Good quality of employee works outcomes
				0.555	Loyalty to organization
				0.517	Provides appropriate organizational structure
				0.492	Commitment of employee to organization's objectives
				0.491	Top management provide pro-active communication channel
				0.475	Communication with trading partners
				0.457	Establishes partnership agreement
				0.419	Employee positive attitude towards e-Purchasing
Group Factor 2 **Change Management**	3.235	5.578	52.608	0.856	Willingness of the organization to change
				0.855	Well managed process of change
				0.830	Have change management programs
Group Factor 3 **Technical Outsourcing And Top Management Responsibilities**	2.425	4.181	56.789	0.834	IT Consultant own business and technical knowledge
				0.808	IT Consultant able to recommends appropriate e-Purchasing system
				0.738	IT Consultant supports project team during implementation process
				0.505	Establishes appropriate milestones for performance measurement
				0.494	Top management offers leadership

Table 6.36, continued

				0.492 0.429 0.417 0.401	Creates performance measures User's knowledge and skills Conducts post-implementation review Top management willingness to spend time and resources
Group Factor 3 **Technical Outsourcing And Top Management Responsibilities**	2.425	4.181	56.789	0.834 0.808 0.738 0.505 0.494 0.492 0.429 0.417 0.401	IT Consultant own business and technical knowledge IT Consultant able to recommends appropriate e-Purchasing system IT Consultant supports project team during implementation process Establishes appropriate milestones for performance measurement Top management offers leadership Creates performance measures User's knowledge and skills Conducts post-implementation review Top management willingness to spend time and resources
Group Factor 4 **Project Team Planning**	2.326	4.011	60.800	0.872 0.762 0.668 0.665 0.512 0.512 0.506	Clear definition of project scope Project activity properly coordinated and monitored Project plan consistent with IS plan Availability of detail project Project teams have strong domain knowledge Roles and responsibilities of project team properly defined and delegated Existence of clear mission, vision, strategies and direction.
Group Factor 5 **Organizational Learning**	1.864	3.214	64.013	0.847 0.828 0.819	Organization's experience with technology application Organization's experience enables effective implementation of IT systems Organization's experience become a base of knowledge for guiding
Group Factor 6 **Stakeholder and Composition**	1.689	2.912	66.925	0.771 0.753 0.682 0.570 0.488 0.474 0.457 0.423	Stakeholders provide information and set requirements Defines the level each stakeholder can get involved Stakeholder early involvement Project team uses effective project management techniques Readiness of trading partners Various cross-functional team members selected User's previous experience using IT application Project team has an experienced and reputable Project Manager.
Group Factor 7 **Organizational Policy and Strategic Plan**	1.488	2.565	69.490	0.586 0.527 0.481 0.453	Alignment of e-Purchasing strategy with IT strategy Incorporation of e-Purchasing policy into existing procurement policy Reinforces commitment of employees Availability strategy plan which sets deadlines, responsibilities and financing

Table 6.36, continued

				0.433	Provides adequate training and education program
				0.415	Steering committee provides directions and guidance of implementation process
Group Factor 8 **Business Process Innovation and External Collaboration**	1.462	2.520	72.010	0.734	Changes the process according organization needs
				0.702	Simplifies processes and eliminates redundant activities
				0.651	Designs and documents important business processes
				0.633	Encourages innovation and learning processes
				0.537	Mutual understanding of needs and capabilities with trading partners
				0.479	Encourages sharing of knowledge and information
				0.450	Allows work cultural transformation towards initiatives
				0.437	Encourages organization to build long term relationship with trading partners

The framework is then validated by testing for homogeneity and reliability in order to determine the internal consistency of the factors. As shown in Table 6.37 below, the Cronbach's Alpha ranging between 0.900 to 0.935 are well within the threshold suggested by George and Mallery (2003). The mean inter-item correlation values for the dataset also show higher than the threshold of 0.45 but not exceeding the value of 0.9 as recommended by Kleefstra et al. (2012). These results indicate that the homogeneity and reliability of the dataset are higher than the cut-offs recommended, implying thereby that the factors are highly reliable (Clark & Watson, 1995) and internally consistent.

Table 6.37: Homogeneity and Reliability of Organizational Critical Success Factors Components

Group Factors	Cronbach's Alpha (α)	Mean Inter-Item Correlation (ρ)
Organizational commitment and relationship development	0.935	0.591
Change management	0.935	0.828
Technical outsourcing and top management responsibilities	0.924	0.582
Project management planning	0.907	0.585

Table 6.37, continued

Organizational Learning	0.918	0.793
Stakeholder and composition	0.900	0.530
Organizational policy and strategic plan	0.913	0.635
Business process innovation and external collaboration	0.927	0.614

As for discriminant validity this was discussed earlier. In Table 6.37, discriminant validity is confirmed when items for each factor are loaded onto single component with loadings of greater than 0.4 (Huynh & Lin, 2013; Nunnally, 1978). Therefore, based on the reliability and validity tests, this study considers the framework of organizational CSFs for e-Purchasing implementation success as achieving best of fit data set.

6.5.3 Discussion of Reliability, Validity and Factor Analysis

In any study of this nature, it is important that the instrument used to obtain feedback from respondents be examined for reliability and validity. From the analysis of reliability test results, it is established that both the independent and dependent variables that form the basis of the framework of organizational CSFs of e-Purchasing implementation success record Cronbach's alpha that meets the threshold set for the variables concerned. In the case of the readings for the independent variable items, they range from 0.886 to 0.946, above the threshold 0.7. For the dependent variable items, the Cronbach's alpha range from 0.895 to 0.913. These results say that the instrument as a whole is reliable and that it is well designed and use appropriate scales. To qualify as a quality instrument, the contents of the instrument must also be of good quality. To ascertain this, a check on content validity through an assessment by qualified academic experts is conducted. Pursuant to this, some items are taken out and the measurement scales are refined to fit with the suggestions of the experts. In addition to content

assessment by experts the instrument is also examined for convergent validity by checking the corrected item-total correlation from SPPS output. The results indicate that the corrected item-total correlation values are greater than 0.4, confirming thereby that convergent validity is satisfied.

Factor analysis is carried out to determine the relationships among sets of inter-related variables. A prerequisite analysis is first performed to examine the dataset by using Bartlett's test sphericity (BTS) and Kaiser-Meyer-Olkin (KMO) test. The BTS indicates the significance of all correlations within the correlation matrix and KMO measures sampling adequacy. The results of these studies reveal that the BTS values for all independent variable items are significant, indicating the presence of correlation among the variables. The KMO test shows that all the independent variable items have KMO values ranging between 0.624 to 0.915, that is greater than the acceptable value of 0.6.

The KMO values for the two independent variables are 0.856 (project management success) and 0.786 (user satisfaction), while the BTS reveals significant values. The overall KMO values for independent and dependent variables are 0.874 and 0.884 respectively. These results prove that the samples are adequate and that there is significant correlation among the instrument items to qualify for factor analysis.

In addition to KMO test and BTS, a test to detect multicollinearity problem is carried out. The correlation matrix results show that the R-values are less than the suggested value of 0.9 and that the determinant values of correlation matrix are greater than the recommended value of 0.00001. As a result, no item from both independent and dependent variables is removed from the list.

The overall results of factor analysis for organizational CSFs show that the KMO and BTS readings are 0.874 and 0.000 respectively. These reading meet the required values. The communalities values range from 0.596 to 0.866. They are greater than the cut-off of 0.5, indicating that the dataset is appropriate for further analysis.

.

In the final stage of factor analysis, the number of organizational CSF components is reduced to 8 after due selection based on the eigenvalues and percentage total variance explained. The final structure of the framework of organizational CSFs of e-Purchasing implementation success is obtained after statistical validation shows high internal consistency, homogeneity, reliability and discriminant validity. The results of reliability, validity and factor analysis are summarized in Table 6.38 below.

Table 6.38: Summary of 8 Components of Organizational CSFs of e-Purchasing Implementation Success Complete With Reliability, Validity, Correlation and Factor Analysis Results.

Component	Cronbach's α	Convergent Validity	Mean Inter-Item Correlation	Cumulative Percentage of variance	Pattern Loading	Organizational CSFs Items
Group Factor 1	0.935	0.818	0.591	47.030	0.602	Relationship of trust with trading partners
		0.882			0.593	Employee cooperation
Organizational Commitment And Relationship Development		0.838			0.585	Good quality of employee works outcomes
		0.845			0.555	Loyalty to organization
		0.752			0.517	Provides appropriate organizational structure
		0.817			0.492	Commitment of employee to organization's objectives
		0.781			0.491	Top management provides pro-active communication channel
		0.807			0.475	Communication with trading partners
		0.719			0.457	Establishes partnership agreement
		0.785			0.419	Employee positive attitude towards e-Purchasing

Table 6.38, continued

Group Factor 2	0.935	0.877	0.828	52.608	0.856	Willingness organization to change
Change Management		0.884			0.855	Well managed process of change
		0.839			0.830	Have change management programs
Group Factor 3	0.924	0.808	0.582	56.789	0.834	IT Consultant own business and technical knowledge
Technical Outsourcing And Top Management Responsibilities		0.816			0.808	IT Consultant able to recommends appropriate e-Purchasing system
		0.812			0.738	IT Consultant supports project team during implementation process
		0.863			0.505	Establishes appropriate milestones for performance measurement
		0.769			0.494	Top management offers leadership
		0.840			0.492	Creates performance measures
		0.678			0.429	User's knowledge and skills
		0.843			0.417	Conducts post-implementation review
		0.804			0.401	Top management willingness to spend time and resources
Group Factor 4	0.907	0.788	0.585	60.800	0.872	Clear definition of project scope
		0.739			0.762	Project activity properly coordinated and monitored
Project Team Planning		0.778			0.668	Project plan consistent with IS plan
		0.766			0.665	Availability of detail project plan
		0.756			0.512	Project teams have strong domain knowledge
		0.765			0.512	Roles and responsibilities of project team properly defined and delegated
		0.580			0.506	Existence of clear mission, vision, strategies and direction
Group Factor 5	0.918	0.786	0.793	64.013	0.847	Organization's need experience with technology application
Organizational Learning		0.824			0.828	Organization's experience enables effective implementation of IT
		0.903			0.819	Organization's experience become a base of knowledge for guiding
Group Factor 6	0.900	0.759	0.530	66.925	0.771	Stakeholders provide information and set requirements
Stakeholder and Composition		0.793			0.753	Defines the level each stakeholder can get involved
		0.791			0.682	Stakeholder early involvement
		0.841			0.570	Project teams use effective project management techniques
		0.606			0.488	Readiness of trading partners

Table 6.38, continued

		0.785 0.463 0.766			0.474 0.457 0.423	Various cross-functional team members selected User's previous experience using IT application Project team has an experienced and reputable Project Manager
Group Factor 7 **Organizational Policy and Strategic Plan**	0.913	0.792 0.761 0.826 0.732 0.843 0.806	0.635	69.490	0.586 0.527 0.481 0.453 0.433 0.415	Alignment of e-Purchasing strategy with IT strategy Incorporation of e-Purchasing policy into existing procurement policy Reinforces commitment of employees Availability strategic plan sets which sets deadlines, responsibilities and financing Provides adequate training and education program Steering committee provides directions and guidance of implementation process
Group Factor 8 **Business Process Innovation and External Collaboration**	0.927	0.852 0.781 0.784 0.866 0.833 0.842 0.826 0.706	0.614	72.010	0.734 0.702 0.651 0.633 0.537 0.479 0.450 0.437	Changes the process according organization needs Simplifies processes and eliminates redundant activities Designs and documents important business processes Encourages innovation and learning processes Mutual understanding of needs and capabilities with trading partners Encourages sharing of knowledge and information Allows work cultural transformation towards initiatives Encourages organization build long term relationship with trading partners

6.5.4 **Correlation Analysis**

To examine the presence of relationship between the organizational CSFs and e-Purchasing implementation success, a correlation analysis is done. The results of the analysis refine the preliminary framework of organizational CSFs for e-Purchasing implementation success established from the qualitative study described in Chapter 4. The findings also refine the 8 components of organizational CSFs. The limitation of factor analysis lies in its inability to examine the inter-variable relationship.

This study is a non-parametric study that uses ordinal scaled variables. According to Bryman and Cramer (2002); Dawsonn and Trapp (2004) and Pallant (2007), a powerful method of examining the presence of relationship between pairs of variables is Spearman's rank order correlation. The correlation coefficient is used to examine the strength of correlation as suggested by Pallant (2007), and is guided by the following conditions: small correlation (r_s= 0.1- 0.29); moderate correlation (r_s = 0.3- 0.49), and strong correlation (r_s = 0.5- 1.0). Meanwhile, zero coefficient value represents no correlation at all (Cohen, 1998).

As mentioned earlier, Spearman's correlation analysis is used to measure the extent of correlation between pairs of independent and dependent variables. In this study, it is performed by using the SPSS bivariate correlation method. Fifty four (54) items of organizational CSFs and 8 items for measuring e-Purchasing implementation success in the context of project management success and user satisfaction (each context has 4 items), are subjected to the analysis.

The results show two items of organizational CSFs as being uncorrelated with e-Purchasing implementation success in the dimensions of project management and user satisfaction, being statistically non-significant at $p>0.05$. For other items, the correlation coefficient ranges from a high of 0.538 to a small of 0.191, all being statistically significant at $p <0.05$. The results are presented in detail in Tables 6.39 to 6.46.

Table 6.39: Spearman's Rank-Order Correlation – Group Factor 1

Spearman's rank –order correlation coefficient (r_s)			
Group Factor	Construct Item (Independent Variables)	e-Purchasing Success (Dependent Variables)	
		Project Management	User Satisfaction
Organizational Commitment and Relationship Development	Relationship of trust with trading partners	0.285 (moderate)	**0.161* (uncorrelated)**
	Employee cooperation	0.307 (moderate)	0.302 (moderate)
	Good quality of employee works outcomes	0.332 (moderate)	0.355 (moderate)
	Loyalty to organization	0.366 (moderate)	0.320 (moderate)
	Provides appropriate organizational structure	0.348 (moderate)	0.354 (moderate)
	Employee commitment to organization's objectives	0.312 (moderate)	0.314 (moderate)
	Top management provide pro-active communication channel	0.401 (moderate)	0.416 (moderate)
	Communication with trading partners	0.365 (moderate)	0.298 (small)
	Establishes partnership agreement	0.334 (moderate)	0.261 (small)
	Employee positive attitude towards e-Purchasing	0.417 (moderate)	0.382 (moderate)
	Mean	0.313 (moderate)	0.316 (moderate)

* All construct items are statistically significant, P<0.05 except bold and oblique item construct, P>0.05

Table 6.40: Spearman's Rank-Order Correlation – Group Factor 2

Spearman's rank –order correlation coefficient (r_s)			
Group Factor	Construct Item (Independent Variables)	e-Purchasing Success (Dependent Variables)	
		Project Management	User Satisfaction
Change Management	Willingness organization to change	0.433 (moderate)	0.453 (moderate)
	Well managed process of change	0.398 (moderate)	0.407 (moderate)
	Have change management programs	0.346 (moderate)	0.360 (moderate)
	Mean	0.392 (moderate)	0.407 (moderate)

* All construct items are statistically significant, P<0.05 except bold and oblique item construct, P>0.05

Table 6.41: Spearman's Rank-Order Correlation – Group Factor 3

Spearman's rank –order correlation coefficient (r_s)			
Group Factor	Construct Item (Independent Variables)	e-Purchasing Success (Dependent Variables)	
		Project Management	User Satisfaction
Technical Outsourcing and Top Management Responsibilities	Vendor owns business and technical knowledge	0.398 (moderate)	0.345 (moderate)
	Vendor able to recommends appropriate systems	0.369 (moderate)	0.415 (moderate)
	Vendor supports project team during implementation process	0.428 (moderate)	0.440 (moderate)
	Establishes appropriate milestone for performance measurement	0.396 (moderate)	0.498 (moderate)
	Top management offers leadership	0.461 (moderate)	0.538 (moderate)
	Creates performance measurement	0.399 (moderate)	0.480 (moderate)

* All construct items are statistically significant, P<0.05

Table 6.41, continued

	User's knowledge and skills	0.297 (moderate)	0.308 (moderate)
	Conducts post implementation review	0.337 (moderate)	0.406 (moderate)
	Top management willingness to spend times and resources	0.352 (moderate)	0.460 (moderate)
	Mean	0.382 (moderate)	0.432 (moderate)

* All construct items are statistically significant, P<0.05

Table 6.42: Spearman's Rank-Order Correlation – Group Factor 4

Spearman's rank –order correlation coefficient (r_s)			
Group Factor	Construct Item (Independent Variables)	e-Purchasing Success (Dependent Variables)	
		Project Management	User Satisfaction
Project Team Planning	Clear definition of project scope	**0.168*** (uncorrelated)	0.271 (small)
	Project activity properly coordinated and monitored	0.187 (small)	0.266 (small)
	Project plan consistent with IS plan	0.259 (small)	0.263 (small)
	Availability of detail project	0.286 (small)	0.286 (small)
	Project team have strong domain knowledge	0.266 (small)	0.311 (moderate)
	Roles and responsibilities properly defined and delegated	0.226 (small)	0.355 (moderate)
	Organization has clear mission, strategies and direction	0.216 (small)	0.235 (small)
	Mean	0.230 (small)	0.284 (small)

* All construct items are statistically significant, P<0.05 except bold and oblique item construct, P>0.05

Table 6.43: Spearman's Rank-Order Correlation – Group Factor 5

Spearman's rank –order correlation coefficient (r_s)			
Group Factor	Construct Item (Independent Variables)	e-Purchasing Success (Dependent Variables)	
		Project Management	User Satisfaction
Organizational Learning	Organization's experience with technology application	**0.136*** (uncorrelated)	**0.105*** (uncorrelated)
	Organization's experience enables effective implementation of IT systems	0.251 (small)	0.191 (small)
	Organization's experience become a base of knowledge for guiding current initiatives	0.242 (small)	0.252 (low)
	Mean	0.210 (small)	0.183 (small)

* All construct items are statistically significant, P<0.05 except bold and oblique item construct, P>0.05

Table 6.44: Spearman's Rank-Order Correlation – Group Factor 6

Spearman's rank –order correlation coefficient (r_s)			
Group Factor	Construct Item (Independent Variables)	e-Purchasing Success (Dependent Variables)	
		Project Management	User Satisfaction
Stakeholder and Composition	Stakeholders provide information and set requirements	0.327 (moderate)	0.407 (moderate)
	Identifies level that stakeholder can get involved	0.341 (moderate)	0.337 (moderate)
	Stakeholder's early involvement	0.375 (moderate)	0.380 (moderate)
	Project team uses effective project management techniques	0.374 (moderate)	0.416 (moderate)
	Readiness of trading partners	0.312 (moderate)	0.373 (moderate)
	Various cross-functional team members selected	0.359 (moderate)	0.393 (moderate)

* All construct items are statistically significant, P<0.05

Table 6.44, continued

	User's previous experience using IT application	0.282 (small)	0.282 (small)
	Project team has an experienced and reputable project manager	0.359 (moderate)	0.399 (moderate)
	Mean	0.341 (moderate)	0.373 (moderate)

* All construct items are statistically significant, P<0.05

Table 6.45: Spearman's Rank-Order Correlation – Group Factor 7

Spearman's rank –order correlation coefficient (r_s)			
Group Factor	Construct Item (Independent Variables)	e-Purchasing Success (Dependent Variables)	
		Project Management	User Satisfaction
Organizational Policy and Strategic Plan	Alignment of e-Purchasing strategy with IT strategy	0.429 (moderate)	0.457 (moderate)
	Incorporation of e-Purchasing policy into existing procurement policy	0.446 (moderate)	0.473 (moderate)
	Reinforces commitment of employee	0.413 (moderate)	0.534 (high)
	Availability strategy plan which sets deadlines, responsibilities and financing	0.314 (moderate)	0.355 (moderate)
	Provides adequate training and education program	0.428 (moderate)	0.466 (moderate)
	Steering committee provides directions and guidance of implementation process	0.341 (moderate)	0.343 (moderate)
	Mean	0.395 (moderate)	0.438 (moderate)

* All construct items are statistically significant, P<0.05

Table 6.46: Spearman's Rank-Order Correlation – Group Factor 8

Spearman's rank –order correlation coefficient (r_s)			
Group Factor	Construct Item (Independent Variables)	e-Purchasing Success (Dependent Variables)	
		Project Management	User Satisfaction
Business Process Innovation and External Collaboration	Changes the process according organizational needs	0.310 (moderate)	0.314 (moderate)
	Simplifies processes and eliminates redundant of activities	0.429 (moderate)	0.385 (moderate)
	Designs and documents important business processes	0.337 (moderate)	0.360 (moderate)
	Encourages innovation and learning processes	0.333 (moderate)	0.346 (moderate)
	Mutual understanding of needs and capabilities with trading partners	0.338 (moderate)	0.376 (moderate)
	Encourages sharing of knowledge and information	0.288 (small)	0.354 (moderate)
	Allows work cultural transformation towards initiatives	0.375 (moderate)	0.415 (moderate)
	Encourages organization build long term relationship with trading partners	0.331 (moderate)	0.261 (moderate)
	Mean	0.343 (moderate)	0.364 (moderate)

* All construct items are statistically significant, P<0.05

The above tables show that organizational commitment and relationship development factor has a significant positive relationship with e-Purchasing implementation success in dimension of project management success ((r_s) 0.313) and user satisfaction ((r_s) 0.316) at 0.05 significance level. Likewise, the following factors have significant positive relationships with e-Purchasing implementation in relation to project management success and user satisfaction at the stated (r_s) respectively: change management factor at (r_s) 0.392) and 0.407; technical outsourcing and top management responsibilities factor at (r_s) 0.382 and 0.432; project team planning factor at (r_s) 0.230 and 0.284; organizational learning at (r_s) 0.210 and 0.183; stakeholder and composition

factor at (r_s) = 0.341 and 0.373; organizational policy and strategic plan factor at (r_s) 0.395 and 0.438; business process innovation and external collaboration factor at (r_s) 0.343 and 0.364. All of the stated values are significant compared to the threshold of 0.05 significance level. These findings are summarized in Figure 6.7 in the form of a correlation path framework to highlight the relationships.

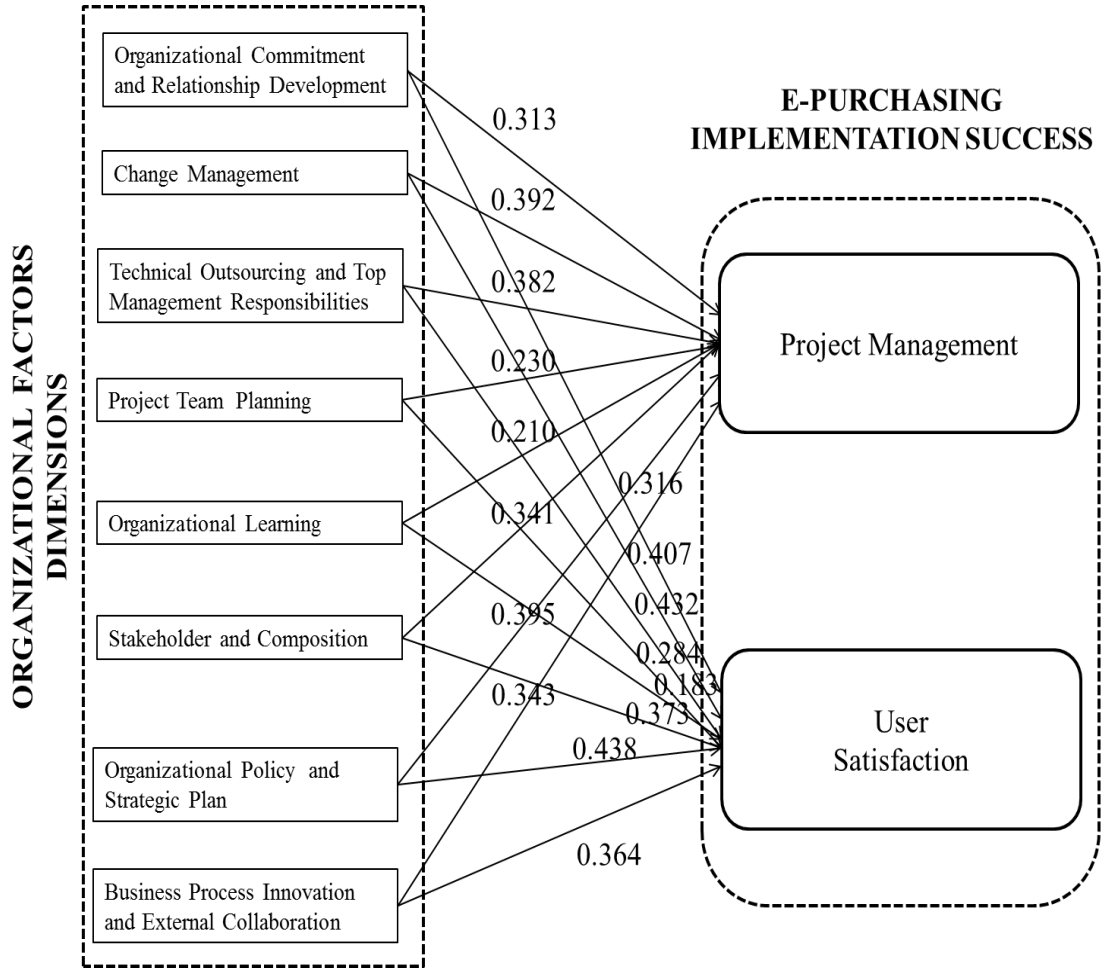


Figure 6.7: Correlation path framework of organizational CSFs for e-Purchasing implementation success.

Based on the correlation analysis, this study decides to retain 52 of the 54 items of organizational CSFs representing the 8 grouping of factors that show significant correlation with e-Purchasing implementation success in the dimensions of project management success and user satisfaction. This refined/final list of items is indicated in Table 6.47 and Table 6.48 below. All the 52 items of organizational CSFs are used in

the multiple regression analysis that follows to investigate the contribution of the items towards the variance of e-Purchasing implementation success. This will be further explained in the subsequent sub-section.

Table 6.47: The 8 Components of Organizational CSFs of e-Purchasing Implementation Success (Project Management Success) – Refine/ Final Components

Component	No. of original CSFs item	No. of current CSFs item (after correlation analysis)	Organizational CSFs Item
Group Factor 1 **Organizational Commitment And Relationship Development**	10	10	Relationship of trust with trading partners (F42) Employee cooperation (F29) Good quality employee works outcomes (F30) Loyalty to organization (F28) Provides appropriate organizational structure (F20) Commitment of employees to organization's objectives (F27) Top management provides pro-active communication channel (F21) Communication with trading partners (F43) Establishes partnership agreement (F40) Employees' positive attitude towards e-Purchasing (F31)
Group Factor 2 **Change Management**	3	3	Willingness of organization to change (F36) Well managed process of change (F37) Have change management programs (F35)
Group Factor 3 **Technical Outsourcing And Top Management Responsibilities**	9	9	IT Consultant owns business and technical knowledge (F53) IT Consultant able to recommends appropriate e-Purchasing system (F54) IT Consultant support project teams during implementation process (F55) Establishes appropriate milestones for performance measurement (F57) Top management offers leadership (F18) Creates performance measures (F56) Users' knowledge and skills (F44) Conducts post-implementation review (F58) Top management willingness to spend time and resources (F17)
Group Factor 4 **Project Team Planning**	7	6	Project activity properly coordinated and monitored (F9) Project plan consistent with IS plan (F6) Provides of detail project (F7) Project team has strong domain knowledge (F10) Roles and responsibilities of project team properly defined and delegated (F11) The organization has clear mission, vision, strategies and direction (F1)
Group Factor 5 **Organizational Learning**	3	2	Organization's experience enable effective implementation of IT systems (F34) Organization's experience become a base of knowledge for guiding initiatives (F33)

Table 6.47, continued

Group Factor 6 **Stakeholder and Composition**	8	8	Stakeholders provide information and set requirements (F26) Identifies level each stakeholder can get involve (F25) Stakeholder's early involvement (F24) Project team uses effective project management techniques (F14) Readiness of trading partners (F41) Various cross-functional team members selected (F12) Users' previous experience using IT application (F46) Project team has an experienced and reputable Project Manager (F13)
Group Factor 7 **Organizational Policy and Strategic Plan**	6	6	Alignment of e-Purchasing strategy with IT strategy (F4) Incorporates of e-Purchasing policy into existing procurement policy (F2) Reinforces commitment of employees (F16) Availability of strategic plan which sets deadlines, responsibilities and financing (F3) Provides adequate training and education program (F19) Steering committee provides directions and guidance of implementation process (F15)
Group Factor 8 **Business Process Innovation and External Collaboration**	8	8	Changes the process according organizational needs (F51) Simplifies processes and eliminate redundancy activities (F52) Designs and documents important business processes (F50) Encourages innovation and learning processes (F47) Mutual understanding of needs and capabilities with trading partners (F39) Encourages sharing of knowledge and information (F48) Allows work cultural transformation towards initiatives (F49) Encourages organization to build long term relationship with trading partners (F38)
Total CSFs items	**54**	**52**	

Table 6.48: The 8 Components of Organizational CSFs of e-Purchasing Implementation Success (User Satisfaction) – Refined/ Final Components

Component	No. of original CSFs item	No. of current CSFs item (after correlation analysis)	Organizational CSFs Item
Group Factor 1 **Organizational Commitment And Relationship Development**	10	9	Employee cooperation (F29) Good quality employee works outcomes (F30) Loyalty to organization (F28) Provides appropriate organizational structure (F20) Commitment of employee to organization's objectives (F27) Top management provides pro-active communication channel (F 21) Communication with trading partners (F43) Establishes partnership agreement (F40) Employees' positive attitude towards e-Purchasing (F31)
Group Factor 2 **Change Management**	3	3	Willingness of organization to change (F36) Well managed process of change (F37) Have change management programs (F35)
Group Factor 3 **Technical Outsourcing And Top Management Responsibilities**	9	9	IT Consultant owns business and technical knowledge (F53) IT Consultant able to recommends appropriate e-Purchasing system (F54) IT Consultant supports project team during implementation process (F55) Establishes appropriate milestones for performance measurement (F57) Top management offers leadership (F18) Creates performance measures (F56) Users' knowledge and skills (F44) Conducts post-implementation review (F58) Top management willingness to spend time and resources (F17)
Group Factor 4 **Project Team Planning**	7	7	Clear definition of project scope (F8) Project activity properly coordinated and monitored (F9) Project plan consistent with IS plan (F6) Availability of detail project (F7) Project team has strong domain knowledge (F10) Roles and responsibilities of project team properly defined and delegated (F11) The organization has clear mission, vision, strategies and direction (F1)
Group Factor 5 **Organizational Learning**	3	2	Organization's experience enables effective implementation of IT systems (F34) Organization's experience become a base of knowledge for guiding initiatives (F33)
Group Factor 6 **Stakeholder and Composition**	8	8	Stakeholders provide information and set requirements (F26) Identifies level each stakeholder can get involve (F25) Stakeholder's early involvement (F24) Project team uses effective project management techniques Readiness of trading partners (F14) Various cross-functional team members selected (F12) Users' previous experience using IT application (F46) Project team has an experienced and reputable Project Manager (F13)

Table 6.48, continued

Group Factor 7 **Organizational Policy and Strategic Plan**	6	6	Alignment of e-Purchasing strategy with IT strategy (F4) Incorporation of e-Purchasing policy into existing procurement policy (F2) Reinforces commitment of employees (F16) Availability of strategic plan which sets which sets deadlines, responsibilities and financing (F3) Provides adequate training and education program (F19) Steering committee provides directions and guidance of implementation process (F15)
Group Factor 8 **Business Process Innovation and External Collaboration**	8	8	Changes the process according organizational needs (F51) Simplifies processes and eliminates redundant of activities (F52) Designs and documents important business processes (F50) Encourages innovation and learning processes (F47) Mutual understanding of needs and capabilities with trading partners (F39) Encourages sharing of knowledge and information (F48) Allows work cultural transformation towards initiatives (F49) Encourages organization to build long term relationship with trading partners (F38)
Total CSFs items	**54**	**52**	

6.5.5 Discussion of Correlation Analysis

The empirical results of the correlation analysis indicate that there exist small and moderate relationships between the variables as shown in Figure 6.8. There is moderate relationship between independent variables and dependent variables (project management and user satisfaction) in the case of organizational policy and strategic plan (r_s =0.395 and 0.438), technical outsourcing and top management responsibilities (r_s= 0.382 and 0.432), change management (r_s= 0.392 and 0.407), stakeholder and composition (r_s = 0.341 and 0.373), business process innovation and external collaboration factor (r_s = 0.343 and 0.364) and organizational commitment and relationship development factors (r_s = 0.313 and 0.316). A small relationship exists in the case of project team planning (r_s = 0.230 and 0.284) and organizational learning factors (r_s = 0.201 and 0.183).

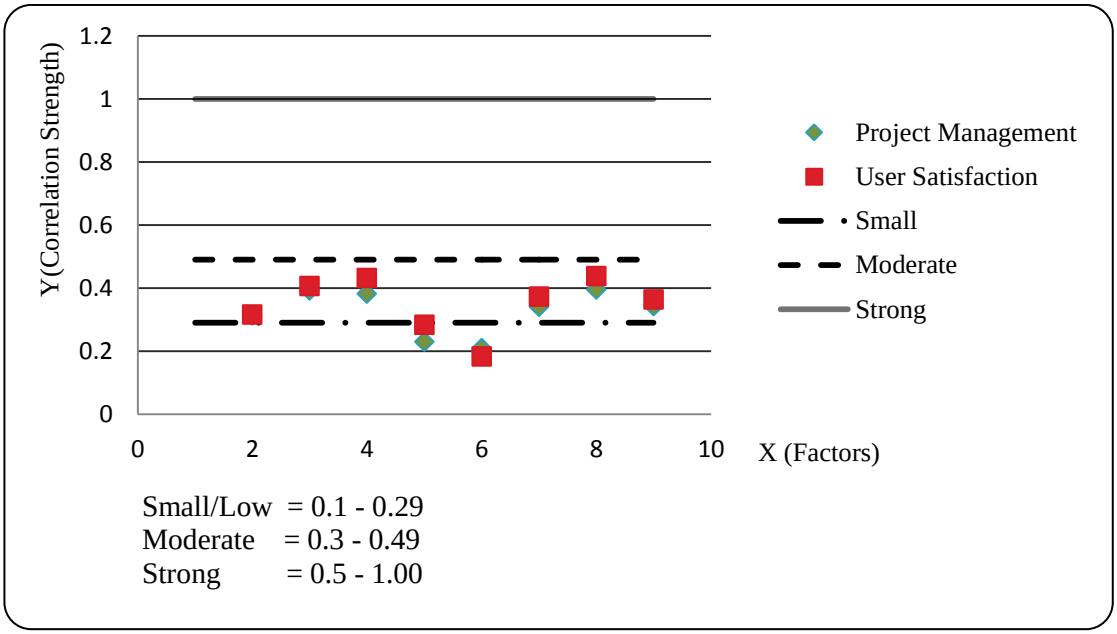


Figure 6.8: Scatter plot of variables in correlation analysis

The small relationship is related to the low ratings given to the indicators of these two factors by the respondents. For project team planning, the following ratings are assigned to the indicators making up this factor: clear definition of project scope (mean score = 4.07 and rated 26 out of 58); project properly coordinated (mean score = 4.07 and rated = 28/58), project plan consistent with IS plan (mean score = 4.04, rated = 34/58), availability of detail project (mean score = 4.05, rated = 33/58), project team has strong domain knowledge (mean score = 4.05, rated = 31/58), and properly defined roles and responsibilities of project team (mean score = 4.06, rated = 30/58). In the case of organizational learning, the following ratings are assigned to the indicators making up this factor: organization's experience with technology application (mean score = 3.96, rated = 46/58), organization's experience enables effective implementation of IT systems (mean score = 3.98, rated = 42/58), and organization's experience become a base of knowledge for guiding initiatives (mean score = 3.96, rated = 47/58).

Figure 6.9 shows that the majority of the 52 items of organizational CSFs possess correlation coefficients that reflect a strong affinity with the two elements of the dependent variable, in addition to possessing a linear relationship that seems to be normally distributed.

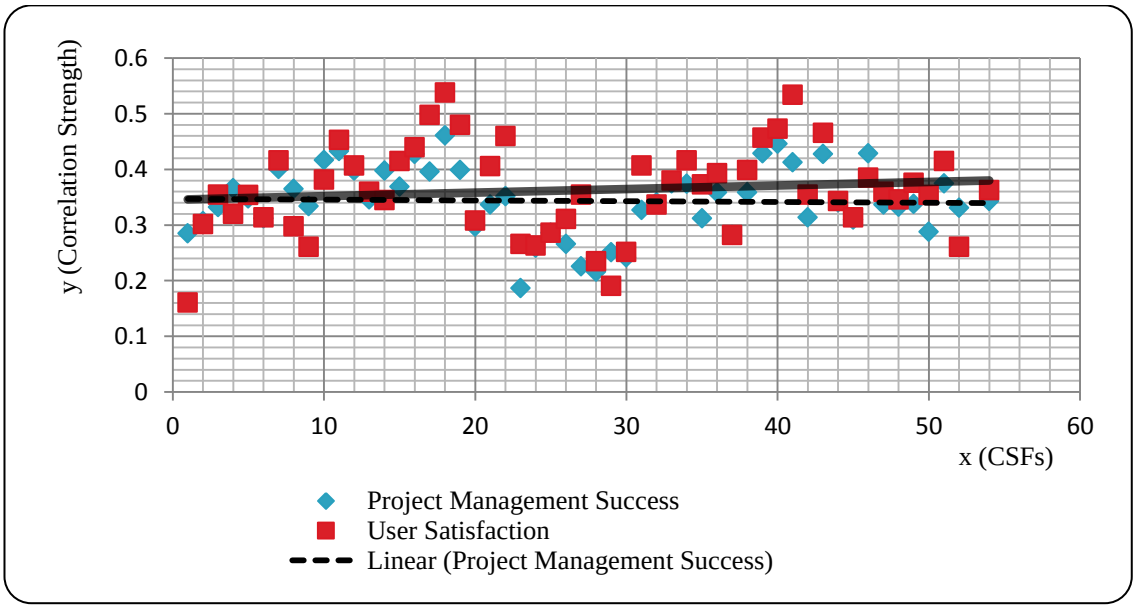


Figure 6.8: Scatter plot of correlation and linearity

Figure 6.10 shows correlation coefficients obtained from the 2 indicators of e-Purchasing implementation success, project management success and user satisfaction. The observed values show that there are no significant differences in correlation strength between them, thus indicating their appropriateness to predict the relationship between the organizational CSFs of e-Purchasing and e-Purchasing implementation success.

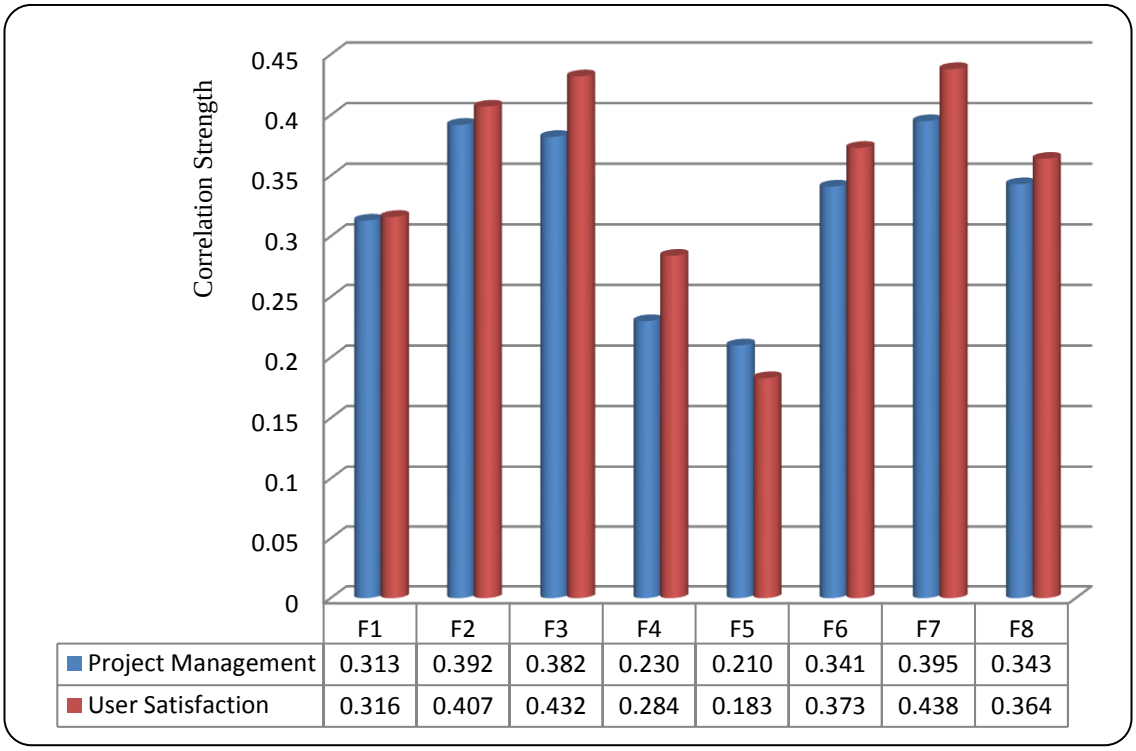


Figure 6.10: Correlation strength between organizational CSFs and e-Purchasing implementation success (in dimensions of project management success and user satisfaction)

To encapsulate the above findings, a correlation coefficient path framework is drawn up. Shown in Figure 6.11 below, this new framework develops an empirically logical relationship of the organizational CSFs with e-Purchasing implementation success. It is a refinement of the theoretical framework of organizational CSFs of e-Purchasing implementation success discussed in Chapter 4. The new framework also incorporates the findings of the factor analysis where CSF items that exhibit insignificant correlation are deleted from the components.

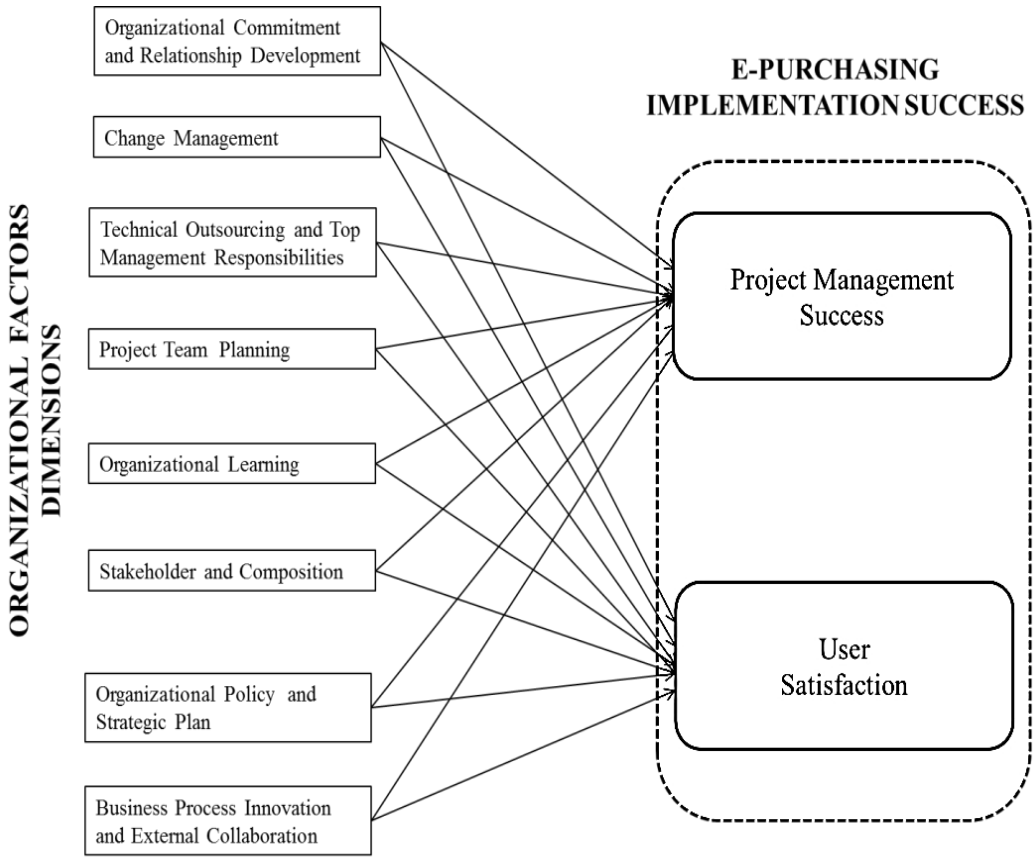


Figure 6.11: Refined framework of organizational CSFs of e-Purchasing implementation success.

6.5.6 Multiple Regression Analysis

Multiple regression analysis is performed to investigate the contribution of each of the CSF items (hereinafter referred to as predictor variables) from the 8 groups of organizational factors towards e-Purchasing implementation success. The 8 groups of organizational factors are; 1) organizational commitment and relationship development, 2) change management, 3) technical outsourcing and top management responsibilities, 4) project team planning, 5) organizational learning, 6) stakeholder and composition, 7) organizational policy and strategic plan, and 8) business process innovation and external collaboration. A total of 52 predictor variables derived from the output of correlation analysis that represent the mentioned 8 groups of organizational factors are used in this analysis. The SPSS version 20 is used to carry out the multiple regression analysis. It generates information about the model as a whole and the relative

contribution of each of the predictor variables that make up the model. By so doing, this study hopes to justify the use of a statistically generated model to predict a particular outcome.

The general form of multiple linear regression equation is:

$\hat{Y} = b_0 + b_1X_1 + b_2X_2 + \ldots\ldots b_pX_p$ _____ (1)

Where;

$\hat{Y}$ = Criterion variable (dependent variable)

$X_1, X_2, \ldots\ldots X_p$ = predictor variable (independent variable)

$b_1, b_2, \ldots\ldots b_p$ = regression coefficients for each predictor variable

b_0 = regression constant

For this study, two multiple linear regression equations will be used to predict the models:

Project Management Success =

b_0 + b_1 (predictor variable 1) + b_2(predictor variable 2) +……b_p(predictor variable p) _____ (2);

User Satisfaction =

b_0 + b_1 (predictor variable 1) + b_2(predictor variable 2) +……b_p(predictor variable p) _____ (3)

To find the best model that could predict the outcome of e-Purchasing implementation success as well as represent the above equations, the stepwise multiple regression method is used. This method relies purely on mathematical criterion to generate the model that best predict the outcome of the variables (Field, 2009; Pallant, 2007).

i) Project Management Success as Dependent Variable

Table 6.49 shows the multiple stepwise regression analysis for project management success as dependent variable.

Table 6.49: Summary of Stepwise Hierarchical Regression Models (Project Management Success)

Predictor Variable	Dependent Variable: Project Management Success		
	Unstandardized Coefficient (B)	Standardized Coefficient (β)	Sig. (p-value)
1) Incorporation of e-Purchasing policy into existing procurement policy	0.243	0.315	0.001
2) IT consultant supports during implementation process	0.201	0.233	0.009
3) Willingness of the organization to change	0.156	0.218	0.012
4) Defines the level each stakeholder can get involved	0.166	0.208	0.014
5) Activity properly coordinated and monitored	-0.203	-0.246	0.006
n	123		
df	5, 117		
F	14.571		
R	0.619		
R^2	0.384		
Adjusted R^2	0.357		
Sig.	0.000		
Durbin-Watson	1.921		

Note: significant when $p<0.05$

This Table shows the values of unstandardized regression coefficient (B), standardized regression coefficient (β) and degree of significance (p-value) of each predicator, df, R, R^2, adjusted R^2, significance and Durbin-Watson value for all the predictors in the linear regression analysis. The R^2 measures the proportion of total variance on the dependent variable that is accounted for by the set of predictors. It tells how the model fits the data set. Referring to the table, the R^2 value is 0.384. This means that 38.4% of the variance in e-Purchasing implementation success (in the context of project management success) is explained by the five predictor variables namely, the incorporation of e-Purchasing policy into existing procurement policy, IT consultant support during the implementation process, willingness of the organization to change,

the definition of the level each stakeholder can get involved, and activity that is properly coordinated and monitored,. The F-value for this model is 14.571 and significant ($p<0.05$). Moreover, the multiple correlation coefficient, R, for this model is 0.619 ($R > 0.50$), and this shows the strength (Cohen, 1998) of association that these five predictors have with the dependent variable. The R^2 value is considered high (R^2 above 0.37) by the standard set by Cohen (1998). Hence, it indicates that the regression line fits the data set well and that there is a strong linear relationship between the predictor variables and the dependent variable.

Durbin-Watson value is shown as 1.921 and this indicates that the serial correlation of residual falls within the acceptable range of 1.5 and 2.5, suggesting thereby that the conditions of no auto correlation problem (Chittihaworn & Islam, 2011) and observations being independent of predicted values (Ahmadpour, 2011; Malik, Hassan, & Iqbal, 2012) are satisfied.

Five predictor variables are found to be of significance in explaining e-Purchasing implementation success based on project management success criteria. These are the incorporation of e-Purchasing policy into existing procurement policy (X_1), IT consultant support during implementation process (X_2), the willingness of the organization to change (X_3), the definition of the level each stakeholder can get involved (X_4), and project activity that is properly coordinated and monitored (X_5). As depicted in Table 6.49, the predicted model generated from this study has the following equation:

Project management success =

$$1.612 + 0.243(X_1) + 0.201(X_2) + 0.156(X_3) + 0.166(X_4) – 0.203(X_5)$$

Table 6.49 shows that the largest beta coefficient (β) relates to the item" incorporating e-Purchasing policy into existing procurement policy" with the value of 0.315. This says that the item makes the strongest unique contribution to explaining the dependent variable when the variance explained by all other predictor variables in the model is controlled for. The β-value for the item "IT consultant support during implementation process" with the value of 0.233 is the second highest, followed by the item "willingness of the organization to change" with the value of 0.156. Ranked fourth is the item "defines the level each stakeholder can get involved" with the value of 0.166 and the item "project activities properly coordinated and monitored" with the value of -0.203 is ranked last.

ii) User Satisfaction as Second Dependent Variable

Table 6.50 shows the multiple stepwise regression analysis results pertaining to user satisfaction as the dependent variable.

Table 6.50: Summary of Stepwise Hierarchical Regression (User Satisfaction)

Predictor Variable	Dependent Variable: user satisfaction		
	Unstandardized Coefficient (B)	Standardized Coefficient (β)	Sig. (p-value)
1) Reinforces the commitment of the employees	0.227	0.287	0.003
2) Establishes appropriate milestones	0.247	0.271	0.004
3) Willingness of the organization to change	0.160	0.213	0.011
n	122		
df	3,119		
F	27.346		
R	0.639		
R^2	0.408		
Adjusted R^2	0.393		
Sig.	0.000		
Durbin-Watson	1.847		

This table shows the value of unstandardized regression coefficient (B), standardized regression coefficient (β) and degree of significance (p-value) of each predicator, df,

R, R^2, adjusted R^2, significance and Durbin-Watson value for all the predictors in the linear regression analysis.

Looking at this table, the R^2 value is 0.408. This indicates that 40.80% of the variance in e-Purchasing implementation success (in the context of user satisfaction) is explained by the three predictor variables. The variables are: reinforcement of the commitment of the employees, establishment of appropriate milestones, and the willingness of the organization to change. The F-value for this model is 27.346 and significant ($p<0.05$). The multiple correlation coefficient, R, for this model is 0.639 ($R > 0.50$), and this shows strong association (Cohen, 1998) between the predictor variables and the dependent variable. The R^2 value is considered high (R^2 above 0.37) according to Cohen (1998). This indicates that the regression line fits the data set well and that there is a strong linear relationship between the predictor variables and the dependent variable.

The Durbin-Watson value of 1.847 indicates that the serial correlation of residual falls within the acceptable range of 1.5 and 2.5, suggesting that the conditions of no auto correlation problem (Chittihaworn & Islam, 2011) and observations being independent of predicted values (Ahmadpour, 2011; Malik, Hassan, & Iqbal, 2012) are satisfied.

Three predictor variables are found to be significant in explaining e-Purchasing implementation success on the basis of user satisfaction. These are the reinforcement of the commitment of employees (X_1), the establishment of appropriate milestones for the project (X_2), and the willingness of the organization to change (X_3). As depicted in the Table 6.50, the predicted model generates the following equation:

User Satisfaction = $1.293 + 0.227(X_1) + 0.247(X_2) + 0.160(X_3)$

The table also shows that the largest beta coefficient (β) is for the item "reinforcement of the commitment of the employees" with the value of 0.287. This predictor then has the strongest unique contribution to explaining the dependent variable when the variance explained by all other predictor variables in the model is controlled for. The β-value for the predictor "establishment of appropriate milestones for the project" with the value of 0.271 is the second highest, followed by the predictor "willingness of the organization to change" with the value of 0.213.

iii) The Path Model of e-Purchasing Implementation Success

Path analysis is a straightforward extension of multiple regression analysis which is used to represent the magnitude and significance of causal relationship between sets of important predictors. In this study, this diagram is used to portray the predicted model of e-Purchasing implementation success via graphical connection between sets of important predictors.

The path coefficient values derived from the outcome of stepwise multiple regression described earlier are used in this analysis. These values refer to the standardized regression coefficient (beta weight). Tables 6.51 and 6.52 show the path coefficient values of five important predictors for project management success and three important predictors for achieving user satisfaction. Figures 6.12 and 6.13 illustrate the predicted path models of e-Purchasing implementation success.

Table 6.51: Path Coefficient (β-weight)- Project Management Success

Predictors	Beta weight (β)	Error Value / Error Variance (e) $=\sqrt{(1-R^2)}$
Incorporation of e-Purchasing policy into existing procurement policy (X_1)	0.315	$\sqrt{(1-R^2)}$ $= \sqrt{(1-0.384)}$ $= 0.7849$
IT consultant supports during implementation process (X_2)	0.233	
Willingness of the organization to change (X_3)	0.218	
Defines the level each stakeholder can get involved (X_4)	0.208	
Activity properly coordinated and monitored (X_5)	-0.246	

Table 6.52: Path Coefficient (β-weight)- User Satisfaction

Predictors	Beta weight (β)	Error Value / Error Variance (e) $= \sqrt{(1-R^2)}$
Reinforces commitment of the employees (X_1)	0.287	$\sqrt{(1-R^2)}$ $= \sqrt{(1-0.408)}$ $= 0.7694$
Establishes appropriate milestones (X_2)	0.271	
Willingness of the organization to change (X_3)	0.213	

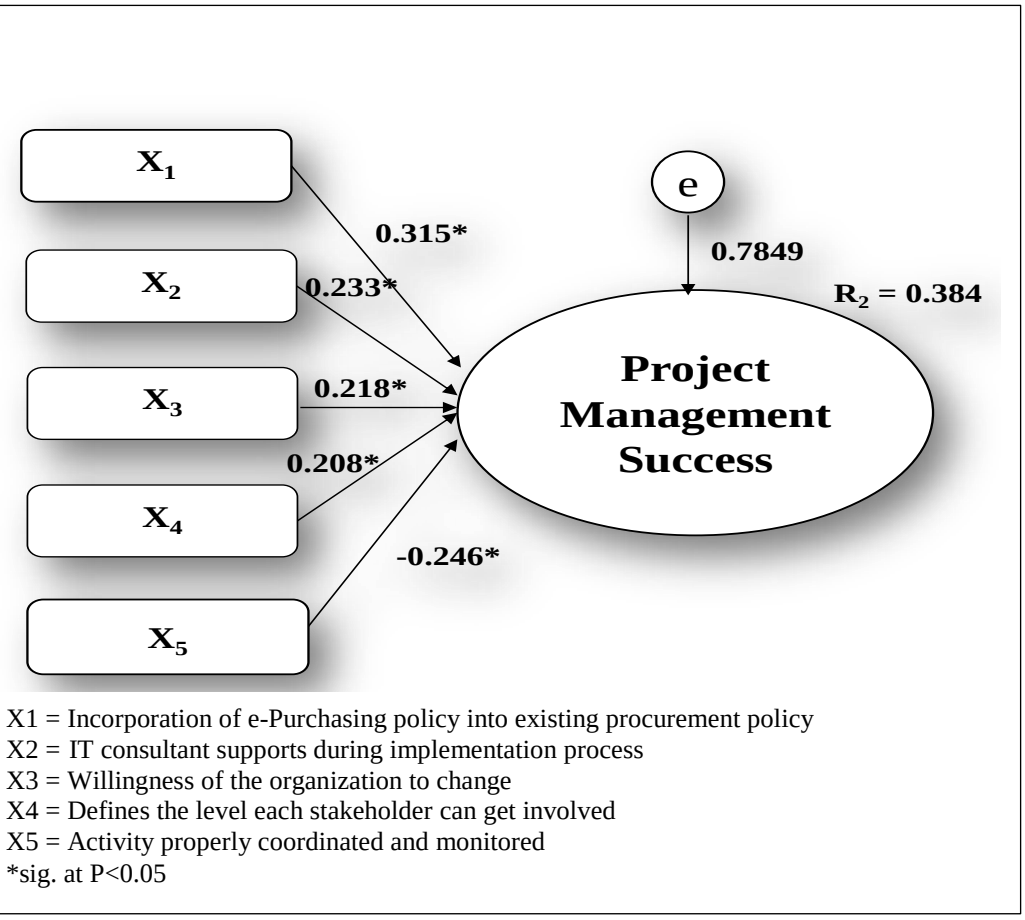


Figure 6.12Predicted Path Model of E-Purchasing Implementation Success (Project Management Success)

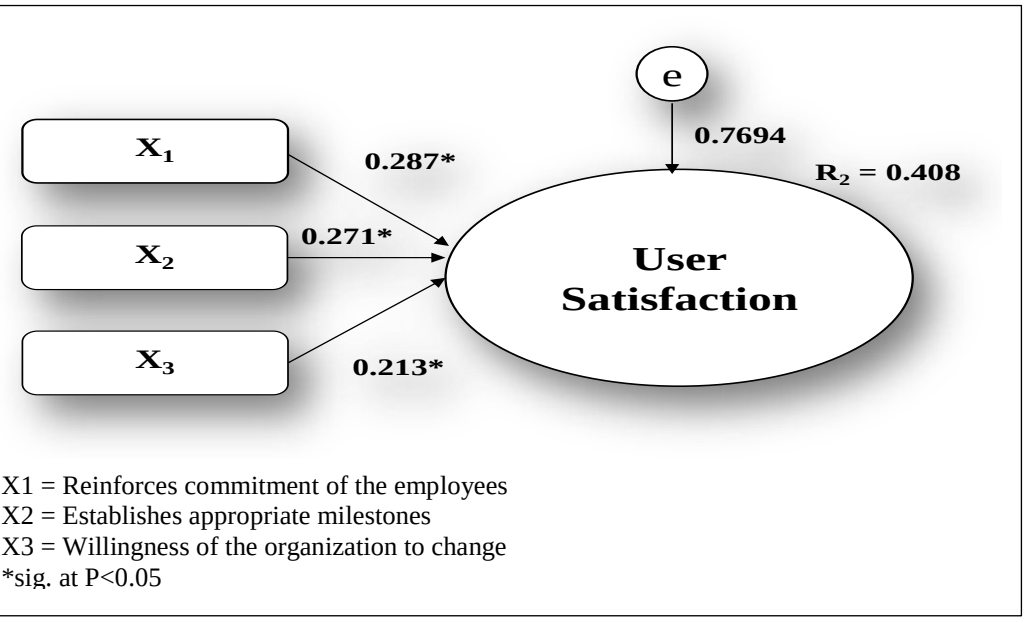


Figure 6.13: Predicted Path Model of E-Purchasing Implementation Success (User Satisfaction)

iv) Checking the Validity of Predicted Regression Model

The predicted regression models are subjected to validity checking to ensure that they satisfy goodness-of-fit criteria and are appropriate to be used for prediction or control. The criteria used to check the validity of the predicted models are:

i) Model Coefficients

An assessment of the predicted models' coefficient and associated variance inflation factors (VIF) provides clues concerning the validity of models. Tables 6.53 and 6.54 show the collinearity statistics of tolerance and VIF of observed data set. The VIF indicates whether a predictor's variance has strong linear relationship with the other predictors' variances, while the tolerance value is the reciprocal of the corresponding VIF. The cut-off points for determining the presence of multicollinearity is tolerance value greater than 0.10 and VIF value of less than 10 (Fatimah, Azahari, & Tamkin, 2013; Pallant, 2007; Salkind, 2007). As can be seen from both Table 6.53 and Table 6.54, all the predictors' variances have the tolerance values of greater than 0.1 and VIF values of less than 10, denoting thereby that both parameters are in the acceptable range and hence the absence of multicollinearity. Based on these considerations, it can be deduced that the predicted regression models for this study satisfy goodness-of-fit and are valid.

Table 6.53: Collinearity Statistics- Project Management Success

Predictors Variable	Tolerance	VIF (Variance Inflation Factor)
Incorporation of e-Purchasing policy into existing procurement policy	0.633	1.580
IT consultant supports during implementation process	0.688	1.454
Willingness of the organization to change	0.714	1.400
Activity properly coordinated and monitored	0.672	1.488
Defines the level each stakeholder can get involved	0.767	1.305

Table 6.54: Collinearity Statistics- User Satisfaction

Variables	Tolerance	VIF (Variance Inflation Factor)
Reinforces commitment of the employees	0.571	1.751
Establishes appropriate milestones	0.578	1.731
Willingness of the organization to change	0.735	1.361

ii) Normality

The other way for checking the validity of predicted regression models is by looking at data set normality. On this, Hair et al., (1998) and Field (2009) suggested the use of histogram and normal P-P Plot of regression standardized residuals. Figures 6.14 to 6.17 show the histogram and normal P-P Plot of regression standardized residuals for the data sets of this study. Looking at the histograms in Figures 6.14 and 6.16, it is evident that they are bell shaped and symmetrical, and as for normal probability (P-P) plot as indicated in Figures 6.15 and 6.17, the values are shown clustering around a straight line, indicating that the models do not violate normal distribution. These diagnostic patterns are an indication that the assumption of normality has been met (Norusis, 1994) for both predicted regression models.

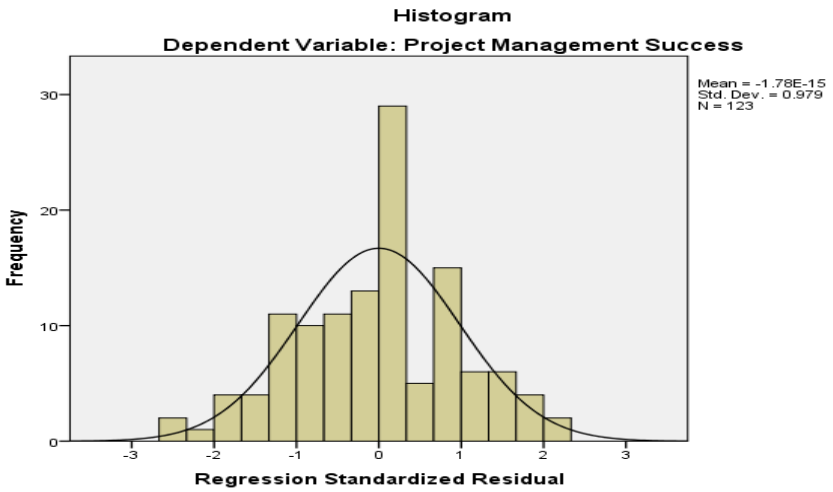


Figure 6.14: Histogram Regression Standardized Residual (Project Management Success)

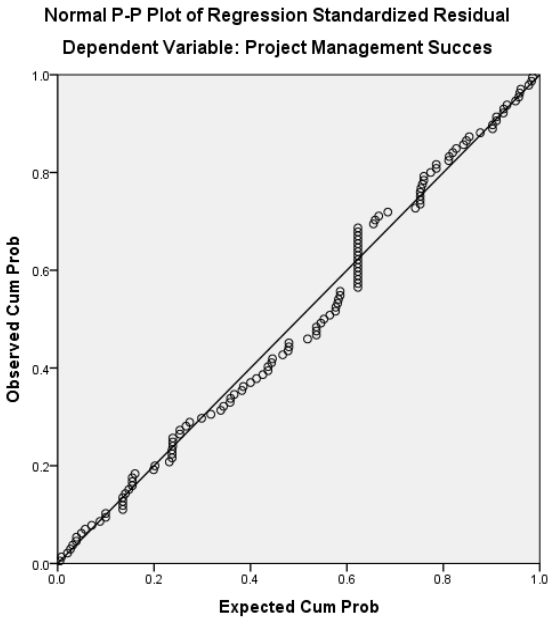


Figure 6.15: Normal P-P Plot of Regression Standardized Residual (Project Management Success)

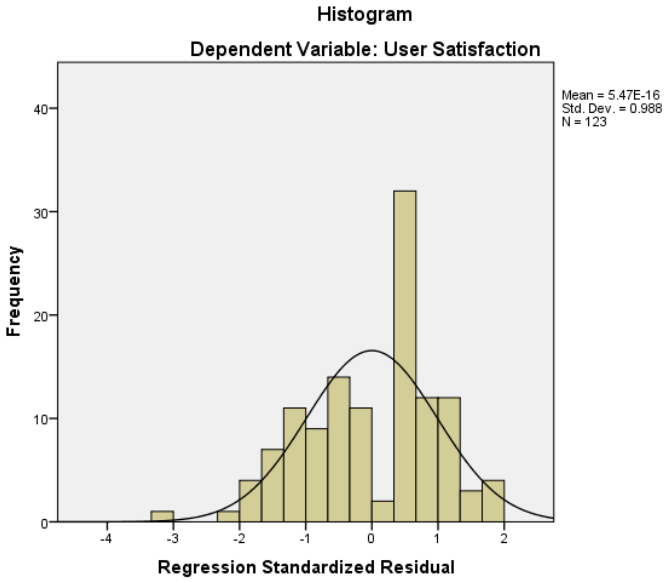


Figure 6.16: Histogram Regression Standardized Residual (User Satisfaction)

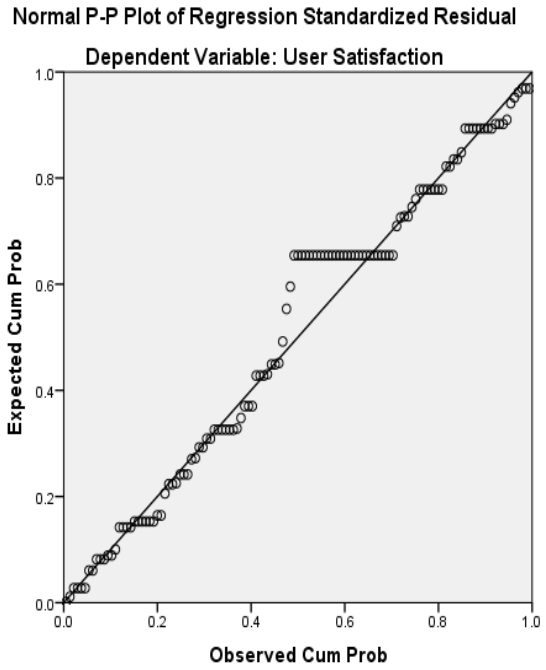


Figure 6.17: Normal P-P Plot of Regression Standardized Residual (User Satisfaction)

iii) Standard Residual and Cook's Distance

An observed dataset appears to fit the predicted model well if the standardized residual value falls within ± 3.0 (Pallant, 2007). Table 6.55 shows the standardized residual values in the case of project management success dependent variable. The residuals fall within the range suggested, thus there is no outlier to the dataset and the predicted model is deemed well fitted.

Cook's Distance is used to assess the influence of outliers in the regression model. According to Tabachnick and Fidell (2007), if the value of Cook's Distance is larger than 1.0, there would be influential points and thus require either deletion or further investigation. Table 6.56 shows the maximum value of Cook's Distance is 0.076, which is less than 1.0. This means that there is no outlier present and the predicted model achieves goodness-of-fit.

Table 6.55: Summary of Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Std. Residual	-2.617	2.173	0.000	0.979	123
Cook's Distance	0.000	0.076	0.009	0.013	123

a. Dependent Variable: Project Management Success

For user satisfaction dependent variable, Table 6.56 shows that one particular case (case number 89) has a residual value of -3.018, which is less than the suggested value of ± 3.0. Moreover, Case Diagnosis of regression analysis output shows that the respondent (case number 89) has recorded a user satisfaction value of 3, but the model predicts a value of 4.30. It is clear from this that the model does not predict the respondent well, since the respondent's rating is less than what this study predicts. However, this study decides to further evaluate this strange case to determine if it has an influence on the results for the predicted model as a whole. This is done through assessing the value of Cook's Distance.

Table 6.56: Summary of Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Std. Residual	-3.018	1.865	0.000	0.988	123
Cook's Distance	0.000	0.088	0.009	0.013	123

a. Dependent Variable: User Satisfaction

Table 6.56 shows that the maximum value of Cook's Distance is 0.088, and this does not exceed the cut-off value of 1.0. Therefore, this study decides to retain case number 89 as it has no influence on the predicted model.

Based on the criteria mentioned above, there appears to be no violation from the underlying assumption of a linear model and this leads the researcher to conclude that the predicted regression model for this study is adequate, fit and reliable.

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6.5.7 Discussion of Regression Analysis

Data analysis shows that five predictor variables have significant positive relationship with e-Purchasing project management success, namely the incorporation of e-Purchasing policy into existing procurement policy, IT Consultant supports for the project team during the implementation process, the willingness of the organization to change, definition of the level each stakeholder can get involved, and the need for activities to be properly coordinated and monitored. They are depicted in Figure 6.12. The results suggest that 38.4% (adjusted R^2 = 35.7%, F-value = 14.571, $p<0.05$) of e-Purchasing implementation success in the context of project management success can be explained by these five predictor variables. Based on these results a prediction model for multiple linear regression equation generated in the context of project management success is;

Project Management Success ($\hat{Y}_1$) =

1.612 + 0.243 (incorporation of e-Purchasing policy into existing procurement policy) + 0.201 (IT Consultant supports for the project team during the implementation process) + 0.156 (willingness of the organization to change) + 0.166 (defines the level each stakeholder can get involved) – 0.203 2(project activity is properly coordinated and monitored).

Three predictor variables are demonstrated to have strong positive relationships with e-Purchasing implementation success in terms of fulfilling user satisfaction. They are the actions taken by the organization to reinforce the commitment of employees to the

implementation initiatives, the establishment of appropriate milestones for performance measurement, and the willingness of the organization to change. The results imply that 40.80% (adjusted R^2 = 39.3%, F-value = 27.346, $p<0.05$) of e-Purchasing implementation success in the context of user satisfaction fulfilment can be explained by these three predictor variables. They are shown in Figure 6.13. Based on these results a prediction model for multiple linear regression equation generated in the context of user satisfaction is;

User Satisfaction ($\hat{Y}_2$) =

1.293 + 0.227 (reinforcement of the commitment of the employees) + 0.247 (establishment of appropriate milestones for the project) + 0.160 (willingness of the organization to change).

It is clear that project management success and user satisfaction do not have significant differences in R^2 values (38.4% versus 40.8% respectively) and multiple correlation coefficient, R, values (0.619 versus 0.639 respectively). This suggests that the respondents have given almost similar weightage to these two sets of measurement of e-Purchasing implementation success. As a result, the predictor variables that build up the regression model of these two sets of dependent variables give almost similar readings on the strength of relationship.

The findings from this study suggest that if organizations pin the success of their e-Purchasing systems implementation on the overall performance of the project (Lind & Culler, 2009) as the indicator of success, they need to control the five predictor variables mentioned earlier. Conversely, if they pin the success of their e-Purchasing systems implementation on the ability of the systems to satisfy the users' feelings and attitudes (DeLone & McLean, 2003) and to meet their requirements (Somers, Nelson, &

Karimi, 2003), they then need to control the three predictor variables.

On the overall, the regression models established in this study are adequate and reliable because the constructed models achieve a goodness of fit and fulfil the underlying criteria of regression validity, such as collinearity value (tolerance>0.1, VIF value < 10), normal distribution, standard residual threshold (observed data set within ±3.0 limit) and Cook's Distance value (< 1.0).

6.6 Summary

This chapter reports on the results and findings from the empirical survey done on organizational CSFs of e-Purchasing implementation success in the construction sector. It is clear at the outset that the e-Purchasing system is being perceived by the respondents as a new way of conducting business transactions. The analysis shows that the current state of e-Purchasing adoption in construction organizations is characterized by four stages of adoption: planning stage, early stage, moderate stage and advanced stage. The technology and system software used to facilitate the purchasing activities by the respondent organizations vary between large organizations and medium-sized organizations despite them being in the same population. Nonetheless, this study reveals that on the overall the respondents' organizations do possess the appropriate technology and system software to facilitate the purchasing process electronically.

There are 8 groups of organizational factors, and they comprise in turn 52 CSF items that are found to have significant positive bearing on e-Purchasing implementation success in both the dimensions of project management success and user satisfaction. These groupings and the items are identified and refined through the assessment of factor analysis and Spearmen's Rank-Order Correlation.

Of these 52 CSF items, only 5 are considered as predicted variables for the successful implementation of e-Purchasing system relating to project management success and 3 items are considered as predicted variables in relation to user satisfaction. These findings are summarised into predicted frameworks of e-Purchasing implementation success shown in Figures 6.18 and 6.19.

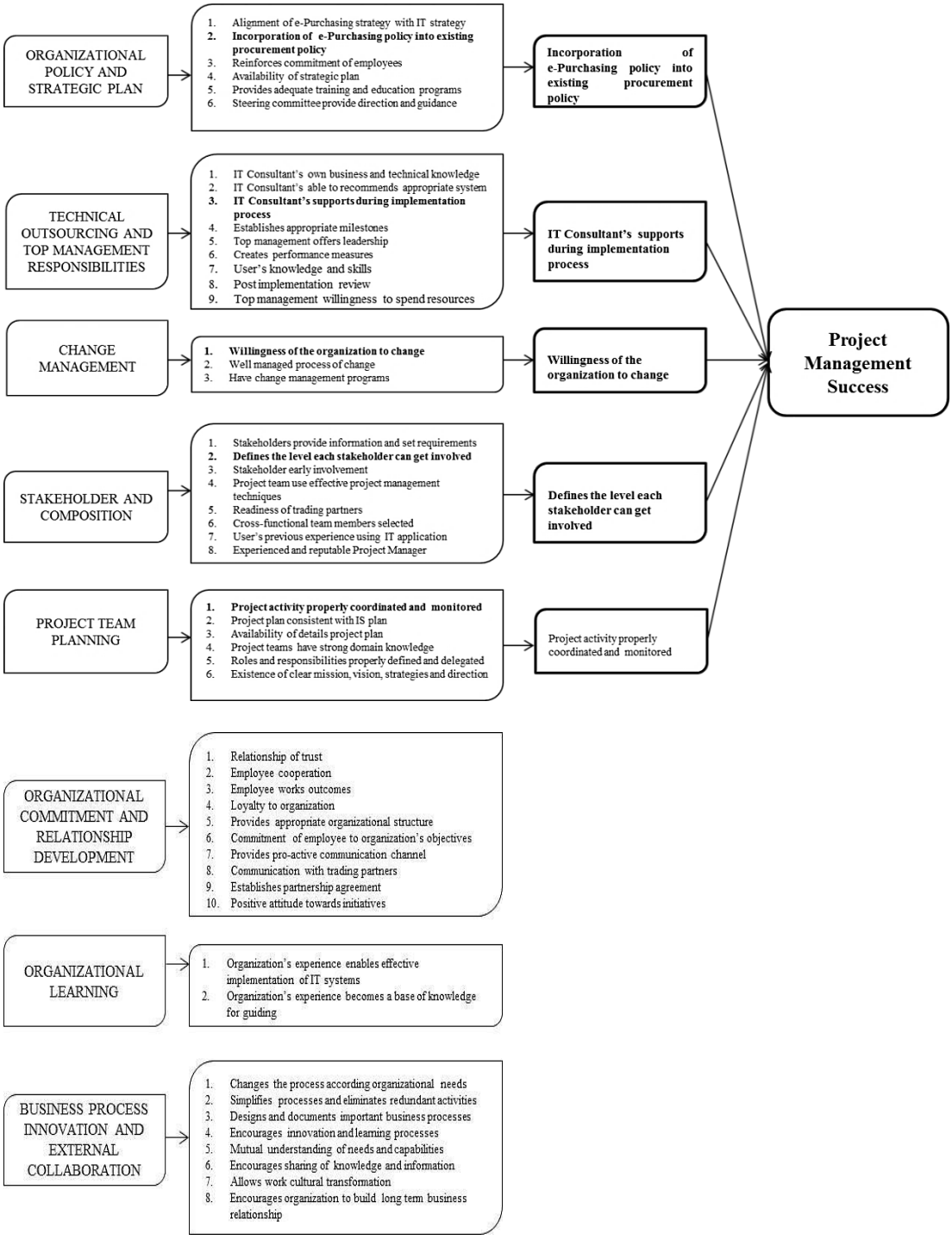

Figure 6.18: e-Purchasing Implementation Success (ePIS) Framework in the Dimension of Project Management Success

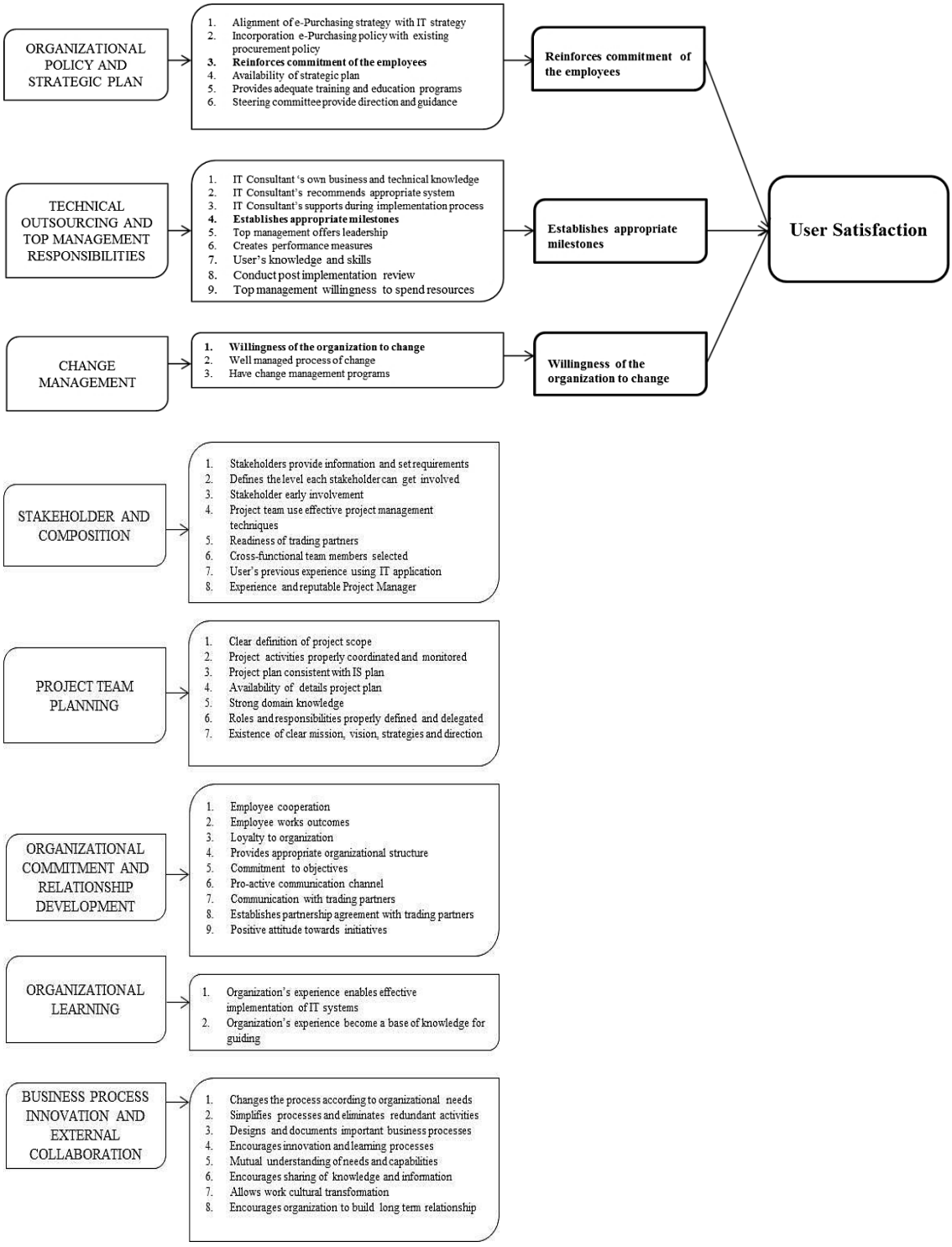

Figure 6.19: e-Purchasing Implementation Success (ePIS) Framework in the Dimension of User Satisfaction

CHAPTER 7

DISCUSSION OF FINDINGS

7.1 Introduction

This chapter provides a brief overview of the results of the study by putting them in the context of the specific objectives to be achieved. The detailed treatments of the findings of both the qualitative and quantitative analyses were described earlier in Chapters 5 and 6. Each subsection presents the findings for each objective and the methods used to achieve that objective. A comparison between the findings of this study with those of previous studies is also made in the course of the discussion. This chapter ends with a deliberation on the e-Purchasing Implementation Success (ePIS) Framework, basically the final product of the study. By way of contrast, some passing references and comparisons are made with frameworks created by other researchers to explain the phenomenon of CSFs of e-Purchasing implementation success.

7.2 E-Purchasing Adoption in Construction Organizations

The first objective of this study, which is to explore the level of e-Purchasing system adoption by Malaysian construction organizations, was achieved through a mixed methods investigation approach encompassing literature review, qualitative face-to-face interview and quantitative study.

From the review of literature on the subject matter, it became apparent that 5 categories or levels of adoption ranging from early adopters to full adopters were used as a way of gauging e-Purchasing adoption in general across industries. These categories are ‘essential functions’ (1st category), ‘single department’ (2nd category), ‘cross

departments' (3rd category), 'enterprise integration process' (4th category) and 'B2B integration/collaboration business' (5th category).

As far as the construction industry is concerned, e-Purchasing system adoption can be rationalized against many variables such as size of company, turnover, percentage of IT related expenditure, past experience, years of e-Procurement adoption and procurement automation. However, since almost 80% of the respondent organizations utilize e-Procurement for the purpose of automating key procurement activities, this criteria will be used to determine the level of e-Purchasing adoption among the construction organizations in the country. To categorize the levels of e-Purchasing adoption, this study adapted the 3 stages of 'low adopters', 'intermediate adopters' and 'advanced adopters' mooted by Caniato et al. (2010) to come up with the 4 stages of 'plan to use' (1st stage), 'early stage' (2nd stage), 'moderate stage' (3rd stage) and 'advanced stage' (4th stage). Based on this categorization, the 1st stage (plan to use stage) corresponds to 10-30% of electronic material purchasing. At this level of adoption, the procurement process is still heavily dependent on the use of telephone/fax machines and manual purchase documentation process.

At the 2nd stage (early stage), corresponding to 31-50% of electronic material purchasing, organizations start to use specific IT applications to facilitate the purchasing process, such as basic productivity software, purchasing software packages and existing traditional technologies such as telephone/fax machines. At this stage, very minimal use is made of electronic mails (e-mail) to support information and communication exchanges, and the focus of automation affects only one or two departments.

At the 3rd stage (moderate stage), corresponding to 51-80% of electronic material purchasing, organizations use IT applications to integrate the purchasing process across several functions or departments or even the entire organization using a single interface system. This stage is characterized by the use of a combination of traditional technologies such as telephone/ fax machines and modern technologies such as e-mail, productivity and purchasing software, supplier portal and Enterprise Resource Planning (ERP).

The fourth stage or advanced stage (best-in-class) refers to the situation where organizations conduct more than 80% of their material purchases electronically. The survey shows that 36.6% of the respondents are included in this category. At this stage, the technologies used to conduct material purchase electronically are similar to the ones used at the moderate level but more use is made of enterprise wide systems to communicate, collaborate and integrate with multiple trading partners when conducting purchasing transactions.

An organization that fully utilizes the capability of e-Purchasing can integrate its purchasing processes from materials requisition to the payment of suppliers, and be connected with its trading partners through system connectivity on a real time basis. The survey findings show that most of the e-Purchasing systems used by respondent organizations integrate the procurement processes only across departments within the organizations, within the companies' groups, or intra-organizations. However, only few of them really utilize e-Purchasing system to create an enterprise-wide and full-scale integration of processes.

7.3 Organizational CSFs

The second objective of this study is to identify the organizational CSFs that have a bearing on the successful implementation of the e-Purchasing system across sectors. To accomplish this, a rigorous review of existing literature on e-Purchasing implementation CSFs was first made. The purpose was to scope the known factors that affect the system's implementation across industries as a starting point before proceeding to identify those that specifically relate to the construction sector. The next step, which corresponds to the third and fourth objectives of this study, involved qualitative and quantitative studies, drawing upon surveys conducted with experts and companies involved in construction and e-Purchasing. The purpose is to screen the factors for those that are truly pertinent to the construction industry. This mixed methods approach to establishing the final organizational CSFs responsible for successful e-Purchasing implementation in construction organizations is discussed below.

7.3.1 Organizational CSFs of e-Purchasing Implementation Success in General

As a prelude to finding the organizational CSFs of e-Purchasing implementation success in construction organizations, which is a research objective, a preliminary review of existing literature on the topic was first made. Using the Resource Based Theory (RBT) as the appropriate theory to support the theoretical framework, the review is predicated on the assumption that intangible resources and capabilities do play an important role in securing organizational competitive positions (Olalla, 1999). Proceeding from this, a summary of critical factors stemming from the organizational dimension that impinge on the successful implementation of IT system solutions in organizations was made (Ang et al., 2001; Grover, 1993; Hussien et al., 2007; King & Sabherwal, 1992; Tallon et al., 2000). Vaidya et al. (2006) have analysed the relative importance of different

CSFs and observed that organizational factors are the most important category for successful e-Procurement initiatives.

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Using the RBT theory to relate with the organizational dimension, this study finally identified twenty six (26) organizational CSFs from literature after reviewing thirty-two (32) publications that include peer reviews, journals and theses associated with e-Purchasing implementation in multiple industries around the world. These organizational CSFs are organizational policy and strategic plan, project plan, project team, appropriate business model, top management support and commitment, effective and knowledgeable project manager, stakeholder involvement, roles and responsibilities of team members, experience with new technology, organizational commitment, appropriate organizational structure, change management, close collaboration with trading partners, relationship building with trading partners, promotion of systems through communication, organizational culture, business process reengineering, training and education program, good quality employees, adequate financial resources, performance measurement, regular monitoring and evaluation of performance, readiness of trading partners, trust between trading partners, communication between trading partners and Vendor/IT Consultant support. All twenty-six of the organizational CSFs were subjected to further refinement in subsequent qualitative study as discussed in the following section.

Before proceeding with the quantitative study to determine which of the twenty-six (26) organizational CSFs are important for the construction sector and if any other factors need to be included in the final list, the criteria for measuring information system (IS) success needs to be determined. According to various researchers, IS success can be measured in various ways (Petter et al., 2008; Rasmy et al., 2005). For this study,

however, two criteria were selected to measure the success of e-Purchasing, namely project management success and user satisfaction. Project management is a key activity in most modern organizations and, as a result, the success of project management has often been associated with the final outcomes of the project (Munns & Bjeirmi, 1996). Many researchers have previously used project management success as a criterion for measuring the success of implementation of enterprise systems (Eakin, 2003; Espinosa et al., 2006; Markus & Tanis, 2000b).

For user satisfaction, it has been discussed scrupulously by previous researchers as an important factor in measuring success of IT system implementation (Delone and McLean, 1992; Jang, 2010; Muylle, Moenaert & Despontin, 2004; Vaidya, Sajeev, & Callender, 2006; Zviran & Erlich, 2003), and been believed to be one of the key factors that affects IS success management (Powers and Dickson, 1973; Holsapple et al., 2005).

7.3.2 Organizational CSFs of e-Purchasing Implementation Success in the Construction Sector

The third objective of this study is to determine the organizational CSFs that are specific to construction organizations. This objective was achieved through a qualitative study involving a series of face-face interviews with industry experts. The aim of the interviews was to elicit the opinions of the experts on the twenty-six (26) organizational factors derived from literature as to whether they have a strong correlation to e-Purchasing success in the particular industry.

Using content analysis to rationalize the experts' feedback, fourteen (14) organizational CSFs including a new factor discovered during the interviews, namely 'user adoption', were finally derived at. This reduced number from the initial 26 factors came about

because of overlapping. These fourteen organizational CSFs are organizational policy and strategic plan, project plan, project team, top management support and commitment, stakeholder involvement, employee commitment, experience with new technology, change management, close collaboration between trading partners, user adoption, organizational culture, reengineering business process, Vendor/IT Consultant support and performance measurement.

These factors are similar to those uncovered by previous studies on e-Procurement success in various industries: Organizational Policy and Strategic Plan (Engström, Wallström, & Salehi-Sangari, 2009; Leipold, Klemow, Holloway, & Vaidya, 2004; Puschmann & Alt, 2005; Quayle, 2005); Project Plan (Chang & Graham, 2012; J. Clark, Kennedy, Schmitt, & Walters, 2012); Project Team (Chang & Graham, 2012; Gartner, 2002), Top Management Support and Commitment (Leipold et al., 2004; Parida & Parida, 2005; Teo, Lin, & Lai, 2009; Vaidya et al., 2006; Williams & Hardy, 2007); Stakeholder Involvement (Chipiro, 2009), Employee Commitment(Mose & Njihia, 2013), Experience with New Technology (Tambovcevs, 2010), Change Management (Bof & Previtali, 2007; Khanapuri, Nayak, Soni, Sharma, & Soni, 2011; Lee, Oh, & Kwon, 2008; Mose & Njihia, 2013; Panda & Sahu, 2011; Panda & Sahu, 2012; Parida & Parida, 2005), Close Collaboration Between Trading Partners (Al-Omoush, 2008; Chang & Graham, 2012), User Adoption (Leipold et al., 2004; Parida & Parida, 2005), Organizational Culture (Lee et al., 2008), Business Process Reengineering (Bof & Previtali, 2007; Mose & Njihia, 2013; Panda & Sahu, 2012), Vendor/IT Consultant Support, and Performance Measurement (Al-Omoush, 2008; Mose & Njihia, 2013).

At this stage, the findings show that most of the CSFs obtained from the face-face interviews are similar with those found in literature except that they are more organised

after having gone through a refinement process. These factors became the foundation for the development of the survey questionnaire used in the quantitative study.

7.3.3 Underlying Structure of the Organizational CSFs of e-Purchasing Success

The fourth objective of this study is to investigate the underlying structure of the organizational CSFs of e-Purchasing success. This objective is achieved by the distribution of questionnaires to a specific population from the sample frame and the analysis of datasets using principle component factor analysis found in SPPS software.

The purpose of conducting the principle component factor analysis (PCFA) is to investigate the underlying structure of the factors and to create a meaningful framework of organizational CSFs of e-Purchasing implementation success in construction organizations. A total of 58 indicators of organizational CSFs derived from the survey questionnaire were used in this analysis. The findings of this analysis indicate that 8 key component factors encompass 54 CSFs indicators. These component factors were highlighted in Chapter 6 in Figure 6.47. Four (4) indicators were eliminated from the 58 items in the course of PCFA for having loading scores of less than 0.4 as the cut-off (Field, 2009; Maccallum et al., 1999; Morgan et al., 2004; Steven, 1995) and for being cross loading items (Lavagnon et al., 2012; Teo, Ranganathan, & Dhaliwal, 2006; King & Teo, 1996). The component factors obtained were statistically validated in terms of homogeneity, reliability and discriminant validity and the findings suggest that this framework is satisfactory and has achieved best fit of data set.

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7.3.4 Factors Influencing e-Purchasing Success

The final objective of this study is to examine the presence of relationship between the said organizational CSFs and e-Purchasing implementation success measured in terms

of project management success and user satisfaction. Two types of analysis were employed for this purpose, namely Spearman rank order correlation and multiple regression analysis. Both analyses were conducted using SPSS software.

Spearman rank order correlation measures the degree of correlation between pairs of independent and dependent variables. The 54 predictor items that represent the 8 groups of organizational CSFs derived from the principle component factor analysis (PCFA) mentioned earlier were the independent variables while the 2 dimensions of e-Purchasing implementation success, project management success and user satisfaction, acted as the dependent variables.

The results shows that the correlation coefficient for both the two dependent variables ranged from a high of 0.538 to a small of 0.191, all being statistically significant at $p < 0.05$. The complete results of the correlation analysis were shown in Tables 6.39 to 6.46 in Chapter 6. On average, the results show that the relationships between pairs of independent and dependent variables fall within the categories of small and medium correlations. Small correlation refers to the correlation coefficients between 0.1 to 0.29, while moderate correlation refers to those between 0.3 to 0.49.

Based on the correlation analysis output, only 52 out of the 54 predictor items of organizational CSFs were shown to have presence of relationship with e-Purchasing implementation success based on project management success and user satisfaction. The two items that did not show significant correlation were consequently removed. The 52 items were shown in Tables 6.47 and 6.48 in Chapter 6. This refinement of the predictor items suggests that the PCFA has its limitations when examining the inter-correlations between a large numbers of observed variables (latent variables).

A new framework of organizational CSFs, which is a refinement of the theoretical framework discussed in Chapter 4, was thereby established after the correlation analysis. The new framework consists of 8 components of organizational factors and 52 CSF predictor items. Figure 6.11 of Chapter 6 illustrates a new framework of the findings. Subsequently, this framework was used in multiple regression analysis to examine the influence of independent variables (organizational CSFs) on the dependent variables (e-Purchasing implementation success in dimension of project management success and user satisfaction).

For the purpose of multiple regression analysis, this study chose the stepwise multiple regression models method. This method is capable of determining the combination of independent variables that best explain the dependent variable through percent variance accounted for (Argyrous, 2005; Cramer & Ebrary, 2003). It will generate information about the model as a whole and the relative contribution of each of the predictor variables that make up the model.

The summarized results of the stepwise multiple regression analysis was presented in Tables 6.49 and 6.50 for the first and second dependent variables respectively. The analysis shows that 38.4% of the variance in attaining project management success is contributed by five predictors, namely, the incorporation of e-Purchasing policy into existing procurement policy, the support rendered by the IT consultant support to the project team during the implementation process, the willingness of the organization to change, the proper coordination and monitoring of project activities, and the identification of the levels of stakeholder involvement.

The results recognized that incorporating e-Purchasing policy into the existing procurement policy is the most important factor. This is so because it will demonstrate clearly the commitment of management to the e-Purchasing initiative. Furthermore, it will force the entire organization to aspire for the realization of the system, ensure that policies are in place to implement the new strategy, and prevent the new initiative from being regarded as a separate entity from the overall procurement strategy. The incorporation of the e-Purchasing policy into the main procurement policy will also enable the organization to begin preparing the employees for the changes to come. This finding was supported by the Spearman's rank-order correlation value of 0.446, which is among the highest values of the 54 predictor items and highest ranked within the group. The significance of incorporating e-Purchasing policy into existing procurement policy was also attested by a previous study done by World Bank (2003). This predictor records not only high correlation coefficient value but also high standard beta coefficient value. From the correlation coefficient (R) value obtained, this study can conclude that the greater the incorporation of e-Purchasing policy into existing procurement policy, the greater would be the chances of project management success.

IT Consultant support of the project team during e-Purchasing implementation is the second most important predictor for project management success. The IT Consultant is an experienced person that not only provides the organization with the system and infrastructure but also understands fully the system's requirements. Thus, he or she must be there to support and inform the project team on these requirements. The support of the consultant can ensure that the project team manage the system implementation process effectively and within the stipulated time frame. This predictor records a Spearman's rank-order correlation coefficient value of 0.428, one of the highest values among the 54 organizational CSF items and the second highest ranking

out of nine within the group. The regression analysis shows that this predictor has both high correlation coefficient and standard beta coefficient values. This indicates that the higher the IT consultant support during the implementation process, the higher the likelihood of project management success. This finding is also similar to the previous finding by Arasa and Achuora (2012), where they claimed that IT consultant support is an important determinant of IS implementation success and organizations are more willing to implement new IT/ IS innovations if they feel there is adequate IT consultant support.

The analysis shows that the third important predictor for achieving project management success of e-Purchasing implementation is the willingness of an organization to change from legacy purchasing systems to e-Purchasing system. The new process totally requires changes to existing process, technology and people practices. As a result, it is imperative that the organization is ready to transition individuals, teams and operation to the new operating scenario of e-Purchasing. Normally, people in an organization will feel very uncomfortable or insecure with impending changes, especially if the changes are related to their jobs. Thus, addressing employee concerns and communicating to them at an early stage the benefits of the changes and how they will fit into the new system will go a long way to assuage their fears. Conversely, lack of organization willingness to change will cause the implementation of the new system to drag and miss critical deadlines or completed in a hurry without due assurance that the system delivers what it is intended to do. Furthermore, employee resistance to accept the changes that the system requires will jeopardize project management success. This finding on the importance of organization's willingness to change reflect similar findings by Ledlum (2010) and Kaski (2012), whose studies dealt with enterprise-wide systems and organization's willingness to change. Organization's willingness to change records

Spearman's rank-order correlation coefficient of 0.433, among the highest value of the 54 predictor items and the first rank out of three within the group. The regression analysis shows that this item has moderate values for both correlation coefficient and standard beta coefficient. This indicates that the greater the willingness of the organization to change, the greater the chances of project management success in e-Purchasing implementation.

The fourth important predictor for achieving project management success is the identification of the level each stakeholder can or should be involved. Stakeholders can refer to individuals or functional areas that will use the system, its tools and the information that it provides (Government, 2006). With so many key people inside the organization who might influence the new system's implementation, it is important to identify the level or extent of stakeholder's involvement in order to avoid chaos. The importance of stakeholder involvement cannot be under-estimated (Vaidya et al., 2006). By identifying the extent of stakeholder involvement, the implementation process can run smoothly and according to schedule, and information required from the stakeholders will be given at the right time and stage. The finding of this study on stakeholder involvement mirrors that of Wahl (2012). The importance of this factor to project management success of e-Purchasing implementation can be seen from the 0.341 Spearman's rank-order correlation coefficient value, which is among the highest values of the 54 predictor items and fifth in ranking out of eight within the group. This factor records moderate values for correlation coefficient and standard beta coefficient, thus indicating that the more the effort by the organization to identify the level or extent of each stakeholder's involvement, the better the chances that project management of e-Purchasing implementation will be successful.

The last predictor that contributes to project management success of e-Purchasing implementation in construction organizations is the existence of proper coordination and monitoring of project activities. To achieve successful system implementation, the organization needs to coordinate and organize the project activities properly across all different people and units involved. It is important that the organization assess and keep track of project milestones on a periodic basis to ensure that project delivery is within the stipulated time frame and budget, and that the scope of the system matches organization needs. In addition, before the system is turned on, it is vital that the users have come to accept it and this calls for a lot of coordination on the part of management and project team to fan the system to users and plan their training. This predictor also involves tracking and monitoring IT Consultant's activities and communication. Although the findings show that this factor has only a small correlation with e-Purchasing implementation success, its impact is nonetheless significant when compared to other organizational CSF predictors (0.187, sig. level at $p < 0.05$). This factor also records a negative standard beta coefficient (-0.246, sig. level at $p<0.05$), which indicates that increasing the coordination and monitoring of project activities will not directly increase e-Purchasing implementation success. However, studies by Umble, Haft, and Umble (2003) indicated that it is critical that the project is properly coordinated and monitored so as to ensure that its implementation is on schedule, thereby affecting the successful implementation of the system.

In summary, all the five mentioned predictors can be used as a predictive model since they are found to significantly influence e-Purchasing project management success. This predictive model was shown in Figure 6.12, Chapter 6.

In the context of achieving user satisfaction of e-Purchasing implementation, the results show that 40.80% of the variance in e-Purchasing implementation success is contributed by three predictor items, namely the reinforcement of employee commitment, the establishment of appropriate milestones, and the willingness of the organization to change.

The results suggest that the reinforcement of employee commitment to the system implementation by management is one of the most important factors to attain user satisfaction. This, however, requires that top management must walk the talk and be the first to be committed to the project. Only then would top management have an effect on employee commitment (Alsamarai & Mashaqba, 2009). This predictor records a value of 0.534 for Spearman's rank-order correlation coefficient, the second highest value of the 54 organizational CSF items and the first rank out of six within the group. The findings of the regression analysis show that this factor has strong correlation and modest standard beta coefficient, suggesting thereby that the stronger the management reinforcement of employee commitment to the initiative, the higher would be the user satisfaction with the implementation of e-Purchasing. This finding echoes that of previous research (Shah, Khan, Bokhari, & Raza, 2011) that stresses the importance of top management reinforcement of employee commitment and participation in enterprise system implementation and how this ultimately leads to system success.

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The second predictor that contributes to user satisfaction with e-Purchasing installation is the establishment of appropriate milestones for performance measurement. Project milestones provide a roadmap for the organization to determine whether particular objectives are achievable or not as the project progresses. Project milestones are also used by users to evaluate whether the system fulfils their needs in terms of quality

required, information sufficiency, user-friendliness and improved work efficiency within targeted time frame. This empirical finding contributes to the list of factors impacting user satisfaction of e-Purchasing implementation. This factor records a Spearman's rank-order correlation coefficient value of 0.498. This is amongst the highest rank values of the 54 organizational CSF items and second highest out of nine within the group. Meanwhile, the results of the regression analysis show that this factor has modest standard beta coefficient and correlation coefficient values. This means that the greater the focus on establishing appropriate milestones for project performance, the greater the likelihood that users would be satisfied with e-Purchasing implementation. The significance of establishing appropriate milestones for performance measurement of enterprise system implementation success was similarly attested to in the study by Aldammas and Al-Mudimigh (2011).

Organizational willingness to change is the last predictor to contribute to e-Purchasing implementation success. The findings show that this predictor contributes to both project management success and user satisfaction. In the latter's case, this factor records a Spearman's rank-order correlation coefficient value of 0.453, among the highest of the 54 predictors and the first out of three within the group. Based on regression analysis this factor is shown to have modest values of correlation coefficient and standard beta coefficient. This leads to the conclusion that the greater the willingness of the organization to change, the greater is user satisfaction with e-Purchasing implementation. This finding is in line with the previous research by Rotchanakitumnuai (2010).

The abovementioned three predictors can be used as a predictive model since they are found to significantly influence user satisfaction with e-Purchasing success. This

predictive model was shown in Figure 6.13, Chapter 6.

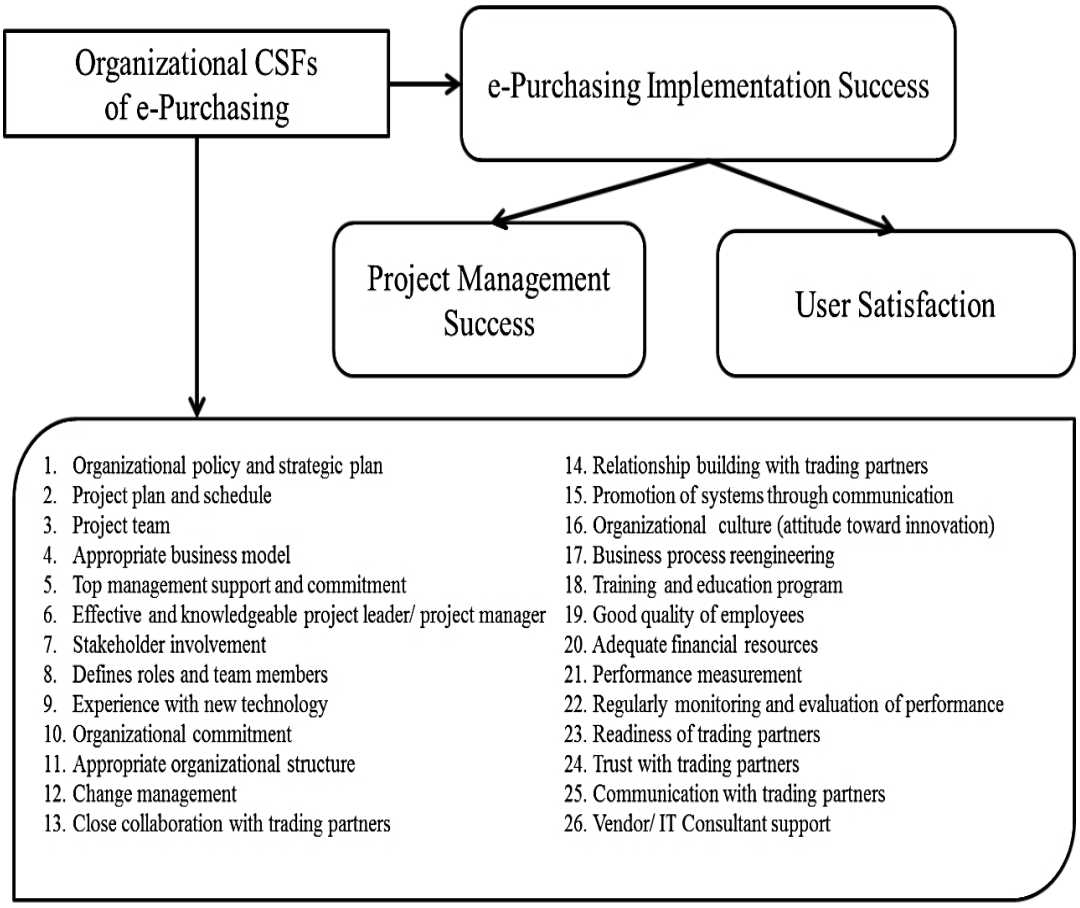
7.4 Non-Influential Factors

Results of the multiple regression analysis show that 47 organizational CSF items out of 52 do not influence project management success, and 49 of the 52 items do not impact user satisfaction with e-Purchasing implementation. In the dimension of project management success, the 47 items exhibit small beta coefficients ranging from -0.098 to 0.121. Examples of such items are 'mutual understanding of needs and capabilities' with beta coefficient of -0.098 and 'offers leadership in organization's e-Purchasing effort' with beta coefficient of 0.121. For the dimension of user satisfaction, the analysis reveals that 49 organizational CSF items have small beta coefficients ranging from -0.097 to 0.172. Items include 'organizations' ability to effectively employ new information technologies" with beta coefficient of -0.097, and 'offers leadership in organization's e-Purchasing effort' with beta coefficient of 0.172.

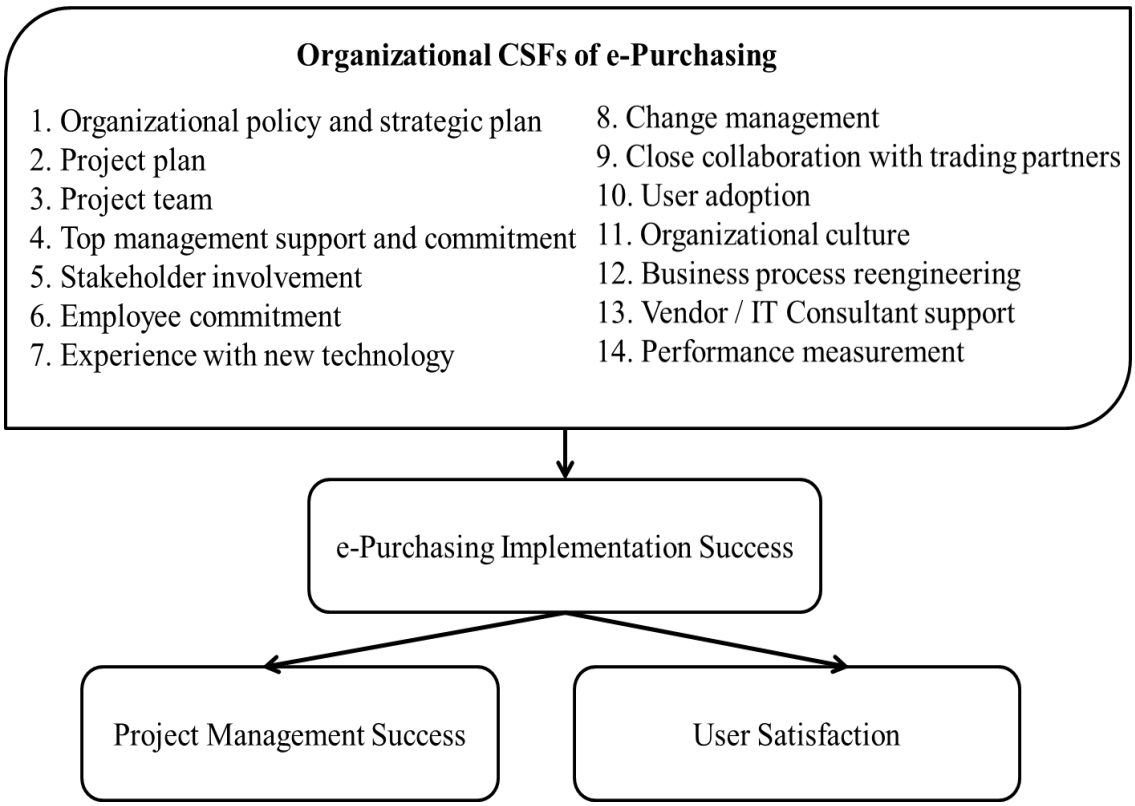
These items with small beta coefficients suggest that they play minor parts in the regression model (Kinnear & Gray, 2010). For the non- influential factors, a change of one standard deviation for that variable (CSF items) produces a small change in standard deviation for e-Purchasing implementation success measured in both project management success and user satisfaction. As a result, 47 organizational CSF items for project management success and 49 organizational CSF items for user satisfaction are recognized as non-influential factors that neither have strong relationships with nor contribute significantly to e-Purchasing implementation success. They were shown in Figures 6.18 and 6.19 in Chapter 6.

7.5 E-Purchasing Implementation Success (ePIS) Framework

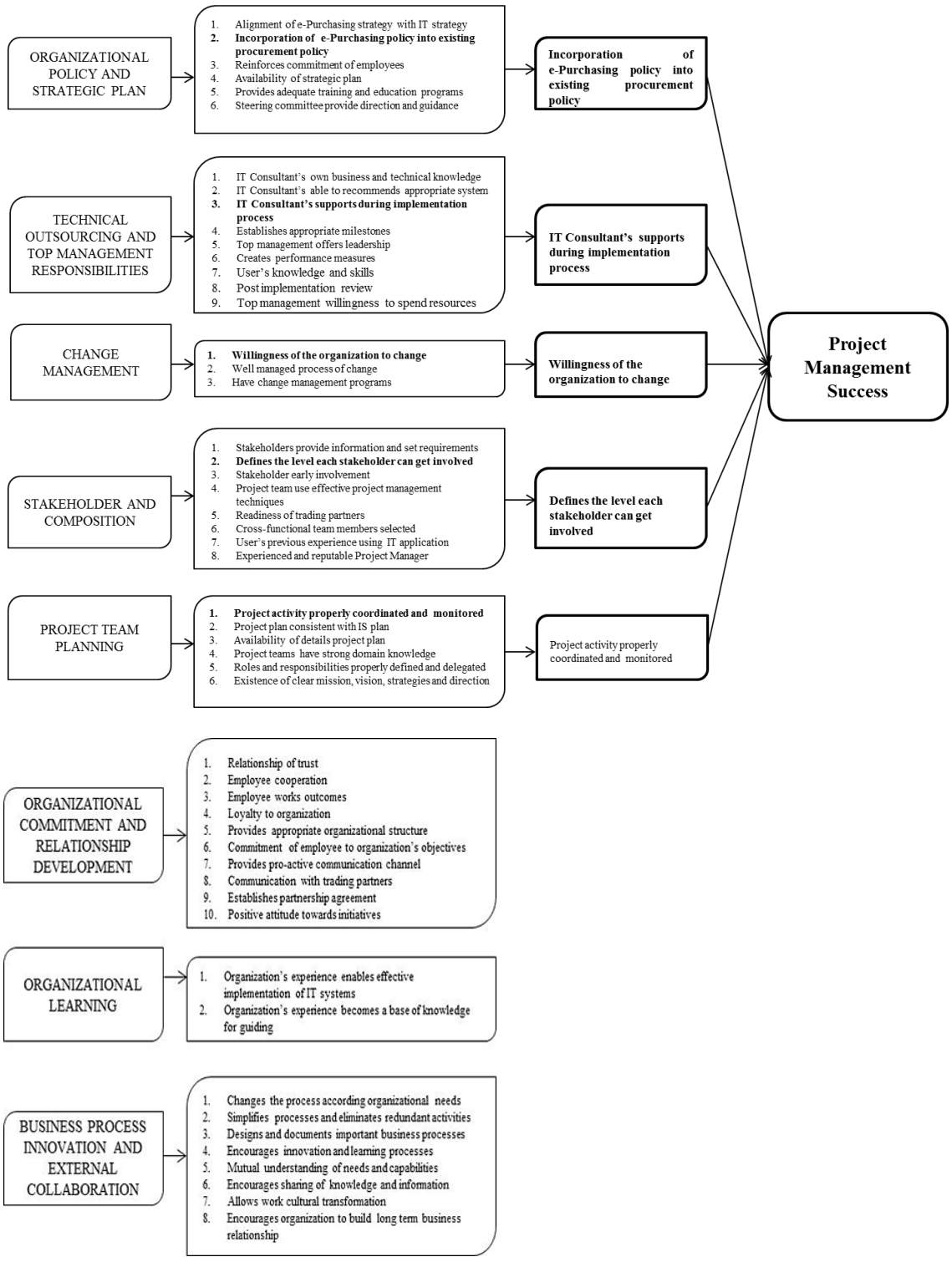
The framework showing the factors affecting e-Purchasing implementation success in the construction sector evolved as the study progresses from the qualitative literature review to the quantitative empirical study of respondent survey inputs. It began with the drafting of the initial theoretical framework drawn from past studies (Figure 3.1, Chapter 3) followed by a modification of that theoretical framework (Figure 4.4, Chapter 4) pursuant to the interview with industry experts and finalized in Figures 5.1 and 5.2 after the completion of quantitative analysis. Having been grounded in empirical research, this model can now be used to predict the CSFs responsible for the successful implementation of e-Purchasing in construction organizations.



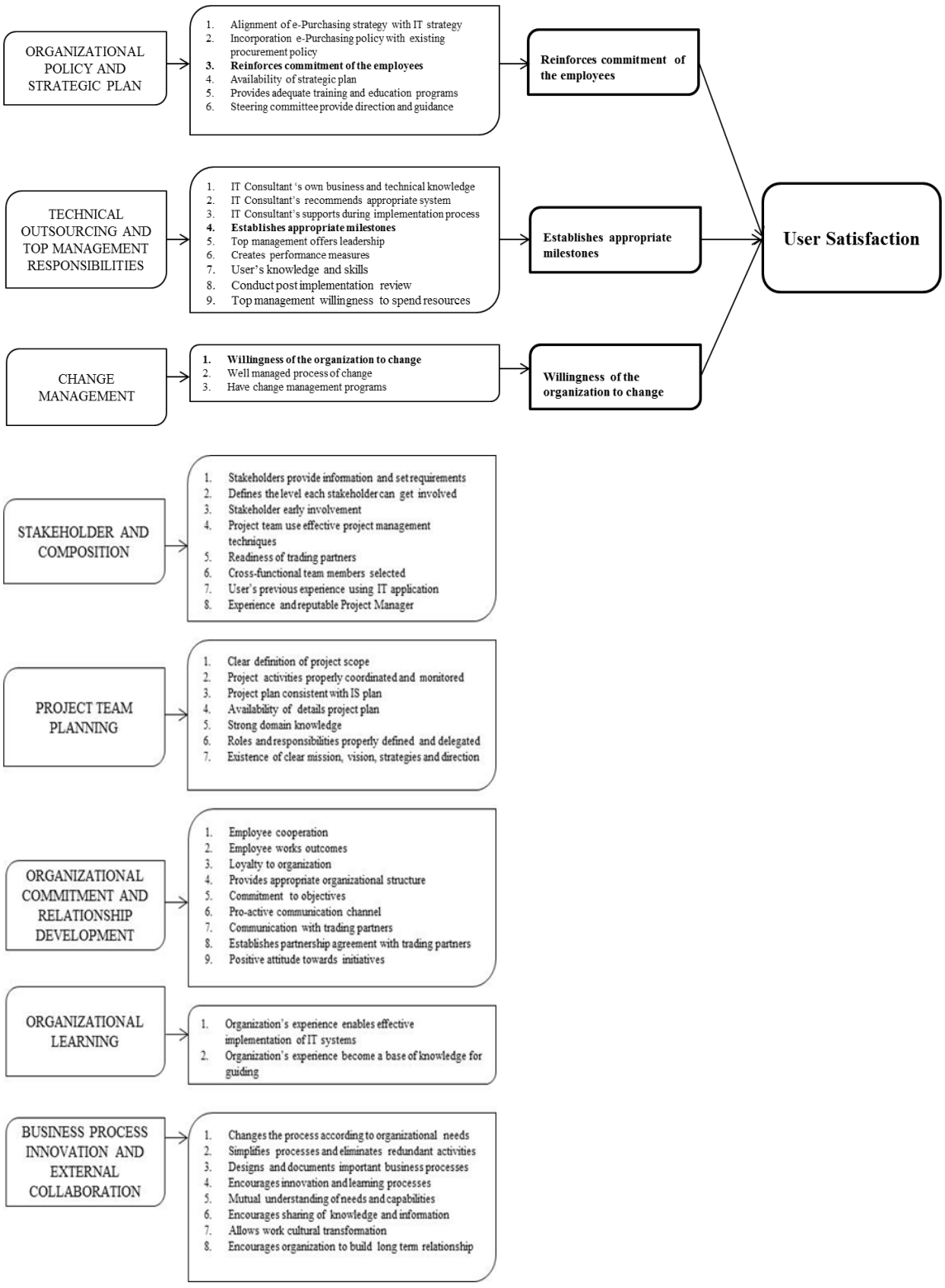
Initial framework of organizational CSFs of e-Purchasing implementation success (from Figure 3.1, Chapter 3).



Modified theoretical framework of organizational CSFs of e-Purchasing implementation (from Figure 4.4, Chapter 4).



E-Purchasing implementation success framework in the dimension of project management success (from Figure 6.18, Chapter 6)



E-Purchasing implementation success framework in the dimension of user satisfaction, (from Figure 6.19, Chapter 6)

With reference to Figure 6.18 above, five (5) component factors out of eight (8) are shown as contributing to project management success. They are i) organizational policy and strategic plan, ii) technical outsourcing and top management responsibilities,

iii) change management, iv) stakeholder and composition, and v) project team planning. These five (5) component factors comprise of thirty-two (32) organizational CSF items, of which five (5) are statistically shown to have a relationship with, and are predictors of, e-Purchasing implementation success. The five items are: the incorporation of e-Purchasing policy into existing procurement policy, IT Consultant support during implementation process, the willingness of the organization to change, the definition of the level each stakeholder can get involved, and proper coordination and monitoring of project activities. The remaining three (3) component factors - organizational commitment and relationship development, organizational learning, and business process innovation and external collaboration - that comprise in total twenty (20) organizational CSF items are statistically shown to have no strong relationship with, and contribution to, successful implementation of e-Purchasing. Hence, these factors are considered as non-predictors of e-Purchasing implementation success measured in terms of project management success.

In Figure 6.19, three (3) component factors out of eight (8), namely, i) organizational policy and strategic plan, ii) technical outsourcing and top management responsibilities, and iii) change management, are statistically shown to have a relationship with, and contribute to, user satisfaction. From the eighteen (18) organizational CSF items that make up the mentioned three (3) component factors, only three (3) items are shown to be predictors of e-Purchasing implementation success. They are management reinforcement of employee commitment to the e-Purchasing initiative, the establishment of appropriate milestones, and the willingness of the organization to change. The remaining five (5) component factors, namely stakeholder and composition, project team planning, organizational commitment and relationship development, organizational learning, and business process innovation and external collaboration,

which in total are made up of 34 organizational CSF items, are statistically shown to have neither strong relationship with nor contribution to successful e-Purchasing implementation. Thus, these organizational CSFs are considered as non-predictors of e-Purchasing implementation success measured in terms of user satisfaction.

It can be deduced from the above framework that it is pertinent for the success of any e-Purchasing initiative in the construction industry that management at the strategic level pays due attention to procurement policy, employee commitment, project milestones, change management, stakeholder involvement, and project planning.

As highlighted previously, resources to an organization go beyond physical assets. Organizational competencies such as the above five predictors that contribute to successful project management and the three predictors that contribute to user satisfaction are themselves resources that yield for the organization a competitive advantage. This means that the findings of this study are in line with the RBT theory that underpins it and are wholly in line with what Hall (1993) suggested as functional capabilities (such as knowledge, skills and experience of employees) and cultural capabilities (such as attitudes, values, beliefs and habits) that can achieve business advantage through the IT initiative.

Table 7.1 shows a comparison of the framework yielded by this study and frameworks generated by other researchers. It shows clearly that frameworks differ in their choice of selection criteria and focus areas. Vaidya et al. (2006), for instance, proposed a framework of CSFs for e-Procurement implementation success in the Public Sector by focusing on three (3) main factors, namely organizational and management, practices and process, and system and technology. Their study was based on literature survey.

Another study by Mose et al. (2013) proposed a conceptual framework for the successful use of e-Procurement that includes twenty (20) items in different categories of CSFs as independent variables and e-Procurement outcome as the dependent variable. Their study focused on online tender and sourcing involving manufacturing firms and conducted through surveys. Yet another study by Arasa and Achuora (2012) developed a theoretical model on the factors affecting e-Procurement implementation success that consists of twelve (12) items based on TOE (technological, organizational and environmental) as independent variables and the e-Procurement impact as the dependent variable. Their focus area was the textile and apparel industry, and data were gathered through surveys. Although there are some similarities between enterprise systems, it is expected that different success frameworks may emerge. As pointed out by Liu (2004) and Hartman and Ashrafi (2004), a framework of critical success factors that has been identified for a particular project may not be applicable to another because of differences in environment, types of stakeholders and priority of organizational goals.

Table 7.1 Comparison of Study Frameworks

Sources	Framework/ Models	Focus Areas	Dimensions of Success	Industry	Specific Level	Approach
This study	**Framework for e-Purchasing Implementation Success**	**Organizational**	• **Project Management Success** • **User Satisfaction**	**Construction (Private Sector)**	**Individual and Organization**	**Mixed Methods**
Vaidya et al. (2006)	Conceptual Framework for e-Procurement Implementation Success	• Organizational & Management • Practices & Process • System & Technology	• User Satisfaction • Supplier Satisfaction	Public Sector	Individual and Project	Literature Survey
Mose et al. (2013)	Conceptual Framework for successful e-Procurement adoption	Managerial, Process & System	e-Procurement Outcome	Manufacturing	Individual and Organization	Cross-sectional Survey
M.Arasa and Achuora (2012)	Model for e-Procurement Implementation Success	Based on TOE Model • Technological • Organizational • Environmental	e-Procurement Impact	Textile and Apparel	Individual and Organization	Mixed Methods

The framework generated by this study focuses on organizational competencies that require continual attention and have the biggest impact to initiative implementation success. It does not only explain the factors that need to be controlled but can also predict how an organization can achieve efficiency in the implementation process. Due to the use of purposive sampling with a small sampling size, the results of this study cannot be generalized to other organizations or to a bigger population. Nonetheless, the framework generated can act as a guideline and a starting point for future research into e-Purchasing implementation in construction organizations since the organizational CSFs obtained from this study were comprehensively validated in qualitative study and empirically examined for their relationship with e-Purchasing implementation success.

7.6 Summary

This chapter provides a brief overview of the results of the study by putting them in the context of the specific objectives to be achieved. The detailed treatments of the findings of both the qualitative and quantitative analyses were described earlier in Chapters 5 and 6.

In addressing the first objective, this chapter discussed the categorization of extent of e-Purchasing adoption across industries as found in literature, the categorization of adoption specific to the respondent organizations in the construction industry, and the characteristics of the technology applications used and the activities automated in these construction organizations.

The second objective pertains to organizational CSFs, which are the main focus of the study. In this chapter, the use of the Resource Based Theory (RBT) of scarce and competitive resources as the underpinning theory and the rationale used by this study to identify organizational CSFs of e-Purchasing implementation success across industries was discussed. This was followed by a discussion of the concepts and measurements of success.

The chapter then discussed the third objective, which is the refinement of the organizational CSFs of e-Purchasing implementation success found in literature in order to identify those that are pertinent to the construction industry. The method of analysis and the number of organizational CSFs reduced were also discussed.

This was followed by a discussion of the fourth objective, which is the rationalization of the underlying structure of the organizational CSFs thus far identified into meaningful

components for the purpose of creating an insightful framework of organizational CSFs of e-Purchasing implementation success in construction organizations.

The chapter then discussed the last objective, which is the identification of the individual predictors, or CSF items, that significantly contribute to e-Purchasing implementation success as measured by project management success and user satisfaction. The statistical methods used to analyse the datasets and the results of each analysis were clearly detailed. The CSF items that emerged as statistically significant predictors and contributors of e-Purchasing implementation success were explained and linked to previous study findings.

CHAPTER 8

CONCLUSION AND RECOMMENDATIONS

8.1 Introduction

This chapter presents the contributions of this study to the existing body of knowledge in the area of supply chain management systems research. It also highlights the limitations of the study and proposes possible future research topics and recommendations for advanced studies.

8.2 Conclusion

The main objective of this research is to uncover CSFs of e-Purchasing implementation success in the construction business that relate to managerial or organizational characteristics. Many studies have been conducted on e-Purchasing implementation success affecting other industrial sectors, but in the case of the construction industry, there have been relatively fewer studies, and the ones that have been carried out thus far have been of a limited scope. To partly address this dearth of construction industry specific study, particularly that which relates to organizational characteristics that have a bearing on e-Purchasing implementation success, this study was undertaken.

As explained in Figure 2.9 (onion model), the key area of this research is Supply Chain Management Systems (SMS). Therefore, many references in this study employ terminologies and concepts from the SCM background. SCM systems, of which e-Purchasing is a sub-set, are applications of technologies to support the management of information within the supply chain. These systems make information shared between trading partners in the supply chain more transparent, thus facilitating decision-making and planning easier. Many applications related to SCM have been discussed in

Chapter 2, such as e-Commerce, Supplier Relationship Management System (SRMS), Enterprise Resource Planning (ERP), and e-Procurement/Purchasing. To come up with this research topic, references were made to articles, studies and research in SCM systems and SCM.

Two important concepts were used to develop the theoretical background of this research. The first is the Resource Based Theory (RBT), which acts as the supporting or underpinning theory; and the second is the critical success factors (CSFs). The RBT was chosen primarily because it gives credence to human resource management as a source of competitive advantage for an organization. It emphasizes on the implementation of strategic initiatives to optimize the use of available resources and capabilities to increase efficiency and effectiveness. More importantly, this theory recognizes organizational attributes as CSFs to achieve competitive advantage. The second concept, which is 'organizational critical success factors', refers to those organizational characteristics, conditions or variables that have significant impact on the success of organizations. It focuses attention to important organizational issues, as opposed to technical or technological issues. These two concepts were combined to derive the research topic, which is 'organizational CSFs of e-Purchasing implementation success.'

This study has accomplished what it set out to do and most of the findings from data analysis suggest consistency with previous study findings. Although it is not without limitations, this study has both theoretical and practical relevance, as will be discussed in the following sections.

Results from descriptive analysis show that almost all of the respondent organizations have adopted e-Purchasing to facilitate procurement operations. However, the level of

adoption differs from one organization to another depending on the size of the company, the number of years of the system's adoption, organization turnover, organization's investment in IT, past experience, and the level of automation of activities within the procurement unit. This finding validates that of a previous study conducted by Caniato et al. (2010) that surmised that the level of adoption of e-Purchasing system by organizations can be categorized as low adopters, intermediate adopters and advanced adopters. The different levels of e-Purchasing adoption by respondent organizations may influence the type of technologies used to facilitate the purchasing process.

This study explored the organizational CSFs through both qualitative and quantitative studies. Results from the content analysis show fourteen (14) organizational CSFs as the main factors that have significant impact on e-Purchasing implementation success in the construction sector. These include a new factor discovered during the interviews. The final list represents a reduction from the original twenty six (26) gleaned from past studies. The findings relating to the CSFs are again consistent with those of past studies done in respect of various industrial backgrounds, and were employed as the basis for the development of the questionnaire instrument used in quantitative study.

Quantitative analysis was performed to determine the underlying structure of the organizational CSFs of e-Purchasing implementation success. Results of the principle components factor analysis reveal eight (8) component factors, which in turn comprise of fifty four (54) sub-items or item predictors, as having profound influence on system implementation success. The selections of the components were based on factor loading score of more than 0.4 as cut-off value and no cross-loading. The framework of

component factors and sub-items was statistically validated and achieved best of fit of dataset.

The final analysis of this study was to examine the presence of relationship between the organizational CSFs of e-Purchasing implementation as independent variables and e-Purchasing implementation success as the dependent variable. For this purpose, two success dimensions namely project management success and user satisfactions were chosen. Results of Spearman rank order correlation analysis show positive correlation between the pair of independent and dependent variables. On average, the results show that the relationship between the pair of independent and dependent variable is of small and medium correlation. The findings of the correlation analysis show that 52 of the 54 CSFs (referred to as the independent variable) are associated with successful implementation of e-Purchasing (referred to as the dependent variable for the two dimensions of project management success and user satisfaction). These findings refine the items that emerged from factor analysis, thus concluding that factor analysis is limited in its capacity to examine inter-correlations between latent variables. From the findings of the correlation analysis, a new framework of organizational CSFs of e-Purchasing implementation success for construction organizations was developed. This represents an improvement to the theoretical frameworks set following literature review and qualitative study.

This study extended the statistical analysis to evaluate the effects of the predictors (the CSFs items) on project management success and user satisfaction using multi regression analysis. For project management success, the results have led to the short listing of the factors that significantly contribute to e-Purchasing implementation success. These factors are the incorporation e-Purchasing policy into existing

procurement policy, the support of the IT consultant to the project team during implementation process, the willingness of the organization to change, the proper coordination and monitoring of the project, and the identification of the levels that stakeholders can get involved. These factors are indeed in line with those uncovered by studies conducted earlier. Meanwhile, for user satisfaction, the shortlisted factors that significantly contribute to e-Purchasing implementation success are the reinforcement of the commitment of employees, the establishment of appropriate milestones, and the willingness of the organization to change. These findings, too, are in line with those of previous studies. Based on these findings, for there to be successful implementation of e-Purchasing, this study expects that there be focused effort to set appropriate procurement policy, ensure the existence of external expert support for the project team during implementation, prepare the organization to embrace the system, boost employee commitment, ensure proper project management, and define stakeholder participation. This summary that is summarized in the form of a meaningful framework known as e-Purchasing Implementation Success (ePIS) Framework can be the starting point for many similar future research in this area.

8.3 Contributions of the Study

The findings of this study can be used to create greater awareness of what factors influence the successful implementation of e-Purchasing. They will provide Malaysian construction organizations with a better understanding of CSFs that affect e-Purchasing implementation. Construction organizations in Malaysia should not only emphasise the technical and financial aspects of the system undertaking, but should also look into all the significant factors discussed in this study in order to be more competitive and avoid the potentiality of huge losses. The implication of this study can be divided into two categories; theoretical and practical contributions. They are addressed below.

8.3.1 Theoretical Contributions

There are significant theoretical contributions of this study as reflected in the findings and the adopted research methodologies. Some of the major ones are as follows;

i) This study contributes to academic research by producing the empirical evidence to support the theories of CSFs and e-Purchasing implementation success. This research confirmed that organizational CSFs are positively correlated with successful e-Purchasing implementation.

ii) This study is probably the first of its kind to specifically study on e-Purchasing implementation in the Malaysian construction industry that highlights the organizational perspective as an ingredient for success. To date, there are no systematically examined and investigated CSFs of e-purchasing implementation in the construction industry as opposed to those involving other industries. Hence, most of the existing studies derived their sets of CSFs from other than construction industry perspective. Thus, they have not really been designed to meet the needs of the construction industry sector. This study aims to fill this knowledge gap and expand the investigation on the CSFs of e-purchasing implementation to the construction industry, focusing on organizational characteristics. This study thus adds to the growing body of knowledge on e-Purchasing implementation and extends the scope of e-Procurement application.

iii) This study provides a unique set of enterprise CSFs that represent the top activities, concerns, strategies, and goals of upper and middle level management. As suggested by Caralli (2004), enterprise CSFs relate to the top two or three layers of management and reflect the various CSFs found throughout the organization. By implication, therefore, this study has taken into consideration

every layer of management responses to e-Purchasing implementation, from upper level management (strategic and tactical) to senior management (functional/operational), and the different perspectives, focus and priorities. This study has, therefore, derived and sifted a set of CSFs that reflect the different types of responsibilities required of managers in the organization.

iv) This study is underpinned by the Resource Based Theory, and the concepts of CSFs and implementation success. Compared to previous studies on enterprise systems that lack theoretical support, this study can be used as reference for other academic pursuits. Most IT/IS research in construction management in the past developed surveys or proposed research models without IT/IS theories because this type of research approach is still relatively new in construction research (Chung, 2007b; B. Chung, Skibniewski, & Kwak, 2009). This research is an attempt to identify the CSFs that affect e-Purchasing success with strong theoretical backing in supply chain management and IT/IS implementation-related research. Therefore, the contribution of this study can be found in a deliberate attempt to formulate the e-Purchasing implementation success framework for the construction sector where businesses are characterized by projects.

v) The findings of this study came about as a result of a thorough research methodology. This methodology starts with the accumulation of a variety of factors scattered in many publications and later confirmed by practitioners in the field through qualitative study. The scrubbed lists of factors obtained were used as the basis for developing a questionnaire. Draft questionnaires were then evaluated by academic experts for content validity. After some changes were made based on the experts' recommendations, the completed questionnaires were distributed to a

number of respondents in a pilot study to check for validity and reliability. An actual survey was subsequently done to gather quantitative data from a targeted sample through a variety of distribution methods. All the research processes mentioned above, which are mixed methods in nature, are particularly suitable for exploratory study of this nature and will serve as a point of reference for other researchers as they conduct studies within this research topic.

vi) This study provides a basis of research for exploring various supply chain management (SCM) system implementation in the construction industry, especially from an organizational perspective. The ePIS (e-Purchasing Implementation Success) framework may also assist in the study of other topics related to construction supply chain management system applications implementations. It can, for example, provide some exploratory insights on the knowledge types needed to manage the CSFs along the implementation process.

vii) Other theoretical contributions of this research are;

- The extraction of 26 organizational related CSFs based on the Resource Based Theory (RBT) that influences the successful implementation of e-Purchasing across industries.

- The refinement of the organizational CSFs based on the Resource Based Theory (RBT) that influence the successful implementation of e-Purchasing in construction organizations.

- The establishment of a new framework of organizational CSFs of e-Purchasing implementation success in construction organizations,

comprising of 8 main component factors and 54 CSF items through factor analysis and correlation analysis.

- The establishment of a predictive framework of factors that can be used to control and predict how an organization can achieve project management success and user satisfaction from an implementation of e-Purchasing.

8.3.2 Practical Contributions

There are several practical contributions that this study provides. The main implications for practitioners are as follows;

i) The final framework presented in this study should provide practitioners with insight on how to better prepare for e-Purchasing implementation. Specifically, the factors that help e-Purchasing implementation success, the critical factors that need to be focused during the implementation process and the wide array of benefits (both tangible and intangible) that can be achieved from e-Purchasing implementation are some of the areas that practitioners can benefit from the findings.

ii) Identification of the critical factors enables managers to obtain a better understanding of issues surrounding e-Purchasing implementation. Managers can use the factors identified and validated in this study to better prepare themselves for a successful implementation of e-Purchasing system. This study provides useful information to organizations that are either embarking on e-Purchasing implementation or considering implementing e-Purchasing system in future.

iii) This study provides a valuable document for the management of CSFs because managers will know the variety of organizational factors that affect e-Purchasing implementation success and their relative importance in the course of the implementation process. The e-Purchasing implementation methodology is an important component of the procurement implementation strategy, and therefore it is necessary that organizational CSFs should not only be identified, but that their relationship to e-Purchasing implementation success should also be established. This knowledge may help in the allocation and management of project resources along e-Purchasing implementation processes.

iv) The proposed ePIS framework will be helpful to construction organization stakeholders and decision makers to have a better understanding of factors that influence e-Purchasing implementation success. The framework would provide guidance to practitioners in their planning and monitoring of an e-Purchasing implementation project. Organizations can develop their own e-Purchasing success frameworks and extract the factors that are specific to their organizations by using the proposed approach and ePIS framework presented in this paper.

v) This study will help practitioners expand their focus from purely technical factors to organizational factors, and to balance the factors that impact an e-Purchasing implementation.

vi) Practitioners can also use this framework to identify areas of improvement in order to increase the success rate of an e-Purchasing implementation.

8.4 Limitations of Research

Although this study leads to valid conclusion and findings, there are nonetheless some limitations related to data collection and analysis. The main limitations are as follows:

i) The sample size of 81 organizations is small. Obtaining more robust results would require a sample size of several hundred organizations. In regression analysis, to obtain a reliable regression model requires enough sample size. A minimum sample size using a formula by Green (1991) is 416 cases but this study employed only 123 cases. As a result, this limits the reliability and validity of generalising these research results to the population.

ii) There is a limited amount of similar research carried out in the context of the construction industry that can be used as benchmark or for the purpose of literature review.

iii) The types of e-Purchasing packages used by the participating organizations were not controlled due to the limited number of targeted companies. The sample used by this study comprises of a mixed combination of e-Purchasing software and application tools. It is likely that the heterogeneous nature of the e-Purchasing systems used might be problematic and could influence the perception of the respondents when they answered the questionnaire.

iv) The organizational CSFs drawn-up were not associated and arranged according to IT/IS project management cycles or construction project management life cycles but were based on an overall view of the system's implementation processes. This is so because the study is a pioneering effort in construction supply chain

management system and construction IT/IS research, and also because there is limited amount of similar research affecting the construction industry.

v) The derivation of the eight (8) component groupings of CSFs was based solely on the judgement and interpretation of the researcher using factor loading scores of the components. Other researchers may interpret the components differently and possibly produce different results.

vi) The findings of this study cannot be generalised to the bigger population as mentioned earlier. It would require several case studies to confirm the findings of this study before they can be regarded as representative of the CSFs of the whole construction sector.

8.5 Recommendations for Future Research

This study provides several directions for future research. The recommendations are;

i) This study did not identify CSFs for e-Purchasing implementation success according to IT/IS project management cycle or construction project management life cycle. Rather, it looked at the CSFs as applicable to the total process of the system's implementation. Hence, a potential area for further research is to utilize IT/IS project management cycles or construction project management life cycles to identify and organize the CSFs. This approach would identify roles and responsibilities and detailed action plans at every identifiable stages of the project life cycle and this would increase exponentially the chances of initiative success.

ii) Another potential research area is to consider the stages of maturity of organizations implementing the e-Purchasing system. What this means is that the CSFs should be identified by maturity levels. This would help practitioners move from one stage to another stage of maturity until they are considered as having attained full system maturity. During a qualitative study, several interviewees recommended to the researcher to focus on the areas that they claimed are important and one of this is that the industry needs to know what the required set of CSFs is at each maturity level of e-Purchasing usage.

iii) Future research can also look at other dependent variables to represent e-Purchasing implementation success. The present study focuses on project management success and user satisfaction as the yardstick of e-Purchasing implementation success. Future research could examine other meaningful measurements of implementation success.

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