University of Bedfordshire

Title: **The relationship between ERP systems success and internal control procedures: a Saudi Arabian study**

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THE RELATIONSHIP BETWEEN ERP SYSTEMS SUCCESS AND INTERNAL CONTROL PROCEDURES: A SAUDI ARABIAN STUDY

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Ph.D

May 2014

University of Bedfordshire

The relationship between ERP systems success and internal control procedures: a Saudi Arabian study

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A thesis submitted to the University of Bedfordshire, in partial fulfilment of the requirements for the degree of Doctor of Philosophy

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Abstract

In recent years, Internal Control has become the focus of attention every time there is a notable scandal in the corporate world. An effective internal control system can prevent an organisation from fraud and errors, and provide an organisation with assurance and competitive advantages. It is argued that in order to have a robust internal control system, an integrated system, such as an Enterprise Resource Planning (ERP) system is needed. ERP systems have the ability to control user access and facilitate the separation of duties, which is one of the most common internal control mechanisms used in order to deter fraud within financial systems. Moreover, there are other factors that can provide support for effective internal control systems.

This thesis aims to explain how ERP success, organisational and ERP factors affect the effectiveness of internal control procedures. In particular, this thesis develops and validates a research model with empirical evidence collected in the context of the Saudi Arabia business environment. In order to achieve the research aim, this research identifies four key propositions derived from the existing literature to establish the relationships between organisational factors, ERP factors, ERP success and effectiveness of internal control procedures.

An exploratory study is used to initially test the four propositions. The findings indicate that different companies follow different requirements that mainly depend on ownership. Additionally, the study indicates that the eight components of the Committee of Sponsoring Organizations of the Treadway Commission's (COSO) Enterprise Risk Management framework are considered by the companies investigated, however there are variations regarding their level of consideration. The findings suggest that further study is needed to explain the impact of ERP success on internal control and to measure the effect of the organisational and ERP factors.

Based on the four propositions, four hypotheses are developed and tested in a quantitative study. A questionnaire is constructed and sent to 217 Saudi ERP-

implemented companies. 110 valid responses are received. Partial Least Squares Structural Equation Modelling (PLS-SEM) is adopted for data analysis and hypothesis testing.

The results suggest that the maturity of the ERP systems, formalisation and centralisation can impact on the success of ERP systems. Prospectors' strategy, organisational culture and management support are positively related to the effectiveness of internal control procedures. The study results show a positive significant relationship between the success of ERP systems and effectiveness of internal control procedures.

This research contributes to the knowledge at different levels. At the theoretical level, it develops and validates a theoretical framework that links the ERP system success to the effectiveness of internal control procedures. At the methodological level, unlike many of previous studies, this study adopts multiple data collection methods, and a powerful statistical technique, PLS-SEM to generate more robust outcomes. Finally, at the practice level, the study is conducted in Saudi Arabia, which is different from the developed countries in many aspects, such as internal control regulations and taxation system. Thus, the findings can be beneficial to Saudi organisations as well as other Middle-East countries.

Dedication

This thesis is dedicated to my Parents for their patience, prayers and spiritual support over the years. It is also dedicated to my wife, my lovely child (Khalid), my brothers and sisters for their continual love, support and encouragement during my journey to complete this thesis.

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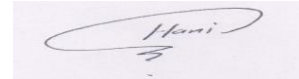
Declaration

I declare that this thesis is my own unaided work. It is being submitted in partial fulfilment of the degree of Doctor of Philosophy, at the University of Bedfordshire. It has not been submitted before for any degree or examination in any other University

__Name of the Student__   *__Signature__*

Hani Khalid Shaiti

List of Abbreviations

Symbol	Name of Item
AICPA	American Institute of Certified Public Accountants
AVE	Average Variance Extracted
CB-SEM	covariant-bases Structural Equation Model
CFA	Confirmatory Factor Analysis
CMA	Saudi Capital Market Authority
COBIT	Control Objectives for Information Related Technology
COSO's ERM	Committee of Sponsoring Organizations Enterprise Risk Management
COSO's IC	Committee of Sponsoring Organizations Internal control
CSA	Control Self-Assessment
EFA	Exploratory Factor Analysis
EICPs	Effectiveness of Internal Control Procedures
ERP	Enterprise Resource Planning
IC	Internal control
ICAEW	Institute of Chartered Accountants in England & Wales
ICPs	Internal Control Procedures
ICS	Internal Control System
IIA	Institute of Internal Auditors
IIA-KSA	Saudi Institute of Internal Auditing
IS	Information System
ISACA	Information Systems Audit and Control Association
IT	information technology
MCI	Ministry of Commerce and Industry
MCAR	Missing Completely At Random
MS	Management support
OC	Organisational culture
OLS	Ordinary least squares regression
PLS	Partial Least Squares
PLS-SEM	Partial Least Squares Structural Equation Model
SCM	supply chain management
SEC	Securities and Exchange Commission
SEM	Structural Equation Model
SGAB	Saudi General Auditing Bureau
SOCPA	Saudi Organisation for Certified Public Accountants
SR	Saudi Riyal
VAF	Variance Accounted For
VIF	Variance Inflation Factor

List of Publications and Conference papers

<u>Working Papers</u>

The Relationship between Enterprise Resource Planning (ERP) Systems and the Effectiveness of Internal Control Procedures; Submitted to the International Journal of Accounting Information System.

Measuring the Enterprise Resource Planning (ERP) System Success in less developed country: Saudi Arabia; Submitted to International Journal of Information Management.

<u>Conference Paper</u>

Shaiti, H., Duan, Y.& Rasaratnam, S. (2014). An Examination of the Role of Enterprise Resource Planning (ERP) Systems in Supporting the Effectiveness of Internal Control Procedures: a Contingency Approach, *The Annual Conference of the British Accounting and Finance Association. London*: BAFA.

Shaiti, H., Duan, Y.& Abdel-kader, M. (2013). Investigating the relationship between Enterprise Resource Planning (ERP) system and internal control: Exploratory study, 11th International Conference on Business: Accounting, Finance, Management & Marketing Athena: Greece.

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Chapter One:
Introduction

1.1 Overview

There is a general perception that the application and enforcement of proper internal control systems (ICS) will normally lead to improve an entity's operations and performances. Internal control (IC) is a crucial feature of an organisation's governance system and is essential to supporting the achievement of an organisation's objectives. An entity puts the ICS in place to keep it on position toward profitability goals, achievement of its mission, and to minimise any unexpected events along the way (COSO, 2011). ICS promotes efficiency and effectiveness, reduces risk of asset loss, supports the reliability of financial statements, and compliance with laws and regulations.

However, establishing and maintaining a proper ICS is a complex, difficult and on-going process for today's organisations (Ashbaugh-Skaife *et al*., 2009). In recent years, IC has become the focus of attention every time there is a notable scandal in the corporate world. For instance, Enron, WorldCom and Tyco in the US, and Parmalat, Ahold in Europe (Huang et al., (2008); Jiang et al., (2010)) have faced breakdown in their ICS. It is an obligatory task for the entity's management to improve its ICS. An effective ICS can prevent an organisation from fraud and errors, and provide an organisation with assurance and competitive advantage.

A group of researchers (e.g. Klamm and Watson, (2009); Morris, (2011); Valipour *et al.,* (2012)) argue that in order to have a robust ICS, an integrated system, such as an Enterprise Resource Planning (ERP) system is needed. ERP systems have the ability to control user access and facilitate the separation of duties, which is one of the most common IC mechanisms used in order to deter fraud within financial systems. However, there are other factors that can affect the influence of ERP systems on the ICS. Existing literature suggests that a number of organisational characteristics can influence the quality of ICS. For instance, Doyle *et al.* (2007a) find that company size, age, structure of complexity and financial resources affect an organisation ability to establish a strong ICS. Zhang *et al.* (2009) find a positive correlation

between the quality of IC and management philosophy, culture, financial position and internal auditing. Further, Jokipii (2010) shows a significant impact of strategy on IC.

Therefore, it is important to investigate the effect of the ERP systems and organisational characteristics on the ICS effectiveness. For this purpose this thesis is guided by contingency approach, which is built on the argument that there is no one best way to organise an organisation, the optimal cause of action depending on external or internal variables. A better organisational performance depends on a better matching between the control system and organisational characteristics (Fisher, 1998).

This chapter provides an introduction to the thesis, including the study background, the study motivations, the study aim and objectives, the method that is adopted to achieve the aim and objectives of this study, and finally the organisation of the thesis.

1.2 Study background

Along with the expansion of the market economy, many accounting and financial fraud cases happen frequently around the world (Rae and Subramaniam, 2008), including some large and well-known companies with a good ICS. Thus, it can be considered that the failure of entity's ICS can due to the mis-implementation of an effective ICS. This section discusses the important of IC, the problems associated with it and the factors that may improve the ICS.

1.2.1 Importance of Internal Control (IC)

IC is one of several features that influence the performance and operation of an organisation. It plays an essential role in achieving the organisation-intended objectives. It can be a classified as one of the most important procedures within an organisation (Doyle *et al.*, 2007a; Dey, 2009). IC is defined by the Committee of Sponsoring Organizations of the Treadway Commission as:

> "*a process, effected by an entity's board of directors, management and other personnel, designed to provide reasonable assurance regarding the achievement of objectives in (1) the effectiveness and efficiency of operations, (2) the reliability of financial reporting, and (3) the compliance of applicable laws and regulations*" (COSO, 1992, p.3).

A system of IC can help an organisation to achieve its targets (including performance and profitability targets), and help to prevent loss of resources. It can help ensure reliable financial reporting, avoid loss to its reputation and other consequences. Additionally, it can help ensure that the entity complies with pertinent laws and regulations. Therefore, ICS is an important feature in an organisation structure which can be used to monitor the entity's activities by the management to ensure good governance (Vijayakumar and Nagaraja, 2012).

According to the Financial Reporting Council (2005), the IC is important for five main reasons. Firstly, ICS has a role in managing financial risks. Secondly, the existence of ICS in a company can help to provide assurance and confidence to the company's shareholders. Thirdly, a part of the firm's objectives are the three IC objectives, namely effective and efficient operations, reliability of the report, and compliance with law and regulation. Fourthly, under the ICS there are different important concepts such as providing effective financial control, protection of assets, and prevention and detection of fraud. Lastly, ICS is not just about mitigating financial risks; it is more for managing and controlling the financial risks.

In addition, IC is one of the most important corporate governance mechanisms; it helps to deliver accountability and enables an organisation to monitor and control its operations. According to the Statement of Auditing Standard (SAS300):

> "*[...] an internal control system can perhaps be distilled into the whole set of controls, financial and otherwise, which enable management to run an efficient business, safeguard assets, protect against error and fraud, and prepare accurate, complete and timely accounting records*" (Auditing Practices Board (APB) 1995, p.20).

It is important for an entity to have a strong and effective ICS or internal control procedures (ICPs), yet there are several consequences that may make that difficult.

1.2.2 Problems of IC

Management requires designing and implementing a strong and effective system of IC. Strong and effective ICS can make frauds difficult to commit and make errors likely to be discovered. It can positively affect the operations of an organisation and the allocation of the entity's resources (Patterson and Smith, 2007). However, there are some problems facing an organisation when it comes to having an effective ICS. Firstly, regarding implementing an effective ICS, there is a gap between theoretical and actual IC performance. Little is known of the actual ICPs utilised in an organisation. Most of the prior research focuses on the material weaknesses of the IC (Doyle *et al*., 2007a; Elder *et al*., 2009; Morris, 2011).

Secondly, the data on quality of IC is not generally obtainable (Krishnan, 2005), which can explain the shortage of studies in this area. Although, some countries have regulations that require companies to report on the effectiveness of their IC over financial reporting, for example the Sarbanes-Oxley Act of 2002 (USA, Canada, Japan and others), there are many countries which have no such regulation. Further, managers might seek to implement weaknesses in the ICS or not to implement the ICS effectively. Managers who aim to commit fraud have a motivation to implement weaknesses into the ICS because the benefits of fraud are more tempting to dishonest managers when the ICS or ICPs is weak (Patterson and Smith, 2007).

Thirdly, another problem of an effective ICS is the cost. There is a positive relationship between a strong ICS and the cost of designing and implementing it. Further, poor monitoring of an entity's ICS can be another problem. The quality of an entity's IC is a function of the quality of its control environment, which includes the board of directors and the audit committee. One of the duties of the audit committee is to oversee the ICS. Krishnan (2005) finds that companies with independent and expert audit committee members are less likely to have IC problems.

Although, many academic scholars and professionals (such as: McEnroe, 2009; Chan *et al*., 2008; Doyle *et al*., 2007a; Morris, 2011) have studied the issues behind the area of IC, there is still an absence of a comprehensive empirical study that investigate the factors (such as the ERP system, structure, strategy and management

support) that can lead to implement an effective ICPs. The following section provides a brief background of the factors that can support the IC effectiveness.

1.2.3 Effectiveness of IC

In the previous section a number of the IC problems are presented. This section addresses the question of how the effectiveness of IC can be supported by ERP systems as integrated systems and organisational factors (such as structure, strategy, size and management support).

- ERP systems and their success

ERP systems are commercial software packages, which provide cross-organisation integration through entrenched business processes and are in general composed of several modules, such as finance, operation and logistics, procurement, human resources, sales, and marketing (O'Leary, 2000). ERP systems emerged in the early 1990s by expanding the traditional Manufacturing Resource Planning (MRP II) system (production planning and planning tools) to integrate activities outside the production scope (Jacobs and Weston, 2007). According to Alshawi *et al.* (2004), today ERP software has become the backbone to many big enterprises around the world.

Although, the cost of ERP software, planning, implementation, customisation, configuration, and testing is high, many academic scholars and professionals (such as Hendricks *et al*., 2007; Grabski *et al.,* 2011; Granlund and Malmi, 2002) have argued that ERP systems as a computerised Information System (IS) can provide an organisation with several benefits. From the business perspective, ERP systems can support the coordination of the information flow, from raw materials to finished goods (Subramanian and Peslak, 2010). This is especially true because ERP systems can automate and make coherent to the information flow from one department (function) to another to ensure smooth completion of processes. They also promise more and better information, which can lead to higher efficiency through retooling common business functions (Al-Mashari, 2003b). ERP systems enable the information to enter once into the system and to be sharable throughout an organisation (McAdam and Galloway, 2005). Additionally, ERP systems have various models, which can provide more support to organisation performance.

Hendricks *et al.* (2007) observe evidences regarding the improvement in the organisation's profitability and performance since the implementation of the ERP systems.

- ERP systems benefit to the IC

Besides the benefits of ERP systems from the general perspective of an organisation, they can improve an organisation's ICS. Firstly, ERP systems can provide direct and easy access for an organisation manager to query the financial information (O'Leary, 2000). Secondly, ERP systems have features to support the control of user access and facilitate the separation of duties, which is one of the most common IC mechanisms used to prevent fraud and errors within financial systems (Turner and Owhoso, 2009). For example, ERP systems can provide the auditors with control reports that show inappropriate segregation of duties. An effective segregation of duties enhances the quality of an organisation's ICS. Thirdly, ERP systems provide timely and complete information, especially for managerial decision purposes (Huang *et al.*, 2008). Fourthly, an extensive utilisation of ERP systems would provide an opportunity to monitor and improve the ICS (Turner and Owhoso, 2009; Masli *et al.*, 2010).

Consistent with these benefits, researchers in the field of accounting information systems provide evidence regarding the impact of ERP systems on the ICS (e.g. Rikhardsson *et al.,* (2006); Huang *et al.,* (2008); Klamm and Watson, (2009); and Morris, (2011)). Rikhardsson *et al*. (2006) examine one ERP solution, called mySAP ERP (offered by SAP, an ERP software vender); they show that mySAP ERP provides functionalities related to accounting, including segment reporting, international accounting standards compliance, planning and control. Additionally, they find that mySAP ERP has functions to support the assessment of IC, such as segregation of duties. Klamm and Watson (2009) and Morris (2011) document that companies using IT systems (ERP) reported fewer IC weaknesses than companies that had not adopted IT systems.

- Organisational factors

Although the IC frameworks, such as COSO's IC, present standardised objectives for an effective ICS, it can still be argued that the effective implementation of ICS is based on a firm's characteristics. This concurs with contingency theory, which states that "each organisation has to choose the most suitable control system by taking into account contingency characteristics" (Jokipii, 2010, p.115). Otley (1980) defines the contingency approach as being "based on the premise that there is no universally appropriate (control) system which applies to all organisations in all circumstances" (p.413). Contingency theory literature identifies a number of factors, such as technology, environment, strategy, structure, and size, which significantly influence the design and implementation of an effective ICS (Chenhall, 2007; Woods, 2009; Jokipii, 2010).

To study the effectiveness of ICPs, it is important to explore the organisational factors that may affect the ICPs and those relationships with the ERP systems. Prior studies identified different contingent factors based on different perspectives. For example, Ge and McVay (2005) focus only on the characteristics (factors) of those companies with material weaknesses (as the most powerful type of IC deficiencies). They find that poor IC is related to business complexity, firm size, and an insufficient commitment of resource for accounting control. Consistent with Ge and McVay (2005), Doyle *et al*. (2007a) find that the existence of material weaknesses is associated with the firm's size, age, financial health, complexity, growth and corporate governance. Zhang *et al.* (2009) find that financial position, size, organisational culture, management philosophy, and internal auditing are positively associated with the quality of IC, whereas degree of decentralisation and control power of the largest shareholder are negatively correlated to the quality of IC.

From the above background, this thesis aims to explain how the ERP success and contingency factors (both organisational and ERP factors) affect the effectiveness of ICPs. The following section explains the motivation and rationale of this study.

1.3 Research motivation and rationale

Failure to detect and prevent frauds has serious effects on an organisation. Referring to Rae and Subramaniam's (2008) study in the USA, the annual financial costs

associated with employee fraud is estimated around US$50 billion per year. In the UK, it is estimated, in 2005, that the annual cost of employee fraud for listed companies alone amounted to some £2 billion. Additionally, between 2011 and 2012, 49% of the Saudi Arabian companies that participated in the Global Fraud Survey were affected by fraud (KAS, 2012). The literatures on fraud (e.g. Rae and Subramaniam, 2008; Barra, 2010; Ashbaugh-Skaife *et al*., 2009; and Cappelletti. 2009) consistently argue that an effective ICS can help an entity to prevent, detect and correct errors and fraud. Therefore, this research is motivated by the on-going debate about an effective IC and its importance in preventing business fraud or errors.

An effective IC can help an entity to achieve its profitability and performance targets, and to avoid loss of resources. It can help ensure reliable financial reporting and compliance with laws and regulations (COSO, 1992). However, the data that determine whether particular ICS is effective is not generally observable (Kinney Jr, 2000; Krishnan, 2005). Researchers use different indicators to determine whether a particular ICS is effective or not, such as management reports of the IC weaknesses, audit committee reports, and 8-K reports (Ramos, 2004; Doyle *et al.*, 2007a; Chan *et al.*, 2008; Morris, 2011). Yet, these indicators could not be sufficient to determine whether an ICS is effective (COSO, 1992; Huang *et al.*, 2008). Additionally, there are some countries (e.g. Saudi Arabia) that have no mandatory IC regulations such as the Sarbanes Oxley (SOX) Act (2002) in the USA. Thus, the need for enhancing the importance of a wider indicator, such as COSO framework components, to assess the effectiveness of ICPs is necessary.

COSO was established in 1985 in order to help companies evaluate and enhance their ICS, and in 1992, COSO published its Internal Control-Integrated Framework. The committee has updated the original framework in response to changes in business and operating environments, increased market globalisation and advances in technology. The original COSO framework contains three objectives and five control components (Control Environment, Risk Assessment, Control Activities, Information and Communication and Monitoring). Between the objectives (what an entity tries to achieve), and the components (what is needed to achieve the objectives) there is a

direct relationship. The presenting and functioning of the five components can be used to assess the effectiveness of particular a ICS (COSO, 1992). Chang and Jan (2010) use a case study approach to answer the question of "what are the key control items in building effective and robust internal control framework" (p.283). They state that the COSO framework can be used to build an effective ICS and can help shareholders, managers, and auditors in assessing the effectiveness of internal control procedures. Therefore, this study is motivated to test the ability of the COSO framework in assessing the effectives of the ICPs for different enterprises.

In addition, the current study is motivated to investigate the factors that can support the effectiveness of ICS and measure their impact. An organisation might need an integrated system, such as ERP systems (Huang *et al.*, 2008). An important feature for a robust ICS is the segregation of duties. The legacy system does not support this function as well as an integrated system does (Turner and Owhoso, 2009). Although, there several studies (Rikhardsson *et al.*, 2006; Huang *et al.*, 2008; Kumar *et al.*, 2008; Morris, 2011) investigated the impact of the implementation of ERP systems on the IC, this study is motivated to investigate the influence of the post-implementation of ERP systems. Further, it is motivated to examine the impact of a large number of factors on the relationship between ERP systems success and ICPs effectiveness.

Furthermore, this research applies contingency approach to respond empirically to calls by Chenhall (2007) and Ifinedo and Nahar (2009), in order to increase understanding of factors that explain success of ERP systems and the effectiveness of ICPs. According to COSO (1992), "different entities' internal control systems operate at different levels of effectiveness" (p.20); this gives rise to the need to adopt a contingency approach perspective. The contingency theory literatures indicate that factors such as external environment, technology, and strategy affect the design and functioning of organisations (Chenhall, 2007). In practice, there is no unique best structure to all organisations under all circumstances; each organisational structure different, and is a response to a set of contingencies (Abdel-Kader and Luther, 2008). The literature shows that important characteristics can affect ERP systems as well as the effectiveness of ICPs (Gable *et al.*, 2003; Bronson *et al.*, 2006; Leone, 2007).

Therefore, the current study seeks to determine which contingency factors are responsible in explaining the success of ERP systems as well as the effectiveness of ICPs. This study is different from other contingency theory studies in that it incorporates a number of contingences that have not been considered deeply in previous research, such as: organisational culture (cooperation and coordination), maturity of ERP systems, and brand of ERP systems.

1.4 Significance of research context – Saudi Arabia

Unlike previous studies that have investigated the effectiveness of ICPs in different legal environments and economies, this study investigates the relationship between ERP systems success, organisational factors and effectiveness of ICPs in the Saudi Arabian business environment. Despite Saudi Arabia's role in the global economy as the largest exporter of petroleum in the world, the Saudi business environment has not yet been adequately the subject of academic studies. Thus, the study attempts to address a significant research gap in the literature. The country has witnessed many reforms, including its social life, political systems, and business.

For instance, after long negotiations, in 2005, the Kingdom of Saudi Arabia became a member of the World Trade Organization (WTO) after adopting numerous regulations to its legal system (WTO, 2012). This competiveness impels most Saudi companies to adopt international practices. According to the WTO (2012) annual report, in 2010, the country ranked twelfth amongst world merchandise exporters and twenty-first amongst importers (considering the European countries together and excluding intra-EU trade). In services trade, the Kingdom of Saudi Arabia ranked thirty-third amongst exporters and eleventh amongst importers.

The legal system of the country is quite different from others'. The country's legal environment is dominated by Islamic Law (Shari'ah), which is based on the holy book of Islam (Qur'an) and the prophetic guidance (Sunnah). All aspects of the country's life are influenced by Islam, including the constitution and social behaviour (Al-Turki, 2011). In practice, Islam influences the business environment and operations. Accordingly, when the country adopts particular standards or practices, such as corporate governance practices or accounting and auditing

standards, it always attempts to adjust these standards or practices in accordance with the country's environment and Islamic law (SOCPA, 1999; CMA, 2006).

Although, the Saudi legal system that relates to business environment has been significantly influenced by U.S and UK system, the country has no mandatory ICS (e.g. SOX Act) regulations that apply to Saudi companies. Additionally, the tax system in the country is different than other. The tax payment only subject to non-Saudi national companies, whereas citizen companies are subject to pay 'Zakat'[1](Al-Sakran, 2001). The rate of Zakat is very small (2.5% of the income) comparing with the tax rate in the countries around the world. Thus, managers who manipulate company earning in order to reduce the income tax would be less motivated to do so in Saudi business environment.

Regarding the technology, Saudi Arabian organisations are not far behind in implemented ERP systems than western organisations where ERP is developed. Although, there are differences between Saudi Arabia and western organisations (in the economic, legal, socio-political, and cultural environment), ERP systems have been adopted in many different Saudi organisations in both private and public sectors (Al-Turki, 2011). ERP systems started to become known in Saudi Arabia from 1993 (Al-Muharfi, 2010). The number of Saudi Arabian companies adopting ERP systems is increasing rapidly, especially among large- and medium-sized organisations and across different types of industries. Some have simply adopted a software systems package (e.g. SAP, ORACLE, PeopleSoft), while others have developed new local ERP systems (e.g. MADAR).

SAP and Oracle are the most popular ERP systems in Saudi firms. For example, Saudi Aramco, SABIC, and the Saudi Electricity Company have implemented SAP, whereas companies like Saudi Telecom Company (STC) and Mobily Telecom Company have adopted Oracle[2]. There are also several organisations that have adopted different types of ERP system, such as PeopleSoft and Microsoft Dynamic. Some researchers in Saudi Arabia have focused on the area of ERP systems (e.g. Al-

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[1] 'Zakat' is a religious tax based on Islamic law, the Sharia, assessed on earnings and holdings. There is no penalty for late payment of the Zakat. It distributes to charity and poor pebole.
[2] sap.com, oracle.com

Mashari, 2001; Al-Mashari, 2003; Al-Mashari and Al-Mudimigh, 2003; Al-Mashari and Zairi, 2006; Al-Mudimigh, Zairi and Al-Mashari, 2001), yet to the best of the researcher's knowledge, the examination of the ERP system success (pre-implementation) in this context remains to be fully addressed.

1.5 Aim and objectives of the study

1.5.1 Study aim

The overall aim of this study is to examine how ERP success, organisational and ERP factors affect the effectiveness of ICPs. In particular, it develops a research model linking ERP success, and organisational and ERP factors to the effectiveness of ICPs and validates the model with empirical evidence collected in the context of the Saudi Arabia business environment.

1.5.2 Study objectives

To achieve the research aim, this study seeks to fulfil the following objectives:

1. To identify the current performance of IC practices, including IC requirements and reports, in Saudi Arabia business environment as well as the organisational characteristics that can improve the effectiveness of ICPs.

2. To establish the relationships between ERP success and contingency factors to the effectiveness of ICPs by proposing a research model and its associated research hypotheses.

3. To test the research hypotheses with empirical evidence collected using a questionnaire survey conducted with the companies in Saudi Arabia.

4. To provide key findings on factors affecting ICPs and offer implications for research and practice regarding the effectiveness of ICPs.

1.6 Research methodology and process

To address the research objectives, this study employs a survey strategy utilising two data collection instruments, interview and questionnaire surveys, in order to increase validity and reliability. This research strategy is structured within the positivist paradigm. This paradigm depends on the assumption that social reality is more objective and includes unbiased decisions. Because the positivist study measurement is an essential element of the research process, the data are highly specific and precise, so findings tend to be more reliable (Collis and Hussey, 2009). Under the positivist paradigm, research is deductive. Therefore, the study starts by developing the preliminary theoretical structure including four propositions based the literature review.

An exploratory study is completed to understand the research context and to develop research hypotheses based on the four propositions. Twelve interviews with the Chief of the Internal Audit department or Accounts and the Chief of the Management Information System department are conducted in order to achieve the study aims. The interviews are semi-structured in nature. The semi-structure model helps the researcher to explore any issues that may arise during the interviews (Blumberg *et al.*, 2008).

Based on the exploratory study as well as literature a questionnaire is developed. The questionnaire survey approach is adopted to collect the primary data and to test the hypothesised relationships among the contingency factors, ERP systems success and effectiveness of ICPs using a structural equation modelling approach. The study is carried out under assumption that the sample organisations surveyed are representative of the general population of the Saudi ERP-implemented firms. 217 questionnaires were distributed, and 110 valid responds were received (response rate of 52%). The data is analysed by using two types of software, the SPSS program and the Partial Least Squares (PLS). Figure presents the study's processes.

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Stage 1
- Research Gap
- Proposition Development
- Preliminary Theoretical Framework

Stage 2
- Interview Questions
- Exploratory Study
- 12 Interviews

Stage 3
- Hypotheses Development
- Updating the Theoretical Framework

Stage 4
- Questionnaire Design
- Questionnaire Pre-testing
- Translation
- Data Collection

Stage 5
- Measurement Model Analysis
- Structural Model Analysis

Stage 6
- Follow up interviews
- Discussion
- Conclusion

Literature Review

Figure 1.1: Research Process

1.7 Organisation of the thesis

This chapter presents the research background including the importance of IC and ERPs, research motivation, research aim and objectives. It also includes the research the significance of the research context, methodology and processes. The remainder of this thesis is organised as follows.

A literature review is provided in chapter two. It covers IC, ERP systems success, and contingency factors, as well as their relationships. This chapter seeks to demonstrate the relative dearth of the study's main aspects. Thus, IC is discussed in terms of identifying IC and its frameworks, followed by presenting prior studies related to IC. Regarding ERP systems, the chapter discusses the success information systems models and presents the prior research in this area. This is followed by an explanation of the contingency factors used in this study (structure, strategy, size, organisational culture, management support, maturity, ERP brand and age). Chapter two concludes by presenting the gaps in knowledge.

Chapter three uses the models and frameworks provided in the previous chapter as the foundation to develop the primary theoretical framework of the study. Contingency theory is also explored; this includes contingency theory framework, forms of contingency fit, criticism of contingency theory, and contingency theory in management accounting. This chapter concludes by identifying four propositions.

Chapter four explains the research methodology employed. This includes research philosophy, especially research philosophy in management accounting, and research approach. Research design and data collection methods are discussed. Then the exploratory study and the quantitative study are explored, including the construction of the questionnaire. It is concluded by addressing the statistical techniques used for analysis.

Chapter 1: Introduction

Chapter five outlines the exploratory study findings and updates the study's theoretical framework. The chapter also discusses the development of four groups of hypotheses, namely: relationships between organisational factors and effectiveness of ICPs, relationships between organisational factors and success of ERP systems, associations between ERP factors and success of ERP systems, and the relationship between ERP systems success and effectiveness of ICPs.

Chapter six summarises the descriptive analysis of the organisational characteristics. It then outlines the development of the measurement model, including the development of appropriate measures of the study's constructs, as suggested by the literature. This chapter explains in detail the processes used to refine these measurements, using factor analysis, and construct reliability and validity.

Chapter seven summarises the descriptive analysis of the study's constructs. This is followed by explaining in detail the procedures for assessing the significance of the structural relationships between the study's constructs in the structural model (which provides the basis for testing the research hypotheses).

Chapter eight discusses the finding of the hypothesis testing and compares the findings with earlier research. This chapter also includes discussing the follow-up interviews for unexpected results.

Chapter nine presents a summary of this thesis and draws conclusions, based on findings from testing the research hypotheses. This chapter also highlights the limitations of the current research, providing opportunities for future research.

Chapter Two:
Literature Review

2.1 Overview

The growing concern about IC in the context of the recent financial crisis casts doubt on the effectiveness of ICPs in avoiding the occurrence of such crises. IC can be considered as the most important procedure within an organisation; it can prevent and detect errors and frauds that an organisation may face and it can provide reasonable assurance for the organisation's data and resources. Consequently, establishing and maintaining an effective ICS is particularly essential to organisations. However, designing an effective ICPs require the company to consider its own characteristics.

Arguably, implemented an ERP system is one way to influence the ICPs of an organisation. Although an ERP system is significantly important, only a modest body of literature examines the effect of this construct on ICPs. Therefore, the focus of this chapter is to explain the underlying concepts, and a principle of the research main constructs, with consideration of Saudi Arabia regulation's systems as it the context of this study. In particular, this chapter provides a critical review of the literature that relates to ICPs, ERP systems, contingency factors and identifies the gaps that can help in developing a theoretical framework for this research.

This chapter is divided into seven sections. Section 2.2 presents the IC framework in the literature and the underlying concepts and principles. Section 2.3 discusses the ERP systems and the success models. Section 2.4 provides a summary of relevant prior research related to ERP systems and ICPs. Section 2.5 discusses the relevant contingency factors to this study. Section 2.6 addresses the gaps in literature. The last section 2.7 summaries the chapter.

2.2 Internal control (IC)

Internal control has long been recognised as an important feature of an organisation. It plays an essential role in achieving organisation-intended objectives. IC is prerequisite and fundamental to successful operations (Vijayakumar and Nagaraja, 2012). It is a broad concept, which includes all controls relating to organisation governance (IFAC, 2012), business activities, management processes (Rae and

Subramaniam, 2008), and more generally the organisation's performance. Additionally, Fadzil *et al*. (2005) indicate that the concept of IC is not fundamentally different from management control, which has an important component of control such as staffing, planning, organising and directing. Therefore, it is important to define and understand the concept of IC and how can be evaluated or assess.

2.2.1 Background of IC

In 1949 the American Institute of Accountants (today known as the American Institute of Certified Public Accountants, AICPA) defined IC with the first authoritative definition as:

> "*Internal control comprises the plan of organization and all of the coordinate methods and measures adopted within a business to safeguard its assets, check the accuracy and reliability of its accounting data, promote operational efficiency, and encourage adherence to prescribed managerial policies*"*(Hay, 1993).*

They reaffirmed it in 1963 as the set of methods adopted within an organisation in order to: oversee the assets, check the reliability and accuracy of its transactions, and compliance with the policies. Auditors, however, have not been satisfied with the definition (Morgan, 1980). During 1980s and 1990s and because of two factors, changes to the concept of IC were underway. These two factors were the expansion of information technology and change in audit methods (Spira and Page, 2003). The implementation of sophisticated information technology has made the business process more complex and eradicated some traditional control processes (Grabski and Leech, 2007). Most of computer software is constructed by an external consultant, so nobody from inside the organisation knows in detail how the software works. Relatively, increasing the adoption of information technology has increased audit fees (Hoitash *et al.*, 2008). That placed the auditors under pressure to reduce their fees and to be more relevant to the business risk approach. Both factors encouraged the UK and USA governments to take responsibility for the way corporations should run (Spira and Page, 2003). In 1992, the Committee of Sponsoring Organizations of the Treadway Commission (COSO) developed a framework, which helps organisations to design and evaluate their ICS. According to COSO, internal control is:

> *"... a process, effected by an entity's board of directors, management and other personnel, designed to provide reasonable assurance regarding the achievement of objectives in (1) the effectiveness and efficiency of operations, (2) the reliability of financial reporting, and (3) the compliance of applicable laws and regulations". (COSO, 1992, p.3).*

Thus, boards of directors or managers are responsible for designing processes, which help to ensure that an appropriate ICS is in place to achieve organisational objectives. The definition includes achieving three classes of objectives. The first class relates to an entity's basic objectives, such as performance and productivity goals and safeguarding of duties. The second class deals with preparation of reliable financial statements, which include temporary, condensed, internal and external financial reporting. The third class addresses the compliance of related laws and regulations.

The definition has admitted for the first time the term "effectiveness", which is a significant change to the concept of IC over the four previous decades. COSO (1992) indicates that ICS can operate at different levels of effectiveness. The effectiveness can be judged in each of three categories, namely: the entity's operations objectives, reliability of financial statements and compliance with applicable laws and regulations (section 2.2.3 provides details). In the same year, the UK government produced the Cadbury report (1992) as a contribution to improve corporate governance, although it is limited to financial aspects. The report enhances the responsibility of the entity's directors for reporting the effectiveness of the ICS to the auditors and the auditors have to state that in their report. Related to UK corporate governance, in 1999 the Institute of Chartered Accountants in England and Wales (ICAEW) published the Internal Control–Guidance for Directors on the Combined Code (often referred to as the Turnbull Report, 1999). They define IC as a combination of the entity's policies, tasks, processes, behaviours and other aspects of the entity that combine the effectiveness and efficiency of its operation; the quality of its internal and external reporting; and the compliance with applicable laws and regulations.

An effective ICS should provide reasonable assurance against fraud or breaches of regulations, material error, and business failure. The report states that, although the board of an entity is ultimately responsible for its ICS, it must be recognised that the

board usually authorise the responsibility of establishing, operating and monitoring the ICS to the management. However, it is important to consider the expression of 'reasonable assurance' in the above definitions. No matter how well ICS is comprehended and operated, it can only provide reasonable, not absolute, assurance to the board and management regarding achievement of an entity's objectives (COSO, 1992). Reasonable assurance is a concept that acknowledges that ICS should be proposed and applied in order to provide top management with the appropriate balance between risk and control, so business objectives will be met (PCAOB, 2004).

Additionally, the Cadbury report emphasises the relationship between the IC and the management risks, as was absent before. The ICS relies on the risk management system to identify the main risks that need to be controlled (AMF, 2010). Therefore, it is important to review the risk management and its relation with the IC.

2.2.2 Risk Management and IC

Risk management and ICS complement each other in controlling the company's activities. Risk management is a dynamic system which should be comprehensive and cover all of the company's activities and assets. Risk management aims to identify and analyse the company's main risks, in order to implement controls which are part of the ICS (AMF, 2010). Therefore, the ICS contributes to the management of the risks incurred in the company's activities. In order to provide a more robust and extensive focus on the broader subject of enterprise risk management, COSO developed an enterprise risk management framework in 2004 (see section 2.2.3) which is expanded on IC framework. They define Enterprise Risk Management (ERM) as a:

> *".... [p]rocess, effected by an entity's board of directors, management and other personnel, applied in strategy setting and across the enterprise, designed to identify potential events that may affect the entity, and manage risk to be within its risk appetite, to provide reasonable assurance regarding the achievement of entity objectives"* *(COSO, 2004, p.2).*

The process is applied across the entity and designed to help the management and other personnel in identifying risks in order to provide reasonable assurance, which enable the entity to meet its business and financial reporting objectives. The definition and the framework of the ERM combine the IC definition and framework.

Thus, risk management and IC should be incorporated within the company's normal management and governance processes and not treated as a separate compliance exercise (FRC, 2013). COSO'ERM (2004) states that the IC is an integrated part of the risk management. Proper risk management and IC can help organisations understand the risks they are exposed to, put controls in place to counter threats, and effectively achieve their objectives. They are therefore a related and important aspect of an organisation's governance, management and operations.

The recognition of the management risk concept in IC has encouraged some researchers to investigate this issue. For instance, Krogstad *et al.* (1999) interpret the Institute of Internal Auditors' (IIA) definition of internal auditors as now *"[recognising] that controls do not exist in a vacuum and implies rather that controls exist to assist the organization in managing its risk and promote effective governance process"* (p.33). Spira and Page (2003) discuss the reasons why the concept of risk links to the concept of IC. They also examine the impact of reinvention of IC as risk management on the internal auditing function. The study indicates that the internal auditors seek to change their role to be more risk management experts. The issue is still unobvious and further, practical study is needed.

Although IC has received attention from academic researchers and professionals, the problem facing them is that data on the quality of IC is not generally observable (Kinney Jr, 2000; Krishnan, 2005). That absence led researchers to use different indicators to identify the quality of IC, such as management reports of the internal control weaknesses, audit committees, 8-K reports and the level of risk (Ramos, 2004; Doyle *et al.*, 2007a; Chan *et al.*, 2008). Therefore, an organisation should establish its IC and RM framework, reflecting its policies and regulations. That has increased the need for a robust IC framework, which can identify, assess and manage the risks. It is important to identify the different frameworks and studies that use them. Therefore, a critical review of IC frameworks and the studies that propose these frameworks is provided next.

2.2.3 IC frameworks

A number of frameworks have been developed in order to support organisations in establishing and evaluating their ICS. The use of IC frameworks has dramatically

increased in importance since the release of the Sarbanes–Oxley Act in 2002 (Tuttle and Vandervelde, 2007). Apparently, the use of a framework to guide an organisation in its design and assessment of its ICS can result in more comprehensive, reliable, and complete assessments. This section discusses four of the IC frameworks: COSO's internal control framework, COSO's Enterprise Risk Management framework, Control Objectives for Information Related Technology (COBIT) and Information Technology (IT) Governance Control Framework. Each framework is identified, discussed and analysed below.

- COSO's internal control framework (1992)
The most widely used model for IC is COSO's Internal Control-Integrated Framework (Lehmann, 2010). Although it is not a mandatory in evaluating ICS, many IC regulations, such as the SOX Act (2002), Turnbull Report (1999), and Saudi Internal Control Standard (SCAS, 2000), promote the use of the COSO framework. Hence, it has become commonly accepted (Hightower, 2009).

The COSO framework was developed in 1992 as a result of calls by the American Institute of Certified Public Accountants (AICPA) as well as the Securities and Exchange Commission (SEC), among others (Dickins *et al.*, 2010). It is designed for an entity to establish and assess its ICS. The framework addresses processes, effected by an organisation's body in term of providing a sensible assurance and to achieve three objectives: the effectiveness and efficiency of operations, reliability of the financial reporting, and compliance with law and regulations (COSO, 1992). Figure 2.1 represents COSO's Internal Control Framework.

Figure 2.1: COSO's Internal Control-Integrated Framework
Source: COSO (1992, p.17)

The COSO framework consists of five interrelated components (Figure 2.1). These components should be effectively present and functioning in order to conclude that the ICS is effective. Therefore, they should be integrated with the management process, yet it can be applied differently for a large company than a small one. Although the control can be less formal and less structured for the small company, it can still be an effective IC. According to COSO (1992) the components are:

Control Environment: the control environment is the foundation for all other IC components and it sets the tone of the entity. It includes the integrity, management's philosophy, ethical values, competence of the entity's employees. It also includes the authority types, and operating style of the entity's managers and employees.

Risk Assessment: every entity faces different types of risk that can be from inside or outside, which must be assessed. Risk assessment refers to the identification, determination, and analysis of relevant risks that may affect a firm from achieving its objectives and settle on how these risks can be managed.

Control Activities: this component contains the policies and procedures that can support the carry-on of management directives. These activities should occur at all the entity's levels as well as functions and should help ensuring that an action is indeed taken in order to manage the risks. Control activities include authorisations,

segregation of duties, verifications, approvals, reviews of operation performance, and reconciliations.

Information and Communication: this component refers to identifying and communicating all relevant information in a form and timeframe in order to enable the entity's people to carry out their responsibilities. This information should include internal and external events, activities, reporting and any data that may influence the entity's decision-making. An effective communication also must be considered among and between the board, management, employees, and external parties, such as suppliers, customers, regulators and shareholders.

Monitoring: it is the processes that assess and evaluate the quality of IC performance over time by different parties such as: top management, internal auditors, and external auditors. This component performs via separate evaluations, on-going monitoring activities or a combination of both. Separate evaluations depend on risk assessment and the quality of on-going monitoring procedures. On-going monitoring should be practised in the course of operations and should contain regular activities of supervision, and other actions such as oversight of the employees in performing their duties.

There is a linkage between these components, forming an integrated ICS, which is reacts dynamically to any changing conditions (e.g. strategy, technology). Additionally, there is a direct relationship between the three classes of objective (i.e. what an entity attempts to achieve) and the five components (i.e. what is needed to achieve the objectives). Figure 2.2 shows that all components are relevant to each class of the objectives. For instance, when looking at the first class of the objectives, effectiveness and efficiency of operations, all five components must be effectively present and functioning to determine whether the IC over operations is effective (COSO, 1992; Hightower, 2009).

Figure 2.2: COSO Framework (1992) Objectives and Components
Source COSO (1992, p.19)

A number of researchers have used COSO's IC framework for assessment of IC quality or effectiveness, such as Fadzil et al. (2005), and Klamm and Watson, (2009). Fadzil *et al.* (2005) examine the influence of the five standards of the SPPIA (Standard for the Professional Practices of Internal Auditors) on the COSO five components. They find that each standard (independence, professional proficiency, scope of work, performance of audit work, and management of the internal audit department) influences one or two of the COSO components. Klamm and Watson (2009) indicate that their results support the interrelationships of the COSO's IC Framework. Their results also show that the number of misstated accounts is positively correlated with the weakness of presented and functioning of COSO components. Jiang *et al*. (2010) find that two of COSO components (control environment and risk assessment) have a positive relationship with the auditors opinion, 'going concern opinion'.

Recently, this framework has been updated by the same committee (COSO, 2011, 2013), in order to address the changes in business environment, the development of technology and to increase the market globalisation, as well as shareholders interest. The updated framework retains the original definition of IC, its five components, and its three objectives. The most distinctive change to the COSO updated framework is the inclusion of 17 principles and their related attributes within the framework components (COSO, 2011). Additionally, according to Janvrin *et al*. (2012) the update framework considers that information technology is related to the IC concept.

Janvrin *et al*. review the updated framework and make several suggestions for research opportunities, including studying the effect of an implementation of an integrated system on the framework.

In addition, COSO has developed another framework, which includes the risk management concept. This framework is presented in the next sub-section.

- COSO ERM framework (2004)
In 2004, the COSO developed the Enterprise Risk Management – Integrated Framework (COSO's ERM), as a response to a need for guidance that can help organisations for designing and implementing an effective approach to risk management. Figure 2.3 is a representation of COSO's ERM framework.
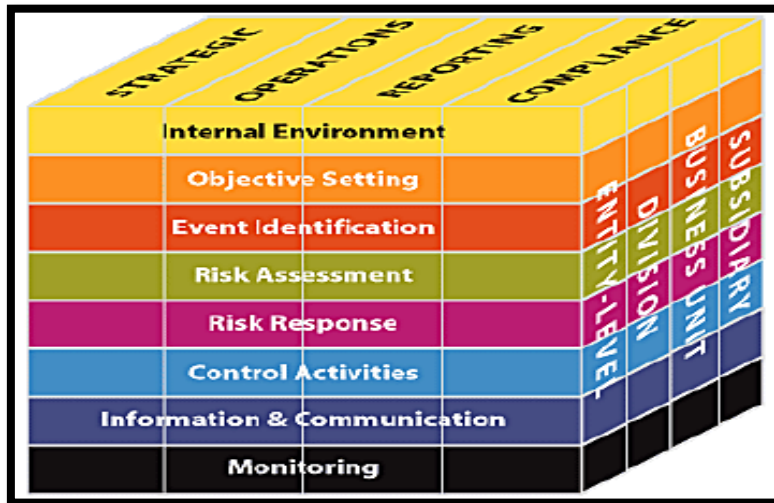
Figure 2.3: COSO's ERM Framework
Source: COSO (2004, p.5)

The COSO's ERM framework does not replace COSO's IC framework; it incorporates the old framework within the new one (COSO, 2004). COSO's ERM framework consists of eight components; five of them are similar to that of COSO's IC Framework (internal environment, objective setting, event identification, risk assessment, risk response, control activities, information and communication, and monitoring). These components are interrelated and have multidirectional influence.

The first component is the internal environment. It is nearly identical to COSO's IC Framework's control environment (Dickins *et al.*, 2010), which is identified in the previous section. The second component is the objective setting. This factor must be

presented before identifying the possible events that may affect the achievement of an entity's objectives. ERM should ensure that top management sets objectives and these objectives support and align with the entity's mission as well as its risk appetite.

After setting objectives, the third component in the ERM framework is event identification. This component includes identifying any event, internal or external, that may influence the achievement of an entity's objectives. For example, changes in technology, interest rate changes or acquisitions. It also includes the distinguish between risks and opportunities. The fourth component is the risk response. Management should determine risk response, such as avoiding, accepting, or sharing risk. They also have to develop a set of actions in order to align risks with the entity's risk appetite. For the remainder components, COSO's ERM is identified them as in COSO's IC Framework (COSO, 2004).

The main difference between COSO's ERM and IC Framework is directional. COSO's IC Framework is illustrated as being integrated from bottom to the top, thus an entity should have only a single set of risks. Whereas COSO's ERM Framework is described as being integrated across the organisation, which allow units and departments to have different risks, and risk responses (Dickins *et al.*, 2010).

Therefore, implementation of COSO's ERM Framework enables an entity to evaluate its ICS and apply a clear risk management process. Limited studies have empirically examined the effectiveness of COSO's ERM Framework (Spira and Page, 2003; Beasley *et al.*, 2005). Beasley et al. (2005) investigate the factors associated with the ERM Framework implementation. They develop a survey by using COSO's ERM definition and elements. They find that the board, senior management, and some of the entity's characteristics explain the reasons for ERM implementation. COSO's ERM Framework is not a complex implementation. Ballou and Heitger (2005) argue that COSO's ERM framework is simple and all organisations can benefit from it regardless of size, risk experience or culture. They conclude that the implementation of the ERM framework is not just for the reason of assessing the ICS, it also supports corporate governance mechanisms, and increases the confidence of stakeholders and regulators (Bowling and Rieger, 2005).

Gordon et al. (2009) indicate that there is a positive impact of the implementation of the ERM framework on organisation performance, but that it is contingent upon matching between COSO's ERM Framework and five contingent variables: environmental uncertainty, industry competition, firm size, firm complexity, and board of directors' monitoring. Collier (2009) makes a comparison between four different approaches to risk management: COSO's ERM, Institute of Risk Management (IRM) (2002), Australia/New Zealand Standards (AS/NZS 4360) (2004), Chartered Institute of Management Accounting (CIMA) (2002). The study states that COSO's ERM and AS/NZS 4360 approach provide more information than the CIMA and IRM. Moreover, COSO's ERM and IRM are more explicit than the other two approaches.

- COBIT IT Governance Control Framework
COBIT is an appropriate control framework that can support an organisation to ensure the alignment between the utilisation of its IT and its objectives (Ridley *et al.*, 2004). It was originally developed by the Information Systems Audit and Control Association (ISACA) and the IT Governance Institute (ITGI) in 1996 (Abu-Musa, 2009). COBIT is an internationally accepted set of tools, which were organised into a framework in order to help the management to ensure their IT supports the achievement of their goals and objectives (ISACA, 2011). It ensures that an entity maximises its benefits of technology and effectively minimises its IT-related risks.

COBIT is one of the most important guidelines for IT governance (Abu-Musa, 2009). According to Lainhart IV (2000) COBIT is currently achieving global recognition as the authoritative source on IT control, IT governance and IT Audit. It incorporates a number of accepted worldwide standards and regulations for IT, such as COSO, International Standards Organization, American Institute of Certified Public Accountants, and Institute of Internal Auditors (Dickins *et al.*, 2010). It has 34 objectives which have been categorised under four primary domains (see Appendix 1.1). These categories are: planning and organisation, acquisition and implementation, delivery and support, and monitoring. The framework also addresses some specific information objectives, including the quality and security of information and the alignment of this information with the entity's business strategy (ISACA, 2011).

It is used worldwide in a variety of ways by public and private industry, accounting firms, government organisations, and academia. Tuttle and Vandervelde (2007) find that COBIT's framework is internally appropriate and useful when applied to auditing IT controls. They indicate that the COBIT framework is considerably related to overall risk assessment of an entity. Furthermore, they suggest that the framework can be used to predict the behaviour of auditors.

- Other IC frameworks
There are other IC frameworks or guidance, established after COSO's IC Framework, such as the Turnbull guidance (in UK), Control Self-Assessment (CSA) (widely use) and some other frameworks developed by academic researchers and professionals (e.g. Mock et al., (2009)). In 1999, the Institute of Chartered Accountants in England & Wales (ICAEW) published the Internal Control: Guidance for Directors on the Combined Code (the Turnbull guidance). The guidance aims to inform the directors of UK listed companies of their obligations and requirements under the Combined Code on Corporate Governance with regard to keeping a good IC (Turnbull, 1999). Additionally, the report intended to:

> "*reflect sound business practice whereby IC is embedded in the business processes by which a company pursues its objectives; remain relevant over time in the continually evolving business environment; and enable each company to apply it in a manner which takes account of its particular circumstances" (Turnbull, 1999, p.4).*

However, the report only provides some guidelines to implement a sound ICS.

The CSA is more an implementation strategy than a control framework (Dickins *et al.*, 2010). It was developed by the Institute of Internal Auditors (IIA) to assess the effectiveness of an entity's risk management and control processes (IIA, 1996). CSA is simply implemented to an entity's units, departments and functions. It allows managers and employees to participate in evaluating the entity's risk management and control processes. CSA's components are aligned with COSO's IC, COSO's ERM and COBIT. In addition, some researchers, for instance, Mock *et al.* (2009), developed an IC framework based on prior IC frameworks or standards. Mock et al. (2009) developed a generic IC over financial reporting assessment model. The model is based on Auditing Standard No. 2 and 5 (PCAOB, 2004) and it contains a financial reporting part and a business process part (Appendix 1.2).

After identifying the IC frameworks, a question such as: whether COSO's ERM framework or another framework can be used to assess the effectiveness of ICPs should be addressed. The next section provides some previous studies regarding IC and how the COSO framework is used by researchers.

2.2.4 Evaluating prior studies of IC

The review of previous studies that have addressed the effectiveness of IC indicates that these studies discuss the topic from different prospective. For example, the importance of disclosing IC deficiencies (Abdel-Khalik, 1993; Shapiro and Matson, 2008), impact of IC weaknesses (Ettredge *et al.*, 2006; Chan *et al.*, 2008; Hoitash *et al.*, 2008), cause of IC weaknesses (Ge and McVay, 2005; Doyle *et al.*, 2007a; Jiang *et al.*, 2010) and the relationship between IC and other factors (Borthick *et al.*, 2006; Rae and Subramaniam, 2008; Morris, 2011). In order to find the gaps in the literature, the following sub-sections discuss some of these studies.

- Importance of disclosing IC deficiencies (weaknesses)
One of the main aspects of ICPs is providing a reasonable assurance regarding the effectiveness of business operations. Although normally the demands for assurance come from the shareholders, Abdel-Khalik (1993) finds that the managers also ask for assurance. He indicates that with the absence of IC regulations, the managers demand operational assurance. He proposes two main reasons for the demand, "....to compensate for the loss of control" that the organisation faces from the changes, and to make the creditors more confident about the organisation's operations. Consistently, Changchit *et al.* (2001) indicate that managers require support from IC in order to approach decision-making. Therefore, disclosing of IC deficiencies can provide an assurance to the entity's management, suppliers, creditors and shareholders.

Ittonen (2010) documents evidence regarding the importance of the material weaknesses disclosure. The evidence suggests that material weakness disclosure is good news to investors. Shapiro and Matson (2008) argue that improving corporate disclosure depends on the implementation of IC regularity. There are two types of IC deficiencies disclosure; regulatory disclosure and voluntary disclosure. One prominent use of IC regulation is the Sarbanes-Oxley Act (2002), SOX. The main objective of this Act is to improve the reliability and accuracy of corporate disclosure. It shows that the SOX Act can induce a stronger ICS and less fraud

(Patterson and Smith, 2007). Essentially, the SOX are mandatory to all U.S organisations and also other companies, around the world, who deal with U.S regulations. In response to the need of strict financial governance lows, other countries (e.g. Germany, Canada, Japan...) enacted the Act.

On the other hand, the Turnbull guidance (1999) is an example for a voluntary disclosure. The Turnbull guidance made a recommendation for the board of directors to disclose significant IC problems (see section 2.2.1). Although disclosure under this report is voluntary, the PricewaterhouseCoopers (2007) report illustrates that 79% of FTSE 350 companies' IC is based on the Turnbull guidance. Therefore, many managers are willing to disclose IC deficiencies, whether, under regulatory disclosure or voluntary disclosure.

- Impact of IC weaknesses
Much research has followed the recent public disclosures of IC weaknesses under the SOX Act (2002), particularly sections 302[3] and 404[4] (Beneish *et al.*, 2008; Chan *et al.*, 2008; Jong-Hag *et al.*, 2013). These studies indicate that poor ICPs could cause more opportunities for managers to manipulate the earnings report. Moreover, intentional and unintentional errors from poor ICPs could lead earnings to become less effective in reflecting the organisation's performance. Chan *et al.* (2008) analyse the audit reports for 149 US companies that have reported IC weaknesses and 908 for companies that have not reported IC weaknesses in the fiscal year 2004 to check if they reported any IC problem. They examine the relationship between IC and earning management. The results indicate a positive relationship between IC deficiencies and discretionary accruals. They suggest that firms should be more concerned with their ICS. Beneish *et al.* (2008) analyse a sample of 330 companies had made unaudited disclosures required by section 302 of the Sarbanes-Oxley Act and 383 companies had made audited disclosures required by section 404. They find that disclosures under section 302 are associated with negative abnormal returns and that impact the equity cost of capital. However, the disclosures under section 404 have no influence on the equity cost of capital. Some of the results are consistent with Tackett et al.

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[3] Section 302 requires top managers to: (1) Certify that deficiencies and weaknesses are confidentially reported to the audit committee. (2) Disclose material weaknesses and material changes in IC to the public.
[4] Section 404 required managers to: (1) Publish information in their annual reports regarding the scope and adequacy of the IC structure and procedures for financial reporting. (2) The statement should also assess the effectiveness of ICPs. Source: http://www.soxlaw.com

(2006) and Doyle *et al.* (2007b)'s findings. In contrast, Jain and Rezaee (2006) and Ashbaugh-Skaife *et al.* (2007) detect a positive relationship between cost of capital levels and capital market reaction, and disclosing of weakness under section 302 and section 404. Ogneva *et al.* (2007) find indirect association between reporting IC weaknesses and cost of equity.

Examining the auditor's opinion, Jiang *et al.* (2010) document an association between the quality of IC and the auditor's 'going concern opinion'. The auditor's opinion can be a 'modified opinion' if the firm discloses the risk or a 'qualified opinion' if the firm does not disclose the risk. They argue that companies with IC weaknesses expect to receive an auditor's 'going concern opinion'.

Although researchers argued that disclosing IC deficiencies under the SOX Act or other mandatory regulations has improved the effectiveness and efficiency of financial reporting (Chan *et al.*, 2008), it has brought different issues to an organisation. For instance, Ettredge *et al.* (2006) and Hoitash *et al.* (2008) indicate that disclosing of IC weaknesses can increase audit fees, delay audit, introduce accounting accruals, decrease share price and increase cost of equity. Consistently, Elder *et al.* (2009) provide evidence that IC material weakness has a significant association with audit fees, especially under section 302 of the SOX Act. Ettredge *et al.* (2006) find that the length of the delay of the audit report is associated with the number of material weaknesses in IC over the financial reporting and also with the type of those weaknesses.

The regulation for disclosing IC problems has improved corporate ICS (Shapiro and Matson, 2008), but the definition of IC material weaknesses is ambiguous. According to Doyle *et al.* (2007a) it is possible that different organisations disclose different types of IC material weaknesses. As a consequence, the disclosing of IC problems might not be sufficient. Therefore, it is important to place more attention to the cause of the IC problems and what the organisations can do to mitigate these problems and risks.

- Cause of IC problems (weaknesses)
Recent studies focus more on the effect of IC deficiencies and problems on different perspective (e.g. Chang and Jan, 2010; Ogneva *et al.,* 2007), yet there are some papers identifying the cause of IC problems (Ge and McVay, 2005; Doyle *et al.*,

2007a; Ashbaugh-Skaife *et al.*, 2009; Jiang *et al.*, 2010). These papers find that the cause of IC problems can be related to the type of company (e.g. small, complex and less profitable), and lack in separation of duties or the type of risk.

Ge and McVay (2005) show that problems in IC related to a lack in separation of duties, inappropriate account reconciliation, lack of an end reporting process and poor revenue recognition policies. Moreover, they analyse the characteristics of the firms that disclosed at least one material weakness in IC after SOX. They study 261 US companies for the period from 2002 to 2004 and conclude that disclosing of material weaknesses is positively associated with business complexity and negatively with firm size and profitability. Consistently with Ge and McVay (2005), Doyle *et al.* (2007a) investigate the weaknesses in IC for 775 US companies between 2002 and 2005. They find that most of those companies were small, having financial problems, a short firm history, and more or more complex operating segments compared to other firms. Jiang *et al.* (2010) classify the cause of the material weaknesses into eight aspects: personnel, process and procedure, documentation, segregation of duties, information system process, risk assessment, closing process, and the control environment.

In addition, increasing the risks would cause higher cost of equity and an increase in IC problems. Ashbaugh-Skaife *et al.* (2009) examine the association between IC deficiencies and idiosyncratic risk, systematic risk and cost of equity. The results indicate that firms with higher idiosyncratic risk (risk affect assets) and systematic risk (market risk) were facing IC deficiencies and this leads to a high cost of equity. The evidence suggests, however, that the "changes in the effectiveness of IC yield changes in the cost of equity consistent with changes in risk" (Ashbaugh-Skaife *et al*., 2009. p.2). Elder *et al.* (2009) document an indirect relationship between IC weaknesses and control risk through the examination of the association between IC weaknesses and audit fees, modified opinion and audit resignations.

The review of the previous literature indicates that there are no many empirical studies have addressed the variables that affect the effectiveness of ICPs. As discussed earlier, many studies on this area focus on the impact of SOX and the material weaknesses of IC. Thus, the following sub-section aims to review the prior

literature of the relationship between IC and other variables and identify the gaps in this area.

- Relationships of IC with other factors
One aim of this study is to investigate how other factors can affect IC effectiveness. An effective ICS is important to management decision making (Changchit *et al.*, 2001), auditors' judgment (Janvrin, 2008), investors' confidence (Woods, 2009; Ittonen, 2010). Therefore, it is important to review some evidence from prior studies that studied the factors that might lead to better IC. Yet, there is limited empirical investigation into the area of IC effectiveness and the relationship with other variables (Borthick *et al.*, 2006; Doyle *et al.*, 2007a; Rae and Subramaniam, 2008). Therefore, in order to review these factors, the researcher refers to some studies related to corporate governance and management control system as IC is an integrated part of the processes of corporate governance (Woods, 2009) and management control systems (Chenhall, 2007).

Accounting researchers have found that organisational size is an important variable when considering the design and use of a management control system (Chenhall, 2007). With respect to ICS, Doyle *et al*. (2007a) and Ashbaugh-Skaife *et al*. (2007) report a positive relationship between organisation size and quality of ICS. Woods (2009) documents that IC is contingent upon three core factors, namely organisational size, central government policies, and information and communication technology. Consistently, Gordon *et al*. (2009) indicate that the relationship between ERM and entity performance is contingent upon the fit of ERM and five factors, which include organisational size, environmental uncertainty, industry competition, board of directors' monitoring and firm complexity.

Additionally, from IC research, evidence suggests the links between IC and organisational strategy. Chenhall states that "contingency–based research predicts that certain types of MCS [management control system] will be more suited to particular strategies" (2007, p.184). Chenhall and Morris (1995) find that the conservative strategy is more appropriate to rigid control. Jokipii (2010) shows a significant impact of strategy on IC. Chenhall *et al*. (2011) study the relationship between strategy as 'product differentiation' (or prospectors), innovation and management control systems. They use three dimensions for control systems: formal

controls, a package of controls that is comprised of social networking, and organic innovative culture. The results indicate a positive association between the strategy and the three control dimensions. Consistent with Jokipii (2010) and Chenhall *et al*. (2011)'s findings, Arachchilage and Smith (2013) as well as Tucker *et al.* (2013) observe a positive relationship between strategy and control system (diagnostic and interactive). Frigotto *et al*. (2013) find that the fit between the management control system and strategy is not helpful in presenting the evolution, yet it is important at the level of practices. In addition, research by Rae and Subramaniam (2008) document an association between the quality of ICPs and three organisational factors (the selection of these factors is based on COSO's IC Framework); namely, corporate ethical environment, the existence of risk management training and internal audit.

Evidence from control system research suggests linkages between different types of structures and the use of a control system (Chenhall, 2007). Bruns and Waterhouse (1975) point out that control is associated with structure of activities. Borthick *et al*. (2006) study the relationship between training (designed with a particular structure and classroom training without a specific structure), knowledge structure and the improvement in the IC reviewing performance. Their results indicate that designed training results in a greater knowledge structure than classroom training. They also provide evidence that the greater knowledge structure can be effective in improving the performance of IC review. Zhang *et al*. (2009) report a negative relationship between the degree of decentralisation and the quality of IC. From a business unit managers viewpoint, Verbeeten (2010) indicates that business unit structure and business unit strategy influence the change in management accounting and control system.

Furthermore, top management, such as the chief financial officer (CFO), plays a leading role in oversight of IC compliances and processes (COSO, 2011; Hoitash *et al.*, 2012) and literature shows that management support positively affects the quality of IC. Zhang *et al*. (2009) study the firm's characteristics that determine the quality of IC. They find a positive correlation between the quality of IC and management philosophy, culture, financial position and internal auditing. Additionally, the characteristics of the audit committee can play a significant role in improving the quality of IC. This relationship is explored by Krishnan (2005). He uses the Securities and Exchange Commission (SEC) requirements for the audit committee as

a measurement for the quality of the audit committee: size, independency and experience. He finds that independency of the audit committee as well as the level of audit committee members' experience are negatively associated with IC problems (Krishnan, 2005).

A small stream of research (Grabski and Leech, 2007; Kumar *et al.*, 2008; Morris, 2011) examines the association between information technology (IT) and the effectiveness of IC. However no study was found that empirically examines the impact of IT success on the effectiveness of ICPs. Section 2.4 reviews the prior studies of the relationship between IT, particularly ERP systems, and ICPs.

As is illustrated above these variables are very important for improving the quality of IC. However, some of the variables require more investigation, such as organisational strategy and organisation culture as stated in the literature. Thus, another aim of this thesis is to fill this gap and provide more evidence for the IC literature. In addition, the location of the study can be an important factor. This study investigates the Saudi Arabian business environment. Thus, it is important to address some perspectives of the country, for instant, the legal environment, monitoring bodies, IC regulations and recommendations.

2.2.5 IC in the Kingdom of Saudi Arabia

The Kingdom of Saudi Arabia is located in the Middle East. The country's government consists of the executive, legislative, and judicial branches (Cassell and Blake, 2012). Firstly, the executive branch is headed by the King and Prime Minister (who must be from the Al Saud family) serving as both the chief of the country and the leader of government under the title "Custodian of the Two Holy Mosques" (CIA, 2011). The executive cabinet is called the "Council of Ministers" and the king is responsible for appointing the members. Secondly, the legislative branch comprises the "Consultative Council" or "Majlis al-Shura", which consists of a chairman and 150 members (appointed by the king) (CIA, 2011). Thirdly, the judicial branch comprises the Supreme Court, the Islamic Courts of First Instance and the Supreme Judicial Council and Appeals (Cassell and Blake, 2012).

The legal system of Saudi Arabia plays an important role in effecting its regulations and practices. The country's legal environment is primitive and dominated by Islamic Law (Shari'ah), which is based on the holy book of Islam (Qur'an) and the

prophetic guidance (Sunnah). All aspects of the Kingdom's life are influenced by Islam, including the constitution and social behaviour (Al-Turki, 2011). In practice, Islam influences the business environment and operations. Accordingly, when the country adopts particular standards or practices, such as corporate governance practices, accounting and auditing standards or IC regulations, it always attempts to adjust these standards or practices in accordance with the country's environment and Islamic law (SOCPA, 1999; CMA, 2006).

There is a number of monitoring bodies in Saudi Arabia, however, in this section only those bodies responsible (directly and indirectly) for IC in Saudi Arabia are briefly identified as follows:

The Ministry of Commerce and Industry (MCI)[5]: is considered as the main body that monitors Saudi companies. Some of the most important responsibilities of the Ministry are to regulate, supervise and register the Saudi companies.

The Saudi Capital Market Authority (CMA)[6]: is an independent body, linked directly to the Prime Minister. The role of the CMA is to provide appropriate rules and regulations to Saudi companies in order to increase investment and to enhance transparency and disclosure standards. In addition, it provides protection to investors and dealers from illegal activities in the stock market (CMA, 2006). The CMA is also in charge of issuing and implementing regulations, practices and instructions, for example in 2006 the CMA issued the Saudi Corporate Governance code (IC is one of its mechanisms).

The General Auditing Bureau (GAB)[7]: is responsible for improving the government accounting system, formulating internal audit regulation and units within government entities, and improving the financial and audit rules and regulations (Faqeeh, 2010).

The Saudi Organisation for Certified Public Accountants (SOCPA)[8]: plays an essential role in developing the accounting and auditing profession in many ways, such as reviewing and publishing of the accounting and auditing standards (SOCPA, 1999).

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[5] **MCI**: http://www.mci.gov.sa/
[6] **CMA**: http://www.cma.org.sa/
[7] **GAB**: http://www.gab.gov.sa/
[8] **SOCPA**: http://www.socpa.org.sa/

The Saudi Institute of Internal Auditing (IIA-KSA)[9]: was recently established in Saudi Arabia as a non-profit professional organisation, which aims to develop and to promote the Internal Auditing (control) profession in Saudi Arabia. The IIA-KSA is a part of an international network representing the Internal Auditors worldwide. It provides support to Saudi organisations by offering technical guidance (e.g. COSO's IC Framework and COSO's ERM Framework), professional training programs, certification (e.g. Certification in Control Self-Assessment), conferences and networking opportunities.

- IC Regulations and laws in Saudi Arabia
Since Saudi Arabia has a strong historical relationship with the U.S and the UK, the business environment in general has been significantly influenced by those countries' regulations, especially in terms of accounting practices, such as accounting and auditing standards, corporate governance, internal control (SOCPA, 1999; CMA, 2006). Although the aspect of the Kingdom's legal system that relates to the business environment is a mixture of regulation and rules from US, British and other countries' legislations, it is influenced and controlled by the Islamic framework. Therefore, the regulations and rules that have been borrowed from other countries have been adjusted in accordance with Islamic regulations and the character of the Saudi environment.

There are many regulations in Saudi Arabia related to the business environment. This section attempts to shed light on the important regulations and laws that relate to the current study.

Companies Law: is considered to be the first and most important regulation that attempt to regulate Saudi companies. This law was issued by Royal Decree in 1965 as a basic system for all Saudi companies at that time. The law has been modified and new rules have been added in order to keep up with the rapid development in Saudi companies. For example, in 2002 a new rule was added to enhance the role of IC for joint-stock companies (MCI, 1965).

Accounting and Auditing Standards: in 1989 the Saudi accounting and auditing standards were issued, originally derived from American standards. SOCPA is the body responsible for developing and reviewing accounting and auditing standards in

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[9] **IIA-KSA:** http://www.iia.org.sa/

the country. Overall, the Saudi accounting and auditing standards play a fundamental role in developing disclosure and financial transaction treatments in the Kingdom's environment. Saudi accounting standards consist of 23 standards, for instance disclosure requirements, inventory standard and revenues standard etc. In addition, the Saudi auditing standards consist of 17 standards, such as independence, audit plan, audit report and the internal control standard for the purpose of reviewing financial statements (SOCPA, 1999).

Saudi Corporate Governance: For long time corporate governance mechanisms were ignored by the Saudi government until 2005 when the Saudi CMA drew attention to problems regarding companies' performance, followed by the 2006 Saudi stock market crisis. That indicated serious issues regarding weaknesses in financial reporting, namely a lack of disclosure, transparency, and accountability (Al-Shamari, 2008). As a consequence, in 2006 the Saudi CMA issued the Saudi corporate governance framework as a recommended regulation to companies; in 2010 it became a compulsory regulation to joint-stock companies.

The Saudi corporate governance framework has included essential rules and standards such as the rights of shareholders, transparency, disclosure (including disclosing the effectiveness of ICPs), and board composition, which regulate the management of joint-stock companies listed on the Exchange (CMA, 2006).

2.3 ERP Systems-related literature

The ERP system is a package solution for an organisation's processes and it is designed to automate and integrate all the organisation's functions. The ERP system is a new generation of information systems (IS); it gathers data from across all of an entity's units letting the entity's management have a broader scope. In many cases, the ERP system does not develop in a coordinated way, it is normally implemented as a result of technology innovations (Themistocleous *et al.*, 2001). Therefore, companies use their ERP system without fully understanding its applications and functions (Myers *et al.*, 1997). According to Al-Mashari (2003b), many companies that have implemented ERP have failed to achieve their estimated benefits. It has been argued that assessing the value of the systems is perhaps what the company should do (Heo and Han, 2003).

Assessment is an important procedure for effective management, to provide feedback to the management in order to improve IS functions (Myers *et al.*, 1997). Basically, assessing ERP success refers to evaluating the performance of ERP systems after implementation, which refers to the fifth phase of the ERP system lifecycle framework proposed by Esteves and Pastor (2001) (Appendix 1.3). Gable et al. (2003) define ERP system success as a utilisation of the systems in order to achieve the organisation's goals. The term 'success' uses in literature interchangeably with the term 'effectiveness' (Grover *et al.*, 1996; Westrup and Knight, 2000; Ifinedo, 2006). Thong and Yap (1994) define the term 'effectiveness' as "the extent to which an information system actually contributes to achieving organisation goal" (p.252). It is important to provide a brief introduction to ERP systems before discussing ERP systems success models.

2.3.1 ERP systems

ERP system is one member of the group of Enterprise System Software (ESS) besides supply chain management (SCM), customer relationship management (CRM), and product life cycle management (PLM) (Shang and Seddon, 2002). It is categorised as the most significant class of ESS. The term ERP was introduced in the early 1990s by the Gartner Group (Jacobs and Weston, 2007) as "integrated suites", which automate core corporate activities such as human resources, manufacturing, finance, distribution and sales (Themistocleous *et al.*, 2001). According to Grabski *et al.* (2011), the adoption of ERP systems is motivated by management's need for timely access to coherent information across the organisation units and functions. Idealistic motivations for ERP systems adoption are included: integration of operations, upgrading legacy systems, regulatory compliance, business process reengineering, and management decision support.

The increased interest in ERP systems can be shown by a comprehensive review carried out by Moon (2007), who identified 313 articles from the literature on ERP systems published between 2000 and 2006. Similar Botta-Genoulaz *et al.* (2005),analyse the research literature on ERP systems from 2003 to 2004. They classify the articles under six categories, namely implementation of ERP, optimisation of ERP, management through ERP, the ERP software, ERP for supply chain management, and case studies. In addition, Esteves and Bohorquez, (2007) reviewed 449 articles in bibliographic databases (including conference and journal

publications) referring to ERP during the period 2001-2005. They particularly notice the number of papers that are related to the implementation phase (207 articles) is greater than the number related to other phases (see Appendix 1.3 for the ERP phases).

The increased interest in ERP systems can also be shown by a number of specific journal issues or dedicated sessions in international conferences (Botta-Genoulaz *et al.*, 2005). For instance, the International Journal of Business Information Systems, the European Journal of Information Systems, and the Americas Conference on Information Systems (Esteves and Bohorquez, 2007). This increase of interest by researchers, certainly follows the growing implementation of ERP systems in companies, but more research is required (Brazel and Dang, 2008; Grabski *et al.*, 2011).

Referring to a number of ERP systems literature review articles, such as Botta-Genoulaz *et al.* (2005), Esteves and Bohorquez (2007), Schlichter and Kraemmergaard (2010) and Shaul and Tauber (2013), as well as the ERP systems literature, there is call for more research for the evaluation phase. Specifically, there are very few papers in the area of ERP systems success. Although researchers such as Gable *et al.* (2003) and Ifinedo and Nahar (2009) study ERP system success, the actual factors that may influence the success of such systems is characteristically absent from their studies. This is another gap that this thesis tries to address.

In the following sections, ERP systems success models are discussed. The first models are DeLone and McLean's (1992) IS success models. The second one is Myers *et al.*'s (1997) comprehensive IS functions assessment model. The last essential model is Gable *et al.* (2003). As the concept of contingencies is central to this research, existing literature on the relationship between ERP systems and contingency variables (e.g. structure, strategy, size, ERP maturity) is also discussed.

2.3.2 ERP system success

ERP systems are designed to integrate all data collection functions within the organisation, for both financial and non-financial data (Spathis and Constantinides, 2004). It supports the company's management to have sufficient information on hand for manufacturing setting, supplier orders, and analysis purposes. Despite the

extensive investment that companies around the world made in ERP systems, systematic attempts to evaluate system success have been few (Seddon, 1997; Gable *et al.*, 2003).

Early research concentrates on economic evaluation and financial measures for assessing the value of IS (Bender, 1986). However, the use of the traditional quantitative measures for evaluating IS success has been criticised (Ballantine *et al.*, 1996; Timo, 1996; Gable *et al.*, 2003). Ballantine *et al.* (1996) as well as Ifinedo (2006) state that the use of economic and financial measures to evaluate IS success might overlap effects with other factors that are unlinked to the IS being assessed. It is more acceptable to rely on "subjective assessment and surrogate measurement" for evaluating IS success, that includes user satisfaction, availability and ease of use (Timo, 1996).

In 1992 DeLone and McLean, and Saunders and Jones developed two different comprehensive models for evaluating IS success. These two models made a valuable contribution to improve the understanding of the evaluation of IS success. Ten years later Gable and his colleagues developed a comprehensive measurement model for assessing Enterprise System (ES) success. They employed 37 non-financial measures of four dimensions: system quality, information quality, individual impact, and organisation impact. Substantially, some researchers argue that Gable et al.'s model might be the most applicable for assessing a contemporary IS such as ERP system (Ifinedo, 2006; Petter *et al.*, 2008; Tsai *et al.*, 2011). However, Ifinedo (2006) argues that a more comprehensive success assessment model for ERP systems can be proposed. There can be more dimensions that can correlate with ERP success.

It is important to study ERP success in order to evaluate the contribution of the systems to the world of practice. Investigating the prior studies of ERP success would help fitting the ERP systems with organisational context which can be the key for measuring the impact of ERP systems on ICPs for this research. Therefore, this section addresses the prior ERP success models and concludes by reviewing the impact of some of other variables, such as organisation structure, strategy, size, and maturity of ERP systems.

- DeLone and McLean's (1992) Information System Success Model

DeLone and McLean's (1992) model of IS success is one of the most widely cited models (Myers *et al.*, 1997; Heo and Han, 2003). DeLone and McLean (1992) argue that it is important to study IS success variables in order to see the contribution of IS to the world of practice. They suggest that scholars should "systematically combine individual measures from IS success categories to create a comprehensive measurement instrument" (p.87). Based on Shannon and Weaver's (1949) and Mason's (1978) works, DeLone and McLean develop a model with six interdependent dimensions: System Quality, Information Quality, Use, User Satisfaction, Individual Impact, and Organisational Impact (Figure 2.4). The system quality and information quality jointly affect the use and user satisfaction dimensions. These effects cause an individual impact; and lastly the individual performance would have some organisational impact. The model is proposed to measure IS success in different levels, i.e. technical level, semantic level, and effectiveness level. According to Seddon (1997), the DeLone and McLean model makes three contributions to the research of IS success. Firstly, the model provides a classification for a multitude of IS evaluation measurements that have been reported in the previous literatures. Secondly, it suggests a model of interdependencies among the six dimensions. Thirdly, the model introduces the relevance of different stakeholders in evaluating the success of IS.
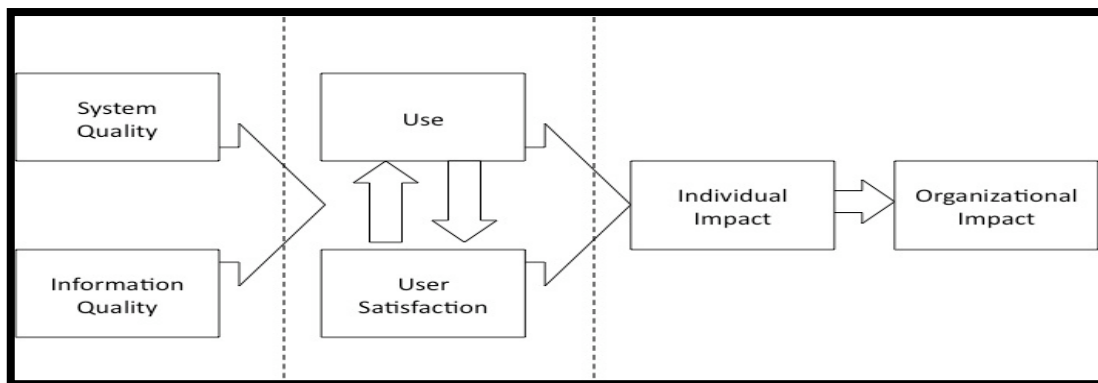
Figure 2.4: DeLone and McLean's (1992) Information System Success Model
Source: DeLone and McLean (1992, p.87)

However, the model has several issues. According to Seddon (1997), DeLone and McLean have done too much in their model, which causes various confusions and problems. One of the problems in the model is the combination between the process and causality in terms of the IS evaluation measurement, which diminishes the value

of the model. Another problem is that the relationships from the system quality, information quality, and user satisfaction to use do not show the ability to measure IS success. Seddon (1997) adds four more variables (expectation, consequence, perceived usefulness, and net benefit to society) in order to clarify the meaning of IS use, yet more empirical study is required in order to validate the contributions (Gable *et al.*, 2003).

An important gap in DeLone and McLean's model is the selection of IS success dimensions for developing a comprehensive measurement model (Gable *et al.*, 2003). DeLone and McLean (1992) suggest that the measures for evaluating IS success should be systematically elected and consider the contingency variables (organisation structure, strategy, size, or technology). However, Myers *et al*. (1997) and Gable *et al*. (2003) document that it is important to employ a full set of success dimensions and not a chosen subset. They also indicate that the model lacks the explanation of causality and theoretical fundamentals.

- A Comprehensive Model for Assessing the IS function by Myers (1997)

Myers *et al.* (1997) suggest a comprehensive IS functions assessment model that matches the organisation performance. They consider the overlap in the DeLone and McLean model as well as the Saunders and Jones model. Saunders and Jones (1992) propose an "IS function performance evaluation model". The model describes how measures can be determined from several dimensions of IS functions, besides considering the importance of contingency factors in the selection of IS function performance measures. However, Myers *et al*. (1997) indicate that the Saunders and Jones model is not considered a comprehensive IS function model because it "provide[s] inadequate list of suggested measure[s] for each dimension" (p.12).
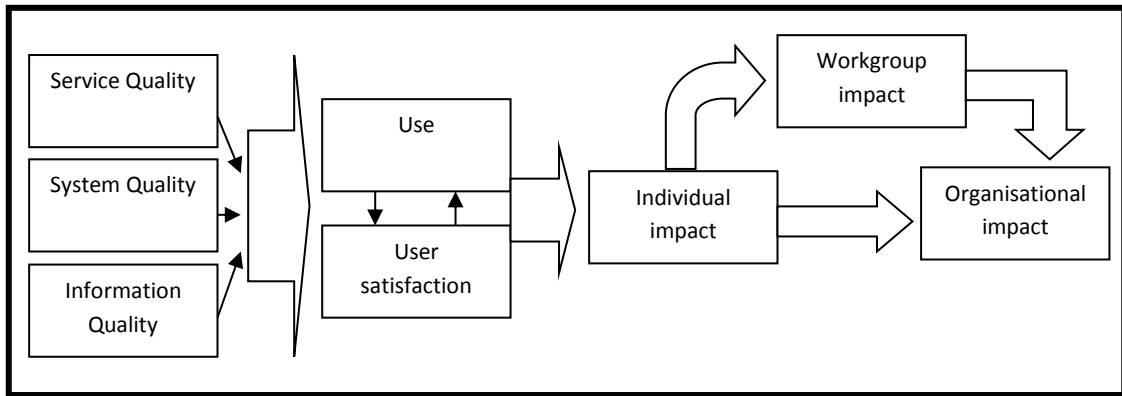
Figure 2.5: Comprehensive IS Assessment Model

Source: Myers et al. (1997, p.13)

Myers *et al.*'s (1997) model contains DeLone and McLean (1992), the six dimensions and additionally "Service Quality" and "Work Group Impact" (Figure 2.5). In this model the system quality, information quality, and service quality jointly affect the use and user satisfaction dimensions. Continually, there is interaction between use and user satisfaction. These effects cause an individual impact; this impact on individual performance would have some work group impact and organisation impact. Lastly this impact on the work group would have some organisation impact. Myers et al. report that IS managers should consider the importance of the equality measure selected among the eight dimensions. They also suggest new measures for each dimension from different work published. However, Myers *et al.*'s model carries some of the DeLone and McLean model's problems (Gable *et al.*, 2003). The completeness of the model is critical: it has positive and negative results and high and low effect.

- Enterprise Systems Success Measurement Model

In 2003 Gable, Sedera and Chan produced a validated measurement model for assessing ERP success. The model is the first comprehensive and empirically tested model that assessed ERP system success. It has been developed based on three different models: DeLone and McLean (1992), Myers *et al.* (1997), and Shang and Seddon (2000), in order to mitigate individual errors. The model contains four dimensions: individual impact, organisation impact, system quality, and information quality (Figure 2.6).
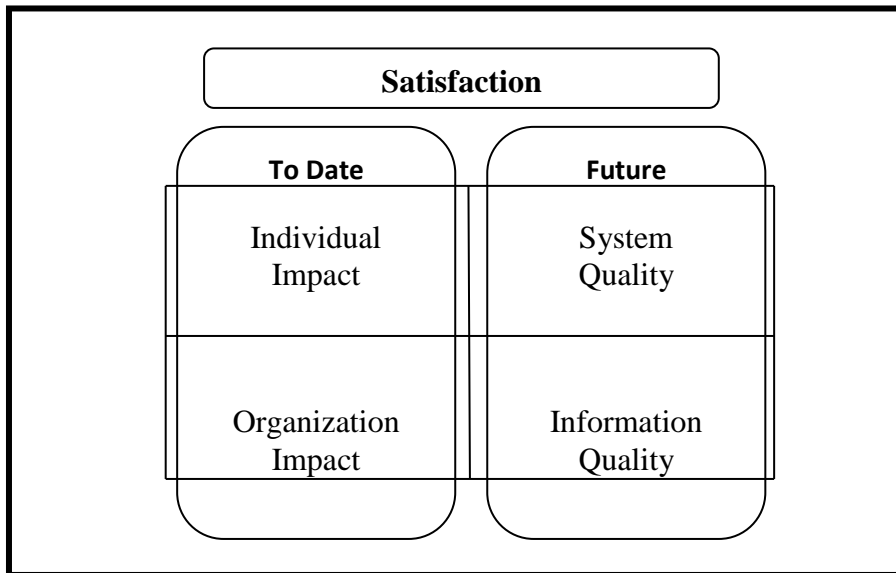
Figure 2.6: Enterprise Systems Success Measurement Model

Source: Gable *et al.* (2003, p.586)

The first two dimensions "are assessments of benefits that have followed (or not) from the systems" (p.586), whereas the last two dimensions are a mirror to the future potentials. Gable et al. eliminated two of DeLone and McLean's dimensions: use and user satisfactions.

- Omitted Use dimension

Gable et al. (2003) identify several reasons for omitting the use dimension from DeLone and McLean's model. Barki and Huff (1985) and Gelderman (1998) discuss the inappropriateness of use as a dimension as a measure of IS success. Another reason is that DeLone and McLean (1992) stated: "usage either perceived or actual is only pertinent when such use is not mandatory" (p.68). In most cases any company implementing an ERP system, the use of the systems would be compulsory, so for assessing ERP success the use dimension would provide little information for the company.

- Revisiting user sastisfactions

Gable *et al.* (2003) find that the measure of user satisfactions dimension is overlapped with the measures of other dimensions (system quality, information quality, individual impact, and organisation impact). User satisfaction should not be treated as a dimension of ERP success; it should be treated as an overall measure of ERP success.

The model addresses several contributions to the literature. The model empirically tested (as a first study) the DeLone and McLean (1992) and Myers *et al.* (1997) models. According to Ifinedo (2006), Gable *et al.* (2003) present a validated model that can measure ERP success from different perspectives. Moreover, the study is one of the complete set of tested ERP measures. However, the model is tested with data only from Australian public organisations. Myers *et al*. (1997) stated that it is important to present most of the appropriate dimensions and measures for evaluating IS success. At the same time, it is important to eliminate unnecessary dimensions and measures (Gable *et al.*, 2008). Therefore, the question that may be asked here is whether the Gable *et al*. (2003) model can be generalisable for different sectors and countries.

- Other IS success models

In 2003 DeLone and McLean reviewed, assessed and updated their IS success model in order to capture the interdependent and multidimensional nature of IS success. They added one more dimension, "service quality". Additionally, they collapsed the "individual impacts" and "organizational impact" into one dimension, "net benefits" (Appendix 1.4). Furthermore, Ifinedo (2006) extends the ES success model that is proposed by Gable et al. The study obtains empirical data, from 2005, of 44 Finnish and Estonian private ERP implemented companies. Ifinedo investigates the prior literatures in order to determine whether there are relevant dimensions that are not included in the Gable *et al.* (2003) model.

ERP systems by nature enhance cross-function operations within companies (Gupta and Kohli, 2006; Grabski *et al.*, 2011). Myers *et al*. (1997) argue that work group impact is an important dimension that can make a contribution toward organisational productivity. Additionally, Ifinedo (2006) finds that ERP implementing companies tend to link the success of the system with the quality of the ERP vendors. As a result of reviewing the prior studies and analysing the empirical data, Ifinedo incorporates the two dimensions to his model, see Figure 2.7.
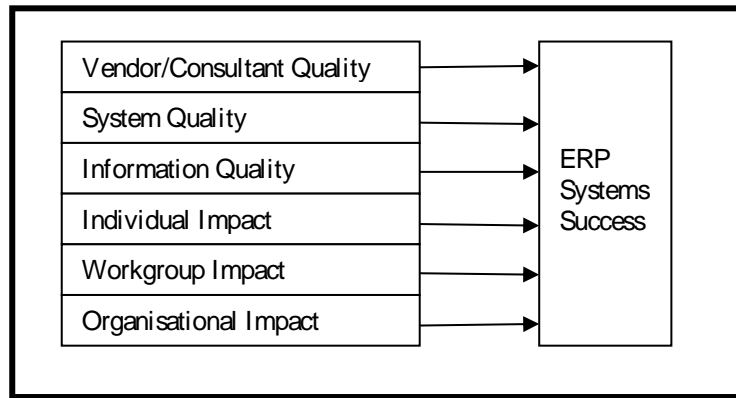
Figure 2.7: the Extended ERP Systems Success Measurement Model

Source: Ifinedo (2006, p.21)

Consistent with Gable *et al.* (2003), Chung *et al.* (2009) develop a conceptual ERP success model. The model classifies into two categories, the success of ERP adoption and the success of ERP system implementation. Appendix 1.5 of this thesis illustrates the model. For successful ERP adoption, Chung *et al.* (2009) use the technology acceptance model (TAM) developed by Davis (1989), as well as DeLone and McLean's (1992) IS success model. For the success of ERP implementation, Chung *et al.* (2009) adopt the ERP system success factors that are suggested by Ferratt *et al.* (2006). However the main aim of the Chung *et al.* (2009) ERP systems success mode is to guide an organisation for a successful ERP implementation as well as to identify the success factors for ERP system implementation.

Therefore, Gable *et al.* (2003) is more suitable for this research, as it focuses on the post-implementation phase. Besides, this model has not been used to evaluate the success of ERP systems for companies in less developed countries like Saudi Arabia. Furthermore, most of the IS success models (DeLone and McLean, 1992; Myers *et al.*, 1997; Gable *et al.*, 2003) indicate the importance of organisation factors in supporting the success of IS. Thus, the aim of the next section is to illustrate the prior literature of the relationships between these factors and ERP systems.

2.3.3 Relationships of ERP systems with other factors

Sophisticated information technology like ERP systems can provide physical and intangible benefits for an organisation. It can mitigate the time cycle, improve operational efficiency, and facilitate better management (Davenport, 2000; Grabski *et al.*, 2011). However, it is important to investigate the factors that influence ERP systems. Many have written about the success factors for ERP implementation (Al-

Mashari *et al.*, 2003; Bowling and Rieger, 2005; Doom *et al.*, 2009; Al-Turki, 2011; Shaul and Tauber, 2013; Ram and Corkindale, 2014), yet few have investigated factors that impact the system's success beyond the implementation (Gable *et al.*, 2003; Ifinedo, 2006). Therefore, before starting investigation of these factors, it is required to review the previous literature on the impact of other variables on ERP systems. Although, the effect might face many organisations, it may not be the case for all (Davenport, 2000).

It is argued that a large company tends to have a highly sophisticated IS (Fisher, 1998; Otley, 1999; Chenhall, 2003). Bruns and Waterhous (1975) indicate that there are two types of control for size perspective: administrative control (applying to large companies) and personal control (applying to small companies). Administrative control needs high level and modern technology, a high degree of formalisation, specialisation, and a high level of job allocation. That means large size organisations are able to provide the ERP systems with a high degree of formalisation and specialisation. Sedera *et al*. (2003) state that ERP benefits differ regarding the organisation size. Mabert *et al*. (2003) surveyed 193 US companies to determine the effect of company size on ERP implementation. They conclude that company size plays a significant role in ERP system implementation. Ifinedo and Nahar (2009) investigate the impact of four information technology (IT) factors (IT asset, employees' IT skills, IT resources, satisfaction with legacy IT system) on ERP success and the interaction with two contingency variables: size and organisation structure. They find that the two contingency variables were moderators in most of the relationships. Laukkanen *et al.* (2007) find that time and company size play an important role in implementing an ERP system successfully.

In addition, a stream of scholars highlight a set of success factors such as the top management support, participation of the team and the communication from different perspectives, internal audit activities (Al-Mashari, 2003a; Karlsen *et al.*, 2006; Shaul and Tauber, 2013). For instance, Liker *et al.* (1999) find that the impact of technology on work contingent upon some factors including the top management philosophy and the labour—management contract. From quantitative studies, Fui-Hoon Nah *et al*. (2003) and Nah and Delgado (2006) confirm that the top management support is one of the most important factors which lead to successful implementation for ERP system projects. Karlsen *et al.* (2006) study the most critical

success factors in IT. They find that the factors include: high level of management support, participation of the end users, identifying clearly the project aim, good communication and feedback from involved parties and apparent responsibilities. Finney and Corbett (2007) reviewed 45 articles to identify the success factors for implementing ERP systems. The top management support is one of the important factors.

Additionally, it is believed that organisational culture and management support play a significant role in ERP system success. Ke and Wei (2008) study the relationship between success of ERP system implementation, leadership and organisational culture. They state that top management support is necessary for implementation of ERP systems. Ke and Wei contend that the fit between ERP system and organisational culture is critical for success of ERP implementation. Organisation culture can also influence the ERP implementation teams (Jones *et al.*, 2006). While culture has been studied widely, it seems that other variables that may interact with the organisational culture, such as technology and control system, need to be studied (Chenhall, 2007).

Moreover, IS scholars argue that the type of structure that an organisation adopts might affect the degree of ERP system success. They point out that ERP systems as a sophisticated technology are associated with the structure's mechanisms. Turner and Owhoso (2009) state that adopting proper organisation structure would help ERP system reports (control report) to monitor and improve the ICPs. Heo and Han (2003) find an association between appropriate IS performance dimensions (i.e. system quality, information quality, individual impact, and organisational impact) and different structure typologies. They point out that firms with centralisation computing as well as centralisation cooperative computing emphasise more in system quality and organisation impact. Morton and Hu (2008) develop a proposition in order to measure the degree of fit between organisational structure and ERP system characteristics. They use four structure dimensions to identify the organisational structure. They conclude that if an organisation had a good fit between structure and ERP system, the system would be more effective.

Although, there are not many studies that have measured the impact of business strategy on ERP systems (Chou and Chang, 2008), the decision of implementing or

updating ERP systems is a strategic decision in nature (Lee and Myers, 2004). That means the decision of implementing ERP systems should be supported by the organisation's strategic objectives, organisation process, and the quantity of organisation resources. Henderson and Venkatraman (1999) develop a model to conceptualise the importance of business strategy being aligned with information technology. Moreover, according to Huang *et al*. (2008), some researchers have argued that successful implementations of ERP systems require a suitable strategy. Aloini *et al*. (2007) analyse 130 articles relating to ERP and risk management in order to summarise some important issues that lead to ERP failure. They find that the most important risk factors were: the selection of the ERP system, the plane strategy, the technique of project management and management behaviour.

Additionally, the type of strategy (see section 2.5.1) is the factor that can determine the impact of the performance (Huang *et al.*, 2008). Theoretically the relationship between the prospector and analyser strategies are positively related with organisation performance, whereas the reactor strategy contributes negatively to it (Miles and Snow, 1978; Croteau and Bergeron, 2001). Croteau and Bergeron (2001) observe that every type of business strategy associates differently with the technology. Prospector and analyser strategies have robust positive relationships with IT, so organisations can improve their technology by supporting the prospectors and analyser strategy activities. Chou and Chang (2008) examine the hypotheses of the relationship between customisation and organisational mechanisms (strategy and operation) and ERP performance at the post-implementation stage. The results support the proposed hypotheses.

Furthermore, evidences from the IS literature supports the importance of ERP systems maturity and ERP system brands. Moreover, Mahmood and Becker (1985) detect that IS organisation maturity is significantly related to user satisfaction. Saunders and Jones (1992) indicate that the maturity of IS may affect the usefulness and relevance of the measures that are used to evaluate the IS success. It has been shown that as organisations gain experience with ERP systems, they can implement more of the built-in control and reduce the gap between the principal and agent (Morris, 2011). Hayes *et al*. (2001) examine the association between the capital market reaction and the first annoncement of ERP system implementation. They find that the market reacted positively to the ERP system implementation announcement.

Specifically, the maket reaction to a company with a large ERP vendor is more positive than to a company with a small ERP vendor. From the management as well as the IT manager viewpoint, Laukkanen *et al.* (2007) and Dowlatshahi (2005), similarly, indicate that the implementation of ERP systems can be different with regards to the ERP implementation age. Wang *et al.* (2011) document that ERP brand and ERP implementation age can positively enhance efficiency of an enterprise's business.

This section illustrates the importance of organisational factors and ERP system factors in improving the success of ERP systems. However, some of these factors, specially the ERP system factors, have not been empirically examined with the link to ERP system success. Hence, this thesis investigates these relationships. In addition, it is mentioned in section 2.2.4 that ERP systems can impact the effectiveness of ICPs. Therefore, the following section illustrates the importance of the ERP systems in enhancing the ICPs. Also it shows prior studies that investigate this relationship.

2.4 The relationship between ERP systems and ICPs

In today's business environment, a control framework, in a logically and completely consistent manner, must conceptualise the important features of IC within an IT context (Tuttle and Vandervelde, 2007). According to Kinney (2000) there are at least three trends that can impact the future of IC practices and research; these are: IT, globalisation, and regulation. However, there is little empirical and archival research relative to the area of ERP systems and IC, such as Rikhardsson *et al.* (2006), Huang *et al.* (2008), Klamm and Watson (2009), and Valipour *et al.* (2012). Most of these studies were published after the SOX (2002) Act in order to investigate the impact of these regulations on ERP systems. According to Granlund (2011), "*accounting researchers should ask in field and survey research a wide number of questions related to the implementation and use of IT, as it may have considerable consequences regarding accounting and control practice*" (p.14).

Rikhardsson *et al.* (2006) explain the mySAP ERP solution system in order to see how ERP systems help companies meet the SOX requirements. An ERP system facilitates management of basic IC functions and provides a framework for control systems management. These two areas can provide evidence for the ability of ERP

systems intertwined with SOX requirements. Rikhardsson *et al.* conclude that these functionalities are not only designed for SOX requirements, they can support any IC requirements. Kumar *et al.* (2008) investigate the challenges that face an organisation in the case of compliance to the ERP systems with IC requirements, particularly those imposed by the SOX Act. Four Canadian companies are examined. The results indicate that the companies faced technical, process-related, and cultural barriers when they came to adopt these requirements.

The SOX Act seeks for organisations to have fewer interfaces in order to mitigate the interruption of information flow within the system. Maurizio *et al.* (2007) point out the need for fully integrated systems like ERP to prevent the interruption of data flow. In general, ERP systems do not require a download of a file; there are linkages between the systems. Moreover, they find that the SAP system supports the firm in complying with SOX Act. Additionally, ERP vendors have taken advantage of the improvement of IC regulations by updating the system reports and features. ERP systems can produce control and exception reports which help to improve monitoring and segregation of duties. The control report can show violation of authorisation or user access, which can mitigate the problem caused by pushing transaction authorisation to a deeper level in the firm. The exception report is a continuous monitoring procedure; it includes controlling the operations, IC, IT, user access and user compliance (Turner and Owhoso, 2009).

IC researchers argue that implementation of sophisticated IT is a necessary procedure (Rikhardsson *et al.*, 2006; Huang *et al.*, 2008). ERP systems can provide the ICS with tools for gathering, analysing and reporting information (Kumar *et al.*, 2008). Huang *et al.* (2008) develop an IC framework from the five COSO IC components as dimensions and the COBIT objective related to IT processes as factors for the framework. They implement Delphi expert questioner to establish IC factors for organisations that use ERP systems. From a sample of 123 firms they detect that the most significant IC factors are "Establishment of IT organization and their relation under the Control Environment dimension" (p.I02). However, they conclude that different countries may have different IC factors. Further, from case study, Valipour *et al.* (2012) confirm that the implementation of ERP systems impacts all the COSO IC components.

In addition, some researchers have examined the level of material weaknesses in IC, contrasting companies that had adopted IT systems like ERP and companies that had not (Klamm and Watson, 2009; Morris, 2011). Consistently, the two papers documented that companies using IT systems reported fewer IC weaknesses than companies that had not adopted IT systems. These studies provide strong evidence of the importance of ERP systems in improving ICS, as specified by SOX, section 404. Moreover, Masli *et al*. (2010) investigate the potential benefits that an organisation can obtain from adopting technology, essentially the technology for IC monitoring. The roles of IC monitoring have been clarified by COSO as: enhancing the control operations and to oversight the control system (COSO, 2009). Masli *et al*. observe a negative relationship between implementation of IC monitoring technology and material weaknesses, increasing audit fees and audit delays.

Another support argument is contained within the issue of agency problems. The financial report, IC, audit committees, and external audit report are mechanisms that can be used to address the agency problems. Abdel-Khalik (1993) discusses the demand of management and stakeholders for assurance. He also shows that ICS can mitigate the agency cost. Moreover, reporting information to shareholders would increase reliability or information and reduce the investors' risk even without requirement by the regulations (Deumes and Knechel, 2008). An earning management is also another agency problem that can be reduced by disclosure of IC report. ERP systems can help in reducing the agency problems. By nature, ERP systems are able to standardise organisational processes and integrate information. ERP systems have instruments that can help to provide faster and more accurate financial reporting to shareholders.

Furthermore, ERP systems are updatable and can be used to build in controls. Morris (2011) argues that the "built-in controls" features and other features that ERP systems have can help an organisation to improve its ICPs. He examines 108 U.S ERP-implemented firms from 1997 to 2003 and matches them (in industry-size) with non-ERP systems implemented firms in order to measure the impact on ICS. Eleven factors are used (organised by Audit Analytics) in order to determine IC weaknesses, such as accounting documentation, non-routine transaction control issues and others. The study finds that companies that have adopted ERP systems report fewer IC material weaknesses than companies that have not adopted ERP systems. However,

Morris does not consider the firms which are non-compliant with the SOX Act; he just examines the large companies that are required to comply with SOX.

ERP systems are able to support other frameworks such as COSO's ERM and COSO's IC framework (Brown and Caylor, 2006). Ramamoorti and Weidenmier (2006) state that the technology is associated with the all COSO's ERM frameworks' components (see section 2.2.3). Chang and Jan (2010) design a ERP IC framework by the use of COSO's IC components and other items. They point out that the framework can help shareholders, managers, and auditors in assessing the effectiveness of ICPs. Similarly, Morris (2011) uses COSO's IC components in order to investigate the different levels of material weaknesses between the companies with ERP systems and those without ERP systems. He finds a positive relationship between COSO frameworks and ERP systems. In addition, ERP systems support other applications such as World Class Manufacturing (WCM), Just-in-Time (JIT), and SCM, which involve in supporting inventory control. From annual reports of quoted UK manufacturing firms over the period from 1986 to 2005 Pong and Mitchell (2012) find a significant relationship between investment in technology (e.g. JIT, WCM and ERP) and the achievement of good inventory control (lower inventory days).

Another argument that supports the ability of ERP systems in improving the effectiveness of IC is the ability of preventing employees from access to the source code. ERP is purchased package software that can protect the source code from unauthorised access. In contrast, the legacy system is normally developed and maintained by the organisation which makes it possible for employees or unauthorised users to have access to the system's source code (Kumar *et al.*, 2008). Gupta and Kohli (2006) investigate the benefit of ERP systems; they find that SAP R/3 integrates the processes, data, and firm elements and units within a single software. This tight integration feature can defend the system source code.

On the other hand, there are arguments against the role of ERP systems in providing adequate ICPs. Several investigators argue that technologies such as ERP systems face different types of threats and are costly. Moreover, there are quite a high number of implementation failures (Gelinas *et al.*, 2011; Morris, 2011). Gelinas *et al.* (2011) indicate that an information system face four types of threats: natural and man-made

disasters, software crashes, errors by human, and fraud or manipulation. However, these threats can affect any systems, integrated or non-integrated; ERP systems have features that can help the management to mitigate the last two types of threats (Chang and Jan, 2010).

Most of ERP systems' researchers are agreed that the "management support" is the first critical success factor for the implementation of an ERP system or the utilisation of the systems (Karlsen *et al.*, 2006; Finney and Corbett, 2007; Al-Turki, 2011). An organisation needs management involved in any errors or risks that might occur (Finney and Corbett, 2007), besides that it needs an executive manager who is technically familiarised (Yusuf *et al.*, 2004). Likewise, the last two categories can also be mitigated by adopting a control framework such as COSO's IC (Rikhardsson *et al.*, 2006). To conclude this argument, the ERP is a successful system but the reasons for the threats that face the system are mostly because of other factors. According to Brown and Nasuti (2005), Deloitt and Touche (1999) evaluate the issues of ERP systems for 62 Fortune 500 companies that adopted ERP systems. They indicate that the organisation's performance problems are caused by three groups: 62% by people, 16% by the organisation process, and 12% by the IT.

All these support arguments for the importance of ERP systems to ICPs can be used to justify the high cost of ERP systems and the other counter argument. Moreover, most organisations are expected to change or update their system every five years; organisations have to maintain a large amount of funds for developing the technology. Therefore, the expenses of implementing ERP systems are something the organisations have to pay and would not be much different than the expenses that might be committed to legacy systems (Umble *et al.*, 2003).

IT researchers have recorded a large number of implemented failures. However, the causative factor of these failures was not the ERP as many authors argue. Umble *et al.* (2003) state ten reasons for the failure of ERP systems as named by IT managers, the three most named reasons were poor management and planning, lack of management support, and change in organisation goals during the implementation. In addition, Brazel and Dang (2008), Morris (2011) and others have stated that most of these failures took place in the early years of the implementation of ERP systems. Further argument that ERP system vendors such as SAP, Oracle, Baa, and

PeopleSoft have recorded an increase in their revenues, which means there are an increasing number of companies applying[10]. It is argued that the success of implementation or use of ERP systems is not a one-time process; an organisation should understand that ERP systems are always seeking upgrade to be able to remain in the competition atmosphere (Dowlatshahi, 2005). Markus *et al*. (2000) present the problems and outcomes of ERP implementation projects. They conclude that a project can be considered a failure at the first stage, but at the next stage it can considered a success.

Although academic literature has placed attention on the area of ERP systems and the area of IC (as presented in this chapter), the area still requires more consideration (Huang *et al.*, 2008). No study has been found, to the researcher's best knowledge that has investigated the effect of ERP system success on effectiveness of ICPs. Therefore, this is another gap that this research tries to address. Additionally, the previous sections in this chapter provide evidences that the relationship between ERP success and effectiveness of ICPs can be contingent upon some factors. Thus, contingency factors should be considered in this study. The next section provides an introduction to contingency theory and a number of contingency factors (organisational and ERP factors).

2.5 Contingency theory

Contingency theory was emerged from the organisational design literature in the early 1960s. The theory is based on the argument that there is no universally appropriate management control system that can apply equally to all organisations in all conditions, however particular characteristics of the control system and its effectiveness will depend on specific organisational factors (Otley, 1999; Chenhall, 2007). The next chapter provides more details about the theory. This section is focussed on the contingency factors, including organisational and ERP factors.

2.5.1 Contingency factors

Early theorists such as Burns and Stolker (1961), Perrow (1970) and Galbraith (1973) focus on investigating the effect of the environment and technology on organisation structure. Later, researchers who draw on this work have investigated more variables such as size, culture and strategy (Chenhall, 2007).

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[10] See the financial reports of these companies, such as: www.sap.com; www.oracle.com

Chapter 2: Literature Review

A number of studies identify the contingency variables (Fisher, 1998; Chenhall, 2003; Abdel-Kader and Luther, 2008). Some contingency variables are within the organisation (internal factors) and some that are outside it (external factors). Under the heading of external variables, researchers identify some factors such as uncertainty (Chenhall and Morris, 1986), turbulence, and hostility (Otley, 1980). Whereas technology, strategy, organisation structure and size are classified as variables within the organisation (Chenhall, 2007).

Fisher (1998) lists the contingency variables of some prior studies in four categories. The first category comprises of variables related to uncertainty. The second category includes variables related to technology and interdependence. The third category is the industry, firm and business unit variables such as size. The last category consists of competitive, strategy and mission. Chenhall (2007) provides a chapter with a review of contingency-based research started from the early 1980s. He includes the findings from the literature of six contingency variables: external environment, technology, structure, strategy, size, and culture. Chenhall also includes a series of propositions related to every variable.

Some contingency factors have higher priorities for examination than others. Therefore, for this study the researcher reviews the accessible articles and database in the field of Accountancy and IS. The aim of this step is to categorise the prior studies related to contingency theory and ERP systems or IC, and additionally, to identify the gaps in the literature. As a result the study came up with five organisational factors: organisational structure, organisational strategy, size, organisational culture, management support, and three ERP factors: ERP system brand, ERP implementation age, and maturity of ERP. Table 2.1 presents some of the prior studies, which investigate the relationship (direct and indirect) between these factors and ERP systems or IC. The following sections identify the organisational factors and ERP factors.

Table 2.1 Prior studies on contingencies with ERP systems or IC

contingencies	ERP system studies	IC studies
structure	Trurner & Owhoso (2009); Heo and Han (2003); Morton and Hu (2008)	Bruns and Waterhouse(1975); Borthick et al (2006); Chenhall (2007); Zhang et al.(2009); Verbeeten (2010)
strategy	Chou and Chang (2008); Aloini *et al*. (2007)	Jokipii (2010); Chenhall (2007); Abdel-Kader& Luther(2008); Chenhall *et al*.(2011); Kapu Arachchilage and Smith (2013); Tucker *et al*.(2013)
size	Sedera et al (2003); Mabert *et al*.(2003); Laukkanen *et al*. (2007); Ifinedo and Nahar (2009)	Chenhall (2007); Doyle *et al*.(2007a) ; Ashbaugh-Skaife *et al*.(2007); Woods (2009); Abdel-Kader& Luther(2008); Gordon *et al*.(2009)
Organisational culture	Ke and Wei (2008)	Zhang *et al*.(2009)
Management support	Al-Mashari, (2003a); Karlsen *et al*., (2006); Fui-Hoon Nah *et al*.(2003) ; Nah and Delgado (2006); Ke and Wei (2008); Shaul and Tauber, (2013)	Krishnan (2005); Zhang *et al*.(2009)
ERP brands	Hayes *et al*.(2001); Wang *et al*.(2011)	
ERP imp. age	Dowlatshahi (2008); Wang *et al*.(2011)	
ERP maturity	Mahmood and Becker (1985); Saunders and Jones (1992); Holland and Light (2001)	

2.5.1.1 Organisational factors
- Organisational structure
There have been different definitions of organisational structure; the cause of the diversity is the difference between the structure outcome and structure dimensions (Chenhall, 2007). Mullins (2007) describes an organisational structure as the outline of the organisation's roles and it relationship with its different parts. Its purpose is to allocate responsibilities and direct activities in order to determine how information flows between the levels of management and how the organisation's objective can be

achieved. Lawrence and Lorsch (1967) state that the structure is about differentiation and integration of an organisation. They indicate that firms with high differentiation (i.e. involving the level of decentralisation authority) and integration (i.e. involving rules and operating procedures) perform better than the firms with low differentiation and integration. Researchers have identified many structural mechanisms.

Pugh *et al*. (1968) define five structural dimensions in an empirical study: centralisation, specialisation, configuration, standardisation, and formalisation. Donaldson (2001) names the structural dimensions as specialisation, standardisation, formalisation, hierarchy, and span of control. Each dimension can determine the type of structure that the firm applies. For example, when an organisation presents strong job descriptions that would indicate the organisation is adopting a structure with a high degree of formalisation. Researchers have defined the structural dimensions in order to determine the organisational structure. Donaldson (2001) defines formalisation as the standard for business processes and documents, whereas differentiation refers to the difference between an organisation's actual structure and the "goal orientation". Chenhall and Morris (1986) define decentralisation as the level of responsibility of the manager and basically it provides managers with greater accountability. Standardisation refers to data consistency and similarity for business activities (Chou and Chang, 2008).

- Strategy
Strategy is one of the contingencies, but it can differ in different contexts. Strategy in an organisation refers to passive tools which the manager can use to influence the nature of other variables such as technology, uncertainty, culture control, and structure (Chenhall, 2007). Also, it can be a guide for an organisation with respect to the environment to improve its performance and decision making. There are various types of business strategies; every type has particular characteristics which make it different from another's strategies. There is no one unversal type of strategy; if there is one it would not be strategic because every organisation would adopt it. According to several scholars, the most admired typology for the business strategy is Miles and Snow. In fact it has been quoted by acadimic researchers more than 650 times (Croteau and Bergeron, 2001). Miles and Snow (1978) classify business strategy into four types: prospector, analyser, defender, and reactor. The first three dimensions are

expected to improve the organisation's performance whereas the reactor is expected to hamper the organisation's performance.

Gupta and Govindarajan (1984) empirically study the effect of managerial characteristics (experience in marketing and sales, willingness to accept risk, and tolerance for ambiguity) on the business strategy. They divide the strategy business units (SBUs) into build, hold and harvest. They find that in the case of "build SBUs" the manager's acts are effective and in the case of "harvest SBUs" the manager's acts hamper. Therefore, involving managers in selecting the type of business strategy would impact the organisation's performance. In addition, Miller and Friesen (1982) indicate to two types of strategy: conservative and entrepreneurial. The firm with a conservative strategy has been found to have high levels of formalisation, specialisation and centralisation, and has positive innovation. In contrast, the firm with entrepreneurial strategy has less standardisation and more decentralisation.

- Size

Organisational size is a significant contingency variable that affects structure, technology and budgeting. Expansion of a firm's size improves process efficiency, system effectiveness and provides more opportunities for specialisation. A large company tends to have a highly sophisticated IS (Fisher, 1998; Otley, 1999) and tends to adopt the type of practices which are incorporated within more formal control systems (Chenhall, 2007). Moreover, large organisations require a large number of employees, documents, functions, assets and resources. Therefore, these firms would be more able to control their operational environment and to reduce task uncertainty (Chenhall, 2007).

There are various gauges for estimating the size such as total of assets, sales, profit, number of shares and number of employees. The way for measuring size can depend on the factors that the study is going to discuss. According to Chenhall (2007) if the study considers " the effectiveness of budgets to coordinate individual activities, then employees is appropriate," (p.184) whereas if the study is assessing the effectiveness of accounting practices then assets and sales may be more appropriate.

- Organisational culture

Pettigrew in 1979 introduced the concept of culture into the field of organisation theory; it was mostly notable in sociology and anthropology (Detert *et al.*, 2000).

Although there is no unparalleled, commonly agreed upon definition of culture, there is some unanimity that organisational culture is holistic, historically specified, and socially constructed (Pettigrew, 1979). Culture consists also of some combinations of vision, behaviours, values, systems and beliefs that exist at every level for an organisation (Hofstede *et al.*, 1990). Detert *et al.* (2000) focus on a firm's culture as "a system of shared values defining what is important, and norms, defining appropriate attitudes and behaviours, that guide members' attitudes and behaviours"(p.850). Culture can affect the interaction between the organisation's staff, customers and stakeholders.

There are several dimensions for measuring organisational culture. One of most broadly used was developed in 1984 by Hofstede who characterised culture by power distance, individualism vs. collectivism, uncertainty avoidance, masculinity vs. femininity and confusion dynamism (Chenhall, 2007). Detert *et al.* (2000) develop an organisational culture framework by referring to Hofstede's (1984) work and other multi-concept frameworks. A small number of dimensions are found to underlie the majority of existing culture perception. The framework consists of eight synthesis dimensions (the basis of truth and rationality in the organisation, nature of time and time horizon, motivation, stability vs. change/innovation /personal growth, orientation to work, task, collaboration/cooperation, control, coordination, and orientation and focus-internal and/or external) and are related to "an ideal culture".

- Management support

Many studies have enhanced the importance of top management support as a necessary feature in better organisation performance (Covin and Slevin, 1988; Nahavandi and Malekzadeh, 1993; Ogbonna and Harris, 2000; Haakonsson *et al.*, 2008). Top management support can refer to the degree of understanding of the organisation's situation and involvement in it. An organisation must pay careful attention to the top management attitudes, beliefs and willingness to provide the necessary resources (Pinto and Slevin, 1988). It is stated that top management support is a critical success factor in promoting organisation development, innovation and motivating employees (Lin, 2010).

2.5.1.2 ERP factors

- ERP brand and ERP implementation age

ERP systems as sophisticated information technology can provide physical and intangible benefits for an organisation. It can mitigate the time cycle, improve operational efficiency, and facilitate better management (Davenport, 2000; Grabski *et al.*, 2011) Therefore, selection of proper ERP software for an organisation as well as an appropriate period of ERP implementation is a prerequisite for a successful project. The brands of ERP software are increasing, but there is differentiation between these brands (Ngai *et al.*, 2008; Wang *et al.*, 2011). Some ERP system software types, such as SAP, Oracle, PeopleSoft etc, have the characteristics of high integration degree, powerful, and inquisitive customer value, yet are costly and difficult to implement. Whereas other ERP software are less expensive, but they are weak and not completely integrated. Therefore, the variety of ERP system software would bring different effects on organisation performance (Wang *et al.*, 2011).

Additionally, the length of time required for ERP system success is ultimately varied, based on the needs of the end user (Dowlatshahi, 2005). Although, some ERP system vendors claim that the implementation of the systems can be completed in six months, in reality, an organisation should expect as long as two years for full ERP implementation. This period of time is typically required for staff training and completion of data conversion (Koch, 2001; Dowlatshahi, 2005).

- Maturity of ERP systems

Organisations are at different stages in the ERP systems adoption process, which ranges from primary analysis of the adoption through to completed implementation and to the maturity of the systems' functions (Holland and Light, 2001). Maturity of ERP systems refer to the growth stages of the system. Nolan (1979) develops a computer growth stage model including six stages: initiation, contagion, control, integration, data administration, and maturity. Moreover, Holland and Light (2001) present a maturity model for ERP systems, which identifies three stages including managing legacy systems and starting the ERP project, ERP implementation is completed, and ERP system is normalised and engaged in the organisation's process.

The IS manager should consider the level of analysis in evaluating IS success dependent on the organisation's characteristics (Saunders and Jones, 1992). The level

of analysis may relate to the level of maturity of IS. For instance, the measures of IS success are expected to be less formalised and less controlled in the firm with less IS maturity. That is because the firm is naturally less experienced with the system (Heo and Han, unpublished). Mahmood and Becker (1985) find that the IS organisation maturity is significantly related to user satisfaction. They suggest a future study to look to the degree of the relationship and to examine the relation of maturity with other success dimensions. Additionally, Saunders and Jones (1992) indicate that the maturity of IS functions may affect the usefulness and relevance of the measures that are used to evaluate the IS success.

2.6 Gaps in Literature

This chapter identifies the most widely used IC frameworks, as well as ERP success models, organisational factors and ERP system factors. The literature review identifies a number of gaps and reveals directions for further research. These gaps are explained as follows:

Firstly, this literature review confirms initial concerns that management accounting literature is contributing little to evaluating the effectiveness of ICPs by using a comprehensive IC framework such as the COSO frameworks. Most prior studies use a single indicator for evaluating the quality of ICS. Whereas the adaptation of a COSO framework, to assess the quality of ICS, can result in more comprehensive, reliable, and complete assessments (Hightower, 2009). Thus, more empirical studies are required to operationalise the COSO frameworks components regarding measuring the construct and its relationships with organisational factors. Additionally, analysis of the literature indicates that the majority of the empirical studies in the field of IC have been undertaken in developed counties with a few from less developed and developing countries. This indicates that there is a need for more studies in less developed countries such as Saudi Arabia, due to the enormous importance of country location, economic and the business environment.

Secondly, a small number of studies have investigated the relationship between ERP systems and ICPs. Chenhall (2007) indicates that a major cause for the slow processes of understanding the issues in the field of management control systems is the lack of studies replications. Based on review and empirical observations Granlund's (2011) suggests that *"accounting researchers should ask in field and*

survey research a wide number of questions related to the implementation and use of IT, as it may have considerable consequences regarding accounting and control practice" (p.14). Moreover, with limited research that examines the impact of ERP systems on the effectiveness of ICPs, only the implementation of ERP systems (e.g. Morris 2011), not the success of ERP system, has been examined. Additionally, reviewing the literature of the relationship between quality of ICS and ERP systems reveals that it is dominated by studies that examine the effect of the ERP implementation on IC with a single indicator, such as material weaknesses of IC reporting.

Thirdly, although researchers such as Gable et al. (2003) and Ifinedo and Nahar (2009) study ERP system success, the actual factors that may influence the success of such systems is characteristically absent from their studies. In addition, with the relationship between the ERP systems and ICS, only the impact of a small number of organisational factors is examined in prior research. These studies ignore the complementary association of a large number of contingencies with ERP success as well as effectiveness of ICPs.

Fourthly, little is known about the success of ERP systems, especially in less developed countries such as Saudi Arabia. That raises a question regarding the variables that can impact the success of the systems. The review of studies that have addressed ERP system success reveals that there are certain ambiguities regarding the relationship between ERP system success and other factors. While these studies concentrate on the association between ERP system success and organisation factors (e.g. organisational structure, management support and size), the exact relationship between the ERP system success and ERP factors (i.e. ERP maturity, brand and implementation age) is still not clear and lacks empirical evidence. Thus, more comprehensive study is required.

Lastly, there seem to be a variety of research methodologies adopted in studying the effectiveness of ICS. However, the majority of the studies are qualitative, using case studies (e.g. Kumar *et al.*, 2008; Valipour *et al.,* 2012; Wei-hua, 2011), theoretical reviews (e.g. Rikhardsson *et al.*, 2006; Brown and Nasuti, 2005; Maurizio *et al.*, 2007; Chang and Jan, 2010) and quantitative method studies utilising archival methods (e.g. Morris, 2011; Masli *et al.*, 2010). Quantitative method studies utilising surveys are limited (e.g. Kallunki *et al.*, 2011; Huang *et al.*, 2008). Thus, there is a

need for more survey studies to demonstrate reliability, validity and generalisability of ERP system success to impact effectiveness of ICPs. Furthermore, studies use selected aspects of contingency theory (see Ifinedo and Nahar (2009) in the area of ERP success and Gordon *et al.* (2009) in the IC area) without explicit reference to contingency theory to explain the relationship between the ERP systems and ICPs, especially in less developed countries.

2.7 Summary

This chapter presents the IC frameworks (with reflection on IC in Saudi Arabia) as well as ERP success models. In this respect, COSO's ERM framework and Gable's ES success model were identified as an appropriate framework and model for assessing the impact of ERP success on effectiveness of ICPs. Prior studies on both areas were presented in order to find the gaps.

Therefore, reviewing the literature reveals that a number of theoretical perspectives can be used to address the research problem, such as contingency theory, which dominates the ERP system success discipline. In addition, a number of organisational factors as well as ERP factors have not been comprehensively examined in the area of IC and ERP system success. The next chapter discusses the theoretical framework.

Chapter Three:
Theoretical Framework

3.1 Overview

This chapter constructs the study's theoretical framework and develops propositions based on arguments and findings from prior studies (see chapter two). The theoretical framework helps to determine the study's key variables, the type of the relationships that link the key variables and the theoretical assumptions of related theory. It is also the basis of the study propositions and the selection of appropriate research methods in order to address the research objectives. The theoretical framework is based on contingency approach.

This chapter is divided into six sections. Section 3.2 discusses the main concepts and assumptions of contingency theory, including the development of the theoretical model and criticism of the theory. Section 3.3 provides the contribution of contingency theory to accounting IS research. Section 3.4 involves the contingencies related to the study. Section 3.5 presents the key study propositions based on the expected relationships between the study's constructs as indicated in the theoretical framework. The final section 3.6 summarises the chapter.

3.2 Contingency Theory

The contingency theory of organisation is a significant theoretical lens that can be used to view the organisation (Donaldson, 2001). It has been developed by a number of theorists such as Burns and Stolker (1961), Perrow (1970) and Galtung (1967) during the period of the organisation theory development in the early 1960s. Essentially, contingency theory has dominated the scholarly studies of organisational design, behaviour and performance during the last twenty five years (Chenhall, 2007). The essence of the contingency approach is that the effectiveness of an organisation's performance results from fitting the contingency variables to the organisation characteristics or systems. For the reason of avoiding the misfit that may result from changing the contingency variables, the organisation should adopt a new characteristic that can align with the change (Drazin and Van de Ven, 1985; Donaldson, 2001).

Basically, the term contingency means that something is true only under specific conditions. Otley (1980) defines the contingency approach as, "there is no universally appropriate control system which applies to all organisations in all circumstances" (p.413). Consistent with this, Fisher (1998) argues that a better organisational performance depends on a better matching between the control system and contingent factors. Donaldson (2001) defines the approach at an abstract level, "the effect of one variable on another depends upon some third variable" (p.5). Thus there is no one best way to organise an entity; the optimal cause of action depends on external or internal variables.

3.2.1 Contingency Theory framework

The core of the structural contingency theory model is that organisational effectiveness results from the fit between the organisation's characteristics, such as organisational systems, and contingencies that reflect the situation of the organisation (Donaldson, 2001). In other words, contingencies influence the effect of the organisational characteristics on organisational effectiveness. Thus, contingency theory can be used to examine the impact of ERP system success and organisational factors, such as organisational structure, strategy or size, on the effectiveness of ICPs.

- The forms of fit

There are several forms of fit in structuring the relationships, including selection approach, system approach, fit (congruence and interaction) approach, intervening variable approach and more recently, the structural equation models approach (such as PLS-SEM). According to Chenhall (2007) these forms have been utilised to categorise the contingency-based research in the field of management control systems. Adoption of a particular form of fit would involve considering the structural relationships between variables, the nature of the causality among the variables, collection of the data and the levels of statistical analysis (Drazin and Van de Ven, 1985; Luft and Shields, 2003).

The selection approach simply examines the way that organisational characteristics are related to organisational systems without attempting to test the link between these relationships to performance (Chenhall and Morris, 1986; Chenhall, 2007). It assumes that only organisations with an appropriate performance can continue to exist in the competitive environment (Drazin and Van de Ven, 1985). Thus, this

model has been criticised for the absence of a performance construct. Further, it has been criticised as a misfit between organisational characteristics and organisational systems, which can lead only to underperformance, rather than bankruptcy (Donaldson, 2001).

The next approach is the systems approach which outlined by Van de Ven and Drazin (1985). It involves when contingencies, organisational system and performance are congruent. Thus, all parts are interconnected and any change in the fit level would affect the performance (Pizzini, 2006; Ferreira and Otley, 2009). Under the systems approach, multiple fit simultaneously can be found (Chenhall, 2007). For example, Chenhall and Langfield-Smith (1998) examine the impact of management techniques and management accounting practices on organisational performance under various strategic priorities. However, a significant issue among these approaches is how multiple fits between contingency variables and organisation system affect the organisational effectiveness (Drazin and Van de Ven, 1985; Selto *et al.*, 1995).

The congruence fit approach considers how the combination between contingency factors and organisational systems lead to higher organisational effectiveness than other incorporation (Chenhall and Chapman, 2006). In another words, for each level or score of contingencies there is a unique organisational system that will maximise organisational effectiveness, yet with other organisational system values the organisational effectiveness will be low. However, this approach is not developed as a way of examining how a single organisational system fits with an element of contingencies (Chenhall, 2007).

The interaction fit approach examines the influences of organisational characteristics on the relationship between the organisational system and organisational effectiveness (Chenhall, 2007). However, this approach only examines the interaction between one single organisational characteristic and one single organisational system and the effect of this interaction on organisational effectiveness (Drazin and Van de Ven, 1985). In addition, it does not consider the interaction between multiple contingency variables on the relationship between the organisational system and organisational effectiveness simultaneously (Donaldson, 2001).

Chapter 3: Theoretical Framework

The intervening variable approach investigates the contingency relationship between the organisational system and organisational effectiveness through intervening variables (Bisbe and Otley, 2004). This approach can be used to demonstrate how the relationship between the organisation system and outcomes are explained by the intervening variables. However, it does not examine the relationship if the model does not aim to investigate the influence on the organisational effectiveness (Chenhall, 2007). Further, it does not aim to study the effect of the contingencies on the organisational system.

The structural equation modelling approach (SEM), which is the most recent contingency approach (Chenhall, 2007), can simultaneously help to explain the relationships between contingencies, organisational systems and organisational effectiveness, and analyse the effect into direct and indirect effects through the organisational systems (Anderson and Young, 1999; Smith and Lagfield-Smith, 2004; Hall and Smith, 2009; Elbashir *et al.*, 2011). The issue of the SEM approach is the prospect of 'equifinality', which means that different initial states (or model) can lead to similar end states (or model) (Chenhall and Chapman, 2006). Yet, according to Donaldson (2001) the 'equifinality' is the inability to determine all relevant contingency variables in the model. Therefore, this issue can be remedied by including all possible contingency variables in the theoretical framework.

Although a review of the literature articulates that a number of contingency-based research studies in the field of management control systems seem to rely on selection and fit (congruence and interaction) approaches in selecting the contingencies (Chapman, 1997), Drazin and Van de Ven (1985) suggest that future contingency research can be designed to examine more than one approach to fit. This can help for better understanding for theory development. They emphasise that researchers should attempt to explore and resolve the interdependencies and relationships among the different approaches to fit.

- Theoretical framework
Regardless of the existence of several theoretical modelling forms, there is an argument that the specification of structural relationships, the nature of the causality among the variables and the level of analysis should be based on substantive theoretical justifications (Luft and Shields, 2003; Chenhall, 2007). However, the

extant literature reviewed in chapter two validates the premise that the main intention of implementing ERP systems is to respond to contextual challenges in order to implement and improve the effectiveness of ICPs, thus providing the theoretical underpinning for empirically testing such an assumption.

Furthermore, Van de Ven and Drazin (1985) argue that "...a major limitation of many studies has been an overly narrow focus on only one or a few contextual dimensions, which limit the studies from exploring the effect of multiple and conflicting contingencies on organisation design and performance" (p.358). Thus, the selection fit of one variable at a time can be an issue because the shared commonality between contingencies (also see the next section) (Otley, 1980; Fisher, 1998). Fisher (1998) proposes that "many factors beyond control system impact organisation outcomes and these factors need to be carefully addressed (or controlled) when empirically examining the relationships..." (p.56). He points out that the final aim of the contingency-based research should include development and assessment of 'a comprehensive model', which involves multiple contingencies and multiple outcome variables.

Following Chenhall's (2007) taxonomy of forms of theoretical fit and the Drazin and Van e Ven's (1985) suggestion, more than one approach can be used to examine the study data; particularly the systems approach and the SEM approach can both be suitable for this study. The theoretical model is developed, see Figure 3.1, in order to simultaneously examine and explain the relationships between contingency factors, ERP system success and effectiveness of ICPs in Saudi Arabia's business environment. Further, the theoretical model proposes the indirect effect of organisational factors on the effectiveness of ICPs through success of ERP systems as mediating factor and the direct effect that captures the influence of organisational factors on the effectiveness of ICPs. The structural path parameter estimates between the constructs are interpreted carefully, not to imply causality, yet to indicate predictive ability of ERP system success on the effectiveness of ICPs. In other words, the intention of this study is not to prove causality, but to validate the structural model, which can predict and explain the influences between contingency variables, success of ERP systems and effectiveness of ICPs.
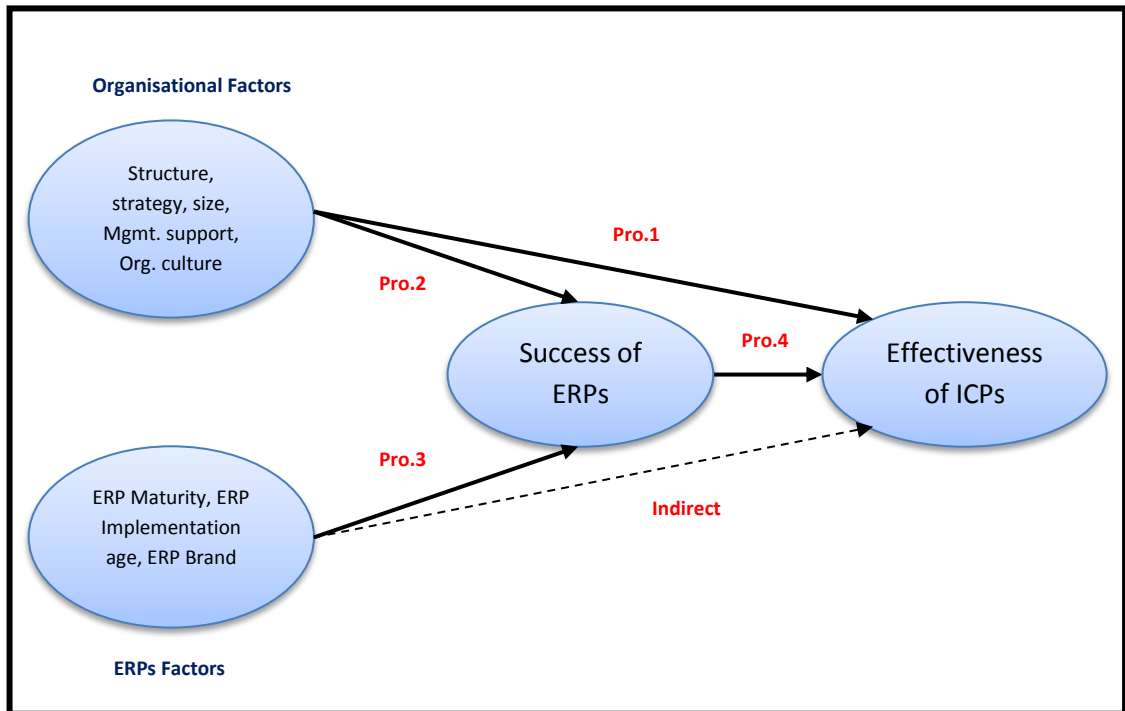
Figure 3.1: Theoretical Framework

In addition the theoretical framework is based on contingency theory of management control systems (Chenhall, 2007), the measurement model of assessing the enterprise system success (Gable *et al.*, 2003) and COSO's ERM framework (2004). The theoretical framework is presented in Figure 3.1 as a structural model. The organisational and ERP system factors are the independent contingency variables. The success of ERP systems is the dependent mediating variable. The effectiveness of ICPs is the dependent variable.

3.2.2 Criticism of the theory

The contingency framework has been widely implemented in accounting and IS literatures for more than 25 years, although it has weaknesses and received the criticisms (Chenhall, 2007; Rom and Rohde, 2007). This section provides some, possible, remedies to overcome prior contingency-based research weaknesses. It is pointed out that research on contingency theory has heavily relied on traditional and functionalist theories rather than on interpretive and critical views (Chenhall, 2007). Predominantly, a questionnaire instrument is used in empirical contingency-based research. Respondent bias and limitations of the questionnaire instrument may cause problems and influence the findings. Therefore, to overcome these problems, this

research uses both questionnaire and interview instruments. It is assumed that using qualitative data can help to gain more understanding of the construct relationships.

Additionally, it has been criticised that the findings of contingency-based research are inconsistent (Abdel-Kader and Luther, 2008) and contingency variables are defined in widely ranging way (Otley, 1980; Chenhall, 2007). It will be difficult to combine the findings (with differing definition of the variable) in order to make a consistent body of knowledge (Fisher, 1998). According to Chenhall (2007) such consistency can be derived from study replication, which can promote the reliability and validity of the findings as well as providing a strong base in order to "move forward by way of model development" (p.166). Particularly, there are some context-related issues in the area of management control systems, like administrative control and using non-financial measures that have lack of replication, which seem to be limiting the ability to update and generalise the contingency-based research findings across different disciplines (Chenhall, 2007). To control the problems, the current study adopts the variables measures from previous research, to allow comparison and replication.

Another weakness of previous contingency research studies is that they investigate the relationship between one or two contingency variable(s) and one aspect of organisational practice, which may lead to fracture or even conflict of the study findings due to the commonality between contingencies. Thus, the researcher tried to adopt a number of variables that are appropriate for this study. Despite the criticisms and weaknesses of contingency theory, it remains a reasonable theory for addressing and understanding the relationships between the contingency factors, ERP system success and effectiveness of ICPs in less developed environments like Saudi Arabia.

3.3 Contingency Theory in Management Accounting and IS

The idea of using IS to deliver support for management accounting is not new (Rom and Rohde, 2007). It is argued that the first use of IS was related to accounting disciplines to automate processes, for instance, posting transactions to journals (Wagner and Monk, 2011). Regardless of this, the research in management accounting and IS has updated since the initiation of integrated IS such as ERP systems. As a result, researchers of management accounting and integrated IS has

explored a number of different research topics (Rom and Rohde, 2007), such as contingency theory in management accounting and ERP system, as in this research.

There has been a history of more than three decades in the published research of contingency theory and different aspects of management accounting practices as well as IS (Otley, 1980; Hong and Kim, 2002; Chenhall, 2007). Initially, accounting researchers accomplished their works based on contingency theory; they attempted to examine the effect of environment, structure, technology strategy, size and culture on the design of management accounting systems (Chenhall, 2007). Otley (1980) proposes the premise of the contingency approach to management accounting practices as:

> "*There is no universally appropriate accounting system which applies equally to all organizations in all circumstances. Rather, it is suggested that particular features of an appropriate accounting system will depend upon the specific circumstances in which an organization finds itself*" (Otley, 1980, p.413).

Rom and Rohde (2007) present a theoretical framework of the relationship between management accounting, integrated IS and some context variables as a tool to map the current research in this area. They observe that several context variables can bring a significant insight into the management accounting and integrated IS relationship, however, they do not list all the variables as it not the main purpose of the framework. Chang and Jan (2010) have designed a ERP internal control framework by the use of COSO components and other variables. They stated that the framework can help shareholders, managers, and auditors in assessing the effectiveness of ICPs.

Management accounting researchers aim for more empirical research that related to the contingency theory in order to help the practitioners in decision making (Chenhall, 2007; Ferreira and Otley, 2009; Baldvinsdottir *et al.*, 2010). For instance, Baldvinsdottir *et al.* (2010) state that contingency theory studies might benefit the practitioners who compares their management accounting system to those of other companies or it can help them in identifying the pros and cons of potential practice. Although, the management accounting and ERP system researchers have developed a particular theoretical framework, there is no comprehensive theoretical framework

for the relationship between a number of contingency variables, ERP system success and effectiveness of ICPs, the researcher found.

3.4 Suggested Contingency Factors

The literature suggests number of contingency factors that may affect the relationship between the ERP systems and the effectiveness of ICPs (see chapter two), including external environment, organisational structure, size, organisational strategy, management support and organisational culture (Otley, 1980; Gable *et al.*, 2003; Rae and Subramaniam, 2008). The contingency theory of management accounting suggests that the effectiveness of an organisation is contingent upon the organisational characteristics (Gerdin and Greve, 2008). Consequently, organisations should provide more consideration to it characteristics as they need to be fit within the organisation system to maintain effectiveness (Donaldson, 2001).

Significantly, some contingency factors have priority to examine than others. Therefore, for this study, the researcher follows three steps in order to identify the most important contingency factors. The first step, the accessible articles and databases in the field of Accountancy and Information System have been reviewed (see chapter two). The aim of this step is to categorise the prior studies related to contingency theory and ERP systems or IC and to identify some gaps (see Table 2.1 in chapter two). As a result the researcher found sufficient clues that suggest a number of important contingency variables when considering the relationship between ERP systems and effectiveness of ICPs. The second step, the researcher discussed the findings from the first step with two academic staff. As a result of that the study came with two groups of contingency factors, namely: organisational factors (i.e. organisational structure, strategy, size, organisational culture, management support) and ERP factors (i.e. ERP system brand, implementation age and maturity).

For the final step, a number of experts in the field of management, IC and ERP systems are interviewed and asked regarding the most important contingency factors that would affect the relationship between the ERP system success and ICPs. For this step the researcher referred to the Fisher (1998) recommendation. He speculates that what determines the appropriateness of contingencies depends on management decisions. Hence, in this research the importance of these factors regarding the field

of study (Saudi Arabia) are investigated in an exploratory study (results are provided in section 5.2). The following section provides the study's key propositions, which are assessed in the exploratory study.

3.5 The Key Propositions

This research proceeds from the assumption that the measure of an ERP system's success is critical in explaining the impact of ERP systems on the effectiveness of ICPs. In order to investigate the relationship between success of ERP systems and IC effectiveness and to understand the relationships between the variables and the study constructs, a theoretical framework was developed (Figure 3.1). The theoretical framework is based on four main relationships. These four relationships are illustrated in four propositions. These propositions are tested, in the exploratory study, in order to construct relevant hypotheses (see section 5.2).

3.5.1 Proposition 1: There is linkage between organisational factors and the effectiveness of ICPs

Proposition 1 suggests that there is a relationship between organisational factors and the effectiveness of ICPs. The data for measuring the effectiveness of IC is not generally observable (Kinney Jr, 2000; Krishnan, 2005). Therefore, to test this proposition, the study makes an assumption that the existing level of COSO's ERM's eight components reflects the effectiveness of ICPs. According to COSO's ERM (2004) framework, there is a direct relationship between IC objectives and the framework components. IC objectives are what an organisation has to achieve, whereas the components refer to what it is needed to achieve the objectives. Therefore, the presence and function of the eight components (from the definition) can indicate the effectiveness of ICPs.

The contingency theory of management accounting suggests that there is no unique management control system appropriate to all organisations, yet the choice of applicable control practices depend upon the circumstances that is surround a specific organisation (Otley, 1999). The study's organisational factors theoretically associate positively with the ICPs. Many studies investigate the relationship between contingencies and management accounting practices in general. For example, Abdel-Kader and Luther (2008) examine the influence of ten organisational variables, including uncertainty, decentralisation, size etc., on a broad set of management

accounting practices. They find that differences in management accounting complexity can be explained by seven contingencies, which involve environmental uncertainty, size, customer power, decentralisation, advanced manufacturing technology, total quality management and just-in-time.

However, specifically, limited studies have empirically examined the impact of organisational factors on the ICPs (Chenhall, 2007). Therefore, it is important to consider the impact of the study's organisational factors on the ICPs in order to explain the effectiveness of the ICPs.

3.5.2 Proposition 2: There is linkage between the organisational factors and ERP system success

Proposition 2 suggests that there is a relationship between contingency factors and ERP system success. The measurement model of assessing the enterprise system success (Gable *et al.*, 2003) has been adopted in this study. Additionally, the study incorporates the service quality dimension to the Gable et al. (2003) enterprise system success model's four dimensions (see section 2.2.3). The reason for adding the service dimension to the Gable et al. model is that some researchers indicated sound purposes for doing that.

For instance, Ifinedo (2006) states that the dimensions and measures used in Gable et al.'s model might be adequate, yet more valid dimensions and measures can add more value to the model. Chien and Tsaur (2007) re-examined the DeLone and McLean (2003) model (updated by including the service quality dimension) for three Taiwanese high-tech firms. They find that system quality and service quality are very significant dimensions for the evaluation of ERP systems. Therefore, the five dimensions are used to assess ERP system success and to form a generalisable model that can be applied to public and private companies.

Additionally, contingency theory posits that matching the organisational system and contingency variables can enhance organisational effectiveness (Drazin and Van de Ven, 1985). Therefore, this proposition proposes that organisational factors are critical in influencing the success of ERP systems, and help improving the quality of ERP functions. Myers *et al.* (1997) indicate that considering contingency theory would improve the quality and productivity of IS functions to better meet the needs of an organisation. Despite the importance of organisational factors for assessing

ERP success, few studies investigate this issue (Gable *et al.*, 2008). Ifinedo (2006) suggests that future study might incorporate the impact of contingency factors, such as organisational structure, strategy, and size, on ERP system success. Consequently, more support evidence is required.

3.5.3 Proposition 3: There is linkage between ERP factors and ERP system success

Proposition 3 suggests that there is a relationship between ERP factors and ERP system success. Evidence from the IS literature supports the importance of ERP factors such as ERP maturity and brand (Saunders and Jones, 1992). Mahmood and Becker (1985) detect that IS organisation maturity is significantly related to user satisfaction. Voordijk *et al*. (2003) illustrate that the success of ERP implementations depends on IT maturity, IT strategy and business strategy, the strategic role of IT, and the implementation method.

Reviewing the literature reveals that there are few studies that investigate these relationships and more are required. Petter *et al*. (2008) refer to the need for more studies on the timing of the success evaluation (i.e., the difference between evaluation at the time of the implementation of the ERP system and the time of the measurement). Thus, it is very important to investigate this proposition.

3.5.4 Proposition 4: There is linkage between ERP system success and the effectiveness of ICPs

The main aim of this study is to investigate the impact of ERP success on the effectiveness of ICPs. Further, under this proposition the study suggests that ERP system success play a mediation role between the relationships of contingency factors and effectiveness of ICPs. There is little empirically-related research in the area of ERP systems and IC (Huang *et al.*, 2008). Most of these studies measure the quality of IC based on a 10-K report (an annual report required by the US Securities and Exchange Commission (SEC) to report IC problems).

However, the study's filed companies are not required to report the material weaknesses of ICS. Therefore, the study is attempted to use more comprehensive assessment, such as the eight components of COSO's ERM framework for assessing the effectiveness of ICPs. A number of studies show the relationship between the ERP systems and COSO framework(s). Brown and Caylor (2006) indicate that ERP

systems are able to support other frameworks, such as COSO's ERM. Consistently, Ramamoorti and Weidenmier (2006) state that the technology (ERP) is associated with COSO's ERM framework's components.

Chang and Jan (2010) design an ERP internal control framework using COSO components and other items. They conclude that the framework can help shareholders, managers, and auditors in assessing the effectiveness of ICPs. Interestingly, Morris (2011) finds a positive relationship between COSO frameworks and the implementation of ERP systems. However, more evidence is required regarding investigating ERP success (post-implementation) and ICPs (adopting COSO's ERM framework). Therefore, this proposition is also important for study.

3.6 Summary

Drawing upon management accounting contingency theory, this research investigates the contingency factors (organisational and ERP factors) that affecting ERP system success and the effectiveness of ICPs. This chapter builds up a theoretical framework and develops four propositions based on previous literature. First: the relationship between organisational factors and effectiveness of ICPs. Second: the influence of the organisational factors on success of ERP systems. Third: the linkage between ERP factors and success of ERP systems. Fourth: the effect of ERP system success on ICPs. These propositions are tested in an exploratory study and chapter five presents the results and provide the study's hypotheses. The next chapter discusses the methodology.

Chapter Four:
Methodology

4.1 Overview

Developing the theoretical framework of the relationship between ERP systems, IC, organisational and ERP factors in the previous chapter represents an initial step towards the development of theory through using the appropriate methodology to address the research objectives. This chapter explains the research methodology adopted for the current study, including research philosophies, paradigms, research approaches, data collection methods and analysis techniques. Additionally, it includes the rationale for implementing this methodology. This thesis uses Saunders et al. (2009) 'the research onion' to structure this chapter.

This chapter has five sections. Section 4.2 discusses the research philosophy and paradigm. All research methodological approaches are based on assumptions regarding epistemology, ontology and human nature. Additionally, this section includes the rationale of adopting the positivist paradigm in this study. Section 4.3 describes the research approaches. Section explains the research strategy. Section 4.5 discusses the research design and data collection. This section contains the exploratory study and the empirical survey. For the exploratory study some details concern its objectives and the method used to collect the study data; for the empirical survey part detail concern the questionnaire, such as designing, pre-testing and administering the questionnaire and non-response bias. Section 4.6 explains the statistical techniques are used in this study. The final section 4.7 summaries the chapter.

4.2 Research philosophy

Appropriate research strategy and methods cannot be selected without concern for the research philosophy. According to Saunders *et al*. (2009) research philosophy is a comprehensive term related to knowledge development and the nature of that knowledge. The research philosophy adopted by a researcher embeds important assumptions about the way that the researcher views the world. Researchers identify distinct research philosophies (based on different assumptions), such as epistemology (the nature of knowing), ontology (the nature of being) and axiology (the nature of value) (Collis and Hussey, 2009; Saunders *et al.*, 2009). However, no philosophy is

better than another; 'better' depends on the research question and how it should be answered.

It is important to explore further the research philosophy through the concept of research paradigm in order to draw an overarching picture (Saunders *et al.*, 2009). A research paradigm "is a philosophical framework that guides how scientific research should be conducted" (Collis and Hussey, 2009, p.55). In social science, two main research paradigms are commonly used, 'positivism' and 'interpretivism' (different terms might be used for these paradigms).

Although other paradigms (for example, existentialism, critical rationalism and linguistic) exist with different philosophical assumptions, Collis and Hussey (2009) argue that these paradigms exist in a "continuum line" which links positivism on one side and interpretivism on the other (see Table 4.1). Therefore this research attempts to illustrate the difference between the two main paradigms. Table 4.1 summarises the assumptions of both paradigms.

Chapter 4: Methodology

Table 4.1: Assumption of the main paradigms

Philosophical Assumption	Positivism ⟷ Interpretivism	
Ontological Assumption (The nature of reality)	Reality is objective and singular, separate from the researcher	Reality is subjective and multiple, as seen by participants
Epistemological Assumption (What constitutes valid knowledge)	Researcher is independent of that being researched	Researcher interacts with that being researched
Axiological Assumption (The role of values)	Research is value-free and unbiased	Researcher acknowledges that research is value-laden and biases are present
Rhetorical Assumption (The language of research)	Researcher writes in a formal style and uses the passive voice, accepted quantitative words and set definitions.	Researcher writes in an informal style and uses the personal voice, accepted qualitative terms and limited definitions.
Methodological Assumption (The process of research)	Process is deductive. Study of cause and effect with a static design (categories are isolated beforehand). Research is context free. Generalizations lead to prediction, explanation and understanding. Results are accurate and reliable through validity and reliability	Process is inductive. Study of mutual simultaneous shaping of factors with an emerging design (categories are identified during the process). Research is context bound. Patterns and/or theories are developed for understanding. Findings are accurate and reliable through verification.

Source: Collis and Hussey (2009, p.58)

4.2.1 Positivism

This research paradigm is also known as the functionalist paradigm (Saunders *et al.*, 2009; Abdel-Kader, 2011). According to the philosophy of ontology, this paradigm takes an objective view of social reality, treated the same as the natural world. Researchers, using this paradigm, believe that the reality exists externally and is independent of the observer. Epistemologically, measurable and observable phenomena can be regarded as valid knowledge about this external reality (Abdel-Kader, 2011).

Positivism is usually linked to the use of the deductive approach (i.e. theory and hypotheses are developed first, then data are collected to test these hypotheses) with

a view to provide explanatory theory in order to understand the social phenomena (Collis and Hussey, 2009). Additionally, positivism tends to use highly standard research instruments, for example questionnaires, to collect quantifiable data from large samples (i.e. for the purpose of generalisation) and analyses these data using statistical techniques to test the hypotheses derived from prior theories (Saunders *et al.*, 2009).

4.2.2 Interpretivism

According to Collis and Hussey (2009) interpretivism was developed as a response to the perceived inadequacy of the positivism paradigm to meet the demand of social scientists. Interpretivism supports the importance of researchers to understand the differences between humans, which emphasises the researchers to grip the subjective nature of social action (Saunders *et al.*, 2009). Interpretivism is underpinned by the assumption of multiple realities, that require multiple methods to be more understandable (Smith, 2003). This paradigm is also underlined by the belief that reality is subjective and socially constructed within human minds through engaging in their experiences and emotion (Collis and Hussey, 2009). Therefore, researchers have to focus on different constructions, interpretations and meanings established based on people's thinking and feelings, collectively and individually as well as their communications.

Unlike positivism, which focuses on measuring social phenomena, the interpretivism paradigm concentrates on exploring the complexity of social phenomena in order to gain interpretive understanding (Collis and Hussey, 2009). Thus, rather than being associated with quantitative methods of analysis as used by positivism to identify the measures of phenomena in the social world, interpretivism tends to adopt a set of methods that seek to interpret and describe these phenomena. Interpretivism research is normally associated with the inductive approach, where data are collected and analysed in order to develop a theory (Saunders *et al.*, 2009).

The differences between positivist and interpretivism paradigms lead to a very important conclusion (i.e. the same as this section started with) that there is no paradigm better than another. Preferring one paradigm depends generally on the research question(s) and objective(s) (Saunders *et al.*, 2009). Therefore, it is

important to know the research philosophy in accounting research in order to adopt an appropriate paradigm in the current research.

4.2.3 Research philosophy in accounting research

Research in accounting has been described by a number of authors as "a parasite research", which means that researchers follow the work of others in order to generate their own findings (Smith, 2003). Thus, accounting research has few theories of their own; much research is guided by a diversity of theories from the social sciences, for instance economics, sociology and psychology (Zimmerman, 2001). Additionally, accounting researchers have no methods of their own; they implement methods from social and natural sciences; and they also adopt many of their instruments from organisational behaviour literatures (Smith, 2003).

Burrell and Morgan (1979) construct a general sociological research framework; it contains of two independent dimensions based on assumptions relating to the nature of social science and the nature of society. These two dimensions generate four paradigms: the functionalist, the interpretive, the radical humanist, and the radical structuralism. The first principal dimension, the social science dimension, contains four distinct but related factors: assumptions relating to ontology, epistemology, human nature and methodology. Table 4.2 illustrates each of these factors.

Table 4.2: Burrell and Morgan's social science dimension

	Subjective approach to social science	Objective approach to social science
Ontology (concerned with the nature of 'reality)	Known as nominalism, views the social world as the outcome of individual consciousness.	Called realism, it emphasises that reality is external and exists independently of an individual's appreciation
Epistemology (concerned with nature of knowledge)	Known as interpretivism, knowledge of the world is obtained through personal investigation and experience.	Call positivism, researchers understand the world through predicted regularities and causal relationships among components.
Human nature (emphasises the link between human beings and their environment)	Human beings are autonomous and free-willed, and act voluntarily in creating the world.	The view of human and human activities is determined by the environment.
Methodology (relate to the approach taken in the process of conducting research)	An ideographic methodological or qualitative approach is applicable, e.g. observation.	A homothetic methodological or quantitative study is applicable, such as questionnaire.

Source: from Ryan *et al*. (2002) and Senik (2009)

The second principal dimension, the society dimension, identifies two alternative and fundamentally different approaches to society: one focuses on regulation, order and stability, and that explains the reason why society tends to hold together. The other is concerned with the fundamental divisions of interest, structural conflicts and inequality (Hopper and Powell, 1985).

The Burrell and Morgan sociological framework become a fundamental basis for many researchers, specifically accounting researchers, such as Hopper and Powell (1985), Laughlin (1995) and Ryan *et al*. (2002), who explored the framework from an accounting research perspective (see Figure 4.1).

Figure 4.1: Hopper and Powell's taxonomy of accounting research
Source: Ryan *et al*. (2002, p.40)

Hopper and Powell (1985) integrate the four assumption of the first dimension (i.e. ontology, epistemology, human nature and methodology) into a single "objective-subjective" continuum in order to categorise the variety of approaches to social sciences. Additionally, Hopper and Powell combine the two dimensions of Burrell and Morgan's sociological framework (nature of social science and the nature of society) to four terms, which can be used as a taxonomy for accounting research: interpretive, functionalist, radical humanist and radical structuralism (see Figure 4.1). According to the Hopper and Powell taxonomy, there are three main categories of accounting research, including: critical research, mainstream research, and interpretative research (Ryan *et al.*, 2002).

Although this classification is useful for demonstrating a range of alternative approaches, it would be inappropriate to argue that all accounting research can be efficiently classified into one of the three categories (Hopper and Powell, 1985; Ryan

et al., 2002). A summary of the underpinning epistemological and ontological differences between interpretive, mainstream, and critical accounting research is provided in Appendix 2.1.

4.2.4 Rationale for adopting a positivist paradigm

Different positivistic theories, over the years, have appeared and been used in accounting research, for instance agency theory, open system theory and contingency theory (Abdel-Kader, 2011). This study draws on the premise of contingency theory in accounting research to develop a contingency framework of ERP system success and effectiveness of ICPs, so that it can help to understand, explain and predict effectiveness of ICPs in relation to success of ERP systems (see section 3.2 and 3.3). In line with previous contingency theory-based accounting research, the current study adopts the positivist paradigm for several reasons. Firstly, this paradigm enables employment of the adopted theories (i.e. contingency theory) in order to address the research aim and objectives and to develop the research hypotheses. In addition, observing the phenomena by, for example, questionnaires can lead to production of credible data, which can be used to test the hypotheses developed.

Secondly, the positivist paradigm is appropriate to this research aim and objectives, as this research seeks to develop an empirically-based theoretical framework of effective ICPs. The effectiveness of ICPs is explained through identifying general and significant relationships between effective ICPs, success of ERP systems, organisational and ERP factors, which can be generalised to a large number of firms. The positivist approach helps the researcher to assess the adopted theory against a unique and large sample of observations (e.g. by questionnaire) that enables the findings to be more generalisable to the entire population.

Thirdly, the theoretical study framework is based on contingency theory. According to Ryan *et al.* (2002) and Abdel-Kader (2011), positivism is an appropriate and commonly used approach, especially, in contingency theory research and within the management accounting discipline.

Fourthly, there is a call by accounting researchers for more positivistic accounting research (Zimmerman, 2001; Baldvinsdottir *et al.*, 2010; Merchant, 2010; Abdel-Kader, 2011). For example, Baldvinsdottir *et al.* (2010) promote the need for management accounting researchers to focus on the technical core of the area under

research and to use the findings of empirical research so that they can be utilised to support practice. Abdel-Kader (2011) reviews the recent developments in positivistic approach in order to provide some directions for future management accounting research. Interestingly, he enhances the need for quantitative data follow by qualitative data in order to provide some answer for unexpected results.

Fifthly, to the best of the researcher's knowledge no previous research has used the positivist paradigm in addressing the relationship between success of ERP systems and effectiveness of ICPs within a contingency model. Therefore, generalisable findings in this area of research are needed.

4.3 Research approach

There are two research approaches: deductive approach (i.e. theory to observation) and inductive approach (i.e. observation to theory).

4.3.1 Deductive approach

Deductive research "is a study in which a conceptual and theoretical structure is developed and then tested by empirical observation" (Collis and Hussey, 2009, p.8). The deductive approach process starts with developing hypotheses from an existing theory, collecting specific data, testing the hypotheses, and then confirming or modifying the theory (if necessary) (Smith, 2003). Thus, deductive research moves from the general to the specific (Collis and Hussey, 2009). Some important characteristics of the deductive approach are investigating the causal relationships between variables, collecting quantitative data, testing hypotheses, a very structured methodology for replication, reductionism and generalisation (Saunders *et al.*, 2009).

4.3.2 Inductive approach

In contrast to deductive research, inductive research "is a study in which theory is developed from the observation of empirical reality" (Collis and Hussey, 2009, p.8). The inductive research process begins by collecting general data, analysing the data, and then generating theory (Smith, 2003). Therefore, the inductive approach moves from individual observation to broader generalisation and theory (Collis and Hussey, 2009). The inductive approach concentrates on gaining an insight into the meanings of events, collecting qualitative data, being more flexible to changes, and less concern with generalisation (Saunders *et al.*, 2009).

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This research is based mainly on the deductive approach, as four propositions are constructed based on the contingency theory and tested in an exploratory study (see section 4.5.1). Then the hypotheses are developed and tested relying on quantitative data and analysed using advanced statistical software (see Figure 4.2).
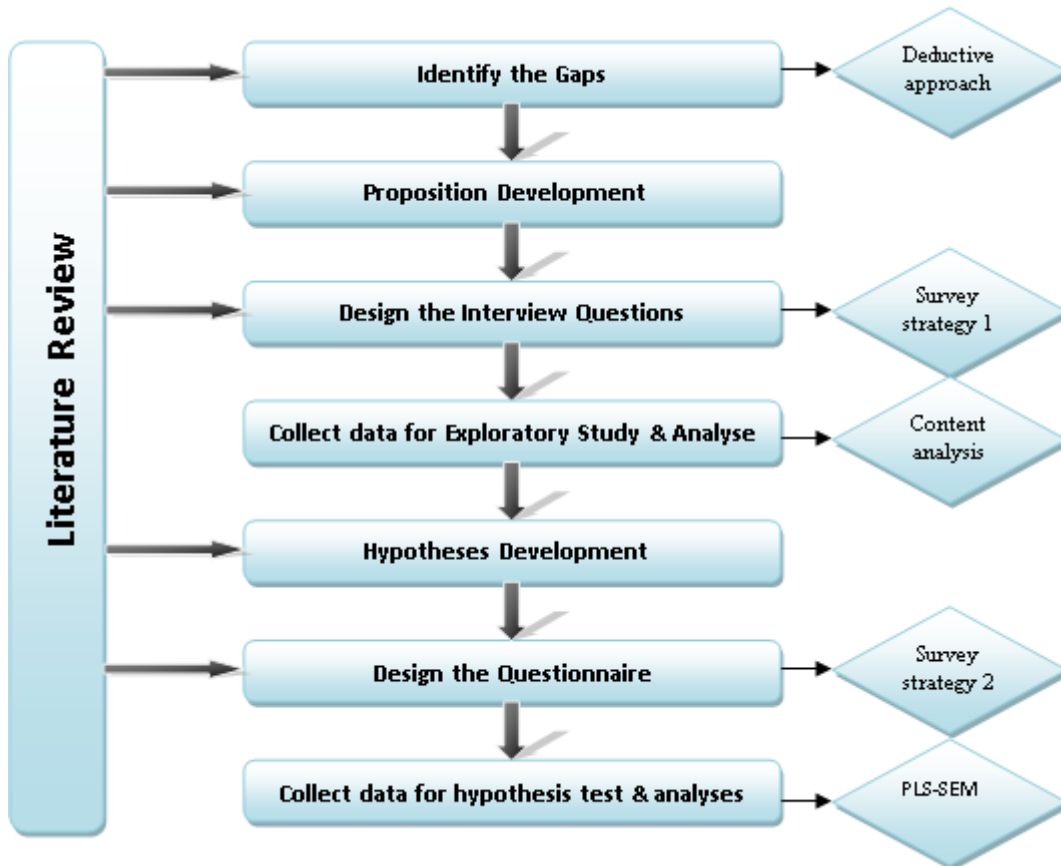
Figure 4.2: Research Processes and Method

4.4 Research strategy

After identifying the research philosophy and paradigm, it is important to determine the research strategy, which must correspond to the research philosophy and the adopted paradigm (Saunders *et al.*, 2009). A number of appropriate research strategies have been proposed for business and management research, such as: experiment, survey, longitudinal studies, case study, grounded theory and ethnography. Some of these strategies are commonly associated with positivistic or deductive approaches, such as experiment and survey, while grounded theory and ethnography are associated with interpretivism or inductive approaches (Collis and Hussey, 2009). However, some research strategies can be used, to some extent, for both paradigms, such as survey and case study (Collis and Hussey, 2009).

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In line with the positivist paradigm that is adopted in the current study and similar to most of accounting research (Ryan *et al.*, 2002), this study adopts the survey strategy. This strategy tends to be used for exploratory, explanatory and descriptive research (Saunders *et al.*, 2009). There are two common data collection techniques that can be used with the survey strategy, interview and questionnaire. Therefore, in the first stage, which is the exploratory study, the current study used the first technique in order to explore the body of knowledge (see section 4.5.1) (Collis and Hussey, 2009). In the following stage, the study adopts the questionnaire method and collects primary data from a large number of organisations in order to test the study's hypotheses and generalise the findings (see section 4.5.2).

The survey is a common method that can be used for theory testing within the management accounting discipline (Abdel-Kader, 2011). According to Collis and Hussey (2009) there are two main purposes of using surveys in business research, descriptive surveys that provide a precise representation of the phenomena and analytical surveys that are conducted to determine whether there is a relationship between variables. The popularity of the survey strategy can be connected to a number of reasons. First, it helps to collect a large number of data from a considerable population and in an economic way (Collis and Hussey, 2009).

Second, using a survey allows more control of cost and time, especially when a sampling technique is used to generalise the results to the population (Saunders *et al.*, 2009). Third, some prior studies in the area of ERP systems and IC indicate that large sample analysis is required (Kumar *et al.*, 2008; Morris, 2011). Fourth, the majority of previous quantitative studies in this area use secondary data (basically management reports and financial statement analysis) to identify the effectiveness of ICPs (e.g. Morris, 2011).

Fifth, the results of the exploratory study indicate that success of ERP systems and effectiveness of ICPs are complicated and implementation of ERP systems is significantly varied across organisations in terms of comprehensiveness and organisational level of implementation. However, the study findings lack generalisability due to the limited number of organisations in these empirical studies. Therefore, this study uses the questionnaire survey strategy for more generalisable findings. Particularly, in the second stage, this study uses the questionnaire method in

an attempt to measure the effect of success of ERP systems on ICPs, through developing a Likert scale for success of ERP systems (that takes into consideration comprehensiveness and organisational level of implementation) and effectiveness of ICPs.

However, survey strategy in general is challenged by selecting a representative sample over the entire population (Collis and Hussey, 2009). Identifying the study population, the sample and the data collection method is critical for a successful study. Therefore, the following section discusses in detail how this study addresses these issues.

4.5 Data collection

There is a wide range of methods or techniques for data collecting, yet it is important to select those in order to meet the philosophical assumptions of the study paradigm, which must meet the study aim and objectives (Collis and Hussey, 2009). A researcher can either use a single data collection method or multiple data collection method (Saunders *et al.*, 2009). According to Ittner and Larcker (2001), using more than one method to collect the study data can help the researcher to provide a consistent body of evidences and that can increase the reader's confidence in the study's results.

Commonly, in positivist studies with a survey strategy, personal interviews and questionnaires are the two data collection methods that are commonly used (Zikmund, 1997). Personal interview is "a two-way conversation initiated by an interviewer to obtain information from a participant" (Blumberg *et al.*, 2008, p.281). This method has advantages as well as clear disadvantages, such as cost and time-consumer. The other method, questionnaire, can reduce some of the interview limitations. A questionnaire is a number of questions left to be completed by a particular participant in a convenient time and location (Blumberg *et al.*, 2008).

Because the complexity of the study's theoretical model, the study context and the number of data required for achieving the study's objectives, using one method for data collection is not practical. Consequently, this study uses two main methods for data collection, interview in the first stage for the exploratory study and questionnaire in the second stage for the quantitative study.

4.5.1 Data collection method for the exploratory study
-Overview of the exploratory study

The exploratory study is defined as a sort of research that has emphasis on the finding of ideas and insights, especially when the researcher has limited amount of knowledge and experience regarding the research area (Collis and Hussey, 2009). Exploratory study is also important when some factors are known, but there is a need for more information to develop a practicable theoretical framework (Weiers, 2011).

Zikmund (1997) indicates that exploratory research normally provides qualitative data; it helps to obtain great understanding of the study's concepts and clarify its problems, instead of explaining the phenomenon in terms of numbers. Exploratory research might be the main research method for investigating the research problem(s) or can be a series of informal studies to supply background information, as it in this study. There are many purposes for exploratory study. It helps to diagnose the situation (Zikmund, 1997). Particularly, for some research topics, there is a need to analyse the situation in order to clarify the problem's nature. The researcher might need to explore the research area in order to be sure the research problem(s) can be formally studied. Exploratory study provides information which helps to diagnose the research problem(s). Exploratory study can also save time and money in order to determine the best opportunity (Blumberg *et al.*, 2008). Additionally, it can enable the researcher to generate one or more hypotheses about the reasons for specific practices, which can be tested subsequently in a scale study (Ryan *et al.*, 2002). It may also be used to discover new ideas. Zikmund (1997) indicates that exploratory study can be the first empirical step examining a new idea.

-Objectives of the study

For this research, the main objective for applying the exploratory study is to gain insights into and familiarity with the research topic and the focus of the subsequent investigation. Another objective is to investigate IC practices, including IC requirements and regulations for Saudi Arabian companies.

In addition, the exploratory study aims to investigate the relationship between the effectiveness of ICPs and the ERP systems. This research stands on the assumption that an ERP system can improve the ICPs (Huang *et al.*, 2008; Kumar *et al.*, 2008).

Therefore, in order to find the contribution of ERP systems, both ERP systems and non-ERP system companies should be investigated.

The objective of the exploratory study is also to investigate the contingency factors that might affect both the success of ERP systems and the effectiveness of ICPs such as structure, strategy, size etc. Significantly, the exploratory study also can act as a trial study to find out whether from the four propositions four hypotheses can be constructed. Also, this study is used to find out whether the financial managers, directors of accounting departments or directors of internal audit departments are able to provide adequate information for this study.

-Method for data collection

The exploratory study mainly used an interview instrument. There are different types of interviews, such as unstructured interview, semi-structured interview, face-to-face etc. This research uses the semi-structured interview which can help the researcher to explore any issues that may arise during the interviews (Blumberg *et al.*, 2008). In addition, questions in this type of interview are likely to be open questions, that help to explore the research problem(s) and gather broad information (Collis and Hussey, 2009).

Based on the review of previous studies (Brown and Nasuti, 2005; Grabski and Leech, 2007; Chang and Jan, 2010; Morris, 2011), the interview questions were designed and linked to the research objectives (see Appendix 3.1). The questions have been reviewed by two academic staff and one provisional. The researcher has considered most of the reviewer's comments and suggestions.

The research sample includes small, medium and large companies. Also the sample includes companies with ERP systems implemented and not implemented (see Table 4.3). That helped the researcher to investigate the impact of ERP systems on ICPs. Most of the interviews were carried out with the financial manager, the manager of accounting department or with the internal auditor. Fourteen interviews with twelve Saudi Arabian companies were conducted. Each interview lasted between one to three hours and most of them were recorded.

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Table 4.3: The Exploratory study sample

Firm code	Interviewee	Firm size	Type of firm
A	Director of Internal Audit dept. & Internal Auditor	Medium	Public Joint-stock
B	Director General Technical Affairs	Large	Public Joint-stock
C	Director of Internal Audit dept.	Large	Public Joint-stock
D	Internal Auditors (IT expert) & Specialist Regulatory Compliance	Large	Public Joint-stock
E	Chief of Risk Management dept.	Medium	Partnership
F	Chief of Accounting dept.	Large	Public Joint-stock
G	Director of Internal control dept.	Large	Private Joint-stock
H	Financial Manager	Large	Private Joint-stock
I	Chief of Accounting dept.	Medium	Partnership
J	Human resources Manager	Medium	Private Joint-stock
K	Financial Manager	Medium	Partnership
L	Financial Manager	Small	Private

During the study interviews, the researcher tried to obtain as much information as possible related to the research objectives. The interviewees were asked questions related to their background, experience and position. Additionally, the interview contributors were encouraged to provide their own views and suggestions with respect to the firms' IS and IC. In the interviews, participants were also asked to identify the dominant contingent variables that might affect the study's main relationships. In general, the interviewees have been very helpful and cooperative. In some, the researcher was given access to some internal reports and some internal documents. Also the researcher was shown by some participants how the ERP system process and how the system can reduce some errors and risks.

After collecting the qualitative data for this study, the content analysis method is used to analyse the data. Content analysis is a method commonly associated with a positivist paradigm (Collis and Hussey, 2009). This method systematically converts the selected item(s) of qualitative data to numerical data. It allows the researcher to test theoretical issues and to enhance the understanding of the data. Thus, through this method, it is possible to distil large number of words into fewer content-related categories. Normally, recorded (audio) interviews and documents such as newspapers and reports can be analysed by this method (Smith, 2003). Therefore, after collecting the data, the next step is to develop categories (main category and sub-category) follow by coding the data according to the categories (see section 5.2) (Elo and Kynga¨s, 2008).

However, the personal interview method may suffer from problems of bias and inaccurate articulation and listening (Zikmund, 1997). Therefore, this method is supplemented by another method, which is the questionnaire.

4.5.2 Data collection for hypothesis testing

Questionnaire survey is the instrument used in this research to collect the data for hypothesis testing. A questionnaire is "a list of carefully structured questions, which have been chosen after considerable testing with a view to eliciting reliable responses from a particular group of people" (Collis and Hussey, 2009, p.191). It is one of the most widespread data collection techniques within the survey strategy. It allows each respondent to answer the same set of questions in an efficient way (Saunders *et al.*, 2009). It has been indicated by many researchers that the questionnaire technique is quicker and cheaper than the interview (Blumberg *et al.*, 2008; Collis and Hussey, 2009). It is also more convenient for participation and it contains less risk of bias than the interview.

According to Abdel-Kader (2011) much of the research implementing contingency theory within the field of management accounting has tended to use questionnaires followed by a statistical analysis technique. Additionally, the questionnaire technique is recommended by many accounting researchers, such as Ryan et al. (2002), Smith (2003) and Abdel-Kader and Luther (2008). Therefore, in order to achieve the current study's objectives, the self-completed questionnaire method was adopted to collect the main data. Both an internet-mediated questionnaire and a postal questionnaire were selected, as they are more relevant and suitable to this study's context.

Study sample

The companies with implemented ERP systems and located in Saudi Arabia were considered as the frame sample of this research. Particularly, all accessible cases in the study field (Saudi Arabia) were selected as the study's sample.

Since there was no existing database of the ERP system population in Saudi Arabia, various sources of data were used in the current study. That includes some previous experimental studies on Saudi Arabian companies, such as Al-Muharfi (2010) and Al-Turki (2011) (93 companies). The researcher contacted some ERP system vendors in Saudi Arabia (e.g. SAP and Oracale) to gain the name of the companies

implemented ERP systems in Saudi Arabia (42 companies). Additionally, some websites were used, for example: websites of top international ERP system vendors, websites of the Minister of Commerce and Industry and the websites for some Saudi companies (78 companies). Finally, a list of 213 companies that have implemented ERP systems was identified.

Construction of the questionnaire

The design of the questionnaire has an essential effect on the reliability and validity of the data that will be collected (Saunders *et al.*, 2009), so the researcher has to make sure that the questionnaire achieves the research objectives and accurately collects the required data. Although the response rate from questionnaire survey is lower than some other type of the survey data collecting method, the response rate can be improved by applying some strategies such as good design, clear explanation of the aim of the questionnaire and pilot testing.

For this study, the researcher selected the study's measures, constructed the questions, designed the questionnaire to increase the response rate, and piloted the questionnaire. The final draft for the questionnaire contains eight pages, without the front cover. According to Saunders *et al.* (2009) an acceptable length of questionnaire should be between four to eight pages. The questionnaire contains four parts. The first part contains 30 questions from COSO's ERM framework to evaluate the ICPs. The second part contains 28 questions mostly from Gable et al.'s (2004) model to evaluate the success of ERP systems. The questions for the third part cover eight contingency variables (structure, strategy, size, organisation culture, management support, ERP brand, ERP implementation age and maturity of ERP systems). The questions for the last part cover demographics. Appendix 4.1 presents the questionnaire.

Question type and design

Commonly, the open and closed questions are the two main types used in questionnaires (Saunders *et al.*, 2009). However, according to Collis and Hussey (2009) the positivist approach suggests closed questions. Closed questions permit the participants to choose from the predetermined answers, so the responses are easier to compare. Additionally, they are very suitable and are normally easier and quicker to answer and to analyse, as the choice of potential answers is limited (Collis and

Hussey, 2009). For this study all the questions are closed except that some questions have the choice "other (please specify)" at the end of the question (e.g. the part four questions).

For the questions' format, the current study mostly used the rating questions, specifically the Likert-style rating scale. For the Likert scale the respondents specify their level of agreement or disagreement with a sentence or series of sentences, commonly on a five- or seven-point rating scale. This study uses the seven-point Likert scale for all the rating questions, which adds more sensitivity and 'specification' to the measurement and has provided more choices to the respondents (Croteau and Bergeron, 2001; Gable *et al.*, 2003). The rating questions in the questionnaire are easy to answer and require less space by providing a set of different statements in one list. The study mainly used positive statements and a few negative statements in order to make sure that the participants read the questions carefully (Collis and Hussey, 2009). Another type of question used for this questionnaire is category questions. Although the researcher tried to provide suitable answers for most of the respondents, there were a number of respondents who provided different answers in the "other (please specify)" category (e.g. the ERP brand questions).

Additionally, the questionnaire design should be attractive in order to increase the response rate and avoid errors. However, designing a good questionnaire is not only about the questions, it includes other aspects such as clear instructions, the logical order of the questions and the presentation of the questions (Collis and Hussey, 2009). Therefore, attention was given to the instructions and to the way that the questions were presented. The matrix-style for the questions has been used in order to save space and to make it easy for the reader to follow the questions and to be pleasant to the eye (Saunders *et al.*, 2009). Also the questionnaire started with the most important questions, which is IC, then ERP systems, contingency factors and lastly demographics. The front page is an important aspect; it provides a chance to motivate the participants to complete the questionnaire (Vaus, 2002). Therefore, further attention has been provided to construct the front page, which includes the printing quality and the information provided on it. For instance, description of the study's objectives and stating the researcher's contact details encourage the respondents, confidentiality, to participate in this study.

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Ethical consideration

This study followed the Code of Research Ethics in the University of Bedfordshire. The research ethics forms were completed in the early stage and submitted to the Research Graduate School at the University of Bedfordshire, to obtain ethical approval before starting the process of data collection. After obtaining the ethical approval, a participant information letter was required. This letter was attached to the questionnaire and showed the title of the research, the researcher's details, the aim of the research and, finally, a statement ensuring confidentiality and the voluntary nature of participation. In addition, another participant information letter was required from the King Faisal University (the researcher sponsor) and was also attached with the questionnaire (see Appendix 5.1).

The participants

Financial manager, director of internal audit department or director of accounting department were used as key participants. From the exploratory study, the researcher found one of the financial managers, director of internal audit department or director of accounting department is responsible for ICPs. It also found that financial manager, director of internal audit department or director of accounting department are likely able to provide precise and useful information regarding the organisation strategy, structure, size, culture, IS and management support. Additionally, it states in the questionnaire that the main participant has the right to share the answers with other parties within the company (see Appendix 4.1).

Pre-testing of the questionnaire

Before starting the data collection it is an important step to pre-test the questionnaire in order to obtain feedback regarding the questionnaire (Vaus, 2002). For example, the pre-test of the questionnaire can help to detect some typing mistakes or unclear statements. Furthermore, it helps to evaluate the validity of the questions and reliability of the data that will be collected (Blumberg *et al.*, 2008). This step requires in the early stage experts on research and in a later stage requires experts in the field (Saunders *et al.*, 2009). Therefore, the pre-test for this study questionnaire was performed in three stages.

In the first stage, the questionnaire first draft was sent to the supervision teem and three PhD researchers (who have passed the stage of data collection) from the

University of Bedfordshire, Business School. All the feedback from supervision teem and the PhD researchers was helpful to improve the questionnaire, such as clarifying some statements, instructions and a statement for the confidentiality of information, *"All the information collected in this survey will remain confidential and will only be reported in aggregate form"*. In the second stage, the questionnaire second draft was posted to four academic staff (two from Anglia Ruskin University and two from King Faisal University) from a business background. The feedback received was useful, for example moving the demographic part to the last page of the questionnaire; clarifying some statements; adding "other (please specify)" to some questions. As a result of these comments the second draft was amended and the third draft was prepared. In the last stage, the third draft was sent to two professionals from two big Saudi companies. However, no essential amendment was suggested. After this stage the final English draft was ready for use.

Translation of the questionnaire

Although most of the potential respondents prefer to fill the English version of the questionnaire, the questionnaire has been translated to Arabic language (as the Arabic language is the national language) for who would like to use the Arabic version. Translating questions into another language requires care, especially it is important that the meaning is the same for all respondents (Saunders *et al.*, 2009). Therefore, the translation of the questionnaire was performed in four steps. In the first step, the questionnaire was translated to the Arabic language. In the second step, the two versions (the Arabic and the English) were distributed to three PhD researchers from the University of Bedfordshire (who are well-known to the two languages) to compare the English version with the Arabic version. All the comments have been considered and the second draft of the Arabic version prepared.

In the third step, the amended questionnaires (Arabic and English) were sent to two academic staff at King Faisal University. Useful feedback received from the academics included for instance, changing some words to more suitable ones; grammar improvement and adding some English words to some Arabic statements to add more value. In the last step, both versions (Arabic and English) were compared by an internal auditor from one of the biggest companies in Saudi Arabia and it was concluded that the two versions have the same contents and meanings.

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Questionnaire administration

After the current study's questionnaire was constructed, pre-tested and amended, the questionnaire was prepared for use for collecting the data. This final stage is known as administrating the questionnaire (Saunders *et al.*, 2009). Saunders et al. find more than 1,000 strategies can help to increase the response rate, such as the clarity and length of the questionnaire. However, the impacts of these strategies on the response rate depend on the way in which the study questionnaire is administered.

There are different types of questionnaire, for instance, internet and internet-mediated questionnaire, postal questionnaire and telephone questionnaire (Saunders *et al.*, 2009). The study used both internet-mediated and postal questionnaires. Multiple-contact techniques have been followed in order to improve the response rate (Dillman, 2007). At the first stage, 217 e-mails were sent to the director of human resource departments (as the only e-mail available in the Ministry of Commerce and Industry database of Saudi companies). The e-mail included the purpose of the study (including a request to send back the financial manager's email address); the participant information letter and questionnaire on 24th August 2012 (see Appendix 5.2). However, most of the emails failed to be sent; the main reason was the 'Shamoon virus'[11] that attacked the biggest oil producer company in the world, Armco, on 15th August 2012. As a result of the attack most large companies in Saudi Arabia disabled employees' e-mail and internet access to protect their company from similar attacks.

At the second stage, after the failure of the first stage the researcher started calling and visiting the study's companies and requesting the postal address or the private email of whoever is responsible for the ICPs (one of the financial manager, director of internal audit department or director of accounting department). Because the ICPs are a very sensitive topic to the companies, in every call or visit the researcher had to introduce the study's purpose and the importance of the study in a careful way. Immediately after every call or visit the questionnaire with participant information letter was sent to the company. This stage took around six weeks. Within the first four weeks, 58 valid responses (46 by email and 12 by post) and 4 non-valid

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[11] http://www.bbc.co.uk/news/technology-19293797 accessed on 20/8/2012

responses were received. The 4 non-valid responses were from non-ERP (or non-fully implemented ERP) system companies.

At the third stage, after approximately two weeks (from the end of stage two) the first follow up e-mail was sent to non-respondents including a remainder message, the questionnaire and a direct web address to the questionnaire[12]. Although the researcher tried to avoid advertising the questionnaire via web address as it likely to provide a very low response rate (Saunders *et al.*, 2009), some financial managers had recommended to use it. As a result, during the following two weeks, 27 valid responses were received (only one completed the web questionnaire and the rest responded via e-mail) and 2 non-valid responses (incomplete); 11 refused to participate as they were very busy with preparing the year-end financial statements or because of some company policy. At the fourth stage, another remainder e-mail was sent to the non-respondents after two weeks of the end of stage three. 9 valid responses were received during the following three weeks.

At the last stage, final follow up by phone was undertaken for the plurality of the non-responses to emphasise the importance of the questionnaire. Some of the non-respondents refused to participate due to lack of the time and some of them promised to send after they completed preparing the final financial statements. However, after a reminder e-mail on 13 January 2013, only 16 further valid responses were received, taking the total to 110 valid responses. The summary of the respondents are presented in Table 4.4.

According to Saunders et al. (2009) "a response rate of approximately 35 per cent is reasonable" "for most academic studies that involve top management or organisations' representatives" (Saunders et al., 2009, p.222). Therefore, the response rate for this study, which is 52%, is acceptable as the organisations' representatives were financial managers, directors of internal audit department or directors of accounting department.

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[12] https://bedshealthsciences.eu.qualtrics.com/SE/?SID=SV_a00ydaTVKSEeRk9

Table 4.4: Response rate

	First requests	Second, Third and final requests	Total
Usable Responses	58	52	**110**
Non-ERP Responses	4	0	4
Incomplete Responses	0	2	2
Refused Responses	0	27	27
Total	62	81	143
Total number of sample			**213**
***Response Rate**	27%	24%	**52%**

*Response Rate = total number of responses/total number of the study sample

(0.516= 110/213)

Checking non-response bias

It is an important to generalise the survey findings, so the study's sample would represent the entire population (Collis and Hussey, 2009). This study uses all accessible cases, yet the non-responses can threaten the representativeness of the study samples and the generalisation of the findings. Significantly, non-response might cause bias in the study findings, when the respondents refused to participate in the research for any reason (Saunders *et al.*, 2009). Researchers should use appropriate procedures in order to minimise the non-responses bias.

Non-response bias can be assessed by comparing the responses from the first request (58 replies) and those from the follow up request (52 replies) (Sax *et al.*, 2003). Looking to the responses rate table (Table 4.4) it shows that there are no significant differences between the two groups. In addition, the t-test was also used to assess the difference between the two groups in terms of demographic characteristics, for instance the company size, the implementation age of ERP systems, the ownership type and the position of the respondents. The results (Table 4.5) show no significant difference between the early respondents and the late respondents on the basis of the demographic characteristics. Therefore, the non-response bias is not applicable to this study.

Table 4.5: Checking Non-Responses Bias

	Respondents	N	Mean	S.D	t	d.f.	Sig.
Size	Early	58	3.02	1.068	.376	108	0.708
	Late	52	2.94	1.018	.377	107.582	0.707
ERP Brand	Early	58	0.74	0.442	.567	108	0.572
	Late	52	0.69	0.466	.565	105.184	0.573
Ownership type	Early	58	3.03	0.936	-.540	108	0.591
	Late	52	3.13	1.010	-.537	104.382	0.592
Qualification	Early	58	3.43	3.267	-.112	108	0.911
	Late	52	3.50	3.172	-.112	107.300	0.911
Position	Early	58	2.21	1.460	-1.008	108	0.316
	Late	52	2.50	1.590	-1.003	104.042	0.318

4.6 Statistical techniques

A wide range of research topics in the field of management accounting research have recently benefitted from developments in using multiple methods and techniques to examine research data (Smith and Lagfield-Smith, 2004; Cadez and Guilding, 2008). These developments require better model specification, which clearly performs the relationships derived from the theory being tested and more rigorous methodology in instrument validation and model testing (Henri, 2006; Chenhall, 2007). Structural Equation Modelling (SEM) is one of the advanced statistical techniques used by many researchers to enhance theory development and model testing (Hair *et al.*, 2010).

Many studies in the field of accounting have called for more utilisation of SEM (Smith and Lagfield-Smith, 2004) to "provide simultaneous tests of measurement reliability and structural relations, which may overcome some of the limitations that have been levelled at the way that management accounting has used more traditional statistical techniques" (Smith and Lagfield-Smith, 2004: p.49). However, a small number of studies in the field of accounting (e.g. Smith and Lagfield-Smith, 2004; Chong and Chong, 2002; Henri, 2006; Cadez and Guilding, 2008) have used SEM compared with other areas in the social sciences. In an effort to respond to the increasing calls for using SEM in the field of accounting research, this study adopts SEM to test the study's theoretical framework. The following sub-sections discuss the SEM, the approaches of SEM and Partial Least Squares (PLS).

4.6.1 Structure Equation Modelling

SEM can be defined as a "statistical technique [that] allows for the simultaneous estimation of multiple and interrelated dependence relationships, has the ability to represent unobservable concepts, and accounts for the measurement error in the estimation process" (Cadez and Guilding, 2008: p.849). The first use of SEM was in early 1980 in marketing research, yet the use of it has become more common in recent years (Hair *et al.*, 2010). Significantly SEM includes both a measurement model and a structural model. The measurement model identifies the reliability of the each measurement and the loading of every observed (manifest) variable on the latent variable by using confirmatory factor analysis. The structural model examines relations between latent variables, and incorporates identified measurement error variances by using regression analysis (Smith and Lagfield-Smith, 2004; Hair *et al.*, 2010).

SEM has advantages and strengths over other analysis techniques (e.g. multiple regression and factor analysis), which encourage the researcher in this study to use it (see Appendix 6.1). SEM is remarkably appropriate in research when a hypothesised dependent variable becomes an independent variable in a following dependence relationship, while multiple regression models are based on one dependent variable (Hair *et al.*, 2010). In this study the success of ERP systems play a dependent variable in the first relationship and an independent variable in the second relationship. In addition, according to Hair *et al.* (2010), none of the other statistical techniques such as factor analysis and multiple regressions, allow in one technique to test both measurement prosperities and the theoretical relationships. Also, SEM permits to estimate together the multiple and interrelated dependent relationships between variables and to estimate the measurement error for the relationship latent variables. Failing to calculate the measurement error can cause bias in the estimation of the regression coefficients for dependent and independent variables (Smith and Lagfield-Smith, 2004).

In a structural equation model there are two approaches that can be used to estimate study relationships, the covariant-bases SEM (CB-SEM) and Partial Least Squares SEM (PLS-SEM) (Hair *et al.*, 2013). Each approach is eligible for a particular research context, thus it is important to provide briefly the difference between the

two approaches. The following section discusses the difference between CB-SEM and PLS-SEM and the justification for using the PLS-SEM.

4.6.2 CB-SEM and PLS-SEM

Although, both the CB-SEM technique and PLS-SEM share the same roots, there are some differences between them. According to Hair *et al*. (2013) CB-SEM is mainly used to confirm or reject a theory, "it does this by determining how well a proposed theoretical model can estimate the covariance matrix for [a] sample data set" (2013, p.4). PLS-SEM, also called PLS path modelling, is normally used when theory needs to be developed in exploratory research, and it does this by concentrating on explaining the variance, when the model is examined, of the dependent variable (Hair *et al*., 2013).

Particularly, the main aim of applying CB-SEM is to explain the covariance matrix of all the indicators, whereas the primary objective of using PLS-SEM is to predict and explain the target construct. CB-SEM is parameter-oriented, thus the discrepancy between the sample and estimated covariance matrix is minimised. Conversely, PLS-SEM maximises the explained variance of the dependent latent variables by "estimating partial model relationships in an iterative sequence of ordinary least squares (OLS) regressions" (Hair *et al.*, 2012, p.415).

In addition, using CB-SEM requires fulfilment of a set of assumptions, such as the multivariate normality of data and large sample size (Hair et al., 2011a). Often in CB-SEM, small sample size can lead to biased test statistics (Hoyle, 1995). However, in a situation where these assumptions are not applicable (normality and large sample size) or the research aim is prediction rather than confirmation of endogenous constructs, PLS-SEM is the appropriate technique of analysis, as it has the minimum demands on residual distributions, measurement scales and large sample size (Chin, 2010; Lee *et al.*, 2011). Hair et al. (2011) provide rules of thumb for selecting CB-SEM or PLS-SEM (Table 4.6), which this researcher used to select the appropriate approach.

Table 4.6: Roles of Thumb for selecting CB-SEM or PLS-SEM

Criterion	The Roles of Thumb
Research Goals	• If the goal is predicting key target constructs or identifying key "driver" constructs, selects PLS-SEM. • If the goal is theory testing, theory confirmation, or comparison of alternative theories, select CB-SEM. • If the research is exploratory or an extension of an existing structural theory, select PLS-SEM.
Measurement Model Specification	• If formative constructs are part of the structural model, select PLS-SEM. Note that formative measures can also be used with CB-SEM but to do so require accounting for relatively complex and limiting specification rules. • If error terms require additional specification, such as co-variation, select CB-SEM.
Structural Model	• If the structural model is complex (many constructs and many indicators), select PLS-SEM. • If the model is non-recursive, select CB-SEM.
Data Characteristics and Algorithm	• If your data meet the CB-SEM assumptions exactly, for example, with respect to the minimum sample size and the distributional assumptions, select CB-SEM; otherwise, PLS-SEM is a good approximation of CB-SEM results. • If the data are to some extent non-normal, use PLS-SEM; otherwise, under normal data conditions, CB-SEM and PLS-SEM results are highly similar, with CB-SEM providing slightly more precise model estimates. • If CB-SEM requirements cannot be met (e.g., model specification, identification, non-convergence, data distributional assumptions), use PLS-SEM as a good approximation of CB-SEM results. • CB-SEM and PLS-SEM results should be similar. If not, check the model specification to ensure that CB-SEM was appropriately applied. If not, PLS-SEM results are a good approximation of CB-SEM results.
Sample size considerations	• If the sample size is relatively low, select PLS-SEM. With large data sets, CB-SEM and PLS-SEM results are similar, provided that a large number of indicator variables are used to measure the latent constructs (consistency at large). • PLS-SEM minimum sample size should be equal to the larger of the following: (1) ten times the largest number of formative indicators used to measure one construct or (2) ten times the largest number of structural paths directed at a particular latent construct in the structural model.
Model Evaluation	• If you need to use latent variable scores in subsequent analyses, PLS-SEM is the best approach. • If your research requires a global goodness-of-fit criterion, then CB-SEM is the preferred approach. • If you need to test for measurement model invariance, use CB-SEM.

Source: Hair *et al*. (2011,2013)

According to the Hair et al. (2011) rules of thumb, the current study used PLS-SEM as a fundamental approach for data analysis, because the complexity of the theoretical model being tested and the size of the sample are not large (i.e. less than 200 cases (see (Li *et al.*, 2011)). Additionally, one of the current study objectives is to predict and explain the constructs' relationships. Finally, the data is to some extent non-normal (see Appendix 6.2).

4.6.3 PLS-SEM

PLS-SEM is an approach to SEM that has been in utilised for many years, especially, in psychology and social science research, including many business researches (e.g. (Fornell and Larcker, 1981)) and IS (e.g. (Vinzi *et al.*, 2010)). Regardless of the increased use of PLS path modelling in other business disciplines (e.g. marketing), the popularity of PLS-SEM (and other SEM modelling techniques) in the accounting discipline has increased slowly (Lee *et al.*, 2011). There are not many empirical studies in the field of accounting using PLS-SEM (e.g. Hall, (2008); Hall and Smith, (2009); Elbashir *et al*. (2011)); according to Lee *et al*. (2011) the unwillingness to use PLS-SEM in accounting research arises perhaps because of lack of understanding of PLS-SEM's benefits and how to use it. PLS-SEM is a latent variable modelling technique that provides a good opportunity for path modelling to move forward without being limited under restricted assumptions, such as normality and large sample size (Hall, 2008).

Four basic components need to be explained before developing the study path model, including: constructs, measured variables, relationship and error terms (Hair *et al*., 2013). Constructs are unmeasured latent variables and that include endogenous constructs (it represent variable(s) that are explained by other variables through SEM relationships) and exogenous constructs (this refers to variables that are not explained by any of the model variables) (Hair *et al.*, 2011). Measured variables, also called indicators, are the directly-measured observations. The relationships are the hypotheses in the structural model. Finally the error terms are the unexplained variance in path model (Hair *et al*., 2013). PLS-SEM comprises two models to be assessed, the measurement model (outer) and structural model (inner), the measurement model is accomplished with factor analysis, while the structural model is accomplished with path analysis (Lee *et al.*, 2011).

The current study uses the SmartPLS software[13], programmed by Ringle *et al*. (2005). Figure 4.3 illustrates the processes for applying the PLS-SEM for this study as recommended by Hair *et al*. (2010). The following chapter addresses the exploratory study and the development of the study's hypotheses.

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[13] http://www.smartpls.de/forum/index.php
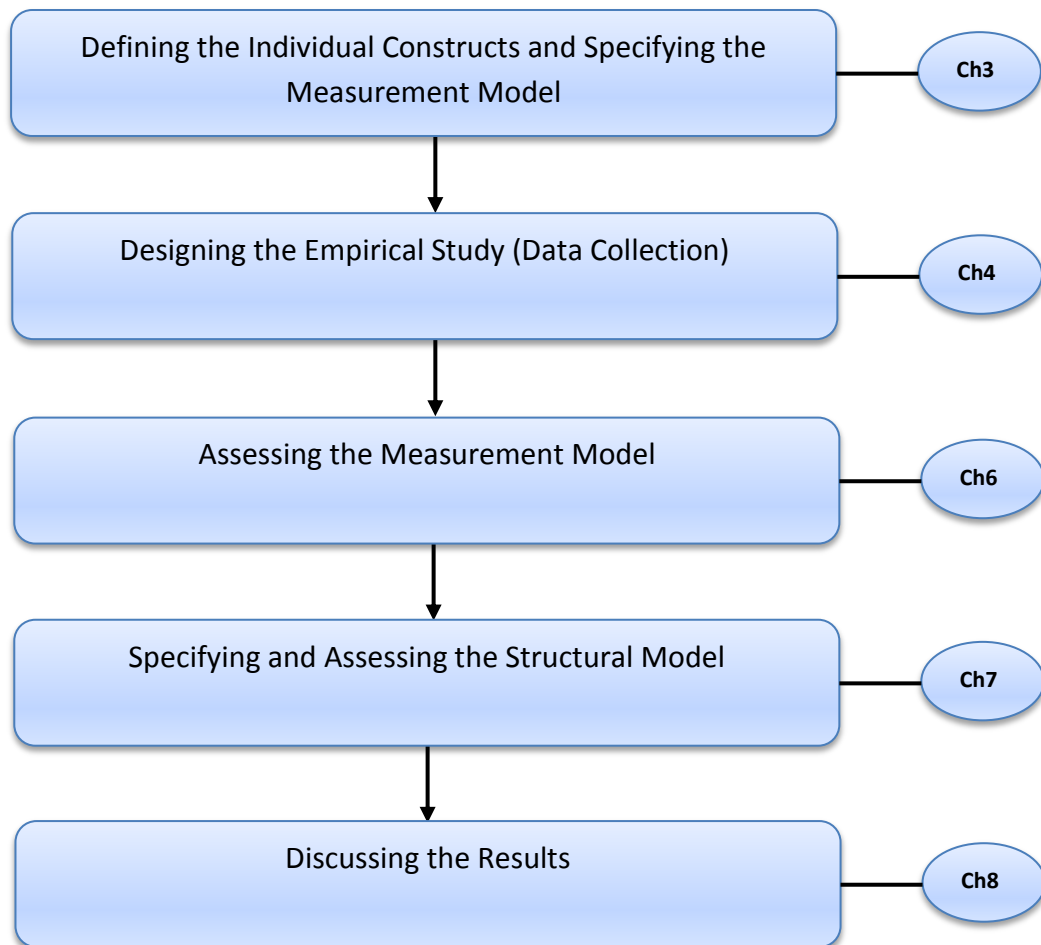
Figure 4.3: Processes for Applying PLS-SEM

4.7 Summary

This chapter discusses in detail the research philosophy and paradigms underpinning this study. Research paradigms are explored that are used in social sciences in general and accounting literature specifically. The study adopted the positivist paradigm and the survey strategy in order to test the study hypotheses that are provided in the next chapter. The chapter also addresses the data collection methods (interviews and questionnaire) and statistical techniques used in the data analysis.

Chapter Five:
Exploratory Study and Hypothesis Development

5.1 Overview

In chapter three, the preliminary theoretical framework was developed with four propositions. These propositions were tested in the exploratory study in order to find out whether hypotheses can be constructed from these propositions. Other objectives of the exploratory study as well as the method used to collect the data were discussed in chapter four. In this chapter the results of the exploratory study are illustrated in section 5.2. In section 5.3 the study's theoretical framework is updated. Section 5.4 illustrates the development of the study's hypotheses. Section 5.5 summarises the chapter.

5.2 Exploratory study

Exploratory study is a type of research which can be used to explore the reasons for particular practices (Ryan *et al.*, 2002). Section 4.5.1 displays an overview of the exploratory study and it objectives. There are several instruments that can be used for collecting the exploratory study data. This study uses the semi-structured interview which can helps the researcher to explore any issues that may arise during the interviews (Blumberg *et al.*, 2008). In addition, some written documents (mostly provided by interviewees) were used as well in this study, such as financial statements, and external auditor reports. These sources of data helped the researcher to gather information such as the firm's size, the type of the companies, and the external auditors' opinion.

The research sample includes small, medium and large companies. Also the sample includes companies with implemented ERP systems and those without. That helped the researcher to investigate the impact of ERP systems on ICPs. Fourteen interviews with well-informed people from twelve Saudi companies were conducted in order to achieve the research objectives. This exploratory study has a variety of company sizes and types (Table 5.1). For confidentiality reasons, the companies name cannot be identified, and they are referred to only as company A, B, C, D ......through to L.

Table 5.1: The Exploratory study

Firm code	Interviewee	Firm size	ERP brand	Type of firm
A	Director of Internal Audit dept. & Internal Auditor	Medium	SAP	Public Joint-stock
B	Director General Technical Affairs	Large	SAP	Public Joint-stock
C	Director of Internal Audit dept.	Large	SAP	Public Joint-stock
D	Internal Auditors (IT expert) & Specialist Regulatory Compliance	Large	SAP	Public Joint-stock
E	Chief of Risk Management dept.	Medium	Legacy system	Partnership
F	Chief of Accounting dept.	Large	Oracle	Public Joint-stock
G	Director of Internal control dept.	Large	Oracle	Private Joint-stock
H	Financial Manager	Large	QAD	Private Joint-stock
I	Chief of Accounting dept.	Medium	Oracle	Partnership
J	Human resources Manager	Medium	Legacy system	Private Joint-stock
K	Financial Manager	Medium	ACCP922	Partnership
L	Financial Manager	Small	Legacy system	Private

5.2.1 Exploratory study's results

For analysing and reporting the data of this study, the content analysis method is used. It is a commonly used method for quantifying qualitative data (Smith, 2003). In particular, the technique of this method starts with determine the main categories and the sub-categories following by coding the data according to the categories (Elo and Kynga¨s, 2008; Collis and Hussey, 2009). The analysis normally relies on frequency of occurrence or other factors.

For the current study, four major categories were built: IC requirements and processes; the effectiveness of the IC; the effectiveness of the companies' IS (ERP or Legacy system) and ERP systems and ICPs. These categories related to the research propositions. From this exploratory study, the researcher built a body of knowledge and gained insights into ICPs in Saudi Arabia. The report of the findings is structured along the main interview categories (Table 5.2). Under each category the interviewees made several comments. The discussion of these categories and comments are provided in the following sections.

Table 5.2: The study categories

	Major categories	Sub-categories
1	IC requirements and processes	• Local IC regulations. • International regulations • IC processes
2	The effectiveness of the IC	• COSO framework • The existing and function of COSO components. • The roles of IC departments. • The independency of internal auditor. • Organisations' characteristics
3	The effectiveness of the companies' IS	• ERP systems & ERP systems success • Legacy systems • Organisations' characteristics
4	ERP system and ICPs	• The support of ERP system to ICPs • The most important organisation characteristics that may affect the relationship

<u>The internal control requirements and process</u>

All of the firms investigated have an IC department or group, yet different companies follow different bodies' requirements or regulations (Table 5.3). In fact, it is very complicated to illustrate it in detail, but the study pointed out the most important bodies. For example, if the government own more than 30% of the company, which is the case for companies A, B, C, D and F, then a company has to comply with the Saudi General Auditing Bureau (SGAB) requirements. On the other hand, if a company deals with a foreign government, then it has to follow the Institute of Internal Auditors requirements. The Financial Manager of company K said, "*We are doing too much work, because we have foreign partner so we have to consider different requirements, such as Saudi Arabian General Foreign Investment Authority, International Organization for Standardization*". Another participant complained that IC requirements are not efficient enough. Chief accounts of company F said, *"Unfortunately there is no specific body look after the IC, even the SGAB they just review the internal auditor report"*.

The results show that there is no clear picture for IC regulations in Saudi Arabia, yet companies having a foreign partner have stronger IC regulations. There should be specific IC regulations which have to be required by all Saudi companies. Additionally, the results reveal that, generally, the board of directors or the management set the IC processes, which the units have to accomplish. According to the director of internal control department of company C, the board of directors,

audit committee and department managers meet every six months to review these processes. He said, "*The main role of our department is to evaluate and help to improve the IC process, also to control the company's units*". The participants of company A stated that, "*we review and control the company process and transactions and by the end of every month we write a report to the mother company*".

Table 5.3: Internal control requirements for different type of companies

Ownership Type	Internal control requirements
Government	• General Auditing Bureau
Public joint-stock	• Institute of Internal Auditors • Capital Market Authority • General Auditing Bureau (government own more than 30%)
Private joint-stock	• Capital Market Authority • Institute of Internal Auditors • Best practice
Partnership	• Best practice • Institute of Internal Auditors (and others if deals with foreign government.)
Sole Proprietorship	• Best practice

<u>The effectiveness of the IC</u>

Although the Saudi Internal Audit Standards refer indirectly to the COSO (1992) framework, some of the participants in this study have no clear idea regarding the framework. However, after defining the framework and its components by the interviewer, the picture became more obvious. The fourteen interviewees indicated that most of the components normally exist, but there are variations regarding their level of implementation. For example, for the information and communication component, Director of Internal Audits of company C said, *"The IC department has the authorisation to access any information they need"*, whereas the IC department at companies E, F, J and L have to request most of the information.

Regarding the level of existing and functioning of the COSO components in the sample, the researcher converted the qualitative data into numerical data, except for company B (the interviewee has insufficient data) (Figure 5.1). To sum up the findings, although the companies have to some extent acceptable ICPs, the companies with a legacy system, such as companies E, J and L, have a low level of IC effectiveness. Also the private companies, with foreign partner, such as K and H, have got the highest level of IC effectiveness. The Financial Manager of company K

explained the reason, he said, "*it is important for us to get the certified to ISO International Standards[14]*". There is more to explain and to investigate especially regarding the impact of the organisation characteristics on the ICPs. All the participants agreed with the importance of the organisational systems, management support, the organisational strategy and structure.
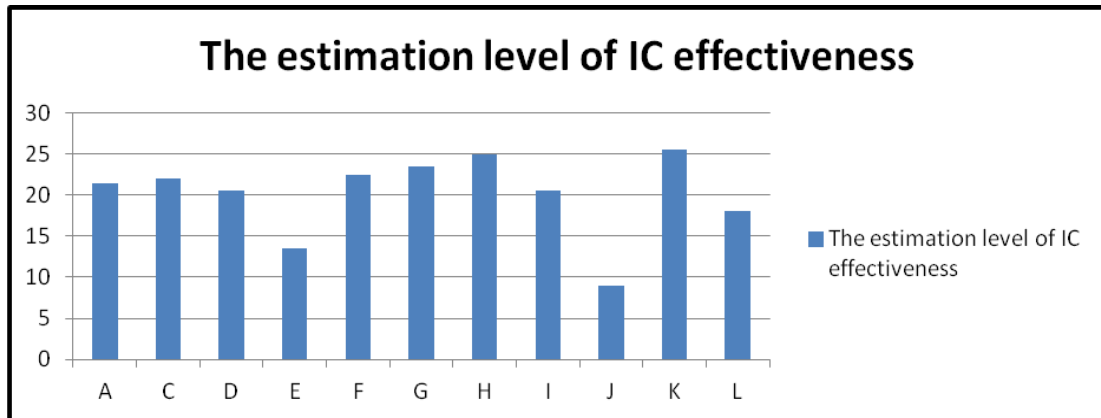
Figure 5.1: Estimation level of IC effectiveness for the exploratory study sample

Additionally, most of the interviewees stated that the internal auditing department or the group is normally the body responsible for IC and RM works. However, there are questions that should be asked: Are the internal auditors independent? And does it matter? The Financial Manager of company H stated that, *"for our nine companies, every internal audit dep. report directly to our audit committee"*. Yet, companies J, K and L have no independent internal auditors, as pointed out by the interviewees. Interestingly, company G director of the internal control department said, *"the internal auditors have to be independent but in the work place there is nothing of that. We call them 'internal auditors, so it must be in somehow a relationship"*. There are debates related to the independency of the internal auditors in the literature. Brown (1983) finds that the independency in auditing is very important for the internal auditors' work. Whereas Wright and Capps (2012) find that the lack of internal audit independence has small impact on internal audit quality.

The effectiveness of the companies' IS (ERP or Legacy system)

Generally, the companies with ERP systems pointed out that the ERP systems have reduced the cost, increased producing results and reports, and reduced the errors

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[14] ISO International Standards are strategic tools and guidelines that help companies to ensure company's operations are as efficient as possible and they help to increase productivity (see http://www.iso.org/iso/home/standards.htm).

(except human errors). The interviewees of companies A and C stated that SAP system is "*a great system*". However, the impact of ERP systems can be different from company to another, as some of the contributors indicated that many variables have to be considered. For example, the maturity of the ERP systems, the implementation of ERP system for companies A, C and F has taken more 6 years before reaching some stage of maturity.

Companies D, G, H, K and I spent less than three years for the full implementation. However, company B still has problems with the implementation of its ERP system. The Director General, Technical Affairs of company B said, "*Our management need to implement SAP software on our old system, which makes the implementation more complicate*". Additionally, some interviewees indicated the importance of other variables that may impact the success of the ERP systems. The interviewees of company D indicated the importance of the "strategy", "management support", "cooperation of the employees" and the "size of the system".

Regarding ERP success, the exploratory study findings are consistent with Chien and Tsaur (2007) who indicate that system quality and service quality are very significant dimensions for evaluating ERP system success. The interviewee of company B said, "*The quality dimensions are important at design and commissioning of the system, but impact dimensions are critically important when running the system*". On the other hand, the Legacy system companies were agreed with the need to have implemented an ERP system in order to improve the work and reduce the cost. The interviewee of company E said, "*The way that we are using for the internal communication is not efficient*".

ERP systems and ICPs

The exploratory study findings indicate that most of the participants agree that the main reason to implement ERP systems is to enhance the control procedures. They showed how ERP systems can support the ICPs. Company F Chief of Accounts said, "*The Oracle system acts as a SOLDIER in term of protecting the firm from manipulation and errors*". There are some applications adopted by the firms to support the internal auditor(s); for example, company A has the 'Audit Model' application, and company D has an 'Audit Information System' and is planning to adopt the 'Global Risk Control' application. Company E the Chief of Risk

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Management department said: *"We are using email and post to request information. If the firm has implemented ERPs, it would help to get the information and theoretically would improve the job if the users are well aware of the system"*.

Additionally, there are some variables playing very important roles in improving the relationship between ERP systems and IC. This study obtained feedback from the participants regarding the most significant factors that can support the relationship. The participants of company D and K highlighted the importance of the maturity of the ERP systems, the firm's size and the firm's strategy. Interestingly, the participant of company G pointed out that, "*the success of the ERP system and its impact on IC is depends on the management and on how they provide to the users what they need as well as the cooperation between the employees*".

The director of the internal audit department and one internal auditor of company A both agreed that for an effective ICS a company should have a well-known ERP system and support from the management (including a good structure). To sum up, from the interviewees' opinions, it is obvious that the most important factors that may impact the ERP systems and the effectiveness of ICPs are different from company to another. In general, the firm characteristics that are related to success of ERP systems, strategy, structure, company size, management support, and organisational culture, explain the effectiveness of ICPs.

5.2.2 Summary of the exploratory study

The exploratory field study provided a helpful insight about the relationship between the ERP systems and IC. Particularly, the researcher elicited the existence of COSO components within the study's sample ICS. The researcher also discovered that from the four propositions, four hypotheses can be constructed. Additionally, the researcher achieved a better understanding of the organisational characteristics that may influence the success of ERP systems, effectiveness of ICPs and the relationship between them.

However, there are some limitations of this study. The number of interviews was small. The questions used in estimating the effectiveness of ICPs were open-ended questions which raise the issue of bias. Also, there was insufficient information from the interviewees regarding the amount of influence that the ERP systems and ICPs

obtain from the organisation characteristics. Lastly, the study used qualitative data to answer the question of whether an ERP system can provide adequate support for the ICPs. Therefore, the researcher left the exploratory study with the task of measuring the effect of these variables on the ICPs quantitatively.

5.3 Theoretical model

The present study develops a contingency model for ERP systems and ICPs by adopting the SEM approach (see section 3.2.1) to address the relationships between the study's constructs. It drew on the premise of contingency factors, ERP system success, and the effectiveness of ICPs. The intention of the researcher is to validate the theoretical model, which can predict and explain the fit between contingency factors, success of ERP systems and effectiveness of ICPs.

Prior management accounting literatures and the exploratory study results (section 5.2.1) suggest some contingency factors, including: organisational structure, strategy, size, technology, management support, and culture. Similarly, in the success of ERP systems previous studies and the exploratory study's results, some key contingency factors are suggested, including organisational structure, strategy, size, management support, organisational culture, maturity of ERP system, ERP brand, and the age of ERP system implementation. The theoretical framework is, specifically, based on contingency theory of management control system (Chenhall, 2007), the measurement model of assessing the enterprise systems success (Gable *et al.*, 2003) and the COSO ERM framework components (2004). The study uses the SEM approach in order to simultaneously estimate the relationships between the contingency factors, ERP success and effectiveness of ICPs. The study's contingency model is presented in Figure 5.2.
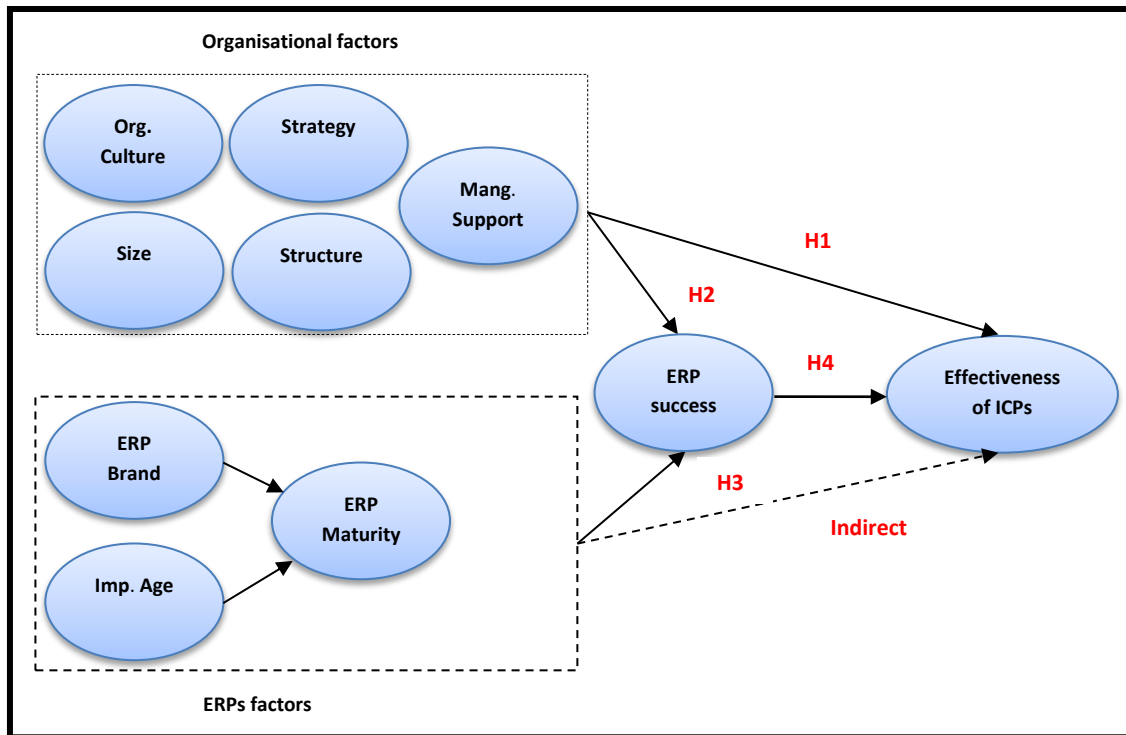
Figure 5.2: the Contingency Model of ERP system and ICPs

The model posits that perception of ICPs effectiveness depends upon the link between ERP success and contingency factors. There are five organisational factors (organisational structure, strategy, size, management support, organisational culture) linked directly to the effectiveness of ICPs and indirectly through the ERP system success. There are also three ERP factors (maturity of ERP system, ERP system brand, and ERP system implementation age) linked indirectly to the effectiveness of ICPs. Further, the five organisational factors as well as the ERP factors link directly to the success of ERP systems. Finally, ERP system success relates directly to effectiveness of ICPs.

5.4 Research hypotheses

Based on the developed theoretical model provided in chapter three, as well as the exploratory study results a number of hypotheses were developed and classified into four groups. The first group includes hypotheses that are related to the organisational factors that influence the effectiveness of ICPs (i.e. structure, strategy, size, management support, organisational culture). The second group involves the hypotheses that are related to the association between the organisational factors and ERP system success. The third group contains the hypotheses that are related to the relationship between the ERP factors (i.e. maturity of ERP, ERP brand and ERP

implementation age) and the ERP system success. The fourth group includes the hypotheses that are related to the influence of ERP system success on the effectiveness of ICPs, and also the mediation effect of the ERP system success on the relationships between the organisational factors and the ICPs effectiveness. The following sections provide more detail about these four groups of hypotheses.

5.4.1 The first group of hypotheses

Several studies have investigated the relationship between a number of contingency variables and management control systems (Otley, 1999; Chenhall, 2007; Abdel-Kader and Luther, 2008). As a result of reviewing the literatures (section 2.5) as well as reviwing the exploratory study results (section 5.2) the researcher deduced five important organisational factors: organisational structure, strategy, size, management support, and organisational culture, which may the effectvness of ICPs contingent on. Under this group there are five hypotheses structed as follows.

- Organisational strucutre and the effectivness of ICPs

Organisational structure is an important contingency factor. It can influence the control systems, efficiency of work, information flows, the motivation of individuals and can help shape the organisation's future (Chenhall, 2007). Researchers have identified many structural mechanisms. For example, Pugh et al. (1968) define five structural dimensions in an empirical study; centralisation, specialisation, configuration, standardisation, and formalisation. These dimensions have been defined by researchers (Chenhall and Morris, 1986; Donaldson, 2001) in order to determine the organisational structure type.

Referring to sections 2.2.4 and 2.5, organisational structure has been found to be significantly related to management control system, IC, organisation performance (Otley, 1999; Borthick *et al.*, 2006; Chenhall, 2007). Bruns and Waterhouse (1975) observe a relationship between the organisational structure and the effect and use of the budgets. Chenhall and Morris (1986) find an association between the decentralisation structure and management accounting systems. They use the timeliness, level of aggregation and integrated information as characteristics of management accounting systems. Borthick et al. (2006) demonstrate that structure training is related to the performance in internal control reviews. In essence, there is

a correlation between organisation structure and effectiveness of ICPs. Thus, it is hypothesised that:

H1: organisational structure is associated with the effectiveness of ICPs.

- Organisational strategy and the effectivness of ICPs

The strategy of an organisation plays an important role in the implementation and adoption of a comprehensive performance management system. There has been an increasing interest in studying the contingent relationship between organisational strategy and management control systems in general (Langfield-Smith, 1997). Rajaratnam and Chonko (1995) find empirical evidences of the relation between organisational strategy and organisational performance.

Different classifications for strategy were suggested by researchers in order to study this contingent relationship. For example, Miles and Snow (1978) provide the taxonomy of prospectors/analysers/defenders. Gupta and Goviandarajan (1984) apply the build/hold/harvest taxonomy. Porter (2004) utilises a product differentiation/cost leadership classification of strategy. Nevertheless, it were argued by some researchers, such as Abdel-Kader and Luther (2008), that these classifications are similar. In other words, the prospectors/product differentiators/builders taxonomy can be used at one end of a continuum and defenders/cost leaders/harvesters at the other end. In this study the strategies characterised by prospectors (or product differentiators/builders) are likely to be more appropriate to the effectiveness of ICPs then the strategies characterised by defenders (or cost leaders/harvesters). Accordingly, the following hypothesis is made:

H2: There is a positive relationship between the strategy prospectors and the effectiveness of ICPs.

- Organisational size and the effectivness of ICPs

The findings of the contingency-based studies show that organisational size is positively associated with accounting and control systems. For instance Bruns and Waterhouse (1975) and Haldma and Lääts (2002) suggest that as an organisation increases in size, the accounting and control systems (e.g. the budgetary control system) tend to be more sophisticated. Furthermore, Abdel-Kader and Luther (2008)

suggest in general that large companies are more likely to implement more sophisticated management accounting practices. It can be noted from these studies that a large organisation allows the management to have a sophisticated and effective ICS. Therefore, this relationship can be hypothesised as follows:

H3: a large size organisation is positively associated with the effectiveness of ICPs

- Organisational culture and the effectivness of ICPs

The relationship between the management control systems and culture represents an extension of contingency-based research from its organisational concerns into more sociological concerns. Contingency research has examined the association between the organisational culture and different constructs, such as decentralisation, control system characteristics, accounting performances and budgetary participation (Chenhall, 2007). Generally, the literature has provided mixed results as to whether organisational culture does have influences across a number of management control system aspects. Hofstede *et al.* (1990) find that organisational culture differently influences twenty units, including production, marketing and development units. Ogbonna and Harris (2000) establish an association between the organisational culture and organisational performance. Bititci *et al.* (2006) suggest a relationship between organisational culture, management style and performance measurement system. It can be predicted that organisational culture is associated ICPs effectiveness. Thus, it is hypothesised that:

H4: There is a positive relationship between the organisational culture and the effectiveness of ICPs

- Management support and the fffectivness of ICPs

Previous studies have found relationships between top management, performance management and organisational effectiveness. Moynihan and Ingraham (2004) find that top management matter to the use of performance information in decision making and somehow to the organisation effectiveness. Top management support or philosophy is a significant contingency variable (Turner and Muller, 2005). Contingency theory suggests that an effective top management philosophy depends on the fit between the characteristics of top management within the organisation situation. Thus, it can be hypothesised that:

H5: There is a positive relationship between management support and the effectiveness of ICPs.

5.4.2 The second group of hypotheses

Myers *et al.* (1997) indicate that considering contingency theory would improve the quality and productivity of the IS functions to better meet the need of an entity. A review of the literature, as well as the exploratory study results, reveal that organisational factors, which include organisational structure, strategy, size, management support and organisational culture, affect the ERP system success. Under this group, there are five hypotheses, which are illustrated as follows.

- Organisational structure and success of ERP systems

Although, ERP systems are an efficient technology that can enhance the performance of an organisation, some researchers argue that the change to more efficient technology cannot necessarily lead to improving the effectiveness of an organisation (Chenhall, 2007). Adopting ERP systems involves reformulating some existing roles and structures that were accepted by employees before. Thus, organisational structure is an important factor that can affect the ERP system success.

Ifinedo and Nahar (2009) investigate the impact of four information technology (IT) factors (IT asset, employees' IT skills, IT resources, satisfaction with legacy IT system) on ERP success and the interaction with two contingency variables, organisation structure and size. They find that the two contingency variables were moderators in most of the relationships. Additionally, several researchers discuss the importance of organisational structure as a critical success factor for ERP systems (Al-Mashari, 2003b; García-Sánchez and Pérez-Bernal, 2007).

Information systems scholars have argued that the type of structure that an organisation adopts might affect the degree of success for ERP system implementation (Morton and Hu, 2008). Moreover, they argue that ERP systems as a sophisticated technology are associated with the structure's mechanisms. Donaldson (2001) states that the structural dimensions are specialisation, standardisation, formalisation, hierarchy, and span of control. Ifinedo and Nahar (2009) point out that centralisation, specialisation and formalisation, are adequate for assessing ERP system success. Chenhall (2007) observes the important the work-based teams structure. Here, the researcher focuses on the following four dimensions:

formalisation, specialisation, decentralisation and work-based teams. The hypothesis is:

H6: Organisational structure is associated with the ERP system success

- Organisational strategy and success of ERP systems

It was indicated in section 2.3.3, organisational strategy is one of organisational factor that can affect the ERP system success. According to Huang *et al*. (2008), some researchers have argued that successful implementations of ERP systems require a suitable strategy. Aloini *et al*. (2007) analyse 130 articles that are related to ERP and risk management in order to summarise some important issues that lead to ERP failure. They find that the most important risk factors were: the selection of the ERP system, the plane strategy, the technique of project management and management behaviour. Croteau and Bergeron (2001) find that every type of business strategy associates differently with the technology. Prospector and analyser strategies have robust positive relationship with information technology, so the organisation can improve its technology by supporting the prospector and analyser strategy activities. Thus, it can be hypothesised that:

H7: There is a positive association between prospector strategy and ERP success.

- Organisational size and success of ERP systems

Growth in size has enabled organisations to improve efficiency and provide organisations with adequate resources and sophisticated technology, yet it can increase the level of complexity (Chenhall, 2007). Therefore, this factor should be considered as important on influencing the ERP system success. Gremillion (1984) observes a small significant relationship between the organisational size and information system use. Mabert *et al.* (2003) surveyed 193 US companies to determine the effect of company size on ERP implementation. They conclude that company size plays a significant role in ERP system implementation. Ifinedo and Nahar (2009) find that size moderates the relationships between IT factors (IT asset, employees' IT skills, IT resources, satisfaction with legacy IT system) and ERP system success. The above studies suggest a positive correlation between the organisational size and the success of the ERP system. Thus, it can be hypothesised that:

H8: There is a positive relationship between organisational size and success of ERP systems.

- Organisational culture and success of ERP systems

Although prior research has focused on the impact of national cultures on management systems and IS (Al-Mashari, 2003b; Berry *et al.*, 2009), it is argued that a strong internal organisational culture and its relations to the leadership may dominate national culture in the workplace and thus influence the actual success of organisational systems (Chenhall, 2007). Boersma and Kingma (2005) stress the importance of organisation culture in shaping the ERP systems. Specifically, they highlight three dimensions of ERP systems, specified as the "constitution" of ERP systems, ERP systems as a "condition" of organisations, and the "consequences" of ERP systems.

Jones *et al.* (2006) demonstrate the link between the eight dimensions of organisational culture and knowledge-sharing during ERP system adoption. They point out that each dimension must be supportive of the others. In addition, organisation cultural can influence the ERP implementation teams (Jones *et al.*, 2006), thus organisation technology (ERPs) and organisation members should not be treated as independent and separate phenomena (Bronson *et al.*, 2006). Ke and Wei (2008) report that the fit between ERP systems and organisational culture is critical for success of the ERP implementation. Based on the prior studies in this section as well as the study in section 2.3.3, it is proposed that organisational culture is likely to have a positive effect on the success of ERP systems. Accordingly, the following hypothesis can be developed:

H9: Organisational culture positively influences the success of ERP systems.

- Management support and success of ERP systems

As illustrated in section 2.3.3 that there are many studies have enhanced the important of top management support in influencing the organisation performance (Ogbonna and Harris, 2000; Haakonsson *et al.*, 2008). It has been argued that top management support is critical in promoting the organisation development, innovating and motivating the employees (Lin, 2010). Additionally, it has been

reported by many researchers that top management support is one important factor for ERP system critical success (Al-Mashari, 2003a; Finney and Corbett, 2007).

Liker *et al*. (1999) observe that the impact of technology on work is contingent upon various factors, including the top management philosophy and the labour management contract. Consistent with quantitative studies, Fui-Hoon Nah et al. (2003) as well as Nah and Delgado (2006) find that the top management support is one of the most important factors which leads to successful implementation for ERP system projects. Ke and Wei (2008) observe a positive relationship between the success of ERP system implementation and leadership. They argue that the top management support is necessary for the implementation of ERP system. Thus, there is a relationship between top management support and success ERP systems. It can be hypothesised that:

H10: There is a positive correlation between top management support and ERP system success.

5.4.3 The third group of hypotheses

The exploratory study results (see section 5.2) and some academic scholars (see section 2.3.3) indicate the importance of the ERP factors (i.e. maturity of ERP, ERP brand and ERP implementation age) in explaining the success of ERP systems. Under this group, there are seven hypotheses including two mediation hypotheses. They are illustrated as follows.

- Maturity of ERP and success of ERP systems

Maturity of ERP functions is an important concept that an organisation should consider when it evaluates the quality or benefits of the organisation's information technology (Ragowsky *et al.*, 2007). The term maturity of technology functions can refer to the level in which the organisation accepts and uses this technology (Holland and Light, 2001). Based on the level of ERP function maturity, the organisation can gain different benefits. Dias and Souza (2004) study's results point to a relationship between the level of maturity of the ERP systems and the potential of perceiving competitive advantage. Ragowsky *et al*. (2007) provide several benefits of high level of maturity of technology function such as increasing the number of IT users among the user groups, providing more control over vendor activities and providing better

understanding of the value, constraints and operations of information technology by the managers as well as the users.

There is a relationship between the level of maturity of ERP functions and the ERP system success. Mahmood and Becker (1985) find that the IS organisation maturity is significantly related to user satisfaction, which they use as a measure of IS success. They suggest a future study to look to the degree of the relationship and to examine the relation of the maturity with the other success dimensions. Saunders and Jones (1992) indicate that the maturity of IS may affect the usefulness and relevance of the measures that are used to evaluate the IS success. Voordijk *et al*. (2003) show that the maturity of IT infrastructure is an important factor for ERP system implementation success. In addition there are different factors that can support the maturity of ERP, such as ERP brand and ERP implementation age. Thus, three hypotheses should be included:

H11: There is a positive correlation between the maturity of ERP and success of ERP

H12: The ERP brand is associated with maturity of ERP systems

H13: There is a positive relationship between the ERP implementation age and the maturity of ERP.

- ERP brand, ERP implementation age and success of ERP systems

The ERP brand and ERP implementation age can support the success of the ERP systems, yet little research has investigated these factors. Markus *et al*. (2000) finds that the success of ERP systems is dependent on the period of the ERP system measure (implemented). Success of ERP systems at one point in time might be very different than at another point in time. Wang *et al*. (2011) find that the ERP system's number of years of implementation are positivly associated with effectiveness of ERP operations, while ERP brand is negatively related to the effectiveness of firm operation. It can be concluded that there are relationships between ERP brand, age of ERP implementation, maturity of ERP and success of ERP systems. Thus, it is hypothesised that:

H14: There is a positive relationship between the ERP brand and success of the ERP system

H14a: There is an indirect relationship between the ERP brand and success of the ERP system

H15: The age of ERP implementation is positively associated with the success of ERP systems

H15a: The age of ERP implementation is indirectly associated with the success of ERP systems.

5.4.3 The fourth group of hypotheses

This group of hypotheses contains the main hypothesis of this research, which is the relationship between the success of ERP systems and the effectiveness of ICPs. Little empirical research related to the area of ERP systems and IC have been published (Huang *et al.*, 2008). For instance, Gupta and Kohli (2006) investigated the benefit of ERP systems, finding that SAP R/3 integrates the processes, data, and firm elements and units within a single software. This tight integration feature can defend the system source code. Maurizio *et al*. (2007) indicate the need for fully-integrated systems like ERP systems to prevent the interruption of data flow.

Morris (2011) argues that the "built-in controls" features and other features that ERP systems have can help an organisation to improve its ICPs. The study finds that companies that have adopted ERP systems report fewer IC material weaknesses than companies that have not adopted ERP systems. Additionally, an ERP system can play a mediation role in influencing the effectiveness of the ICPs. Therefore, there is a direct and indirect relationship between success of ERP systems, contingency factors and effectiveness of ICPs. Accordingly, it can be hypothesised that:

H16: Success of ERP systems is positively associated with the effectiveness of ICPs.

H16a: There are indirect relationships between the contingency variables and the effectiveness of ICPs.
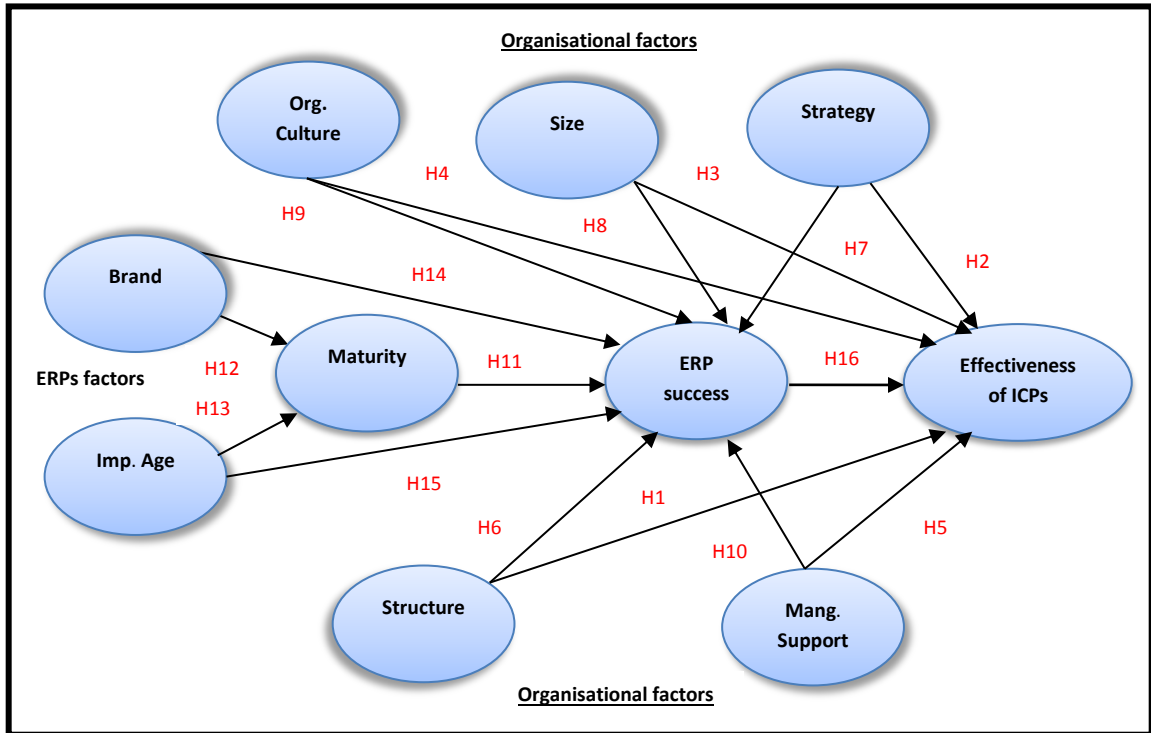
Figure 5.3: the Theoretical Framework

5.6 Summary

This chapter extends the work in chapter three, where after developing the propositions, they have been tested in the exploratory study. The chapter discusses the results of the exploratory study in the first part. The study findings indicate the importance of investigating more of the study's issues. Therefore, based on previous literature as well as the findings from the exploratory study, four main hypotheses are developed. The following chapter covers the measurement model analysis.

Chapter Six: Measurement Model Analysis

6.1 Overview

PLS-SEM is adopted for the data analysis in this study, in order to assess the measurement error and to test the relationships between the study's constructs (Lee *et al.*, 2011). The current study assesses the two models of PLS-SEM (Hair *et al.*, 2012). The first model is the measurement model (outer model), which identifies and assesses the latent variables at the observation level. It also assesses the reliability (e.g. internal consistency reliability) and validity (e.g. convergent and discriminate validity). The second model is the structure model (inner model), which tests the relations between latent variables at the theoretical level (Hair *et al.*, 2012). This chapter assesses the first model of the PLS-SEM, the measurement model.

Before assessing the model it is important to examine and screen the data. Thus section 6.2 discusses the results of the data examination and screening. That involves the analysing of the missing data and detecting outliers. In section 6.3 the processes used to assess the measurement model, including validity and reliability testing are provided. Section 6.4 presents the first part of the descriptive analysis in order to gain an overview about the respondents' background as well as the organisations' main characteristics. In section 6.5 the selected measures for each of the research constructs based on prior studies are illustrated. In addition, the procedures for assessing the reliability and convergent validity of each construct are discussed in detail. Section 6.6 provides the discriminant validity for all constructs. Lastly, a summary is provided in section 6.7.

6.2 Data Examination

The task of examining or screening the study data might seem mundane and inconsequential, however it is an essential preliminary step for data analysis to obtain a better understanding of the data (Hair *et al.*, 2010). Also, it helps the researcher to ensure that the required conditions of the data underlying analysis are considered. According to Tabachnick and Fiddell (2007), the processes of data examination involves identifying the missing values, detecting outliers and testing the assumption of normality. This section identifies, in detail, the procedures used in the current study to screen the data, which include analysing the missing data and detecting

outliers, but does not include the normality assumption test, as PLS-SEM model applies prediction-oriented measures (nonparametric) (Chin, 2010).

6.2.1 Missing data

Missing values take place when survey participants fail to answer one or more of the survey questions. Therefore, valid values for one or more variables will be unavailable for analysis. This requires identifying the pattern and the extent of the missing data in order to understand the processes that cause the missing data (Hair *et al.*, 2010).

According to Hair *et al.* (2010), two types of missing data may be involved in research. The first type is ignorable missing data. This type does not need specific remedies because it is part of the research design (e.g. design a questionnaire with skip patterns, so the respondents can skip over some questions that are not applicable) or it is under the control of the researcher. The second type is non-ignorable missing data. This type does require some remedies because it expected as a result of some factors related to the respondents (e.g. the respondent has insufficient knowledge to answer).

To identify whether the missing data is ignorable, the extent and patterns of the missing data should be assessed (Hair *et al.*, 2010). According to Hair *et al.* (2010), missing data under 10% can generally be ignored, but variables with high levels of missing values as high as 15% are candidates for deletion. "Ultimately the researcher must compromise between the gains from deleting cases and/or variables with missing data versus the reduction in sample size and variables to represent the concepts in the study" (Hair et al. 2010: p.48).

For the current study, the first step, the cases (i.e. respondents) were checked for missing data by using SPSS. Following the rules of thumb by Hair *et al.* (2010) (missing data more than 10% should be removed) two cases (see Table 6.1) were identified and removed. The level of missing data for the remaining cases was low enough to continue to the next step.

Table 6.1: Missing Data

Number of Case:	No.
Without missing data	77
With missing data less than 10%	31
With missing more than 10%*	2
Total of cases	110

*The missing data of these two cases is 14.1% and 15.6%, so they removed

The second step, the study indicators were checked and it was found that the missing data percentage is less than 10% for all indicators except for six, two are related to IC, three to ERP success and one to maturity of ERP system. These indicators have a higher percentage of missing data (between 10.9% and 17.2%). As a result of that, the researcher decided to remove these variables to avoid any measurement bias, especially given that the other variables can effectively measure their respected constructs.

The final step, the degree of complete randomness (Missing Completely At Random, or MCAR) tested in order to consider the patterns of missing data and to certify that there is no systematic error (Hair *et al.*, 2010). Consequently, Little's MCAR test was performed (using SPSS). The null hypothesis for this test is that the data are MCAR. The results of Little's MCAR test (Chi-square 4443.6888, df. 4452, sig 0.5, $p > 0.05$) fail to reject the null hypothesis, so the data are missing completely at random. This means that the data has no systematic error, which supports a wide range of options in treating the missing values (Tabachnick and Fidell, 2007; Hair *et al.*, 2010).

6.2.2 Detecting outliers

Outliers are defined as "observations with a unique combination of characteristics identifiable as distinctly different from the other observations" (Hair et al., 2010: p.64). According to Hair *et al.* (2010), outliers can occur as a result of procedure error (e.g. data entry error), extraordinary event, extraordinary observation without explanation and observations falling within the ordinary range but unique in their combination. An outlying value can be problematic as it distorts statistical analysis. There are three methods for detecting the outliers, univariate, bivariate and multivariate (Hair *et al.*, 2010). However, this study identified the outliers from univariate and multivariate perspectives. The bivariate method can be inadequate for

this study as it requires a large number of graphs as well as it requires two variables at a time (Hair *et al.*, 2010).

Univariate methods examine each variable in order to identify a unique observation (range out the distribution), while the multivariate method examines each observation across a combination of variables (Hair *et al.*, 2010). In this study univariate outlying values were examined through transforming all the data into standardised values (using SPSS). Typically, for small sample size (80 or lower) outliers can be identified when the standard score is 2.5 or greater, whereas for over 80 sample size the standard score can be increased up to 4 (Hair *et al.*, 2010). In this study, all the standard scores for the study's variables are below 2.5 (see Appendix 7.1). To identify multivariate outliers, the Mahalanobis D^2 measure has been applied as a part of the regression analysis (using SPSS). This measure examines the position of every observation relative to the centre of all observations of a combination of variables. A multivariate outlier can be considered when the probability associated with D^2 is equal or less than 0.001 (Hair *et al.*, 2010). In this study few cases were classified as multivariate outliers and that is acceptable especially if the study's sample contains a variety of company sizes and types (Tabachnick and Fidell, 2007; Hair *et al.*, 2010).

To sum up, this study retained the outliers as they are not representative for the population or seriously deviate from the normality (Hair *et al.*, 2010). Additionally, PLS-SEM is not sensitive to the normality of data where it is the main statistical technique used in this study for data analysis.

6.3 Processes of evaluating the measurement model

Before assessing the significance of the study's variables relationships, it is important to demonstrate if the study's measures have a satisfactory level of reliability and validity (Fornell and Larcker, 1981). Thus, the first step is evaluating the measurement model. This section continues the discussion of the PLS-SEM by describing four basic processes for evaluating the measurement model, including the theoretical model specification (additional details in chapters two and three) and content validity, assessing the construct dimensionality, assessing the constructs reliability and validity (Hulland, 1999; Hair *et al.*, 2010).

6.3.1 Conceptual model specifications and content validity

The process begins with the theoretical model specification, which identifies the theoretical foundation of the study's constructs (Hair *et al.*, 2010). In academic research the theoretical foundation of a construct should be derived from the literatures. For this study, the definitions of the study's constructs are addressed in chapters two and three, while the next section of this chapter identifies the constructs' measures.

Content validity reveals to what extent the measures (indicators) belong to a particular construct (Vinzi *et al.*, 2010). Thus, the purpose of this process is to ensure that the selection of construct measures extends from prior empirical research as well as theoretical and practical considerations (Hair *et al.*, 2010). Principal component analysis is a suitable technique for assessing the measures' underlying factor structure (Vinzi *et al.*, 2010). Section 6.5 of this study addresses the content validity in respect of uni-dimensionality for each construct.

6.3.2 Assessing construct dimensionality

Assessing the dimensionality of a construct should be considered when developing a path model (Hulland, 1999). The term uni-dimensional construct means that the measured variables are strongly associated with each other and represent a particular construct (Hair *et al.*, 2010). Assessing construct uni-dimensionality can be through either Exploratory Factor Analysis (EFA) or Confirmatory Factor Analysis (CFA) (Hair *et al.*, 2010). In general, factor analysis techniques play an essential role in assessing the uni-dimensionality for a set of measured variables. This technique identifies the number of factors and the loading value of every indicator on the factor(s) (Pallant, 2010).

This study uses CFA as the study constructs' measures extends from prior empirical research as well as theoretical and practical considerations (Hair *et al.*, 2010) except for ICPs both EFA and CFA are used as some of the construct measures lack of prior empirical evidences (Appendix 8.1 and 8.2 provide the results of both tests). In practice, the results from SmartPLS (i.e. the main software) and SPSS software are used to assess the constructs uni-dimensionality. Communalities (above 0.5) are used to confirm the number of factors extracted for each construct. Indicators showing low factor loadings (less than 0.40) and/or high cross-loadings (above 0.40) and/or low

communalities (below 0.50) are removed (Field, 2009; Hair *et al.*, 2010) in order to avoid the multicollinearity problems (Williams *et al.*, 2010). The Kaiser-Meyer-Olkin (KMO) test of sampling adequacy, Bartlett's test of sphericity and Cronbach's alpha are also using to assess the factors (Hair *et al.*, 2010). More details are exhibited in section 6.5.

6.3.3 Assessing construct reliability

Reliability refers to "the degree of consistency between multiple measurements of a variable" (Hair et al., 2010: p.125). Reliability also relates to the ability of an instrument to be consistently interpreted between different situations (Field, 2009). It can be measured by different methods, for instance test-retest, internal consistency and split-half reliability (Field, 2009; Hair *et al.*, 2010). However, internal consistency is one of the most commonly used measures of reliability, which assesses the consistency between multiple variables used in measuring a construct (Hair *et al.*, 2010). Different measures can be used to assess internal consistency, including indicator reliability, Cronbach's alpha and composite reliability (Field, 2009); these measures are explained briefly as follows.

- **Indicator reliability**

Indicator (observed variable) reliability is assessed by testing the correlations between the measures and their constructs or the standardised loadings of the indicators (Hulland, 1999; Hair *et al.*, 2012). This measure considers the correlation of an indicator and a latent factor. Although loadings of 0.5 or more can be acceptable for exploratory studies (Hair *et al.*, 2012), loadings of 0.7 and above are commonly used by many researchers in order to assess the indicator's reliability (Hulland, 1999). According to Hulland (1999) having loadings of 0.5 or more implies that more than 50% of the variance in the observed variable results from the construct.

- **Cronbach's alpha**

Cronbach's alpha is the most commonly used measure of scale reliability (Field, 2009). It assesses the consistency for multiple-measures of a construct (Hair *et al.*, 2010). A rule of thumb implemented by many researchers is to accept 0.7 as a lower limit, but it can drop to 0.6 in exploratory research (Hair *et al.*, 2010). However, there are two main issues in assessing Cronbach's alpha: firstly, the sensitivity to the

number of items in the scale (positive relationship between the number of items and the reliability value) (Hair *et al.*, 2010); and secondly, it assumes that all items are equally reliable (Hair *et al.*, 2012). Thus, the composite reliability assessment is performed beside the Cronbach's alpha in this study.

- **Composite reliability**

Composite reliability was developed by Froner and Larcker in 1981 in order to assess the reliability of a construct that includes a number of items (Hulland, 1999). According to Hair *et al.* (2011), in contrast to Cronbach's alpha, composite reliability assumes that indicators are not equally reliable, which makes it more suitable to PLS-SEM. The values of composite reliability are suggested to be 0.7 and above (Hulland, 1999), but can be accepted between 0.6 and 0.7 in exploratory research (Hair *et al.*, 2011).

6.3.4 Assessing construct validity

After identifying the theoretical foundation of the construct(s), assessing construct dimensionality, and assessing the reliability, a final assessment of the construct(s) should occur, which is construct validity (Hair *et al.*, 2010). Construct validity can be defined as "the extent to which a scale or set of measures accurately represent the concept of interest" (Hair et al., 2010: p.126), or "whether an instrument actually measures what it set out to measure" (Field, 2009: p.11). Different assessments of construct validity can be performed, such as convergent validity, and discriminant validity (Hair *et al.*, 2010).The two forms of assessing the validity can be explained as follows.

- **Convergent validity**

Convergent validity examines the correlation of two measures from the same concept (Hair *et al.*, 2010). Examining the convergent validity is an important procedure when a construct is measured using multiple-indicators as "the researcher should be concerned not only with individual indicator reliability, but also with the extent to which the measures demonstrate convergent validity" (Hulland, 1999: p.199). It can be assessed using Average Variance Extracted (AVE), which should be above 0.5 in order to indicate a satisfactory level of convergent validity. A ≤ 0.5 degree of AVE indicates that the variance found by the construct is larger than the variance result from measurement error (Fornell and Larcker, 1981).

- **Discriminant validity**

Discriminant validity assesses whether each construct measures is sufficiently distinct from other construct measures (Hair *et al.*, 2010). According to Hair et al. (2012), two techniques can be used to measure the discriminant validity: Fornell-Larcker's and the cross loadings technique. Fornell and Larcker (1981) exhibit a method for evaluating the discriminant validity of two or more constructs. The method based on comparing the AVE of each construct with the square of the coefficient of correlation between this construct and any other construct (i.e. AVE should be larger for acceptable discriminant validity) (Croteau and Bergeron, 2001). The second technique is cross loadings; it requires that the loadings of all indicators used in assessing this construct to be higher than all other items included in the model (Chin and Dibbern, 2010). The assessment of discriminant validity for all constructs is at the end of this chapter (see section 6.6).

6.4 Descriptive analysis

6.4.1 Descriptive analysis of respondent demographics

The overall response was 110 out of 213 questionnaires giving a response rate of 52% (for more details refer to section 4.5.2 and Table 4.3). Data examination in section 6.2.1 revealed that two cases were identified with more than 10% of missing data, and as a result were removed (Hair *et al.*, 2010). The remaining cases number 108. Table 6.2 summarise the demographic characteristics of the respondents. The results show that all of the participants, who responded to the question of education qualification, indicated that they have at least a bachelor's degree. Moreover, the educational background of the majority of the respondents is accounting and finance (89%). Thus the respondents used in the sample are relatively knowledgeable in the IC area.

From Table 6.2 it can be seen that the majority of the respondents are in director position, 41 (38%) of the respondents are director of the accounting department, 28 (26%) are financial managers, and 25 (23%) are director of the internal audit department, except for 3 (3%) who are financial analysers. This implies that most of the study's respondents participate in the decision-making process, and there are a number of participants who contribute in board meetings. The results on demographic characteristics suggest that participants of this study are conversant

with the day-to-day operations, including the ICPs, as well as the organisational characteristics (e.g. organisational technology, strategy, culture), so they could provide the needed information on organisational characteristics and effectiveness of ICPs.

Table 6.2: Demographics Characteristics of Respondents

Characteristic		N	N%
Education Qualification & Background	PhD	1	1%
	Master in Acc	10	9%
	Bac in Acc & CIA, CPA other	6	6%
	Bac in Acc & train In IS	16	15%
	Bac. in Acc &train in RM	6	6%
	Bac. in Acc. & Fin.	57	53%
	Bac. in Bus. Man.	6	6%
	Bac. in IS	4	4%
	Bac. in Risk Management	2	2%
Position	Director of accounting dep.	41	38%
	Director of internal audit	25	23%
	Financial Manager	28	26%
	Manager of IS	4	4%
	Director of IC	2	2%
	CFO	5	5%
	Financial analyser	3	3%

6.4.2 Descriptive analysis of organisational characteristics

In total there were five distinctive ownership types listed in the questionnaire (Appendix 4.1); the numbers of responses collected from each type is indicated in Table 6.3. The highest response percentage comes from public joint-stock and private joint-stock companies (37% and 32% respectively) while the lowest response percentage comes from sole proprietorship and government companies (4% and 3% respectively). This implies that an ERP system is not common for sole proprietorship companies, as most of them are small and they cannot handle the high cost of implementing an ERP system. Additionally, in Saudi Arabia there are few government companies (most Saudi companies are from the other types).

Table 6.3: Descriptive Analysis of Organisational Characteristics

Characteristic		N	N%
Ownership Type	Sole Proprietorship	4	4%
	Partnership	26	24%
	Private Joint-stock Company	35	32%
	Public Joint-stock Company	40	37%
	Government	3	3%
Size	Small	13	12%
	Medium	18	17%
	Large	77	71%
ERP Brand	SAP	44	41%
	ORACLE	23	21%
	PeopleSoft	3	3%
	Microsoft Dynamics	7	6%
	Bann	6	6%
	FOCUS	3	3%
	Others	22	20%
Age of ERP implementation	less than 1 year	13	12%
	1-2 years	11	10%
	3-5 years	21	19%
	6-8 years	28	26%
	more than 9 years	35	32%

One of the many important company characteristics of this study is company size. Three size classifications, small, medium and large, were used to describe the study's companies. The size of the company has been measured by using the total assets (see section 6.5.5 for more detail about the measures and the referring studies). "Small" refers to those firms have less than Saudi Riyal (SR) 50 million (around £8 million). "Medium" firms have total assets less than SR 250 million (around £41 million) and more than SR 51 million. Firms with total assets more than SR 251 million (around £41 million) are characterised as "Large" firms. It can be discovered from this study that the majority of the participating firms are large companies with total assets more of than SR 251 million (around £41 million).

When company size was further analysed in terms of firm type, some very interesting observations were found. Although there are several large- and medium-size partnership and private joint-stock firms, it was found that most of the large size companies are joint-stock (both public and private) and government companies. The findings in the quantitative study are consistent with the findings in the exploratory study (see section 5.2) that there is more interest in ERP implementation among large size companies than small and medium size companies.

The study findings illustrate that there are more than 20 brands of ERP systems used by Saudi Arabian companies, some of them well-known such as SAP, Oracle and PeopleSoft and others quite new such as Peachtree, Solomon and RPG. Table 6.3 shows that "SAP software" is the most popular ERP system with 44 (41%) among the study's firms, follow by "Oracle software" (21%) and then Microsoft-Dynamics with Bann software (7 and 6 companies respectively). By further analysing the ERP system brands in terms of firm size, the study indicates that the well-known ERP software such as SAP and Oracle are implemented by the large company, whereas the small and most of the medium size companies implemented other ERP system brands. One possible interpretation is that the cost of implemented well-known ERP software is the reason.

Table 6.3 also illustrates the age of ERP system implementation for the study's firms. More than half of the firms had the ERP system for more than six years. There are only 13 (12%) companies of the study's sample using the ERP for less than one year; on deeper investigation, it was found that most of these companies are from the small size companies. To sum up, the quantitative findings in this study are consistent with the findings in the exploratory study, particularly, regarding the relation between the company size and the ERP brand as well as the ownership types.

6.5 Assessing the study measurement

This section displays in detail the instruments used in this study to measure the research variables (effectiveness of IC, ERP success, structure, strategy, size, organisational culture, management support, ERP brands, age of ERP implementation, and maturity of ERP) and the procedures of assessing their reliability and validity. In general, all the instruments used in this study have been adopted from literatures (the sources are provided below).

6.5.1 Effectiveness of Internal Control Procedures (EICP)
- **Measures of EICP**

IC is one of the business mechanisms that can be used to provide reasonable assurance regarding the achievement of business objectives. Section 2.2.3 discusses different IC frameworks. Unlike many of previous studies (such as Ramos, 2004; Doyle *et al.,* 2007a; Chan *et al.,* 2008), which use only on one indicator to assess the effectiveness of IC (e.g. management reports of the internal control weaknesses,

audit committees report or 8-K reports), this study implements the COSO' ERM framework (see section 2.2.3) as it enables an entity to evaluate its ICS and apply a clear risk management process.

Particularly, the eight components apply in order to measure the EICPs. According to COSO (2011) what determines whether a particular ICS is "effective" is whether it can be a subjected to the presence and functioning of the framework's components. Thus, in total, 30 indicators, illustrate in Table 6.4, were used in this study. These indicators have been mainly implemented from the COSO (1992 & 2004, 2011) frameworks and some from several studies (such as Beasley *et al.,* 2005; Amudo and Inanga, 2009).A seven-point Likert scale was adopted in this study, allowing a wide range of choices to the respondents and to ensure consistency with the original scales. The respondents were asked to specify their level of agreement or disagreement on a consistent agree-disagree scale for the construct statements.

Table 6.4: Measure of EICPs

Component	Measure No.	Measure description
Internal (control) **Environment**	IE1	- Authority and responsibility
	IE2	- Independency of internal auditor.
	IE3	- Identified risk appetite
	IE4	- Ethics value and a code of conduct.
Objective Setting	OS1	- Setting the objects for every level
	OS2	- Objectives support mission.
	OS3	- Objectives aligned with risks
Event Identification	EI1	- Considers all expected internal event.
	EI2	- Considers all expected external event.
	EI3	- Identifies every event independently.
Risk Assessment	RA1	- Analyses every risk.
	RA2	- Risk assessment technique.
	RA3	- Assess the "probability" for risks.
	RA4	- Assess the cost impact for risks.
Risk Response	RR1	- Selects a response for each risk.
	RR2	- Align the risk response with risks.
	RR3	- Effect of risk response on risks.
Control Activities	CA1	- Risk responses effectively carried out.
	CA2	- Physical oversight over assets
	CA3	- Functions to review performance reports
	CA4	- Variety for controls activities.
	CA5	- Using of IT for control.
Information & Communication	Ifo&Co1	- Identified information can be captured.
	Ifo&Co2	- IS effectively provides information.
	Ifo&Co3	- IS communicates the info...timely.
	Ifo&Co4	- IS communicates the info broadly.
Monitoring	M1	- Control system monitored.
	M2	- Evaluation of monitoring activities
	M3	- IC operates effectively.
	M4	- Modifies the process of IC.
Sources	COSO, 1992,2004,2011; Amudo and Inanga (2009); Fadzil *et al.,* (2005)	

- **EFA of EICP**

EFA is implemented to assess the uni-dimensionality of EICP, using the principal component method, as it the "most commonly used approach" (Pallant, 2010). EFA for EICP was performed in two steps. At the first step, EFA was performed for all the indicators respecting their components (dimensions) separately, except for IE3 and OS3, as the rates of missing data were higher than 10%, so they were removed to avoid measurement bias (Hair *et al.*, 2010). Missing data analysis is discussed in section 6.2.1. The loadings of the measures, as first order latent variables, were checked in respect of their components using SPSS software. The initial results of EFA indicate that most of the indicators (first order latent variables), as assumed,

loaded highly on their respected dimensions except for 9 indicators (OS1, OS2, EI1, EI2, EI3, RR1, RR2, RR3 and CA1), which were removed (see Appendix 8.1). The results of EFA also suggest that the remaining indicators were loaded in five factors, including internal (control) environment, risk assessment, control activities, information and communication and monitoring. The reminder components correspond with the COSO's IC (1992) framework as well as with the Saudi Auditing Standards.

At the second step, the loadings of all first order latent variables were checked for the second order latent variables (IE, RA, CA, Inf&Co and M), see Appendix 8.1 and 8.2. The level of communalities of the five components (dimensions) were above 0.5 (see Table 6.5), which is acceptable according to Hair et.al. (2010).

Table 6.5: EFA of EICPs

Measures	Loading	Communalities	Eigen Value	Variance Extracted	KMO	Bartlett's (Sig.)
IE	0.717	0.515	3.117	62.35%	0.808	0.00
RA	0.778	0.605				
CA	0.844	0.713				
Inf&Co	0.792	0.627				
M	0.812	0.659				

IE, Internal Environment; RA, Risk Assessment; CA, Control Activities; Inf&CO, Information & communication; M, Monitoring.

Additionally, the results of the EFA (see Table 6.5) confirm the uni-dimensionality of the EICP construct. One factor emerged from this analysis explaining 62.35% of EICP variability. All loadings were higher than 0.4, ranging from 0.717 to 0.844. The Bartlett's test of sphericity (220.695, p ≤ 0.05) and Kaiser's measure of 110 sampling adequacy (0.808) indicated that EFA is appropriate and within the acceptable levels (Pallant, 2010).

- **Reliability of EICP**

PLS-SEM assesses the reliability for each dimension (component) (Table 6.6) and also to assess construct (EICP) reliability (Table 6.7). For indicator reliability, the results in Table 6.5 disclose that all indicators (highly loading) have high indicator reliability (0.7 and above) on each component. Also, Cronbach's alpha and composite reliability were calculated for each component; all the figures were above 0.7 (Hair *et al.*, 2010).

Table 6.6: Indicator Reliability of EICPs

Measure	Loading	Cronbach's alpha	Composite reliability	AVE
IE	0.737	0.6679	0.8134	0.5945
RA	0.721	0.9158	0.9401	0.7970
CA	0.873	0.8633	0.9087	0.7155
INF&CO	0.777	0.8907	0.9249	0.7556
M	0.793	0.8515	0.8996	0.6927

In addition, Cronbach's alpha and composite reliability were calculated (Table 6.6) in order to assess the reliability of EICP construct. Cronbach's alpha is 0.8463, indicates an acceptable level of reliability (Field, 2009). Table 6.7 shows also the value of composite reliability (0.8907), which reveals that the EICP measurement is internally consistent and has acceptable reliability (above 0.7). To sum up, the results of the reliability tests for EICP suggest that the five components (internal environment, risk assessment, control activities, information and communication, and monitoring) can adequately assess the EICP construct.

Table 6.7: Reliability of EICPs

Construct	Cronbach's alpha	Composite reliability	AVE
EICP	0.8463	0.8907	0.6203

- **Convergent validity**

For assessing the convergent validity of EICP measurement, the AVE was evaluated. According to Hair *et al*. (2010), the value of AVE should be above 0.5 to indicate a sufficient level of convergent validity. Table 6.7 shows that the AVE of EICP is 0.6203, which indicates a reasonable level of convergent validity. The assessment of discriminant validity for all constructs is displayed at the end of this chapter.

6.5.2 ERP system success
- **Measuring ERP success**

ERP systems are a new generation of IS, which gathers data from across all of an entity's units letting the entity's management have a broader scope (Moon, 2007). It has been argued that assessing the value of the system is perhaps what the company should do (Heo and Han, 2003). Therefore, rather than looking to the effect of implemented ERP systems, this study considers the success of ERP systems.

ERP systems success can be defined as an utilisation of the systems in order to achieve the organisation's goals (Gable *et al.*, 2003). Assessing ERP success refers to

evaluating the performance of ERP systems after the implementation. Ballantine *et al*. (1996) and Ifinedo (2006) stated that the use of economic and financial measures to evaluate the IS success might overlap the effect with other factors that are unlinked to the IS being assessed. It is more acceptable to rely on "subjective assessment and surrogate measurement" for evaluating the IS success, that include user satisfaction, availability and ease of use (Timo, 1996).

Section 2.3.2 discusses the IS success models. This study uses the four ERP success dimensions in Gable et al.'s model, besides the service quality dimension (DeLone and McLean, 2003; Gable *et al.*, 2003) for measuring the ERP success (Table 6.8). A seven-point Likert scale was adopted in this study, allowing a wide range of choices to the respondents and to ensure consistency with the original scales (Gable et al. 2008). Thus, the respondents were asked to specify their level of agreement or disagreement on a consistent agree-disagree scale for the construct statements.

Table 6.8: Measure of ERP success

Dimension	Measure No.	Measure description
System Quality	SQ1	- Easy to use
	SQ2	- Easy to learn
	SQ3	- Meets the users' requirements
	SQ4	- Functions and features
	SQ5	- Doing the job without errors
	SQ6	- User interface
	SQ7	- Number of computers and equipment
	SQ8	- Fully integrated
Service Quality	ServQ1	- Responsiveness
	ServQ2	- Reliability
	ServQ3	- Assurance
	ServQ4	- Tangible
	ServQ5	- Personalized attention
Information Quality	InfQ1	- Information for users
	InfQ2	- Usable information
	InfQ3	- Understandable information
	InfQ4	- Relevant information
	InfQ5	- Formatted information
	InfQ6	- Concise information
Individual Impact	IndIm1	- Individual's learning and creativity
	IndIm2	- Individual's awareness
	IndIm3	- Decision making
	IndIm4	- Time require
Organisation Impact	OI1	- Entity's costs
	OI2	- Staff costs
	OI3	- Overall costs
	OI4	- Outcomes and outputs
	OI5	- Support e-government/e-business
Sources	DeLone and McLean, 1992; 2003; Gable *et al.,* 2003; 2008; Ifinedo, 2006; Saunders and Jones, 1992; Myers *et al.,* 1997	

- **CFA of ERP success**

CFA is implemented to assess the uni-dimensionality of ERP success. Three of the measures were removed from the analysis due to the high level of missing data (ServQ4, ServQ5 and OI5) above 10% (to avoid measurement bias) (Hair *et al.*, 2010). The high level of missing data in these measures (ServQ4, ServQ5 and OI5) can be described, as they may not be applicable to some of the study's sample. For instance, supporting e-government or e-business (OI5) is basically more suitable for public organisations (not for private organisations) (Ifinedo and Nahar, 2009). The analysis of missing data is discussed in section 6.2.1.

The CFA for ERP success, as a second order latent variable including a number of first order latent variables was performed in two steps. First step, separately, CFA was performed for each ERP success dimensions. As a result, loadings of the all

indicators were checked for their respective first order latent variables or dimensions (system quality, service quality, information quality, individual impact, and organisational impact). The initial results of CFA indicate that all variables, as assumed, loaded highly on their respective first order latent variables except for SQ6, SQ7 and IQ1, which were removed for low communalities among other indicators in their dimension.

At the second step, loadings of all first order latent variables, dimensions, were checked for the second order latent variable (ERP success). The findings of the CFA for ERP success indicate an acceptable level of communality (above 0.5), see Table 6.9. However, the results of the dimensions' loadings reveal that all the dimensions are highly loaded (more than 0.7), except for ServQ (0.606) on the ERP success construct. As a result, the service quality dimension was removed due to a low correlation of this factor to its construct (Hair *et al.*, 2010). Bartlett's test of sphericity (260.06, $p \leq 0.05$) and Kaiser's measure of 110 sampling adequacy (0.812) indicated that CFA is appropriate and within the acceptable levels (Pallant, 2010).

Table 6.9: CFA for ERP success

Measures	Loading	Communalities	Eigen Value	Variance Extracted	KMO	Bartlett's (sig.)
SQ	0.863	0.684	3.28	65.74%	0.812	0.000
ServQ	**0.606**	0.534				
IQ	0.871	0.718				
IndIm	0.881	0.778				
OI	0.798	0.579				

SQ: System Quality; ServQ: Service Quality; IQ: Information Quality; IndIm: Individual Impact; OI: Organisational Impact.

- **Reliability of ERP success**

Exploring the results of indicators loadings in Table 6.10 reveals that the four indicators have high reliability as they highly load (more than 0.7). Thus, the remaining assessments will be completed with the four remaining dimensions (system quality, information quality, individual impact and organisation impact), which harmonise with the Gable *et al*. (2003) model.

Table 6.10: Indicator Reliability of ERP success

Measure	Loading	Cronbach's alpha	Composite reliability	AVE
SQ	0.882	0.8949	0.9195	0.6565
InfQ	0.879	0.9432	0.9568	0.8162
IndIm	0.883	0.9067	0.9346	0.7815
OI	0.803	0.9323	0.9510	0.8292

Further, to assess the construct reliability of the ERP success measurement, Cronbach's alpha and composite reliability were calculated (Table 6.11). Cronbach's alpha is 0.8613, indicating an acceptable level of reliability (Field, 2009; Hair *et al.*, 2010). Table 6.11 illustrates also the value of composite reliability (0.9003), which indicates that the ERP success measurement is internally consistent and has acceptable reliability (above 0.7). To sum up, the results of the reliability tests for ERP success suggest that the four dimensions, which are the system quality, information quality, individual impact and organisational impact, are suggested to assess the ERP success construct.

Table 6.11: Reliability of ERP success

Construct	Cronbach's alpha	Composite reliability	AVE
ERP success	0.8613	0.9003	0.6447

- **Convergent validity**

The value of AVE should be above 0.5 to indicate a sufficient level of convergent validity. Table 6.11 displays that the AVE of ERP success is 0.6447, which indicates a reasonable level of convergent validity.

6.5.3 Structure

- **Measuring organisational structure**

Pugh et al. (1968) identifies five structural dimensions in an empirical study: centralisation, specialisation, configuration, standardisation, and formalisation. Bruns and Waterhouse (1975) identified the structure mechanisms as centralisation, structure of activities and lack of autonomy. Donaldson (2001) stated that the structural dimensions are specialisation, standardisation, formalisation, hierarchy, and span of control. Interestingly, Chenhall (2007) points to an important dimension of structure which is the team-based structure.

Organisational structure is more complicated than distinguishing between decentralised and centralised or between other commonly-described structure dimensions (Morton and Hu, 2008). Therefore, for the purpose of this study three dimensions from the structural contingency theory literature are used in order to examine the relationship between organisational structures and the study's dependent constructs (ERP systems success and EICPs). The first structure dimension is formalisation; two measures (Table 6.12) are used to assess this dimension. In this study, the dimensions of formalisation and specialisation are combined into a single dimension of formalisation, because specialisation and formalisation are frequently highly correlated (Donaldson, 2001; Morton and Hu, 2008).

Table 6.12: Measure of Structure

Structural Mechanism	Measure No.	Measure description
Formalisation	Structure 1	- Diversified occupational speciality
	Structure 2	- Descriptive of the jobs.
Decentralisation	Structure 3	- Participation of employees in decisions
Team-based	Structure 4	- Relationship b/w manager and staff
Sources	Bruns and Waterhouse, 1975; Chenhall, 2007; Morton and Hu, 2008	

The second dimension is decentralisation. The dimension of decentralisation refers to "the extent to which formal authority for making decisions rests at higher levels of an organization" (Bruns and Waterhouse, 1975; p.184). Only one measure is used to assess this dimension. The third dimension is team-based, which refers to the relationship between the entity's supervisor and the workers (Chenhall, 2007). Also one measure is used to measure this dimension.

- **Formalisation structure**

The dimension of formalisation refers to the formalisation in the workplace and documentation (Morton and Hu, 2008). A seven-point Likert scale is used, it rang from strongly agree to strongly disagree. The respondents were asked to state whether the description of the jobs is presented (Table 6.12).

- **CFA of formalisation structure**

The initial results of CFA for formalisation indicate an acceptable level of communality (above 0.5) and the loading of the two factors are highly loading (above 0.5), thus confirming the uni-dimensionality of formalisation. The result of

Bartlett's test of sphericity is 47.63 (p ≤ 0.05) and Kaiser's measure of sampling adequacy is 0.5.

- **Reliability of formalisation structure**

SmartPLS software was used to assess the indicator reliability of formalisation structure. Exploring the results of indicators loadings in Table 6.13 reveals that all indicators are highly reliable as they are highly loading (above 0.7) on the formalisation structure construct.

Table 6.13: Reliability Coefficients of Organisational Structure

Construct	Measure	Loading	Cronbach's alpha	Composite reliability	AVE
Formalisation	**Structure 1**	0.813			
Structure	**Structure 2**	0.925	.688	0.859	0.755

Furthermore, Table 6.13 demonstrates the value of Cronbach's alpha and composite reliability as 0.688 and 0.859 respectively. The values indicate that the formalisation structure construct is internally consistent and has acceptable reliability, around 0.7 for Cronbach's alpha and above 0.7 for composite reliability (Field, 2009; Hair *et al.*, 2010). Therefore, the two measures can adequately assess the construct.

- **Convergent validity of formalisation structure**

The results in Table 6.14 reveal that the AVE of formalisation structure is 0.755, which indicates a satisfactory level of convergent validity (AVE ≥ 0.5) according to Hair et al. (2010).

- **Decentralisation and team-based structure**

For the decentralisation and team-based dimensions none of the CFA, reliability and convergent validity assessment was performed, as they are measured by a single indicator (Table 6.12). However, the discriminant validity of these dimensions, along with other dimensions and constructs are tested at the end of this chapter.

6.5.4 Strategy
- **Measuring strategy**

There are various types of business strategies; every type has particular characteristics which make it different from other strategies. According to several scholars, the most admired typology for the business strategy is Miles and Snow

(Croteau and Bergeron, 2001). Miles and Snow (1978) classify business strategy into four types: prospector, analyser, defender and reactor.

The first three types are expected to improve the organisation's performance whereas the reactor is expected to hamper the organisation's performance. In addition, there are other common strategy taxonomies, such as build/hold/harvest and product differentiation/cost leadership (Chenhall, 2007). According to Abdel-Kader and Luther (2008) "arguably, these taxonomies are not significantly different and can be reconciled with prospectors/builders/product differentiators at one end of a continuum and defenders/harvesters/cost-leaders" at the other end (p.8).

This study applies the Miles and Snow (1978) typology and refers to the indicator approach suggested by Croteau and Bergeron (2001). They indicate that every type of business strategy associates differently with the technology. Prospector and analyser strategies have robust positive relationships with information technology, so organisations can improve their technology by supporting the prospector and analyser strategy activities. In practice, this approach allows the organisational strategy to be measured based on a continuum; where a high score on the continuum refers to prospector strategies and a low score refers to defender strategies. Basing on a continuum allows respondents to be flexible in locating their organisations, as it is not necessary for organisations to be located at one of the extremes. On a seven-point Likert scale ranging from strongly agree to strongly disagree, respondents were asked to position their entities, relative to their supporting new product, innovation, response to new opportunity, competition, planning and high risk project (Table 6.14).

Table 6.14: Measuring of Strategy

construct	Measure No.	Measure description	Sources
Strategy	Strategy1 Strategy2 Strategy3 Strategy4 Strategy5 Strategy6	- Supporting new products/services - Leading to innovation - Responds quickly to opportunity - Competitive activities - Promotes long range planning/decisions - Involving in high-risk projects	Miles and Snow (1978); Croteau and Bergeron (2001)

- **CFA of strategy**

The initial finding of CFA for organisational strategy indicates a low level of communality, which less than 0.5 for Strategy 6 (0.384) indicators ('Involving in

high-risk projects') as shown in Table 6.15 as well as the loading is less than 0.7. Thus, Strategy 6 was removed from the analysis. The results displayed in Table 6.15 confirm the uni-dimensionality of the strategy construct. One factor has emerged from this analysis, explaining 67.36% from the variability of strategy. Bartlett's test of sphericity (371.26, $p \leq 0.05$) and the value of KMO is 0.868, which suggests the CFA for strategy construct is appropriate and within acceptable levels (Hair *et al.*, 2010).

Table 6.15: CFA for Strategy

Measure	Loading	Communalities	Eigen Value	Variance Extracted	KMO	Bartlett's test (sig.)
Strategy 1	0.736	0.604	4.041	67.36%	0.868	0.000
Strategy 2	0.887	0.760				
Strategy 3	0.904	0.789				
Strategy 4	0.806	0.721				
Strategy 5	0.863	0.785				
Strategy 6	**0.562**	**0.3384**				

- **Reliability of strategy**

The finding for indicators loadings in Table 6.15 shows that all indicators are highly reliable as the loading level is greater than 0.7 on the strategy construct (after removing Strategy 6). Additionally, Table 6.16 shows that the values of Cronbach's alpha and composite reliability are 0.8985 and 0.9248 respectively. The values indicate that the strategy construct is internally consistent and has acceptable reliability (greater than 0.7) (Croteau and Bergeron, 2001). In general, the results of the reliability tests suggest that the strategy can be measured adequately using the five measures.

- **Convergent validity**

To assess the validity of the strategy the convergent validity should indicate a sufficient level (AVE $\geq$ 0.5) (Croteau and Bergeron, 2001). The results in Table 6.16 reveal that the AVE of organisational strategy is 0.712, which indicates a sufficient level of convergent validity.

Table 6.16: Reliability Coefficients of Organisational strategy

Measure	Cronbach's alpha	Composite reliability	AVE
Structure	0.8985	0.9248	0.7120

6.5.5 Size of the organisation
- **Measuring the organisation size**

Organisation size is an important factor in explaining the success of ERP systems (Gable *et al.*, 2003; Laukkanen *et al.*, 2007), management accounting practices (Abdel-Kader and Luther, 2008) and IC (Ashbaugh-Skaife *et al.*, 2009). Organisation size has been gauged in the literature using different measures, for instance total assets (Bronson *et al.*, 2006; Beneish *et al.*, 2008), number of employees (Bruns Jr and Waterhouse, 1975) and annual revenue (Mabert *et al.*, 2003) (see section 2.5.1). This study uses total assets for measuring the size construct (see Table 6.17). Particularly, the respondents were asked for the company total of assets. Five choices were attached with this question (see Appendix 4.1). The descriptive analysis of this construct was presented in section 6.4.2.

Table 6.17: Measuring size

Construct	Measure No.	Measure description	Sources
Size	Size	- Total of Assets	Lovata and Costigan (2002) & Abdel-Kader and Luther (2008)

Since only a single measure has been used to assess this construct, none of the CFA, reliability and convergent validity assessment is performed. Nevertheless, the discriminant validity assessment of this construct, along with other constructs is presented at the end of this chapter.

6.5.6 Organisational culture (OC)
- **Measure of organisational culture**

Detert et al. (2000) develop an organisational culture framework with eight dimensions of culture, including: orientation to change, control, coordination, and responsibility, orientation to collaboration, basis of truth and rationality, orientation to work, motivation, orientation and focus and nature of time horizon. Jones et al. (2006) examine the eight organisational culture dimensions and how these dimensions impact the ERP implementation teams to share knowledge across the organisation.

This study measures organisational culture by using the organisational culture framework developed by Detert *et al*. (2000) as it is simple, concise, and covers the main aspects of the construct. Specifically, by considering the two main constructs (dependent constructs) which are the EICPs and ERP system success, the

organisational culture is assessed from two different perspectives in this study, including orientation to collaboration (i.e. isolation vs. collaboration) and orientation to control, coordination, responsibility (i.e. concentrated vs. shared).

The first perspective is orientation towards collaboration. This element assesses the value of organisational culture that supports team work and believes the individual effort is not effective (Detert *et al.*, 2000; Jones *et al.*, 2006). The second perspective (coordination, centralisation and control) refers to the structure of the decision-making, whether it is concentrated or shared (see Table 6.18).

Table 6.18: Measure of Organisational Culture

Construct	Perspective	Measure	Measure description
Organisational Culture	Orientation towards collaboration	OC1	- Employees work in project teams
		OC2	- Employees willing to collaborate
	Coordination and control	OC3	- Coordination
		OC4	- Controlling
Sources	Detert et al., (2000); Jones et al., (2006)		

- **CFA of organisational culture**

Table 6.19 illustrates the results of assessing the unidimensionality of organisational culture. The findings show a low level of loading and communality for OC4 (-0.170, 0.136 respectively). Thus, OC4 was removed. The loading of remain indicators were greater than 0.70, ranging from 0.926 to 0.981. Bartlett's test of sphericity (207.171, $p \leq 0.05$) and the value of KMO is 0.654, which suggests the CFA for the organisational culture construct is appropriate and within acceptable levels (Hair *et al.*, 2010).

Table 6.19 CFA for Organisational Culture

	Measure	Loading	Communalities	Eigen Value	KMO	Bartlett's test (sig.)
Collaboration	**OC1**	0.936	0.824	2.785	0.654	0.000
	OC2	0.926	0.786			
Coordination	**OC3**	0.981	0.602			
	OC4	<u>-0.170</u>	**0.136**			

- **Reliability of organisational culture**

The findings from SmartPLS for the indicator loadings (Table 6.19) suggest that all indicators are highly reliable, as the loading level is greater than 0.7 on the organisational culture construct. Additionally, the value of Cronbach's alpha and

composite reliability shown in Table 6.20 (0.7620 and 0.850 respectively) indicate that organisational culture construct is internally consistent and has acceptable reliability (greater than 0.7) (Croteau and Bergeron, 2001). The results of reliability tests, in general, suggest that the three measures of organisational culture can adequately measure it.

Table 6.20: Reliability Coefficients of Organisational Culture

Measure	Cronbach's alpha	Composite reliability	AVE
OC	0.7620	0.8500	0.5882

- **Convergent validity**

For a sufficient level of convergent validity, AVE should be greater than 0.5 (Hair *et al.*, 2010). Table 6.20 shows that the AVE of organisational culture is 0.588, which indicates a sufficient level of convergent validity. Additionally, the discriminant validity for this construct is displayed at the end of this chapter.

6.5.7 Management support (MS)

- **Measure of management support**

Top management support is the most frequently named critical success factor for ERP system implementation and for organisation performance (Al-Mashari *et al.*, 2003; Bowling and Rieger, 2005; Doom *et al.*, 2009; Al-Turki, 2011). It is necessary for top management to provide emotional support by encouragement and maintaining a high level of staff morale and motivation (Galy and Sauceda, 2014). The top management support can refer to the degree of understanding of the organisation's satiation and involvement in it. An organisation must pay careful attention to the top management attitudes, beliefs and the willingness to provide the necessary resources (Pinto and Slevin, 1988; Thong *et al.*, 1996). This study refers to some research that investigate the impact of management support (such as Covin and Slevin (1988); Thong et al., (1996); Linying *et al.*,(2009)) in order to find valid indicators for measuring this construct. On a seven-point Likert scale ranging from strongly agree to strongly disagree, respondents were asked to position their top management, relative to their supporting research and innovation, willing to take risks, provide necessary resources, involves the staffs, and provide direction (Table 6.21).

Table 6.21: Measure of Management Support

Construct	Measure No.	Measure description
Management	MS1	- Supporting research and innovation
Support	MS2	- Willing to take risks
	MS3	- Helps to provide necessary resources
	MS4	- Involves employees in strategic plan.
	MS5	- Providing direction and motivation.
	MS6	- Delegating tasks to others
Sources	Nahavandi and Malekzadeh, (1993); Pinto and Slevin (1988); Turner and Muller, (2005); Linying *et al*.,(2009)	

- **CFA of management support**

The findings from CFA test for management support show a low level of communality, less than 0.5 for MS2 and MS6 (0.231 and 0.489 respectively) indicators (see Table 6.22). Further, indicators loadings show low level, less than 0.7, for the same indicators (0.467 and .0672 respectively). Thus, MS2 and MS6 were removed from the analysis and another round of analysis was conducted using the remaining indicators. One factor has emerged from this analysis, explaining 75.718% from the variability of management support construct. Bartlett's test of sphericity (256.957, p ≤ 0.05) and the value of KMO (0.809) suggests the CFA for management construct is appropriate and within acceptable levels (Hair *et al.*, 2010).

Table 6.22: CFA for Management Support

Measure	Loading	Indicator Loading	Communalities	Variance Extracted	KMO	Bartlett's test (sig.)
MS1	0.814	0.862	0.696	75.718%	0.809	0.000
MS2	**0.464**		**0.231**			
MS3	0.821	0.848	0.657			
MS4	0.893	0.889	0.795			
MS5	0.882	0.879	0.778			
MS6	**0.672**		**0.489**			

- **Reliability of management support**

The PLS-SEM technique was applied in order to assess the indicator reliability of study constructs. Exploring the results of indicators loadings in Table 6.22 reveals that the remaining indicators are highly reliable as they are highly loading (greater than 0.7) for this construct. Furthermore, Table 6.23 demonstrates the values of Cronbach's alpha and composite reliability are 0.893 and 0.957 respectively. The values indicate that management support construct is internally consistent and has acceptable reliability, above 0.7 (Field, 2009; Hair *et al.*, 2010). Therefore, the four

management support measures (MS1, MS3, MS4 and MS5) can adequately assess the MS construct.

Table 6.23: Reliability Coefficients of Management Support

Measure	Cronbach's alpha	Composite reliability	AVE
MS	0.893	0.9257	0.7571

- **Convergent validity**

Table 6.23 shows that the AVE of management support is 0.757, which indicates a sufficient level of convergent validity. The discriminant validity for this construct is displayed at the end of this chapter.

6.5.8 ERP system brand (brand)
- **Measure of ERP system brand**

The number of ERP software brands is increasing, but there is differentiation between these brands (Wang *et al.*, 2011). Some ERP system software types such as SAP, Oracle, PeopleSoft etc., have the characteristics of high integration degree, powerful, and inquisitive customer value, yet are costly and are difficult to implement. On another hand, there are other types which are less expensive, but they are weak and not completely integrated.

This study uses the name of the ERP software as the only indicator of ERP brand (Table 6.24). The descriptive analysis of this construct is presented in section 6.4.2. Additionally, referring to Gupta and Kohli (2006) and Wang *et al*. (2011) studies, the ERP system brands were divided into two groups, well-known software and less-known (see section 6.4.2). In addition, this construct does not require an assessment of CFA, reliability and validity, as it measured by one indicator. However, the discriminant validity assessment of this construct, along with other constructs is presented at the end of this chapter.

Table 6.24: Measuring ERP system brand

Construct	Measure	Measure description	Sources
ERP Brand	Brand	-ERP system vender	Gupta and Kohli (2006) and Wang et al. (2011)

6.5.9 Maturity of ERP (maturity)
- **Measure of ERP maturity**

Maturity of ERP systems refers to the growth stages of the system. Nolan (1979) developed a computer growth stage model including six stages (see section 2.5.1)

Consistent with Nolan (1979), Holland and Light (2001) use five characteristics: cost, entropy, complexity, flexibility and competitiveness. This study refers to both studies to develop the measure of the ERP maturity. A seven-point Likert scale is adopted in this study. The respondents were asked to specify their level of agreement or disagreement on a consistent agree-disagree scale for the construct statements (see Table 6.25).

Table 6.25: Measure of Maturity

Construct	Measure No.	Measure description	Sources
ERP Maturity	Maturity1	- Users of ERP system increased.	Nolan (1979); Holland and Light (2001); Heo and Han (2003)
	Maturity2	- ERP system's applications	
	Maturity3	- Control processes of ERP resources	
	Maturity4	- Budget for the ERP project	
	Maturity5	- Responsibility for operating ERP	
	Maturity6	- Control of conventional data process	

- **CFA of maturity**

The Maturity5 indicator was removed from the analysis due to the high rate of missing data (higher than 10%), to avoid measurement bias (Hair *et al.*, 2010), see section 6.2.1 for the details. However, the high level of missing data in Maturity5 may be because some of the respondents do not have this information.

The results of CFA for ERP system maturity indicate a low level of communality, less than 0.5 for Maturity1 (0.272) as well as low loading, less than 0.7 (0.521) (see Table 6.26). Thus, Maturity1 was removed from the analysis and another round of analysis was conducted using the remaining indicators, which confirmed the uni-dimensionality of the maturity construct. One factor emerged from this analysis, explaining 70.14% of the variability of maturity. Bartlett's test of sphericity (175.12, $p \leq 0.05$) and the value of KMO (0.784) suggest the CFA for the maturity construct is appropriate and within acceptable levels (Hair *et al.*, 2010).

Table 6.26: CFA for Maturity

Measure	Loading	Indicator Loading	Communalities	Variance Extracted	KMO	Bartlett's test (sig.)
Maturity.1	**0.521**		**0.372**	70.14%	0.784	0.000
Maturity2	0.842	0.866	0.709			
Maturity.3	0.834	0.867	0.695			
Maturity.4	0.836	0.792	0.698			
Maturity.6	0.794	0.780	0.630			

- **Reliability of maturity**

The findings in Table 6.26 for indicator loadings show that the remaining indicators are highly reliable as the loading level is greater than 0.7. Additionally, Table 6.27 shows that value of Cronbach's alpha and composite reliability is 0.8439 and 0.895 respectively. The values indicate that the maturity construct is internally consistent and has acceptable reliability (greater than 0.7). In general, the findings from the reliability tests suggest that maturity can be measured adequately measured using the four measures.

Table 6.27: Reliability Coefficients of Maturity

Measure	Cronbach's alpha	Composite reliability	AVE
Maturity	0.8439	0.895	0.6809

- **Convergent validity**

The findings in Table 6.27 indicate that the AVE of organisational strategy is 0.6809, which indicates a sufficient level of convergent validity. The discriminant validity is displayed at the end of this chapter.

6.5.10 Age of ERP implementation (age)

- **Measure of ERP implementation age**

There are different factors that can support the success of the ERP systems such as the ERP brand and age of ERP system implementation. However, there is little research investigating this factor. In this study the number of year since the implementation is used as a measure of this construct, see Table 6.28. Particularly, the respondents were asked for the period of ERP system implementation and five choices were attached with this question: less than 1 year, between 1-2, 3-5, 6-8, and more than 8 years.

The descriptive analysis of this construct is presented in section 6.4.2. This construct does not require an assessment of CFA, reliability and validity, as it is measured by one indicator. However, the discriminant validity assessment of this construct is presented at the end of this chapter.

Table 6.28: Age of ERP system Implementation

Construct	Measure	Measure description	Sources
Age of ERP Implementation	Age	Number of year for ERP implementation	(Wang *et al.*, 2011)

6.6 Discriminant validity

Discriminant validity "is exhibited only if all the correlation in x variable and y variable (measurement) are statistically significant and each of these correlations is larger than all correlations" (Fornell and Larcker, 1981, p.41). Two different techniques can be used to assess the discriminant validity, including the Fornell-Larcker technique and the cross loading technique (Hair *et al.*, 2012).

- **Fornell-Larcker**

The Fornell-Larcker method requires the AVE for each construct to be larger than its squared inter-correlation with other constructs (Fornell and Larcker, 1981). Alternatively, the assessment of discriminant validity can be made by comparing the square root of AVE for each construct with the correlations between all other constructs (Davis *et al.*, 2009).

Table 6.29: Square Root of AVE and Correlation Matrix of Study Constructs

	Brand	Col.	Coo.	Dec.	EICPs	ERPs	For.	MS	Mat.	Size	Str.	Team	Age
Brand	1												
Col.	-0.25	**0.931**											
Coo.	-0.04	0.479	1										
Dec.	0.01	0.306	0.557	1									
EICPs	-0.16	0.525	0.564	0.54	**0.782**								
ERPs	-0.11	0.273	0.300	0.20	0.479	**0.862**							
For.	-0.01	0.450	0.416	0.57	0.607	0.373	**0.871**						
MS	-0.08	0.468	0.678	0.61	0.662	0.241	0.478	**0.870**					
Mat.	-0.18	0.209	0.183	0.19	0.402	0.575	0.203	0.296	**0.827**				
Size	-0.42	0.095	-0.071	-0.08	0.052	0.167	0.044	-0.029	0.181	1			
Str.	-0.05	0.405	0.582	0.51	0.687	0.381	0.644	0.627	0.269	0.120	**0.841**		
Team	0.01	0.402	0.540	0.59	0.439	0.278	0.450	0.570	0.250	0.000	0.559	1	
Age	0.02	-0.032	0.143	0.13	0.016	0.114	0.050	0.036	0.293	0.301	0.048	0.100	1

Brand	ERP Brand	**MS**	Management support
Col.	Organisational culture toward collaboration	**Mat.**	ERP maturity
Coo.	Organisational culture toward coordination	**Size**	Company size
Dec.	Structure (decentralisation)	**Str.**	Strategy
EICPs	Effectiveness of internal control procedures	**Team**	Structure (team-based)
ERPs	ERP system success	**Age**	Age of ERP implementation
For.	Structure (formalisation)		

The constructs correlation matrix was developed by the SmartPLS software in order to assess the discriminant validity through the Fornell-Larcker technique and square roots of AVE are shown on the diagonal (table 6.29). The table shows that the all square roots of AVE for the study constructs are higher than the correlation between

each construct and another (in same row or column). Therefore, all the constructs have an acceptable level of discriminant validity.

- **<u>Cross loading</u>**

The second technique of discriminant validity is cross loadings, which are argued to be "more liberal" (Hair *et al.*, 2012, p.424). According to Vinzi *et al.* (2010) a construct suggests satisfactory discriminant validity when each construct is more correlated with its own indicator(s) than with any of the other constructs' indicator(s). The correlation matrix is prepared between the study constructs and their indicators by SmartPLS in order to check if there are any cross loadings. The correlation matrix illustrates the correlations or loadings of all the measures to their respective constructs as well as their loading to the other constructs.

The results in Table 6.30 indicate that all indicators have high correlations with their respective constructs compared with their correlations to the other constructs in the same column or row. In other words, there is no cross loading for any of the study constructs. Therefore, all the constructs achieve the satisfaction levels of discriminant validity and can be utilised in the structural model to test the hypothesised relationships between these constructs.

Table 6.30 the Correlation Matrix of the Constructs and Indications

	Brand	Col.	Coo.	Dec.	EICPs	ERPs	For.	MS	Mat.	Size	Str.	Team	Age
Brand	**1.00**	-0.25	-0.04	0.01	-0.18	-0.11	-0.01	-0.08	-0.18	-0.42	-0.05	0.01	0.02
Cul.1	-0.23	**0.94**	0.48	0.28	0.48	0.31	0.44	0.45	0.15	0.11	0.34	0.36	-0.02
Cul.2	-0.23	**0.93**	0.41	0.29	0.50	0.20	0.40	0.42	0.24	0.07	0.42	0.39	-0.04
Cul.3	-0.11	0.51	**1.00**	0.53	0.49	0.29	0.40	0.54	0.15	0.01	0.49	0.49	0.10
Stru.3	0.01	0.31	0.56	**1.00**	0.54	0.20	0.57	0.61	0.20	-0.08	0.51	0.59	0.13
IE	-0.11	0.41	0.42	0.49	**0.74**	0.24	0.50	0.60	0.33	-0.02	0.59	0.38	-0.03
RA	-0.06	0.38	0.46	0.43	**0.72**	0.25	0.50	0.44	0.14	-0.01	0.52	0.33	0.09
CA	-0.19	0.50	0.45	0.50	**0.87**	0.34	0.63	0.59	0.31	0.10	0.66	0.41	-0.01
InfCo	-0.16	0.42	0.40	0.27	**0.78**	0.53	0.39	0.40	0.35	0.04	0.42	0.26	0.03
M	-0.16	0.34	0.48	0.39	**0.79**	0.54	0.34	0.54	0.43	0.08	0.48	0.32	-0.01
SQ	-0.16	0.26	0.24	0.20	0.51	**0.88**	0.37	0.25	0.57	0.17	0.36	0.32	0.17
IQ	-0.07	0.24	0.12	0.08	0.36	**0.88**	0.30	0.11	0.52	0.18	0.27	0.19	0.09
IndIm	-0.07	0.22	0.35	0.18	0.43	**0.88**	0.32	0.28	0.41	0.12	0.38	0.25	-0.04
OI	-0.08	0.22	0.34	0.24	0.34	**0.80**	0.29	0.18	0.48	0.11	0.30	0.19	0.18
Stru.1	-0.01	0.37	0.28	0.43	0.43	0.21	**0.81**	0.32	0.21	0.07	0.52	0.35	0.04
Stru.2	-0.01	0.42	0.42	0.54	0.61	0.40	**0.93**	0.49	0.16	0.02	0.60	0.43	0.05
MS1	-0.06	0.28	0.58	0.49	0.56	0.23	0.36	**0.86**	0.32	0.04	0.59	0.44	0.10
MS3	-0.19	0.43	0.54	0.50	0.55	0.19	0.38	**0.85**	0.30	0.05	0.54	0.47	0.05
MS4	-0.03	0.45	0.65	0.60	0.59	0.22	0.41	**0.89**	0.19	-0.08	0.50	0.53	-0.04
MS5	0.00	0.47	0.58	0.54	0.60	0.20	0.52	**0.88**	0.23	-0.10	0.57	0.54	0.03
Mat.2	-0.25	0.30	0.11	0.14	0.33	0.54	0.23	0.27	**0.87**	0.23	0.26	0.22	0.26
Mat.3	-0.15	0.13	0.18	0.11	0.28	0.52	0.02	0.21	**0.87**	0.15	0.11	0.13	0.25
Mat.4	-0.09	0.10	0.15	0.14	0.38	0.41	0.17	0.27	**0.79**	0.13	0.31	0.27	0.18
Mat.6	-0.10	0.14	0.18	0.28	0.36	0.41	0.27	0.24	**0.78**	0.07	0.24	0.23	0.28
Size	-0.42	0.10	-0.07	-0.08	0.05	0.17	0.04	-0.03	0.18	**1.00**	0.12	0.00	0.30
Str.1	-0.05	0.29	0.42	0.37	0.42	0.24	0.44	0.48	0.27	0.22	**0.74**	0.41	0.10
Str.2	-0.07	0.28	0.45	0.37	0.59	0.34	0.53	0.47	0.20	0.18	**0.89**	0.34	0.03
Str.3	-0.06	0.29	0.53	0.43	0.58	0.28	0.49	0.55	0.17	0.10	**0.90**	0.51	0.07
Str.4	0.04	0.33	0.57	0.46	0.49	0.32	0.47	0.47	0.18	0.02	**0.81**	0.57	0.06
Str.5	-0.05	0.48	0.49	0.50	0.73	0.40	0.72	0.65	0.31	0.02	**0.86**	0.52	-0.01
Stru.4	0.01	0.40	0.54	0.59	0.44	0.28	0.45	0.57	0.25	0.00	0.56	**1.00**	0.10
Age	0.02	-0.03	0.14	0.13	0.02	0.11	0.05	0.04	0.29	0.30	0.05	0.10	**1.00**

Age	Age of ERP implementation	**MS**	Management support	**RE**	Risk Assessment
Brand	ERP Brand	**Mat.**	ERP maturity	**CA**	Control Activities
Col.	Collaboration	**Size**	Company size	**Inf&Co**	Information & communication
Coo.	Coordination	**Str.**	Strategy	**EICPs**	Effective of internal control procedures
Dec.	Structure (decentralisation)	**Team**	Structure (team-based)	**SQ**	System Quality
M	Monitoring	**Cul.**	Organisational culture	**IQ**	Information Quality
ERPs	ERP system success	**Stru.**	Structure	**IndIm**	Individual Impact
For.	Structure (formalisation)	**IE**	Internal Environment	**OI**	Organisational Impact

6.7 Summary

This chapter presents the first part of the descriptive analysis (the second part is discussed in chapter seven as the findings are more related to the structure analysis). Additionally, it provides detailed explanation of processes that are required for evaluating the measurement model, which is an important step before testing the hypothesised relationships in the structural model (see chapter seven). Thus, the chapter discusses four basic processes of evaluating the measurement model, including the conceptual model specification and content validity, assessing the construct dimensionality, assessing the constructs' reliability and assessing the constructs' validity.

In general, the results confirm the uni-dimensionality of the research constructs. Also, the indicators used in measuring the research constructs show acceptable levels of indicator and composite reliability. All the research constructs meet the criteria of convergent and discriminant validity. Finally, the results suggest that the measurement model can be adequately utilised in testing the structural model, which is discussed in detail in the next chapter.

Chapter Seven:
Structure Model Analysis

7.1 Overview

In the previous chapter the reliability and validity of the research constructs are assured through the four processes of evaluating the measurement model. That can provide an adequate insurance to assess the structural relationships proposed in the theoretical model. This chapter presents, in detail, the process of data analysis to test the structural relationships between the study constructs, which is a part of the hypothesis testing procedures.

Section 7.2 presents the second part of the descriptive statistics. That includes the descriptive analysis of contingency factors, success of ERP systems and effectiveness of ICPs. Section 7.3 explains the processes and measures used in assessing the structural model and hypothesis testing using PLS-SEM, including path coefficients, R² value and predictive relevance. Section 7.4 presents the results of hypothesis testing based on path coefficients and their significance levels. The last section7.5 summarises the chapter.

7.2 Descriptive Statistics for the Study Factors

This section displays some descriptive statistics including frequencies, percentages, means and standard deviations in order to summarise the individual set of observed variables that measure the contingency factors (except organisation size, ERP brand and age of ERP implementation, as they were presented in section 6.4.2), success of ERP systems and EICPs.

7.2.1 Contingency factors

In section 6.4.2 the descriptive analysis for some of the organisation and ERP factors, which include company size, age of ERP implementation and ERP system brands were presented in order to provide a brief description for the study sample. Table 7.1 shows some descriptive statistics of the other organisation and ERP factors, which include the organisational structure, organisational strategy, organisational culture, management support and maturity of ERP systems. The participants were asked to indicate their agreement with statements (on a seven-point Likert scale as 1 is strongly disagree and 7 is strongly agree) reflecting the degree of

formalisation, degree of decentralisation, degree of team-based, prospector strategy, oriented toward collaboration, oriented toward coordination, management support and maturity of ERP functions.

Among the organisational structure construct, the degree of formalisation (M= 5.88, SD= 1.17) and the degree of team-based (M= 5.56, SD= 1.32) are presented highly with around 75% and 61% of the participants agreeing that their companies focus on the formalisation (formalisation and specialisation are combined into a single dimension of formalisation, see section 6.5.3) and team-based structure respectively. However, for the degree of decentralisation (M= 4.58, SD= 1.62) is diverse among the Saudi companies. Although 29% of the respondents agree that their companies allow employees to participate in their firms' decisions, 26% of participants disagree with that and that seems to be high compared with the other dimensions. This can be explained more after the hypothesis testing in the next chapter.

In addition, the results in Table 7.1 state that the study's companies tend to be more prospectors than defenders in formulating their strategies (M= between 5.49 and 5.88, SD= between 1.16 and 1.5). High scores on the strategy scale indicate prospector strategy, while low scores indicate another type of strategy. In total, less than 11% (12) of the respondents indicate a low score on the strategy scale, while more than 87% (96) of the respondents state a high score.

The organisational culture perspective is ranked as follows: orientation toward collaboration (M= 5.58, SD= 1.15) and orientation toward coordination (M= 5.61, SD= 1.13). All indicators of organisational culture are significant with a mean 5.5 and above. Over 92% of the participants agree that organisational culture within the study's sample is a combination of collaboration and coordination culture.

The results in Table 7.1 reveal that the top management in the Saudi companies (i.e. with implemented ERP systems), in general, use the entrepreneurial style Covin and Slevin (1988) by focus on supporting development and innovation (M= 5.58, SD= 1.46), and providing all necessary resources (M= 5.77, SD= 1.19). However, there is less concentration on involving the employees in strategic planning (M= 4.94, SD= 1.61) and delegating tasks to others (M= 5.29, SD= 1.59). The results are consistent with the low score that the respondents indicate for the degree of decentralisation.

Chapter 7: Structure Model Analysis

On the maturity of ERP systems, it emerged that the Saudi companies are somewhat satisfied with their ERP system functions (M= around 5.0, and SD= around 1.3). Table 7.1 shows that around 75% of the Saudi companies (i.e. with implemented ERP systems) are, in general, satisfied with the ERP systems' application and control process. 50% of the companies are pleased with the ERP system budget and 74% of the respondents agree or somewhat agree with the control of conventional data processing activities after the implementation of ERP systems. However, between 17 and 29 of the respondents neither agrees nor disagrees with the maturity of ERP systems, which is higher than for the other contingency factors.

Table 7.1 Descriptive Analysis of Contingency Variables

	1	2	3	4	5	6	7	N	Mean	SD
Organisational Structure										
Degree of Formalisation	1	1	4	6	14	48	34	108	5.88	1.174
	1%	1%	4%	6%	13%	44%	31%			
Degree of Decentralisation	6	10	12	6	40	24	8	106	4.58	1.626
	6%	9%	11%	6%	37%	22%	7%			
Degree of Team-based	2	3	4	5	27	42	24	107	5.56	1.319
	2%	3%	4%	5%	25%	39%	22%			
Organisational Strategy										
Strategy 1	1	0	4	9	14	44	36	108	5.88	1.166
	1%	0%	4%	8%	13%	41%	33%			
Strategy 2	0	2	2	10	22	30	41	107	5.86	1.193
	0%	2%	2%	9%	20%	28%	38%			
Strategy 3	0	4	3	12	21	31	36	107	5.68	1.322
	0%	4%	3%	11%	19%	29%	33%			
Strategy 4	0	2	4	14	29	33	23	105	5.49	1.194
	0%	2%	4%	13%	27%	31%	21%			
Strategy 5	2	4	5	12	20	29	35	107	5.53	1.500
	2%	4%	5%	11%	19%	27%	32%			
Organisational Culture										
Toward Collaboration	0	4	2	9	23	52	18	108	5.58	1.145
	0%	4%	2%	8%	21%	48%	17%			
Toward Coordination	1	1	2	10	30	41	23	108	5.61	1.126
	1%	1%	2%	9%	28%	38%	21%			
Management support										
MS1	1	6	4	9	20	34	34	108	5.58	1.461
	1%	6%	4%	8%	19%	31%	31%			
MS3	2	2	0	8	18	51	27	108	5.77	1.197
	2%	2%	0%	7%	17%	47%	25%			
MS4	3	9	7	19	23	29	18	108	4.94	1.608
	3%	8%	6%	18%	21%	27%	17%			
MS5	3	8	4	9	25	34	25	108	5.29	1.589
	3%	7%	4%	8%	23%	31%	23%			
Maturity of ERP systems										
Maturity 2	1	3	3	21	29	41	10	108	5.19	1.195
	1%	3%	3%	19%	27%	38%	9%			
Maturity 3	1	3	4	19	28	45	8	108	5.19	1.188
	1%	3%	4%	18%	26%	42%	7%			
Maturity 4	3	5	5	29	22	26	8	98	4.76	1.415
	3%	5%	5%	27%	20%	24%	7%			
Maturity 6	3	5	4	17	23	50	6	108	5.09	1.364
	3%	5%	4%	16%	21%	46%	6%			

7.2.2 Success of the ERP systems

Four dimensions are used to assess the success of ERP systems, as suggested by the measurement model in the previous chapter. The four dimensions are system quality (SQ), information quality (IQ), individual impact (IndIm), and organisation impact (OI) (the removal of the service quality dimension is discussed in section 6.5.2). Furthermore, a number of indicators were suggested to measure each of these dimensions.

The questionnaire's participants were asked to indicate their level of agreement on a seven-point Likert scale (1 is strongly disagree and 7 is strongly agree) with statements reflecting the quality as well as the impact dimensions of ERP system success. The results in Table 7.2 show that three out of the four dimensions of ERP system success have a mean of 5.7 and above as follows: system quality (M= 5.81, SD= 1.02), information quality (M= 5.89, SD= 0.97), individual impact (M= 5.69, SD= 1.06). The results suggest that the study participants agree with the quality of the system, the information provided by the system, and the individual impact of the system. However, they only somewhat agree with the impact of the ERP system on the organisation (M= 5.33, SD= 1.35). A closer examination of the dimension of organisational impact reveals that the respondents believe costs of ERP systems have been reduced but not with a high level of success.

In general, Table 7.2 shows that the mean of the success of ERP systems (for the four dimensions together) is above the average with value of M= 5.5. This implies that Saudi Arabian companies, in general, tend to have successful ERP systems. Although these results seem to be surprising, as Saudi Arabia is not a developed country, the descriptive statistics of various contingency factors that are provided in section 6.4.2 can explain more about that. Particularly, the ERP brand, more than 70% of the study's sample companies implemented well-known ERP software, such as SAP, Oracle and PeopleSoft. According to Wang *et al*. (2011) these types of ERP software have the characteristics of high integration, powerful, and realising customer value, so the selection of these types of ERP system can be a prerequisite for a successful ERP system.

Table 7.2 Descriptive Statistics of ERP Success

	1	2	3	4	5	6	7	N	Mean	SD
System Quality								108	5.81	1.024
SQ1	1	1	2	9	19	50	26	108	5.76	1.118
	1%	1%	2%	8%	18%	46%	24%			
SQ2	1	1	5	7	20	52	22	108	5.67	1.16
	1%	1%	5%	6%	19%	48%	20%			
SQ3	1	0	5	8	27	39	28	108	5.68	1.167
	1%	0%	5%	7%	25%	36%	26%			
SQ4	1	1	2	7	11	51	35	108	5.95	1.114
	1%	1%	2%	6%	10%	47%	32%			
SQ5	2	5	2	12	25	36	24	106	5.42	1.414
	2%	5%	2%	11%	23%	33%	22%			
SQ8	1	3	4	10	16	45	26	105	5.63	1.303
	1%	3%	4%	9%	15%	42%	24%			
Information Quality								108	5.89	0.97
IQ2	1	0	0	6	10	60	31	108	6.04	0.916
	1%	0%	0%	6%	9%	56%	29%			
IQ3	1	1	1	5	11	61	28	108	5.95	1.008
	1%	1%	1%	5%	10%	56%	26%			
IQ4	1	1	1	4	14	62	25	108	5.92	0.987
	1%	1%	1%	4%	13%	57%	23%			
IQ5	1	3	3	4	22	55	20	108	5.67	1.168
	1%	3%	3%	4%	20%	51%	19%			
IQ6	1	2	4	3	24	51	23	108	5.7	1.154
	1%	2%	4%	3%	22%	47%	21%			
Individual Impact								108	5.69	1.056
IndIm1	1	3	4	16	27	38	18	107	5.35	1.275
	1%	3%	4%	15%	25%	35%	17%			
IndIm2	1	3	3	12	25	47	16	107	5.45	1.215
	1%	3%	3%	11%	23%	44%	15%			
IndIm3	1	2	2	9	19	52	23	108	5.69	1.156
	1%	2%	2%	8%	18%	48%	21%			
IndIm4	2	1	0	6	22	48	29	108	5.82	1.134
	2%	1%	0%	6%	20%	44%	27%			
Organisational Impact								108	5.33	1.347
OIm1	3	4	2	20	19	38	21	107	5.3	1.455
	3%	4%	2%	19%	18%	35%	19%			
OIm2	2	8	4	19	29	27	18	107	5.04	1.498
	2%	7%	4%	18%	27%	25%	17%			
OIm3	3	6	4	16	34	25	20	108	5.1	1.491
	3%	6%	4%	15%	31%	23%	19%			
OIm5	1	2	2	12	29	38	24	108	5.56	1.202
	1%	2%	2%	11%	27%	35%	22%			
Success of ERPs								108	5.55	0.98

7.2.3 EICPs

According to the measurement model analysis's results, which are discussed in the previous chapter, five main components have been suggested to assess the EICPs. These components include internal environment (IE), risk assessment (RA), control activities (CA), information and communication (Inf&Co), and monitoring (M). In addition, a number of indicators were suggested to measure each of these components. The descriptive statistics of the indicators used in measuring EICPs, including mean and standard deviation are presented in Table 7.3 below.

The descriptive statistics of the EICPs are measured on a seven-point Likert scale (1 is strongly disagree and 7 is strongly agree) and show above average scores of the five components. Although Table 7.3 illustrates that, overall, the study's respondents agree with the presence and functions of the components (M= 5.7, SD= 0.96), the risk assessment component is indicated with (M= 5.36, SD= 1.3), showing that the respondents believe their companies have, relatively, an effective ICPs.

In general, the results suggest that the effective level of the ICPs for companies, who implemented ERPs in Saudi Arabia, is above average. This is consistent with the exploratory study findings. The results also imply that the practice of COSO framework is very common in Saudi Arabian companies and that can be reasonable as the framework components are recognised in the Saudi Auditing Standards. However, that might not be an adequate reason, so more prediction and explanation is provided in section 7.3.

Table 7.3 Descriptive Statistics of EICPs

	1	2	3	4	5	6	7	N	Mean	SD
Internal Environment								108	5.93	1.288
IE1	2	4	1	3	15	42	37	100	6.25	0.947
	2%	4%	1%	3%	14%	39%	34%			
IE2	2	3	2	10	11	27	50	104	5.88	1.342
	2%	3%	2%	9%	10%	25%	46%			
IE4	1	3	3	6	16	36	42	101	5.48	1.453
	1%	3%	3%	6%	15%	33%	39%			
Risk Assessment								108	5.36	1.3
RA1	1	4	4	15	27	31	25	107	5.39	1.365
	1%	4%	4%	14%	25%	29%	23%			
RA2	3	4	8	8	24	38	22	107	5.32	1.502
	3%	4%	7%	7%	22%	35%	20%			
RA3	1	4	3	15	28	33	22	106	5.38	1.327
	1%	4%	3%	14%	26%	31%	20%			
RA4	1	5	5	12	21	45	18	107	5.37	1.356
	1%	5%	5%	11%	19%	42%	17%			
Control Activities								108	5.94	1.044
CA2	0	0	1	12	16	46	33	108	5.91	0.991
	0%	0%	1%	11%	15%	43%	31%			
CA3	1	0	3	9	17	40	38	108	5.9	1.152
	1%	0%	3%	8%	16%	37%	35%			
CA4	2	5	9	10	13	28	38	106	5.51	1.623
	2%	5%	8%	9%	12%	27%	35%			
CA5	1	1	2	4	23	37	40	108	5.94	1.134
	1%	1%	2%	4%	21%	34%	37%			
Information& Communication								108	5.82	1.012
Inf&Co2	0	2	2	7	20	40	34	105	5.87	1.119
	0%	2%	2%	6%	19%	37%	31%			
Inf&Co3	0	1	1	9	17	51	27	106	5.86	0.99
	0%	1%	1%	8%	16%	47%	25%			
Inf&Co4	0	3	3	7	22	42	30	107	5.75	1.182
	0%	3%	3%	6%	20%	39%	28%			
Inf&Co5	0	1	5	12	25	37	27	107	5.62	1.171
	0%	1%	5%	11%	23%	34%	25%			
Monitoring								108	5.79	0.996
M1	0	1	6	10	25	40	26	108	5.62	1.166
	0%	1%	6%	9%	23%	37%	24%			
M2	0	1	5	6	22	46	25	105	5.73	1.094
	0%	1%	5%	6%	20%	43%	23%			
M3	1	0	7	3	23	40	33	107	5.79	1.195
	1%	0%	6%	3%	21%	37%	31%			
M4	1	1	4	7	15	46	31	105	5.82	1.191
	1%	1%	4%	6%	14%	43%	29%			
EICPs								108	5.7	0.96

7.3 Evaluation of the Structural Model

After evaluating the measurement model in the previous chapter and providing evidence for reliability and validity of the constructs' measures, the following step is to evaluate the structure (inner) model. PLS-SEM has the power in explain variance as well as creating the significance of all path coefficients. PLS-SEM is inapplicable as CB-SEM to distinction between variance and covariance (Hair *et al.*, 2012), which is mainly due to the assumption of distribution-free variance (see section 4.6.3). Therefore, evaluating the inner model in PLS-SEM should be performed by using non-parametric evaluation criteria (Hair *et al.*, 2012).

According to Chin (2010), the PLS structural model can be assessed by R-square (coefficient of determination), path coefficients and Q^2 predictive relevance. In addition, re-sampling methods (e.g. bootstrapping and jackknifing) can be used to test the significance of path coefficient estimates. The following sub-sections propose and explain the structural model results.

7.3.1 Coefficient of determination (R-Square)

Coefficient of determination (R²) of endogenous (dependent) constructs is a predictive power used to assess the structural model, and normally it is the first value to start looking at (Chin, 2010). As in ordinary least squares regression (OLS), the R² value in PLS represents the proportion of total variance of the constructs that is explained by the model (Hair *et al.*, 2012). Another way of looking at the R² value is in terms of the correlations between each of the independent variables and the dependent variables (Tabachnick and Fidell, 2007). However, the judgment of whether the value level of R² is high or low depends on the research discipline (Hair *et al.*, 2011). For instance, R² value of 0.2 can be considered high in some research areas, such as consumer behaviour, while R² result of 0.75 can be perceived as high in success driver studies (Hair *et al.*, 2011). Hulland (1999) reviewed four studies (that used PLS in analysis); he found the R² values for endogenous constructs range from 0.12 to 0.64. In marketing research, Hair *et al*. (2011) indicate that R² of 0.25, 0.5 and 0.75 for endogenous constructs can be described as weak, moderate and substantial respectively.

In management accounting research, different R² values have been reported (Chenhall, 2005; Hartmann, 2005; Naranjo-Gil and Hartmann, 2006), but there is no

explicit threshold for high R^2 value. The highest R^2 value reported in the areas of accounting researches was not very low as consumer behaviour studies (0.2). For instance, Hartmann (2005) reports R^2 of the study endogenous constructs with value range between 0.05 and 0.242. In Chenhall's (2005) study, the highest R^2 value of the dependent construct is 0.32. Additionally, in the study of Naranjo-Gil and Hartmann (2006), R^2 results are between 0.107 and 0.279. Also, in a study by Elbashir *et al* (2011), R^2 results are reported between 0.14 and 0.41. Pong and Mitchell (2012) study, R^2 are reported between 0.28 and 0.81. In the current study, the values of R^2 of endogenous constructs ranges from 0.122 to 0.668 (see Table 7.4). Comparing with other studies in the field of accounting, these values of R^2 fall within the acceptable range.

Table 7.4: Summary of R^2, Redundancy and Communality

Constructs	R^2	Redundancy	Communality
Age of ERP Implementation			1
ERP Brand			1
Culture (Collaboration)			0.8662
Culture (Coordination)			1
Management Support			0.7567
Size			1
Strategy			0.7079
Structure (Decentralisation)			1
Structure (Formalisation)			0.7580
Structure (Team-based)			1
ERP Maturity	0.122	0.013	0.6843
ERP success	0.454	0.036	0.7437
EICP	0.668	0.110	0.6120

The results in Table 7.4 indicate that the two predictor variables, ERP system brand and age of ERP implementation, explain about 12.2% of the variation in ERP maturity ($R^2= 0.122$). Organisational and ERP factors (strategy, structure, size, management support, organisation culture, ERP brand, ERP age implementation and maturity) explain 45.4% variation of the success of the ERP systems ($R^2= 0.454$). Finally, organisational factors and success of ERP systems explain 66.8% variation of EICPs ($R^2= 0.668$).

7.3.2 Path coefficient

An individual path coefficient of the structural model in PLS can be explained as standardised beta coefficients of OLS regressions (Hair *et al.*, 2011). The standardised regression coefficient (or β) "is the regression coefficient that would be

applied to the standardized X (independent variable) value-the z-score of the X value-to predict standardized Y (dependent variable)" (Tabachnick and Fidell, 2007: p.131). In other words, it is the estimated change in the endogenous variable for a unit change of the exogenous variable (Hair *et al.*, 2010). It represents the type of the relationship between the independent and dependent variables as well as its strength (Tabachnick and Fidell, 2007). The sign refers to whether the relationship between the two constructs is positive or negative, whereas the value of the regression coefficient represents the degree to which the exogenous variable is associated with the endogenous variable, indication that the regression coefficient is statistically significant (Hair *et al.*, 2010).

To assess the significance of path coefficients, the t-statistics (and the calculated p-value) for each coefficient can be used as a basis for testing the proposed relationships between the constructs. In order to report the significance of the path coefficients in PLS-SEM, the non-parametric techniques of re-sampling should be used (Barroso *et al.*, 2010). Consequently, bootstrapping and jackknifing are two common approaches used in PLS-SEM analysis. The current study uses the bootstrapping approach to assess the significance of path coefficient. It was first introduced and used for PLS by Chin in 1998. The bootstrapping approach performs a non-parametric technique for estimating the precision of PLS-SEM estimates, "N sample sets are created in order to obtain N estimates for each parameter in the PLS-SEM model" (Chin, 2010:p.675).

The bootstrapping procedure for this study uses 500 samples with replacement as recommended by Naranjo-Gil and Hartmann (2006). The method of jackknifing was not used, as it is not provided by SmartPLS, and according to Chin (2010) it is less efficient than bootstrapping (since it can be considered as an approximation to the bootstrapping method). Figure 7.1 provides a summary of the path coefficient. More explanation and detail about significance of path coefficients is presented in the section of hypothesis testing.
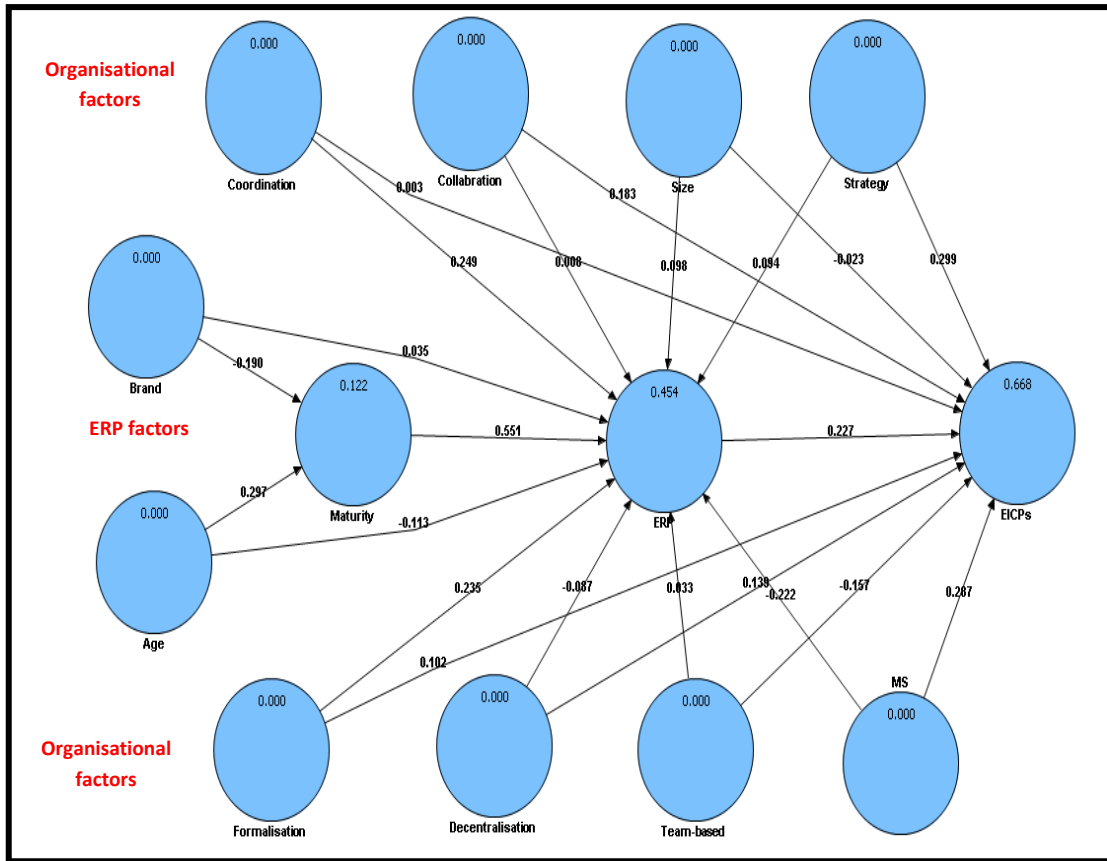
Figure 7.1: Path Diagram with Path Coefficients-Whole Sample

7.3.3 Q² predictive relevance

Besides looking to the path coefficient (R²) technique to assess the structure model, anther technique called predictive relevance can be also considered (Chin, 2010). This technique assesses the model's capability to predict; it was developed by Stone and Geisser between 1974 and 1975. The predictive relevance (Q²) technique represents a synthesis of "cross-validation and function fitting" (Geisse, 1975, p.320), which hypothesises that the model must be capable to predict each endogenous latent variable's indicators adequately (Hair *et al.*, 2011). The rationale of this technique is that "the prediction of observables or potential observables is of much greater relevance than the estimation of what are often artificial construct-parameters" (Geisser, 1975, p.320).

According to Chin (2010), this technique can fit the PLS as "hand in glove" (p.679). The SmartPLS software uses a "blindfolding" procedure in terms of assessing the model's ability of production. The blindfolding procedure omits a part of the data by using "omission distance D" for a specific block of indicators during estimations of the parameter. In the next step, the obtained parameter estimate is used to predict the

omitted part (Gotz *et al.*, 2010). It is important to choose the omission distance D before calculating Q², so the number of valid observations divided by D is not an integer (Hair *et al.*, 2011). As long as the number of cases is large, experience shows that D values from 5 to 10 are advantageous (Chin, 2010). The equation for calculating the Q² is as follows:

$$Q^2 = 1 - (\Sigma D\ ED \div \Sigma D\ OD)$$

Where the E is sum of squares of prediction error and the O is the sum of squares of prediction error utilising the mean for prediction. Q² comes in two different forms: cross-validated communality and cross-validated redundancy. The first Q² form (communality) obtains "if prediction of the data points is made by the underlying latent variable score", while the second Q² form (redundancy) obtains "if prediction is made by those latent variables that predict the block in question" (Chin, 2010: p.680). According to Hair *et al*. (2011), it is preferable for data prediction in PLS to use the cross-validated redundancy, as it uses the estimates of the measurement model as well as the structural model, unlike the cross-validity communality (Hair et al., 2011a). In general, a result of Q² greater than zero indicates that the model is considered to have predictive validity, while Q² value less than zero indicates that the model cannot be granted the validity of productivity (Gotz *et al.*, 2010).

In this study, both cross-validity communality and cross-validity redundancy forms were calculated by SmartPLS. Table 7.5 shows positive Q² results (for both communality and redundancy) for all constructs and that suggests the study's model has predictive relevance.

Table 7.5: Cross-validated Communality and Redundancy

Construct	Cross-Validity Communality	Cross-Validity Redundancy
Age Implementation	1	
Brand	1	
Culture (Collaboration)	0.8666	
Culture (Coordination)	1	
Management Support	0.7567	
Size	1	
Strategy	0.7352	
Structure (Formalisation)	0.7808	
Structure (Decentralisation)	1	
Structure (Team-based)	1	
ERP Maturity	0.6920	0.0740
ERP success	0.7352	0.3507
EICPs	0.6119	0.3901

Consequently, the results in the current study's model imply that the structural relationships proposed are not only limited to the current data, it can be also used to predict the dependent latent variables using other sets of data.

7.3.4 Multicollinearity

Multicollinearity arises from strong correlation between more than two indicators (Gotz *et al.*, 2010). The best situation in a study would be to have high correlation between the exogenous variables and the endogenous variable, but with little collinearity among the exogenous variables (Hair *et al.*, 2010). High degree of multicollinearity can threaten the validity of the results extracted from the tested model, because it can lead to incorrect estimation of the regression coefficients (Hair *et al.*, 2010). In other words, high multicollinearity makes the standard error high, so the t-statistic becomes small (*t-statistic = estimating coefficient/standard error*) and as a result a significant relationship can be non-significant.

Table 7.6: Variance Inflation Factor (VIF)

Construct	EICP		ERP		Maturity	
	Tolerance	VIF	Tolerance	VIF	Tolerance	VIF
Age Implementation	.778	1.286	.785	1.274	.798	1.253
Brand	.632	1.582	.631	1.586	.634	1.578
Culture (Collaboration)	.676	1.479	.647	1.545	.645	1.549
Culture (Coordination)	.417	2.395	.677	1.478	.417	2.399
MS	.378	2.647	.347	2.884	.347	2.878
Size	.618	1.617	.617	1.621	.617	1.621
Strategy	.391	2.560	.376	2.663	.377	2.656
Structure (Formalisation)	.551	1.814	.551	1.815	.543	1.841
Structure (Decentralisation)	.444	2.253	.447	2.238	.438	2.282
Structure (Team-based)	.503	1.989	.497	2.010	.493	2.027
Maturity	.568	1.759	.691	1.447		
ERP success	.343	2.917			.402	2.489
EICPs			.424	2.357	.409	2.445

Multicollinearity can be assessed by using the Variance Inflation Factor (VIF) of exogenous constructs, which calculates the inverse of the tolerance value (Gotz *et al.*, 2010). The value of the VIF illustrates whether a predictor has a strong linear relationship with other predictors (Hair *et al.*, 2010). There is no obvious threshold value for VIF, but commonly it should not exceed a value of 10 (Gotz *et al.*, 2010); if the VIF exceeds 10 it indicates a multicollinearity problem.

The VIFs of the current study's independent variables have been checked using SPSS (see Table 7.6). The results indicate that the largest value of VIF is 2.917, which is less than 10. Therefore, the VIF values provide an assurance that the current study has no multicollinearity problems. Another way to assess multicollinearity is to check the correlation matrix of independent constructs table that is provided by SmartPLS. High correlations between independent variables, in general 0.90 or more, is a sign of a multicollinearity problem (Hair *et al.*, 2010). In this study the correlation matrix between independent variables, in Table 7.7, indicates that there is no high correlation between the study's independent variables (the maximum in the correlation matrix is 0.687).

Table 7.7 Correlation Matrix between Independent Constructs

	Brand	Col.	Coo.	Dec.	EICPs	ERPs	For.	MS	Mat.	Size	Str.	Team	Age
Brand	1												
Col.	-0.25	1											
Coo.	-0.04	0.479	1										
Dec.	0.01	0.306	0.557	1									
EICPs	-0.16	0.525	0.564	0.54	1								
ERPs	-0.11	0.273	0.300	0.20	0.479	1							
For.	-0.01	0.450	0.416	0.57	0.607	0.373	1						
MS	-0.08	0.468	0.678	0.61	0.662	0.241	0.478	1					
Mat.	-0.18	0.209	0.183	0.19	0.402	0.575	0.203	0.296	1				
Size	-0.42	0.095	-0.071	-0.08	0.052	0.167	0.044	-0.029	0.181	1			
Str.	-0.05	0.405	0.582	0.51	0.687	0.381	0.644	0.627	0.269	0.120	1		
Team	0.01	0.402	0.540	0.59	0.439	0.278	0.450	0.570	0.250	0.000	0.559	1	
Age	0.02	-0.032	0.143	0.13	0.016	0.114	0.050	0.036	0.293	0.301	0.048	0.100	1

Brand	ERP Brand	MS	Management support
Col.	Organisational culture toward collaboration	Mat.	ERP maturity
Coo.	Organisational culture toward coordination	Size	Company size
Dec.	Structure (decentralisation)	Str.	Strategy
EICPs	Effectiveness of internal control procedures	Team	Structure (team-based)
ERPs	ERP system success	Age	Age of ERP implementation
For.	Structure (formalisation)		

7.4 Hypothesis Testing

In the stage of constructing the study's theoretical framework, four main relationships were developed. These relationships were illustrated in four propositions and in the exploratory study they were tested in order to construct relevant hypotheses. As a result of the exploratory study, four groups of hypotheses were constructed (see section 5.4).

In this section mediator analysis processes is discussed, follow by testing and reporting the study four groups hypotheses. The first group examines the association between organisational factors and the EICPs. The second group examines the association between organisational factors and ERP success. The third group examines the relationship between the ERP factors and ERP success. The last group examines the association between ERP success and EICP. In addition, it examines the indirect effect of organisational factors on EICP through ERP success. Results are presented in Table 7.8 and for ease of interpretation the path coefficients are superimposed on the path diagram in Figure 7.2.

Table 7.8: Path Coefficients

Path From	Path To			
	Predicted sign	Maturity	ERP	EICPs
Brand	-,+	0.190**	0.035	
Age Implementation	+,-	0.297***	0.113	
Culture (Collaboration)	+,+		0.008	0.183*
Culture (Coordination)	+,+		0.249**	0.003
Management support	-,+		0.223	0.287**
Size	+,-		0.098	0.023
Strategy	+,+		0.094	0.299***
Structure (Formalisation)	+,+		0.235*	0.102
Structure (Decentralisation)	-,+		0.087	0.139
Structure (Team-based)	+,-		0.033	0.157*
Maturity	+		0.551***	
ERP success	+			0.227**
R²		0.122	0.454	0.668

***, **, and * Significant at 0.01, 0.05, and 0.1 levels respectively (two-tailed).
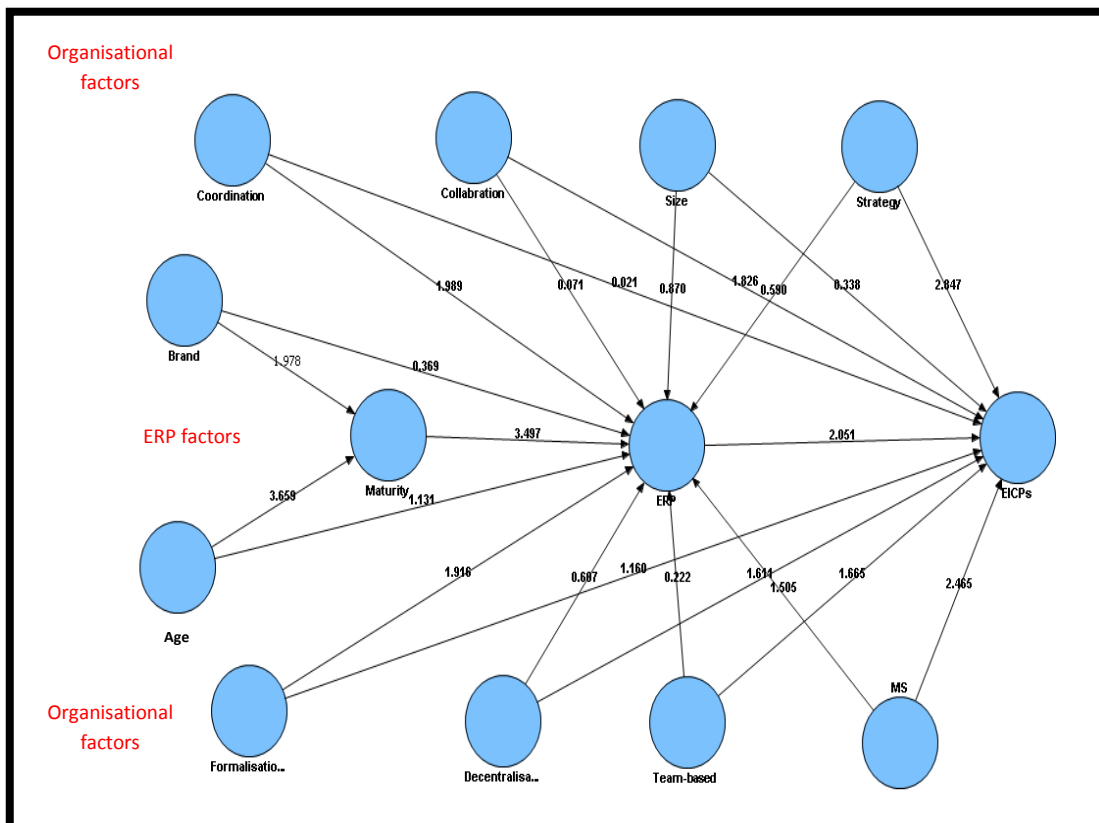
Figure 7.2: Path Diagram with Path Coefficients-Whole Sample

7.4.1 Mediator analysis processes

The mediator role is to "explain how external physical events take on internal psychological significance" (Baron and Kenny, 1986: p.1176). Mediation concentrates on a theoretically established indirect path relationship between the independent and depended variables via a mediator variable (Hair *et al.*, 2013). According to Hair *et al.* (2013), technically, there are three stages in analysing a mediator model. First stage, testing the variable functions as a mediator by meeting the three conditions that are suggested by Baron and Kenny (1986):

> "(a) Variations in levels of the independent variable significantly account for variations in the presumed mediator. (b) Variations in the mediator significantly account for variations in the dependent variable. (c) When [relationship between independent and mediator as well as relationship between mediator and dependent] are controlled, a previously significant relation between the independent and dependent variables is no longer significant." (p.1176)

Second stage, assessing the significance of the mediator effect be using the Sobel test (Bontis *et al.*, 2007) and by the bootstrap the indirect effect as suggested by Preacher and Hayes (2008).

- *Sobel test equation*   *Z-value* $= a*b/SQRT(b^2*s^2a + a^2*s^2b)$
- *Bootstrap t-statistic*   *t* $= (a.b)/sd(ai.bi)$

Third stage, the size of the mediator effect should be assessed using the Variance Accounted For (VAF= a.b/(a.b+c)) (Shrout and Bolger, 2002). According to Hair *et al*.(2013) if the VAF is larger than 80%, it can assume a full mediation. In a situation where VAF is less than 80% but larger than 20%, can be assume as a partial mediation. If the outcome of VAF is less than 20%, in that case there is, almost, no mediation.

7.4.2 Organisational factors and EICPs

This section presents the results of the first hypothesis group, between the organisational factors (organisation structure, strategy, size, organisation culture and management support) and EICPs. There are five hypotheses under this group.

- Structure and EICPs

Hypothesis H1 predicts a relationship between organisation structure (formalisation, decentralisation and team-based) and EICPs. However, the study results suggest a non-significant relationship of formalisation structure ($\beta= 0.102$ and $p > 0.1$), and the decentralisation structure ($\beta=0.139$ and $p > 0.1$) with EICPs, yet team-based structure is negatively associated ($\beta= 0.157$ and $p > 0.1$) with EICPs. Therefore, this hypothesis is partially supported.

- Strategy and EICPs

Consistent with hypothesis H2, which predicts a positive association between prospector strategy and EICPs, a significant positive association is found ($\beta= 0.299$ and $p \leq 0.01$) between prospector strategy and EICPs. Consequently, this hypothesis is supported.

- Size and EICPs

Hypothesis H3 predicts a positive relationship between organisation size and EICPs. Surprisingly, the results show no significant relationship between organisation size and EICPs with a negative coefficient of organisation size ($\beta= -0.023$ and $p > 0.1$). Consequently, this hypothesis is not supported.

- Organisation culture and EICPs

Hypothesis H4 predicts a positive relationship between organisation culture (orientation towards collaboration and coordination) and EICPs. Consistent with this hypothesis, the results in Table 7.8 indicate that organisational culture towards coordination is not significantly associated with EICPs ($\beta= 0.003$ and $p > 0.1$), while the organisational culture towards collaboration is significantly and positively associated with EICPs ($\beta=0183$ and $p \leq 0.1$). Therefore, this hypothesis is partially supported.

- Management support and EICPs

Consistent with hypothesis H5, which predicts a positive association between management support and EICPs, a significant positive association is found ($\beta= 0.287$

and p $\leq$ 0.05) between management support and EICPs. Consequently, this hypothesis is supported.

7.4.3 Organisational factors and ERP success

The study sought to establish that ERP success would be associated significantly with company structure, strategy, size, management support, and organisation culture. A structural model is developed to examine the association between ERP success and organisational factors. This section presents the results of the contingency relationships between company structure, strategy, size, management support, and organisation culture on the one hand, and ERP success on the other. Therefore, there are five hypotheses, under this group, which are illustrated as follows.

- Structure and ERP success

Hypothesis H6 predicts a positive relationship between organisation structure (formalisation, decentralisation and team-based) and ERP success. The study results in Table 7.8 suggest a significant positive relationship between formalisation and ERP success (β= 0.235 and p $\leq$ 0.1), but non-significant relationship between decentralisation as well as team-based and ERP success (β= -0.087 and p > 0.1; β= 0.033 and p > 0.1 respectively). Therefore, this hypothesis is partially supported.

- Strategy and ERP success

In according with the contingency theory and some empirical studies (O'Leary, 2000; Croteau and Bergeron, 2001; Chenhall, 2007), it is hypothesised (hypothesis H7) that there is likely a positive association between prospector strategy and ERP success. Surprisingly, the significant of this relationship is greater than 0.5, thus the non-significant positive coefficient of strategy (β= 0.094 and p > 0.1) does not support the hypothesised association between prospector strategy and ERP success. Therefore, hypothesis 7 is not supported in this study and should be discussed further in the next chapter.

- Size and ERP success

Hypothesis H8 predicts a positive relationship between organisation size and ERP success. However, the results show no significant relationship between organisation size and ERP success (β= 0.098 and p > 0.1). Consequently, this hypothesis is not supported.

- Organisation culture and ERP success

Hypothesis H9 predicts that the organisational culture including: orientation towards collaboration and coordination is positively associated the ERP success. Consistent with this hypothesis, the results suggest that organisational culture towards coordination is significantly and positively associated with ERP success (β= 0.249 and p $\leq$ 0.05), but organisational culture towards collaboration is not significantly associated with ERP success (β=0.081 and p > 0.1). Therefore, this hypothesis is partially supported.

- Management support and ERP success

Hypothesis H10 predicts a positive relationship between management support and ERP success. However, the non-significant negative coefficient of management support (β= -0.223 and p > 0.1) does not support the hypothesised relationship between management support and ERP success. Therefore, this hypothesis is not supported and is discussed further in the next chapter.

7.4.4 ERP factors and ERP success

The effect of ERP brands, the age of ERP implementation and ERP maturity on ERP success is highlighted under this section. There are seven hypotheses, including two mediation hypotheses, under this group. The results of these hypotheses are illustrated as follows.

- Maturity of ERP system and ERP success

Hypothesis H11 predicts a positive association between maturity of ERP system and ERP success. Consistent with the hypothesis, the results indicate that maturity of ERP system is significantly and positively associated with the ERP success (β= 0.551 and p < 0.001). Consequently, this hypothesis is supported. In addition, no study has been found (from the researcher best knowledge) with the purpose of exploring the relationship between ERP brand and ERP implementation age with maturity of ERP functions. So, hypothesis H12 and hypothesis H13 explore that, as follows.

ERP brand and maturity of ERP

It is hypothesised H12 in this study that there is likely to be a strong relationship between ERP brand and maturity of ERP functions. The results in Table 7.8 indicate that ERP brand is significantly but negatively associated with maturity of ERP (β= -0.190 and p $\leq$ 0.05).

ERP Implementation age and maturity of ERP

The results in Table 7.8 regard hypothesis H13, which predicts a positive association between the ERP implementation age and maturity of ERP, indicate a significant positive association between the age of ERP implementation and maturity of ERP (β= 0.297 and p < 0.001).

- ERP brand and ERP success

It is hypothesized (H14) that there is likely to be a relationship between ERP brand and ERP success. The results indicate that ERP brand is non-significantly associated (β= - 0.035 and p > 0.1) with ERP success. Therefore, hypothesis H14 is not supported.

- ERP Implementation age and ERP success

Hypothesis H15 predicts a positive relationship between age of ERP implementation and ERP success. The results indicate a non-significant relationship between age of ERP implementation and ERP success (β= -0.113 and p > 0.1). Consequently, hypothesis H15 is not supported.

The mediate effect of the maturity of ERP system

The first mediation model is illustrated in hypothesis H14a, which predicts a significant mediating effect of ERP maturity on the relationship between ERP brand and ERP success. First the three conditions (see section 7.4.1) are examined for the current relationship using the path coefficients presented in Figure 7.3. The coefficient of the direct path between ERP brand (independent variable) and ERP success (dependent variable) is reduced when the indirect path via maturity of ERP (mediator) is introduced into the model. The standardised beta of the direct path was β=-0.124 and after the ERP maturity is introduced as a mediator β=-0.022 (see Figure 7.3). Second the significance of the mediation effect is measured using the Sobel test (Bontis *et al.*, 2007) and the bootstrapping. However, a non-significant mediating effect of maturity of ERP on the relationship between ERP brand and ERP success is found (t=1.35 and p > 0.1). Therefore, there is no evidence to support hypothesis H14a.
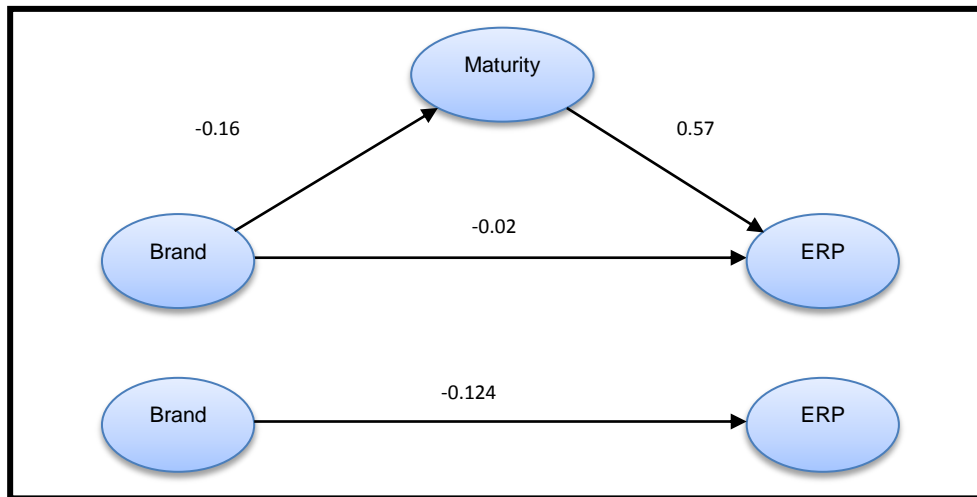
Figure 7.3: Mediator model for the relationship between ERP success and Brand (Mediation effect of Maturity)

For the second mediating model, the study finds evidence to support hypothesis H16a which predicts a significant mediating effect of maturity of ERP on the relationship between age of ERP implementation and ERP success. Firstly, the three conditions are assessed for this hypothesis; as in Figure 7.4 (without the mediator $\beta=0.197$ and with the mediator $\beta= -0.052$). Secondly, the result of the bootstrap t-statistic shows a significant mediating effect of maturity of ERP on the relationship between the period of ERP implementation and ERP success ($t= 2.99$ and $p <0.01$). Thirdly, the size of the mediator effect is assessed and the result of VAF is approximately 80%. According to Hair *et al.* (2013), this is a full mediation.
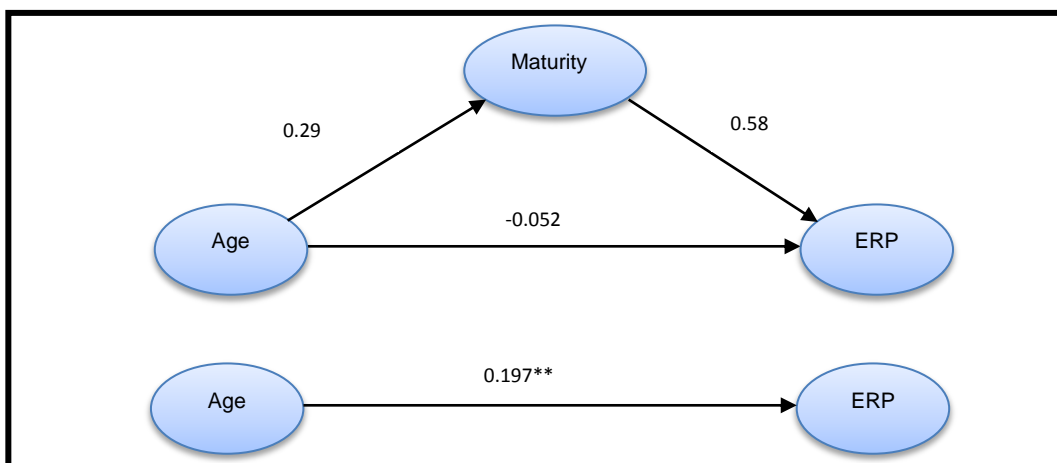
Figure 7.4: Mediator model for the relationship between ERP success and implementation age (Mediation effect of Maturity)

In summary, maturity of ERP functions mediates the relationship between ERP implementation age and ERP success, yet does not mediate the relationship between ERP brand and ERP success.

7.4.5 ERP success and EICPs

This section presents result of the main hypothesis, which is between ERP success and EICPs. Hypothesis H16 predicts a positive relationship between ERP success and EICPs. Consistent with this hypothesis the results provided in Table 7.8 indicate a significant and positive relationship between the ERP success and EICPs ($\beta = 0.227$ and $p \leq 0.05$). Therefore, this hypothesis is supported. In addition, in this study the ERP success plays a mediation role between the some of the contingency variables and EICPs, so the following section discusses the results.

- Mediating effect of ERP success

The three mediation effect conditions (refer to section 7.4.1) are applied to three of the contingency factors, including organisation structure, specifically formalisation structure, organisational culture (coordination) and ERP maturity.

1- Between the relationship of formalisation and EICPs

Hypothesis H16a1 predicts a significant mediating effect of ERP success on the relationship between organisational structure of formalisation and EICPs. Consistent with the hypothesis, the study finds evidence to support this hypothesis.

First, the three conditions are assessed for this hypothesis; as in Figure 7.5. Second, the result of the bootstrap t-statistic shows a significant mediating effect of ERP success on the relationship between the formalisation and EICPs ($t = 2.56$ and $p \leq 0.01$). Third, the size of the mediator effect is assessed and the result of VAF is around 20%. According to Hair et al (2013) this is a partial mediation.
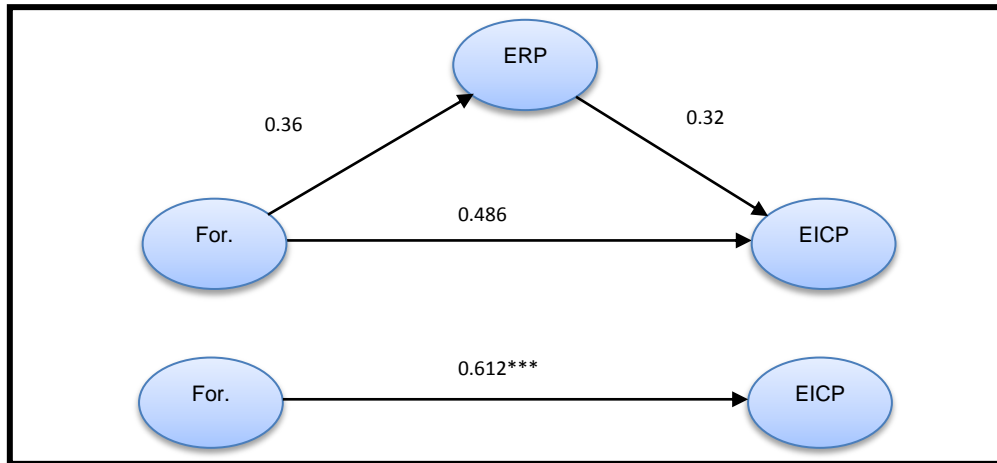
Figure 7.5: Mediator model for the relationship between formalisation and EICPs (Mediation effect of ERP success)

2- <u>Between the relationship of coordination and EICPs</u>

Hypothesis H16a2 predicts a significant mediating effect of ERP success on the relationship between organisational culture (i.e. organisational culture toward coordination) and EICPs. First, the three conditions are assessed for this hypothesis (see Figure 7.6). Second, the t-statistic shows a significant mediating effect of ERP success on the relationship between the organisational culture toward coordination and EICPs (t= 2.16 and p ≤ 0.05). Third, the result of VAF is around 21%. According to Hair et al (2013) this is a partial mediation.
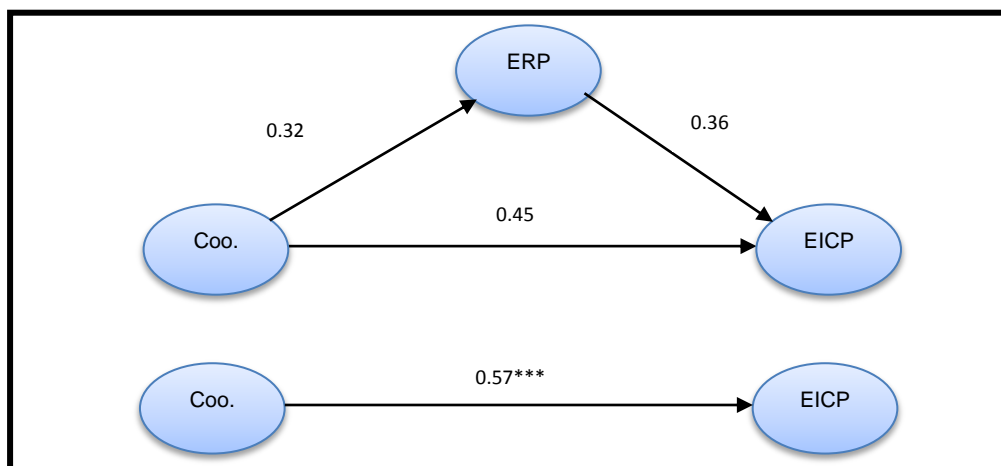
Figure 7.6: Mediator model for the relationship between coordination & EICPs (Mediation effect of ERP success)

3- <u>Between the relationship of ERP maturity and EICPs</u>

Hypothesis H16a3 predicts a significant mediating effect of ERP success on the relationship between ERP maturity and EICPs. First, the three conditions are assessed for this hypothesis (see Figure 7.7). Second, the t-statistic shows a significant mediating effect of ERP success on the relationship between the ERP maturity and EICPs (t= 3.42 and p ≤ 0.001). Third, the result of VAF is around 84%. According to Hair *et al.* (2013) this is a full mediation.
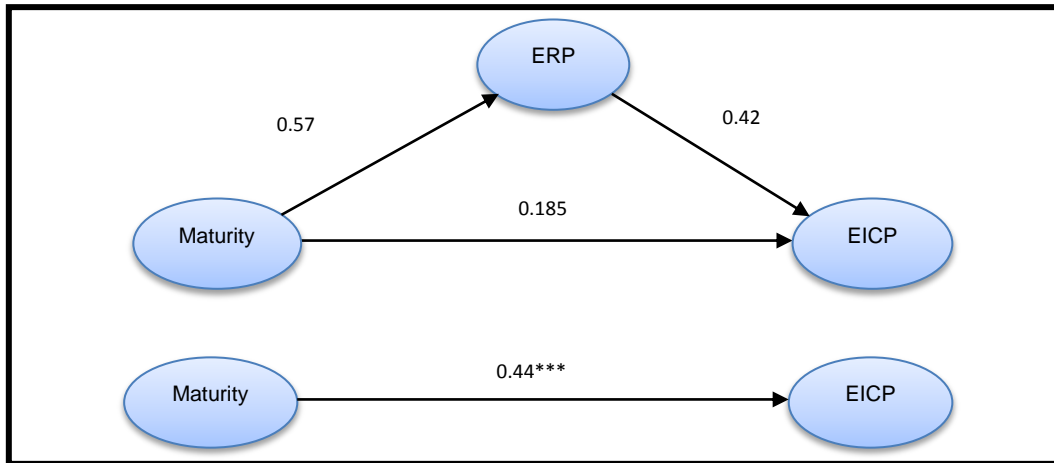
Figure 7.7: Mediator model for the relationship between Maturity and EICPs (Mediation effect of ERP success)

In summary, ERP success partially mediates the relationship between formalisation structure and EICPs as well as the relationship between the culture (coordination) and EICPs, while it fully mediate the relationship between the ERP maturity and EICPs. Further, ERP success does not mediate the relationship between the other contingency factors and EICPs as the three conditions are not apply.

Table 7.9: Summary of the study hypotheses results

	Organisational Factors and EICPs	*Section 7.4.2*
H1	Organisational structure is associated with the effectiveness of ICPs.	Partially Accepted
H2	There is a positive relationship between the prospector strategy and the effectiveness of ICPs.	Accepted
H3	A large size organisation is positively associated with the effectiveness of ICPs.	Rejected
H4	There is appositive relationship between the organisational culture and the effectiveness of ICPs.	Partially Accepted
H5	There is a positive relationship between management support and the effectiveness of ICPs.	Accepted
	Organisational Factors and ERP system success	*Section 7.4.3*
H6	Organisational structure is associated with the ERP system success.	Partially Accepted
H7	There is a positive association between prospector strategy and ERP success.	Rejected
H8	There is a positive relationship between organisational size and success of ERP system.	Rejected
H9	Organisational culture positively influences the success of ERP systems.	Partially Accepted
H10	There is a positive correlation between top management support and ERP success.	Rejected
	ERP Factors and ERP system success	*Section 7.4.4*
H11	There is a positive correlation between the maturity of ERP and success of ERP systems.	Accepted
H12	The ERP brand is associated with maturity of ERP systems	Accepted
H13	There is a positive relationship between the age of ERP implementation and the maturity of ERP systems.	Accepted
H14	There is a positive relationship between the ERP brand and success of ERP systems.	Rejected
H14a	There is indirect relationship between the ERP brand and success of ERP systems through ERP maturity.	Rejected
H15	The age of ERP implementation positively associated with the success of ERP systems.	Rejected
H15a	The age of ERP implementation indirectly associated with the success of ERP systems through ERP maturity.	Accepted
	ERP system success and EICPs	*Section 7.4.5*
H16	Success of ERP systems is positively associated the effectiveness of ICPs.	Accepted
H16a1	There is indirect relationship between the structure (formalisation) and the EICPs through the ERP success.	Accepted
H16a2	There is indirect relationship between the culture (coordination) and the EICPs through the ERP success.	Accepted
H16a3	There is indirect relationship between the ERP maturity and the EICPs through the ERP success.	Accepted

7.5 Summary

The current study's main aim is to develop a structural model that explains how the link between ERP success, organisational and ERP factors affect the effectiveness of ICPs for Saudi Arabian companies. The structural model is developed in chapter five and is evaluated at the beginning of this chapter, following by testing the study hypotheses. Among the organisational factors, organisational structure (team-based), management support, organisational strategy and organisational culture (collaboration) are found to be significantly associated with EICPs. Additionally, it is found that ERP success is significantly related to EICPs. However, size is not significantly associated with the EICPs.

It is found that organisational culture (coordination), maturity of ERP systems and organisational structure (formalisation) are significantly related to the success of the ERP system, whereas organisational size, strategy and management support are not significantly associated with ERP system success. The results of this chapter provide evidence of the mediation effect of the ERP system success on the relationships between organisational structure (formalisation), organisational culture (coordination), ERP maturity from one hand and EICPs from the anther hand. The next chapter discusses the results of this study.

Chapter Eight:
Discussion

8.1 Overview

The aim of this study is to explain how the ERP success, organisational and ERP factors affect the effectiveness of ICPs. Particularly, field study was utilised in order to provide empirical evidence of the importance of ERP system success, as well as organisational and ERP factors in providing effective ICPs to Saudi Arabian companies. A survey strategy was implemented, including interviews and questionnaire collecting data method, to assess study's relationships.

Additionally, after analysing the structure model, follow-up interviews were conducted. The purpose of the follow-up interviews is to gain further explanation of the unexpected results of the structure model analysis, as it suggested by some researchers (such as Merchant (2010); Baldvinsdottir *et al.* (2010) and Abdel-Kader (2011)). Therefore, these follow-up interviews were accomplished with five ERP-adopting companies. Particularly, semi-structured interviews were conducted, including two with the head of an IT department, one with an internal auditor, two with a financial manager (one of them the chief of the accounts payable department involved in the interview). All of the participants have working experience of more than ten years; the questions are attached in the Appendix 3.2. For confidentiality reasons, the companies name cannot be identified, and they are referred to only as company A, B, C, D and E.

This chapter discusses the results in view of the prior studies as well as some explanation by the interviewees (i.e. follow-up interviews), specially for the unexpected results. The discussion of the study results is classified into four main groups according to the hypotheses groups (see Table 8.1). The findings of the follow-up interviews are attached under each hypothesis. The follow-up interviews questions are attached in Appendix 3.2.

Chapter 8: Discussion

Table 8.1: Summary of the study hypotheses results

	Organisational Factors and EICPs	*Section 7.4.2*
H1	Organisational structure is associated with the effectiveness of ICPs.	Partially Accepted
H2	There is a positive relationship between the prospector strategy and the effectiveness of ICPs.	Accepted
H3	A large size organisation is positively associated with the effectiveness of ICPs.	Rejected
H4	There is appositive relationship between the organisational culture and the effectiveness of ICPs.	Partially Accepted
H5	There is a positive relationship between management support and the effectiveness of ICPs.	Accepted
	Organisational Factors and ERP system success	*Section 7.4.3*
H6	Organisational structure is associated with the ERP system success.	Partially Accepted
H7	There is a positive association between prospector strategy and ERP success.	Rejected
H8	There is a positive relationship between organisational size and success of ERP system.	Rejected
H9	Organisational culture positively influences the success of ERP systems.	Partially Accepted
H10	There is a positive correlation between top management support and ERP success.	Rejected
	ERP Factors and ERP system success	*Section 7.4.4*
H11	There is a positive correlation between the maturity of ERP and success of ERP systems.	Accepted
H12	The ERP brand is associated with maturity of ERP systems	Accepted
H13	There is a positive relationship between the age of ERP implementation and the maturity of ERP systems.	Accepted
H14	There is a positive relationship between the ERP brand and success of ERP systems.	Rejected
H14a	There is indirect relationship between the ERP brand and success of ERP systems through ERP maturity.	Rejected
H15	The age of ERP implementation positively associated with the success of ERP systems.	Rejected
H15a	The age of ERP implementation indirectly associated with the success of ERP systems through ERP maturity.	Accepted
	ERP system success and EICPs	*Section 7.4.5*
H16	Success of ERP systems is positively associated the effectiveness of ICPs.	Accepted
H16a1	There is indirect relationship between the structure (formalisation) and the EICPs through the ERP success.	Accepted
H16a2	There is indirect relationship between the culture (coordination) and the EICPs through the ERP success.	Accepted
H16a3	There is indirect relationship between the ERP maturity and the EICPs through the ERP success.	Accepted

Section 8.2 discusses the results of hypotheses that are related to the relationships between organisational factors and EICPs. Section 8.3 discusses the results of hypotheses that are related to the links between organisational factors and ERP system success. Section 8.4 discusses the seven hypotheses that are related to the relationship between the ERP factors and ERP success. Section 8.5 discusses the results of hypotheses that are related to the relationships between ERP success and EICPs as well as the mediation effect of ERP success. Finally, section 8.6 summarises the chapter.

8.2 Organisational Factors and EICPs

The exploratory study (chapter five) indicated that organisational factors can influence the effectiveness of EICPs. The suggested factors are organisational structure, strategy, size, organisational culture, and management support. The exploratory study findings on the organisational factors are quantitatively examined and presented in the previous chapter. This section discusses these results in detail.

8.2.1 Organisational structure

On organisational structure, the questionnaire survey results indicated a negative impact of team-based structure on the effectiveness of ICPs. Further, the results did not show any evidence regarding the direct impact of formalisation and decentralisation structure on the effectiveness of ICPs. However, the results reveal that formalisation structure indirectly (through ERP success) affects the effectiveness of ICPs. This means ERP success mediates the relationship between the formalisation structure and the effectiveness of ICPs. Referring to Mullins (2007) description of organisational structure (see section 2.5.1), the degree of outlining organisation's roles and it relationship with its different parts is diverse among the company-implemented ERP system in Saudi Arabia. They emphasise the individual-based structure, while at the same time indirectly (through ERP system) they focus on occupational specialisation and formal job descriptions.

These findings agree with contingency studies, which argue that formalisation and specialisation structure are associated with management control system (Chenhall, 2007). From the financial controller or chief financial officer's point of view, Nicolaou (2000) finds that organisational formalisation is significantly contributed to perceptions of controlling effectiveness and to perceptions about the accuracy of

accounting information outputs. Chalos and Poon (2000) report that participation in capital budgeting teams is correlated with improved performance with information sharing and an emphasis on budget performance, intervening in this relationship.

However, employee participation in decision-making as well as closeness between supervisor and staff are emphasised less among the study's sample. This may be due to the degree of complexity of the ICPs. Bruns and Waterhouse (1975) find a negative relationship between centralisation and the complexity of control systems. Consistently, Zhang *et al.* (2009) report a negative relationship between the degree of decentralisation and the quality of IC. This implies that the more decisions are centralised the less complex the entity's control system is and the higher the quality of its IC. Thus, the study findings suggest that for more effective ICPs an entity should focus on centralisation as well as individual-based structure and that is inconsistent with the predicted hypothesis.

The follow-up interview findings are consistent with the study suggestion regarding the formalisation and centralisation structure, whereas the participants provide no explanation regarding individualism. In general, the interviewees indicate that for an optimal ICS the organisational structure should be centralised. The participants of companies C and D declared that, "*for large or medium size companies, the structure is better to be centralised...for less cost and effort*". However the internal auditor of company E stated that, "*an effective ICS need to be consider regardless of the organisation structure... it require organised systematic approach*". Regarding the formalisation, all the participants agree that ERP systems support the formalisation structure and the relationship between them would affect the EICS. Thus, the organisation structure should be formalised. The internal auditor of company E said, "*As the ICS requires a systematic and organised approach... a formalisation structure is preferred*".

8.2.2 Organisational strategy

Considerable attention has been paid to organisational strategy as a contingent factor of the management control system (e.g. Langfield-Smith, 1997; Otley, 1999). Three broad taxonomies have been employed in examining the relationship between the strategy and the management control system: Miles and Snow's (1978) prospectors/analysts/defenders model, Porter's (1980) product differentiation/cost-

leadership classification and Gupta and Govindarajan's (1984) build/hold/harvest model. According to Abdel-Kader and Luther (2008), these taxonomies are not significantly different. Thus, prospectors/builders/product differentiators can reconcile at one end of a continuum and defenders/harvesters/cost-leaders can be at the other end. On organisational strategy, the survey results indicate that the study's sample focused on developing new products, innovation, competitive activities and long-range planning. The results of hypothesis 2 provide confirmation for the argument that the adoption of prospector (builder or product) strategy is positively associated with a broad scope management accounting system (Abernethy and Guthrie, 1994).

The study is also consistent with the findings of Chenhall and Morris (1995) and Jokipii (2010). They show a significant impact of strategy on (internal) control. Chenhall *et al.* (2011) study the relationship between strategy as 'product differentiation' (or prospectors), innovation and management control systems. They use three dimensions of control systems, including: formal controls, a package of controls that is comprised of social networking, and organic innovative culture. The results indicate a positive association between the strategy and the three control dimensions. Additionally, the participants of the follow-up interviews enhance the importance of developing new products, innovation, competitive activities and long-range planning for ICPs effectiveness. To sum up, the suggestion of this relationship is consistent with the predicted hypothesis.

8.2.3 Size

Size is among the contingent factors that capture the complexity of the organisations and their need for an effective ICS. The exploratory study results (section 5.2.1) indicate the importance of company size (total assets) when the EICPs is considered. This is consistent with a number of prior studies' findings. For instance, Ge and McVay (2005) and Deumes and Knechel (2008) show a significant relationship between company size and internal control deficiencies. Similarly, Doyle *et al.*(2007a) and Ashbaugh-Skaife *et al.* (2007) report a positive relationship between organisation size and quality of ICS.

Contrary to the exploratory study, the questionnaire survey results reveal no significant correlation between company size and EICPs. The non-significant

relationship between company size and EICPs is consistent with the results of some previous studies which also failed to find a significant relationship between large companies and the effectiveness of ICPs. For example, Fauzi *et al.* (2011) find no positive relationship between organisation size and sophisticated management control system. They indicate that size is associated with traditional management control system. Ryan and Trahan (2007) provide evidence that large organisations show fewer improvements after the adoption of value-based management system than small organisations. They explain that by the increase of monitoring costs with increase in company size.

Another explanation of the no statistical significant relationship between company size and the EICPs is that all organisations are concerned about ICS, no matter what size they are. COSO (2004, 2011) argues that the frameworks (either IC or ERM) are applicable for small firms as well as mid-sized and large firms, as long as each firm is present and functioning in a proper way. The framework "*is designed to assist organizations at any size in developing a means to monitor the continued operating effectiveness of internal control related to financial reporting, operational, and compliance control objectives*" (McCollum, 2008, p.13). Further, a result from a survey by the COSO committee reveals that the participants strongly agree that the COSO framework is applicable to different sizes (Vandervelde *et al.*, 2012). To sum up, this study suggests that regardless of the company size, an organisation should consider the ICPs effectiveness.

The follow-up interviews findings are consistent with the study suggestion that an effective ICS is required by a large company as well as small one. The financial manager of company A said, "*Size is not matter, more important is the management success*". Similarly, the presenter of company D stated that, "*it is not necessary that the company size affect the ICS, because all companies' size needs an effective ICS*".

8.2.4 Organisational culture

As found in the exploratory study and as expected in hypothesis 4, there is a positive relationship between organisational culture and EICPs. The questionnaire results pointed towards most of the study's sample supporting organisational culture toward collaboration in order to have effective ICPs. This means, there is an atmosphere between manager and employees which supports team-work and willingness to

cooperate. This value is centred on the belief that cooperation can lead to better decisions, higher control quality, and higher morale (Detert *et al.*, 2000). According to COSO (1992) the supervisor and other person should consider how control responsibilities need to be conducted.

On the other hand, the results do not show a direct impact of organisational culture toward coordination on EICPs. Yet, there is indirect impact (through ERP success) on EICPs. That means ERP success mediates the relationship between organisational culture toward coordination and effectiveness of ICPs.

From a general view, the results are consistent with the COSO framework and also with previous studies. COSO (1992) states that first component of its framework, control environment, is influenced by the "entity's history and culture" (p.23). Bhimani (2003) indicates that organisational culture elements are important in the design of an innovative management accounting system. Pfister (2009) reveals that organisational culture impacts the degree of IC effectiveness. Similarly, from senior managers of "Best and Biggest" companies in Brazil point of view, Reginato and Guerreiro (2013) find a significant correlation between the constructs of organisational culture and management controls. They indicate that the practices of management control systems are strongly influenced by organisational culture.

As there is no specific research that studies (i.e. in the researcher knowledge) the impact of organisation culture on the EICPs from these two perspectives (collaboration and coordination), the study suggests that in order to obtain an effective ICPs, Saudi Arabian enterprises should take their organisational culture into consideration and direct it toward collaboration and coordination (though the ERP system).

Consistently with the study's suggestion, the follow-up interview findings are supported. The participants of companies A and C indicated the importance of cooperation and collaboration for more effective ICPs. Yet the participants of company C said, "*A strong manager plays a significant role in enforcing the organisational culture*". The interviewee of company D represented that, the "*ERP system help to make the staff is involved in activities and to share ideas*". The IT manager of the company B said, "*The Company has a change management unit under the IT department, which involve the stuff in some decision making*".

8.2.5 Management support

As expected in hypothesis 5, the results support the proposed positive relationship between management support (measured by development support, providing the resource, involving employees in planning and providing direction as well as motivation) and the EICPs. These results are consistent with organisational culture toward collaboration aspect between manager and staff, which is discussed in the previous section.

The questionnaire findings are also consistent with exploratory study as well as prior research in management accounting. Analysis of field-based data from threatened companies in the USA, Simons (1991) addresses the relationship between management control system, strategy and top management support. Simons find that there are different ways that top management support the control system. Equally, COSO (1992) states that top management are directly responsible for all of an entity's activities, including the ICS. Further, Zhang *et al.* (2009) report a positive relationship between management philosophy and the quality of IC. Both Abernethy *et al.*(2010) and Doeleman *et al.* (2012) indicate that leadership style is a significant predictor of the control system.

Additionally, from the follow-up interviews, the researcher found that the six interviewees emphasise the role of the management in supporting the ICS. In practice, the presenter of company B said, "*Management support affects the ICS by more than 90%*". The financial manager of company C declared that, "*the management support plays an important and wide role in making the IC procedures and policies*".

In summary, the results of the contingency relationships between organisational structure, strategy, size, organisational culture and management support on one side and the EICPs on the other side suggest that, in practice, the effectiveness of ICPs do not always take place in a context that matches the one proposed in the literature. Further, some of the factors of this context seem to be contradictory at times. As predicted, the findings provide support to the hypothesised association between organisational structure (team-based and formalisation), strategy organisational culture, management support and ICPs effectiveness. Yet, the results do not find a significant relationship between ICPs effectiveness and company size. Interestingly,

the questionnaire survey results as well as the follow-up interviews suggest an association between ICPs effectiveness and centralisation structure, whereas an association has been hypothesised between ICPs effectiveness and decentralisation structure.

8.3 Organisational factors and ERP success

This section discusses the results of the five contingency relationships between organisational structure, organisational strategy, size, organisational culture and management support on one hand, and ERP system success on the other.

8.3.1 Organisational structure

The quantitative survey results show that the study's sample is focussed on formalisation structure and less focussed on decentralisation and team-based structure when ERP system success is considered. This means the study's sample emphasises occupational specialisation and formal job description, while at the same time they focus less on decentralising the decision-making or on individual-based structure. This result is consistent with the contingency research. Contingency variables can be classified into task uncertainty and task interdependence (Donaldson, 2001). The ERP systems as the technology variable can be referred to as task uncertainty and task interdependence. The standardisation and integrated nature of the ERP system enables it to reduce uncertainty (Chenhall, 2007; Grabski *et al.*, 2011). The low level of uncertainty is associated with organisational structure that encompasses a high level of formalisation and a high degree of centralisation. As a consequence, ERP systems can fit well with organisational structures with high formalisation and low level of decentralisation.

On the other hand, Sharma and Yetton (2007) have pointed out that information systems such as ERP systems are characterised by a high degree of interdependence. That means ERP systems can fit with a structure that has a low level of formalisation and a high centralisation level. Because the nature of the ERP system (standardising the processes) requires high formalisation, the task uncertainty is believed to be a stronger contingency variable than task interdependency (Donaldson, 2001). Benders *et al.* (2006) observe a link between the type of structure and ERP implementation success. They discuss that the utilisation of the ERP systems can provide a

standardisation structure. Benders *et al.* (2006) also demonstrate a link between the implementation of ERP systems and increasing the degree of centralisation.

Morton and Hu (2008) indicate entities whose structure types are a better fit with ERP systems are likely to have better chances of successful implementations. Additionally, the current study results are in line with the findings of the survey conducted by Ifinedo and Nahar (2009) in two European countries, which reveal a positive relationship between organisational structure and ERP system success. Based on the Donaldson (2001) and Morton and Hu (2008)'s arguments regarding the type of structure dimensions that can fit ERP systems, Ifinedo and Nahar (2009) focus on centralisation, formalisation and specialisation to assess the relationship between the structure and ERP system success.

To sum up, the study suggests, consistent with the prior research, an association between ERP system success and centralisation structure instead of decentralisation structure. The study suggests that individual-based structure is can better fit with ERP system success. Additionally, the follow-up interview findings are consistent with the study suggestion regarding formalisation and centralisation structure, but not with individual-based structure. In particular, the participant of company B represented that, "*centralisation structure is better especially in the case with our company, which has a number of branches around the country*", whereas the internal auditor of company E stated that, "*A successful ERP system should be supported by a team-based structure. Because the team based structure is strongly integrated with business goals and objectives*". All the participants agree that for successful ERP system, organisation structure should be formalised.

8.3.2 Organisational strategy

Surprisingly, and contrary to the proposed relationship in hypothesis 7, the results suggest that ERP system success is positively associated with the analyser or defender strategies instead of prospector strategies. The current study results contradict the view that every type of business strategy associates differently with the technology (i.e. ERP system). Prospectors' strategy has robust positive relationship with information technology, so an organisation can improve its technology by supporting the prospectors and analyser strategy activities (Croteau and Bergeron, 2001).

Chapter 8: Discussion

One possible explanation is that, within an individual company, different strategies can impact ERP system success. A quick review of ERP systems research revealed that there can be different strategies for a successful implementation of ERP systems (Gupta and Govindarajan, 1984; Aladwani, 2001; Croteau and Bergeron, 2001). Aladwani (2001) argues that a successful implementation of ERP systems requires a proper match by the top management between "*appropriate strategies with the appropriate stage to overcome resistance sources (habits and perceived risks) effectively*" (p.274). He suggests a model (based on ERP and marketing literature) which demonstrates how this argument can be tested. Consistently, Gupta and Kohli (2006) state that strategy variously affects the ERP systems among the sectors, units and over time. Thus, ERP systems may be more significant to some business units, within an individual company, than others.

Another explanation is that, different factors may impact the type of strategy that affects the ERP systems. For example, Nahavandi and Malekzadeh (1993) propose that leadership styles can affect the type of strategy. Particularly, a challenge-seeker leader type is likely to select prospector and differentiation strategies, whereas a challenge-averse leader type is likely to select defender and cost leadership strategies. Interestingly, these results are in some points in line with the findings of Croteau and Bergeron (2001) who find that the analyser strategy impacts directly on the effectiveness of an entity's information technology whereas the prospector strategy affects the information technology indirectly. Thus this study suggests that another type of strategy may influence ERP system success.

The follow-up interview findings show no clear explanation regarding whether prospectors or defenders are better to ERP system success. All participants emphasise the importance of developing new products, innovation, competitive activities and long-range planning for ERP system success. They did not provide the importance level of every indicator. The financial manager as well as the chief of accounts payable department of company C stated that, "an entity should have a proper planning and strategy". Therefore, regardless of the taxonomy strategies, the interviewees agreed that the company should have an appropriate strategy and this should be known by staff.

8.3.3 Size

The exploratory study results (section 5.2.1) reveal that a large company with sophisticated IS (e.g. ERP systems) is different when compared with a small company with a legacy system. Contrary to the exploratory study findings, the questionnaire survey results reveal no correlation between the organisation size and ERP system success. This means the results do not support hypothesis 8. However, the questionnaire findings are not really conflicted with the previous research in the area of ERP systems. On one hand, based on the responses of 44 Finnish companies, Laukkanen *et al.* (2007) reveal significant differences between small, medium-sized and large entities in adoption of ERP systems. Further, Ifinedo and Nahar (2009) find a relationship between organisation size and ERP system success.

On the other hand, Gremillion (1984) indicates that the relationship between size and information system is very small. He provides two explanation points: the relationship between company size and adaptation of an information system is not continuous; and the effect of the IS use may be different among the units. Raymond (1985) reveals that entity size (in terms of number of employees) is not significantly correlated to user satisfaction, or system utilisation. He suggests that size may influence IS success through different factors, such as maturity and time frame. Additionally, Mabert *et al.* (2003) find that entities of different sizes approach the implementation of ERP systems differently. They indicate that different aspects need to be considered within the relationship of size and ERP systems, such as the cost and the benefits of the ERP software, and the age of the ERP system adaptation.

Another explanation of the non-significant results can be related to the measurement (total assets). Although company size is viewed as a uni-dimensional construct, this study reinforces Gupta's (1980) findings, which indicate that researchers need to view company size as a multi-dimensional construct (e.g. the structural characteristic of organisations, the amount of energy imported, and the components approaches) for any significant comparison among contingency studies to be made. Thus, researchers may need to reconsider Gupta's argument and develop a more reliable measure of company size for the sample. The implication is that the relationship between company size and ERP system success in the study's sample is difficult to confirm in the current study.

The findings of the follow-up interviews indicate different opinions regarding the importance of company size for ERP system success. The IT manager of company B said, "*There are factors mediate the relationship, like training, management support....*" The interviewee of company D said that, "*company's size should impact the success of ERP system, as the cost of the annual license is based on the number of employees*". This opinion supports the argument that company size should be measured by other indicators, like the number of employees. The internal auditor of company E stated that, "*Size has no impact on the success of ERP. The larger the organisation, the more customisation requirements will arise depending on whether the organisation follows a centralised or decentralised structure*".

8.3.4 Organisational culture

As found in the exploratory study and as expected in hypothesis 9, there is a positive relationship between organisational culture and the success of ERP systems. The questionnaire survey's results point towards most of the study's sample supporting organisational culture toward coordination in order to have successful ERP systems. This means, the managers of the study's sample encourage their employees to be free in their creation, thinking when in it comes to decision-making. This is consistent with Detert *et al.* (2000) and Jones *et al.* (2006)'s findings. Detert *et al.* (2000) indicate that all the entity's staff should be involved in supporting the decision-making.

From four case studies of firms in the petroleum industry that had implemented SAP R/3, Jones *et al.* (2006) reveal that three of the companies support the flexibility of their employees in pursuing ideas and make decisions on their own. Regarding the impact of organisation culture of coordination on the ERP systems, Jones *et al.* (2006) imply that junior staff must share ideas with senior staff for better ERP implementation. Additionally, Chou and Chang (2008) find that for an entity with ERP systems, greater improvements in coordination with other sub-units are significantly associated with greater overall ERP benefits.

Inconsistently with Detert *et al.* (2000) and Jones *et al.* (2006), the results report that the organisational cultures of the study's sample are less collaborative, which means staff believe that individual (or task) effort has more value than collaboration (time-work). There is no specific explanation of these results, yet the results are consistent

with organisation structure. The current study finds no significant relationship between team-based structure and ERP system success. This implies that the study's sample believe working together is either viewed as inefficient or a violation of individual autonomy.

The follow-up interview participants agreed with the importance of organisation culture toward coordination for ERP system success. Company C interviewees claimed that, "*the end-users should be aware of the decision and it should be shared*". The IT manager of company D said that, "*ERP system not only for IT department or the management, but it is for the all committee*". However, the participant disagrees with organisational culture toward individualism. Thus, the follow-up interviews provide no explanation of the survey findings regarding the non-significant relationship between organisational culture toward collaboration and ERP system success.

8.3.5 Management support

Surprisingly, the results do not support the proposed positive relationship between management support and the success of ERP systems in hypothesis 10. These results do not emphasise the view that top management who support the development, innovation, providing resources, involving employees in planning, and providing direction as well as motivation to staffs, is likely to affect the success of ERP systems.

One possible explanation of the non-significant association between management support and success of the ERP system is that the impact of top management support can be significant in the stage of implementation (Al-Mashari *et al.*, 2003; Bowling and Rieger, 2005; Doom *et al.*, 2009; Al-Turki, 2011) where providing resources, innovation and providing motivation and direction to staff are very important. While in the stage of pre-implementation the effect of management support depends on the top managers' styles. Shao et al. (2012) argue that the "effectiveness of management support is dependent on the top manager's leadership style and the specific phase of enterprise systems" (p.4692). For ERP post-implementation stage, Galy and Sauceda (2014) find that top management support negatively affects the net assets.

Additionally, in an empirical study Shao *et al.* (2012) find that the leadership style indirectly impacts ERP success through organisational culture. This means, the

relationship between management support and ERP system success is mediated by organisational culture. Thus, this can be another explanation regarding the non-significant relationship between management support and ERP system success. Further explanation of this result is the measure of support by top management. Boonstra (2013) shows a relationship between top management support and IS success. However, he indicates that management support is a multidimensional phenomenon, which tends to change over time. Similarly, Shao *et al.* (2012) state that the effect of top manager leadership styles can be different for the four phases of the enterprise system lifecycle (adoption, implementation, assimilation and extension). In order to see the influence of leadership styles on ERP success, more investigations are required.

The interviewees in the follow-up interviews provided some explanation for the non-significant relationship between management support and the success of ERP systems. Internal auditor of company E said, "*Management support is very important. There will be effective ERP system if the management is fully supportive*". Company B interviewee stated that, "*management support would affect the ERP system, if the employees are willing to work, cooperate, and improve*". Financial manager of company C declared that "*there is difference between supporting the ERP implementation and continuing support for the success*". Thus, managers may support the implementation initially, but they may not continue the support. He also pointed out the impact of the team (both technical team and financial team) on management activities.

In summary, the results of the second group of hypotheses suggest that the proposed relationships between the organisation factors and success of ERP systems, in general, do not always take place in a context that matches the one proposed in the literature. As predicted, the results provide evidence to the hypothesised association between organisational structure, organisational culture and ERP success. However, the results could not find a significant relationship between prospector strategy, organisational size, management support and ERP success. The participants of the follow-up interviews provide some explanations, yet they failed to explain some of the non-significant relationships, such as organisation strategy and individualism structure. From the results the researcher suggests that analyser or defender strategy

can impact ERP systems success. Further, measuring leadership styles can provide more information regarding the influence on the success of ERP systems.

8.4 ERP factors and ERP success

This section discusses the results of the contingency relationship between maturity of the ERP systems, ERP brand and the age of ERP implementation on one hand, and ERP success on the other hand. In addition, the findings of the relationship between ERP brand as well as the age of ERP implementation and ERP system success are discussed.

8.4.1 Maturity of the ERP system

As expected in hypothesis 11, the questionnaire results confirm the positive association between maturity of ERP systems and success of ERP systems. These results are consistent with the argument that indicates the phase of maturity may differently affect ERP system success (Saunders and Jones, 1992; Gibson *et al.*, 1999; Holland and Light, 2001). Consistently, Mahmood and Becker (1985) find a significant association between user-satisfaction and the Nolan benchmark maturity variables (i.e. Nolan (1979) computer growth stage model). Additionally, Voordijk *et al*. (2003) illustrate that the success of ERP implementations depends on IT maturity, IT strategy and business strategy, the strategic role of IT, and the implementation method.

Based on 24 organisations in the US and Europe, Holland and Light (2001) develop a maturity model for ERP systems with three stages (i.e. managing legacy systems and starting the ERP, post-implementation, and maturity) and reveal that entities move continuously through the three-stage curve. Although Holland and Light describe the stages as discrete, they state that in practice the stages overlap. They conclude that firms become more sophisticated in implementing the system, thus in future the firms of all sizes or types are likely to move through the maturity stages quickly. Further, Dias and Souza (2004) find a relationship between the level of ERP maturity and the possibility of perceiving the ERP systems as a generator of competitive advantage.

Furthermore, the quantitative study's results support the association between ERP brands and maturity of ERP systems in hypothesis 12, as well as the relationship between age of ERP implementation and maturity of ERP systems in hypothesis 13. The review of previous literature indicates that the linkage between ERP brands and

ERP implementation age on one side and ERP maturity on the other side has not been investigated. However, the exploratory study findings reveal that these two factors are very important and can impact other variables. Hayes *et al.* (2001) report that large ERP vendors are different than smaller ERP vendors in respect of market response. Further, Wang *et al.* (2011) state that with the different ERP implementation age, staff will be different in using ERP systems.

8.4.2 ERP system brand

Although no evidence is available that would indicate association between ERP brands and ERP system success, there is corollary evidence that ERP brands can impact other factors, such as market response and efficiency of the entity's operations (Hayes *et al.*, 2001; Wang *et al.*, 2011). However, the questionnaire survey's results indicate that ERP system success with large ERP vendors, reflected by SAP, Oracle, PeopleSoft and Bann, is not significantly different than with the smaller ERP vendors such as Peachtree, Solomon and RPG. This implies hypothesis 14 is not supported in this study. Additionally, the results also indicate the indirect relationship between ERP brands and ERP system success through the maturity of ERP systems is not supported.

These findings conflict with Wang *et al.*'s (2011) findings. Wang *et al.* reveal that ERP brands positively impact enterprise business efficiency. However, Hayes *et al.* (2001) do not "suggest that large ERP vendors offer higher quality products than smaller vendors" (p.8), although they show a significant relationship between large ERP vendors and the market response. Beside Hayes *et al.*'s (2001) suggestion another possible explanation of the non-significant results is that around 75% of the study's sample is from large ERP vendors (see section 6.3.2). Thus, the small variance between the two samples has no significant impact on ERP system success.

From the perspective of the follow-up interviews, participants indicated that ERP brand or vendor is important, but there are some factors should be considered. For example, the IT manager of company C said, "*we implemented SAP, which is well-known ERP software, but we straggled with it at the first two or three years and the reason is the operator company*". He explained that the ERP vendor is different from the operator company. The IT manager of company D pointed out that nowadays the well-known ERP vendors provide small ERP software which is suitable for medium

and small companies. Further he said, "*Every ERP vendor has specialist in particular application, such as there is ERP vendor better in financial application or manufacturing application*". The participant of company E said, "*The main element fact in the ERP system is how to customise it to be implemented in the organising regardless of the software of the ERP system*".

8.4.3 ERP implementation age

Findings from the exploratory study show that the duration of the ERP systems are different from one company to another. This is consistent with Nicolaou and Bhattacharya (2006) who find that the period of ERP implementation represents significant conditions for the system's post-implementation success. Thus, the study suggests that the age of ERP implementation can be an important factor in ERP system success.

Surprisingly, the questionnaire results do not support the proposed relationship between the age of ERP implementation and ERP system success in hypothesis 15. These results do not support the view that the age of ERP implementation is a key and direct factor for a successful ERP systems (Dowlatshahi, 2005). Consistent with the findings of this study, Raymond (1985) and Montazemi (1988) suggest no relationship between information system success performance and information system maturity as measured by the duration of information system operation.

On another hand, the result of hypothesis 15a illustrates that the indirect relationship between the age of ERP implementation and ERP system success through the maturity of ERP systems is significant. In another words, the maturity of ERP systems play a mediation rule in this relationship. The results suggest that the age of ERP implementation enhances the maturity of ERP systems and consequently the maturity of the systems would influence ERP system success.

Similar to ERP brand, the participants of the follow-up interviews provided some factors that the relationship may be based on. The IT manager of company D said, "*The preparation of the system and the number of models that the company wanted is may impact the age period of ERP implementation*". One of the company C presenters said, "*That the period of ERP implementation depends on technical team and financial team*". Whereas the company E auditor thinks that the age of the ERP system has no impact on ERP success.

In summary, although there are few studies related to the relationship between the ERP factors and ERP system success, the results of this study, in general, do not always take place in a context that matches the one proposed in the literature. As predicted, the results provide evidences to the hypothesised association between maturity of ERP systems and ERP success. Furthermore, the results support the hypothesised direct association between the age of ERP implementation, ERP brand and maturity of ERP systems. However, the results fail to find a direct significant relationship between ERP brands, age of ERP implementation and ERP success. The presenters of the follow-up interviews provide some explanation regarding these relationships. Interestingly, the study reveals the relationship between the age of ERP systems and ERP system success could be through the maturity of ERP systems. The next section discusses the final group of hypotheses.

8.5 Success of ERP systems and EICPs

One of the objectives of this study is to evaluate and validate a model that explains how link between contingency factors and success of ERP systems affects the EICPs in Saudi Arabian companies. Thus, the first stage involves assessing the uni-dimensionality, reliability and validity as reported in chapter six. For the success of ERP systems, the results of CFA indicated that four dimensions, namely system quality, information quality, individual impact and organisational impact can be adequately used to assess the ERP success construct. This result is consistent with Gable *et al*.'s (2003) model for assessing Enterprise System (ES) success (see section 2.3.2). Gable *et al.* (2003) empirically tested the model with survey data gathered from twenty-seven Australian State Government Agencies that implemented SAP R/3 in the late 1990s. Their results demonstrate the reliability and validity of the model for assessing ERP system success.

For the EICPs, the EFA and CFA results suggest that out of the eight components (see section 2.2.3) five components (internal environment, risk assessment, control activities, information and communication, and monitoring) can adequately assess the EICPs construct. This result is consistent with COSO's IC framework as well as Huang *et al*. (2008) and Klamm and Watson (2009)'s studies. Similarly, Morris (2011) uses COSO's IC components in order to investigate the different levels of material weaknesses between companies with ERP systems and those without ERP systems. He finds a positive relationship between COSO frameworks and ERP

systems. According to Janvrin *et al*. (2012) the updated COSO's IC (with the same five components) integrates information technology into IC concepts. Further, the Saudi Arabia Internal Control Standard (SCAS, 2000) recommends Saudi companies to present these five components. These findings can help researchers for measuring the two constructs in future studies. The validation of the model in the current study is important to both academic researchers and practitioners if they want to fully understand the success of ERP systems as well as the effectiveness of ICPs.

The second stage involves testing the relationship between the success of ERP systems and the EICPs. This is the main and last group of hypotheses; it corresponds to Granlund's (2011) call for empirical studies on this relationship. He suggests, based on review and empirical observations, that "*accounting researchers should ask in field and survey research a wide number of questions related to the implementation and use of IT, as it may have considerable consequences regarding accounting and control practice*" (p.14). Thus, as expected in hypothesis 16 the quantitative results support the proposed positive relationship between the success of ERP systems and the EICPs. The results are consistent with exploratory study. The participants in the exploratory study emphasise the role of the ERP systems. Particularly, the ERP systems have some applications which support the control procedures within the organisations. Further, the exploratory study results show that the presence and functions level of ICPs for the organisations with ERP systems is better than for organisations with legacy systems (see Figure 5.1 in chapter five).

Although the literature review indicates that the association between success of ERP systems and EICPs has not been investigated (to the best of the researcher's knowledge), there are a number of prior studies investigating the linkage between the implementation of ERP systems and ICS (e.g. Ramamoorti and Weidenmier, (2006); Kumar *et al.,* (2008); Klamm & Watson, 2009; Chang and Jan, (2010); Morris, (2011)). These studies are, in general, consistent with the current study findings. Huang *et al*. (2008) develop an IC framework from the five COSO IC components as dimensions and the COBIT objective that related to IT processes as factors for the framework. They detect that the most significant IC factors are "Establishment of IT organization and their relation under the Control Environment dimension" (p.I02).

Consistently, Klamm and Watson (2009) and Morris (2011) document that companies using IT systems (ERP) reported fewer IC weaknesses than companies that had not adopted IT systems. These studies provide strong evidence of the importance of ERP systems in improving ICS. Masli *et al*. (2010) observe a negative relationship between implementation of IC monitoring technology and IC material weaknesses. From case study, Valipour *et al*. (2012) confirm that the implementation of ERP systems impact all COSO's IC components. Additionally, the participants of the follow-up interviews indicated that the main reason for the ERP system is to provide full control to a company. Company C interviewees stated that, "*ERP system is a tool for an effective ICS*". The IT manager of company D said, "*A robust ICS depend on a strong ERP system*".

The last stage involves testing the mediation effect of the success of ERP systems on the relationship between the contingency factors and the effectiveness of ICPs. From the questionnaire survey results proposed in hypothesis 16a, it can be concluded that success of ERP systems mediates the relationships between formalisation structure, organisational culture toward coordination, ERP maturity and the EICPs. However, ERP success does not mediate the relationship between the other contingency factors and EICPs as the three conditions do not apply.

These results concur with the extant management control system literature, which suggests that technology (e.g. ERP systems) can mediate the relationships between contingency variables and management control systems (Chenhall, 2007). As discussed earlier, researchers within the accounting field point out that the design and use of management control systems in organisations is dependent on the link between contingency variables and organisational system (Otley, 1980; Fisher, 1998; Granlund, 2011; Frigotto *et al.,* 2013). Thus, the ICPs effectiveness results from the link between ERP systems and the contingency factors.

8.6 Summary
This chapter discusses in detail the results of the hypothesis testing as suggested by the structural model in chapter seven as well as the follow-up interviews' findings. The discussion includes the explanation of the influence of organisational factors on ICPs effectiveness. Further, the chapter discusses the influence of the organisational and ERP factors on the success of ERP systems. The chapter also confirms the

importance of the success of ERP systems on the EICPs in Saudi Arabian companies. It concludes that the success of an ERP system can mediate the relationship between some contingency factors (i.e. organisational structure, organisational culture and ERP maturity) and the EICPs. The next chapter concludes the thesis.

Chapter Nine:
Conclusion and Recommendations

9.1 Overview

This chapter brings the study together by setting out the final conclusion and recommendations. Thus, in section 9.2 the study objectives are recalled in an attempt to address them based on the study findings. Section 9.3 includes a summary of the study findings. Section 9.4 presents the main contributions of the study. Section 9.4 discusses the implications and recommendations. Section 9.5 of this chapter presents the limitations of this study and possible directions for future research. The final summary of this thesis and chapter presents in section 9.6.

9.2 Revisiting the Research Objectives

IC is one of several features that influence the performance and operation of an organisation. It plays an essential role in achieving the organisation's intended objectives. It can be classified as one of the most important procedures within an organisation (Doyle *et al.*, 2007a; Dey, 2009). A review of the literature reveal a number of gaps in relation to the EICPs, the success of ERP systems, the theoretical performance and the actual practices of ICPs in the Saudi Arabian business environment. Therefore, the aim of this thesis is to examine how the ERP success, organisational and ERP factors affect the EICPs in the content of Saudi Arabia. To achieve this aim, the study has attempted to fulfil the following objectives:

1. To identify the current performance of IC practices, including IC requirements and reports, in Saudi Arabia business environment as well as the organisational characteristics that can improve the effectiveness of ICPs.

2. To establish the relationships between ERP success and contingency factors to the effectiveness of ICPs by proposing a research model and its associated research hypotheses.

3. To test the research hypotheses with empirical evidence collected using a questionnaire survey conducted with the companies in Saudi Arabia.

4. To provide key findings on factors affecting ICPs and offer implications for research and practice regarding the effectiveness of ICPs.

To address these objectives, this study employs the survey strategy, which is commonly associated with the positivistic paradigm and deductive approach (Collis and Hussey, 2009). The two commonly use data collection techniques for this strategy are used, namely interview and questionnaire (Saunders *et al.*, 2009). First after analysing the literature and developing the study propositions, an exploratory study is conducted. Personal interview is the instrument used in this research to collect the exploratory study data. The exploratory study aims to address the first objective.

The qualitative data is collected through fourteen semi-structured interviews from twelve Saudi Arabian companies. These companies include implemented and non-implemented ERP systems. That help the researcher to investigate the impact of ERP systems on ICPs and to identify the organisational characteristics that support the study constructs. Most of the interviews are carried out with the financial manager, the manager of the accounting department or with the internal auditor. Each interview lasted between one to three hours and most of them are recorded. The researcher uses content analysis (Collis and Hussey, 2009) to analyse the qualitative data. The findings are integrated at the discussion and interpretation stage.

The qualitative findings as well as the literature review are incorporated into the theoretical model development, the questionnaire design and the hypotheses construction to address the second objective of this thesis.

A questionnaire survey is undertaken to test the hypothesised relationships among the organisational factors, ERP systems factors, ERP systems success and the EICPs using the structural equation modelling approach. The questionnaire survey sought to address the third objective. A questionnaire survey is administered using an internet-mediated questionnaire and a postal questionnaire, as they are more relevant and suitable to this study. This instrument is used to collect quantitative primary data. In total, 217 questionnaires are sent to the study sample and 110 valid responses are received.

SmartPLS software is used to analyse the quantitative data. The measurement model is assessed (in chapter six) with CFA entailing uni-dimensionality, reliability (indicator, Cronbach's alpha and Composite) and validity (convergent and discriminate validity). The PLS structural model (chapter seven) is assessed by: R-squared (coefficient of determination), path coefficients and Q2 predictive relevance. In addition, re-sampling methods, bootstrapping, are used to test the hypotheses.

Finally, after analysing the structure model, follow-up interviews is conducted. The purpose of the follow up interviews is to gain further explanation of the unexpected results of structure model analysis. The findings of both qualitative and quantitative data discussed in detail in order to seek the study key findings and implication for research and practice. This stage related to final objective of this thesis.

9.3 Summary of the key findings

A number of key findings are generated through testing the proposed contingency relationship between success of ERP systems, organisational and ERP factors, and the EICPs.

9.3.1 The exploratory study

The first objective of this study is to explore current performance of IC practices in Saudi Arabia, including investigating the organisation characteristics that affect the ICS. An exploratory study is completed to address the research objective one. The study explores three main questions related to the procedures and regulations of IC in Saudi Arabia, organisational characteristics supporting IC, and the support of ERP systems.

Q1: What are the procedures of IC, currently, in Saudi Arabian firms?
The researcher built a body of knowledge and gained insights into IC requirements in Saudi Arabia. All of the firms investigated have an IC department or unit. In practice, the board of directors set the ICPs, which all the units have to accomplish and the internal auditors evaluate and help to improve these procedures. Further, the results indicate that there is no clear picture for IC regulations in Saudi Arabia; different companies fulfil different requirements. For example, if the government own more than 30% of a company, then it has to comply with the SGAB requirements. While, if a company deals with a foreign government, then it has to follow the IIA requirements. In addition, the findings reveal that the eight components of the

COSO's ERM framework are normally existed, but there are variations regarding their level of implementation.

Q2: Which of the organisational characteristics support the EICPs?
Under this question, there is a sub-question related to the factors that may influence the ERP systems. In general, the results indicated that both organisational factors and ERP systems factors can influence the EICPs within the Saudi firms. However, from the interviewees' point of view, the importance of the particular factor can be different from one company to another. The recurrent organisational factors are the organisational strategy, structure, system, size, management support and organisational culture. Some of the ERP system factors that most of the participants considered are the maturity of the systems, brand and the age of implementation the systems.

Q3: To what extent do the ERP systems support the ICPs in Saudi firms?
The findings of the study reveal that the main purpose of adopting the ERP systems is to help the management to control the company's transactions and processes. The results show that some of the ERP vendors have particular models or applications to support the internal auditors' activities. However, how much ERP systems can influence the ICPs required? The quantitative study addressed this question. Thus, the following sub-section summaries this study.

9.3.2 Questionnaire survey study
After proposing the study model with the four main hypotheses (i.e. related to objective two), these hypotheses are quantitatively tested by using questionnaire survey instrument. The questionnaire survey study is accomplished to address the research objective three. The summary of the quantitative study findings are illustrated with the four groups hypotheses as follow:

-Relationships between organisational factors and the EICPs
 The researcher formulates five hypotheses related to first group (i.e. related to proposition1), which sought to examine the linkage between organisational factors and the EICPs in Saudi ERP implemented firms. As shown in Table 9.1, the hypotheses related to structure, strategy, management support and organisational culture are accepted or partially accepted, while the hypothesis related to size is rejected. The analysis of the exploratory study findings and descriptive statistics helped the researcher to understand the organisational factors that characterise the

Saudi firms implemented ERP systems and assisted in explaining the results regarding the relationships between organisational factors and EICPs. Further, after analysing the data, the researcher conducted five follow-up interviews in order to provide some answers to unexpected results.

Table 9.1 Summary result for testing the first group of hypotheses

	Organisational Factors and EICPs	
H1	Organisational structure is associated with the EICPs.	Partially Accepted
H2	There is a positive relationship between the prospector strategy and the EICPs.	Accepted
H3	A large size organisation is positively associated with the EICPs.	Rejected
H4	There is appositive relationship between the organisational culture and the EICPs.	Partially Accepted
H5	There is a positive relationship between management support and the EICPs.	Accepted

The study measures the EICPs based on the COSO's ERM framework, yet the EFA and CFA results suggest that out of the eight components five components can adequately assess the EICPs construct, namely internal environment, risk assessment, control activities, information and communication, and monitoring. This result is consistent with the COSO's IC framework, previous research and the Saudi Arabia Internal Control Standard (SCAS, 2000).

The results suggest that centralisation, individual-based and formalisation structure explain the EICPs, yet the formalisation structure explains the EICPs through the ERP systems success. In other words, ERP systems success enhances the formalisation structure. The results also suggest that prospector (builder or product) strategy and management support explain the EICPs. Thus, the management that support the development, providing resources, involving the employees in planning and providing direction as well as motivation would emphasise the EICPs.

Although the results did not find a significant relationship between ICPs effectiveness and company size, the COSO framework as well as the follow-up findings reveals that regardless the company size, organisations should consider the ICPs effectiveness. Further, the findings suggest that in order to obtain effective ICPs, Saudi Arabian enterprises should take their organisational culture into consideration and direct it toward collaboration and coordination (though ERP systems).

Chapter 9: Conclusion & Recommendations

In summary, the results, in general, provide evidence of contingency relationships between organisational structure, strategy, organisational culture and management support on one hand, and the EICPs on the other. However, the relationship between company size and the EICPs is not supported. Section 8.2 provides justification and explanation of the unsupported relationships.

-Relationships between the contingency factors and ERP success
Twelve hypotheses are proposed related to second and third group (i.e. related to propositions two and three), dealing with organisational factors, ERP factors and ERP systems success. These hypotheses sought to examine the linkages between organisational factors, ERP factors on one hand and the success of ERP systems on another hand in Saudi ERP-implemented firms. Table 9.2 summarises results for testing these hypotheses.

Table 9.2 Summary result for testing the second and third group of hypotheses

	Organisational Factors and ERP system success	
H6	Organisational structure is associated with the ERP system success.	Partially Accepted
H7	There is a positive association between prospector strategy and ERP success.	Rejected
H8	There is a positive relationship between organisational size and success of ERP system.	Rejected
H9	Organisational culture positively influences the success of ERP systems.	Partially Accepted
H10	There is a positive correlation between top management support and ERP success.	Rejected
	ERP Factors and ERP system success	
H11	There is a positive correlation between the maturity of ERP and success of ERP systems.	Accepted
H12	The ERP brand is associated with maturity of ERP systems	Accepted
H13	There is a positive relationship between the age of ERP implementation and the maturity of ERP systems.	Accepted
H14	There is a positive relationship between the ERP brand and success of ERP systems.	Rejected
H14a	There is indirect relationship between the ERP brand and success of ERP systems through ERP maturity.	Rejected
H15	The age of ERP implementation positively associated with the success of ERP systems.	Rejected
H15a	The age of ERP implementation indirectly associated with the success of ERP systems through ERP maturity.	Accepted

The study measures the success of ERP systems, mainly, based on the Gable et al.'s (2003) model for assessing the Enterprise System (ES) success. The results of CFA indicate that four dimensions – system quality, information quality, individual impact and organisational impact – can be adequately used to assess the ERP success

construct. The descriptive analysis results in chapter seven reveal that the study's sample companies have quite successful ERP systems, which indicate that the companies in Saudi Arabia consider the importance of the ERP system and its success.

For the second group of hypotheses, the findings suggest that the proposed relationships between the organisation factors and success of ERP systems, in general, do not always take place in a context that matches the one proposed in the literature. As predicted, the results provide evidences to the hypothesised association between organisational structure of formalisation, organisational culture toward coordination and ERP systems success. However, the findings could not reveal a significant relationship between prospector strategy, organisational size, management support on one hand and ERP success on another hand. Section 8.3 provides justification and explanation of some unsupported relationships, yet the other relationships need more investigation.

For the third group of hypotheses, which contain five direct relationships and two indirect relationships, the results suggest that maturity of ERP system explain the success of ERP systems. Additionally, the questionnaire survey results find a correlation between age of ERP implementation, ERP brand and maturity of ERP systems. However, the results fail to find a direct significant relationship between ERP brands, age of ERP implementation and ERP success. The researcher provides some explanation in section 8.4.

-Relationship between the success of ERP systems and the EICPs
The researcher formulates two hypotheses related to the final group of hypothesis (proposition four). The first hypothesis is sought to examine the direct linkage between ERP systems success and EICPs. The second hypothesis is proposed to examine the mediation role of the ERP systems success between the relationships of contingency factors and the EICPs in Saudi ERP implemented firms. As shown in Table 9.3, the results support all the related hypotheses.

Table 9.3 Summary result for testing the last group of hypotheses

	ERP system success and EICPs	
H16	Success of ERP systems is positively associated the effectiveness of ICPs.	Accepted
H16a1	There is indirect relationship between the structure (formalisation) and the EICPs through the ERP success.	Accepted
H16a2	There is indirect relationship between the culture (coordination) and the EICPs through the ERP success.	Accepted
H16a3	There is indirect relationship between the ERP maturity and the EICPs through the ERP success.	Accepted

The qualitative findings from the exploratory study indicate a difference between companies implemented and non-implemented ERP systems in the level of ICPs effectiveness. The results emphasise the importance of ERP systems in supporting the COSO components, which results support the EICPs. The results also reveal that the main reason for implemented ERP systems is to enhance control processes. The study indicates that the built-in controls and other features have helped companies to improve their ICS.

The quantitative results support the proposed positive relationship between the success of ERP systems and the EICPs, which are consistent with the exploratory study findings. That means the success of ERP systems affect the present and function of the five components, namely internal environment, risk assessment, control activities, information and communication, and monitoring. That consistent with Valipour *et al*. (2012), who suggests that the ERP systems can impact on the EICPs and management can rely on the data that provided by ERP systems in order to make a reliable and valid decision. In addition, the current study results indicate a mediation effect of the ERP systems success on some of the relationships between the contingency factors and the EICPs. In this study the mediating effect of ERP systems success is tested, applying the three steps suggest by Hair *et al.* (2013), see section 7.4.1.

ERP system success mediates the relationships between formalisation structure, organisational culture toward coordination, and ERP maturity from one side and the EICPs from another side. However, the ERP systems success did not mediate the relationships between strategy, decentralisation and team-based structure, company size, organisational culture toward collaboration, ERP age and brand, and management support on one hand and the effectiveness of ICPs on another hand.

Thus, it can be argued that the EICPs results from the link between ERP success and the contingency factors (formalisation, coordination and ERP maturity).

This thesis proposes and validates a model that demonstrates the impact of contingency factors and ERP system success on the EICPs in the Saudi Arabian business environment. The purpose of the study is not to infer causality, but rather to develop a model that can explain, simultaneously (as SEM approach used), the effect of contingency factors and ERP systems success on the EICPs. This section shows that the study findings and results address the research problem, achieve the aims and objectives by utilising the appropriate methodology and research techniques.

9.3.3 Main findings
To conclude this section the main findings are presented as follows:

- Although there is no specific IC requirement for Saudi firms, the study results, particularly the descriptive analysis, indicate that the Saudi firms have adequate ICPs. That implies there are other factors playing a significant role in enhancing the EICPs within the Saudi firms, such as ERP systems, management support, structure and strategy. Further, the Saudi firms consider that the COSO framework and its components can be used to assess the EICPs.

- The study results indicate that the Saudi firms have quite successful ERP systems, although the results show no significant relationship between ERP system success and management support. The findings reveal some explanation such as that most of the study sample implemented well-known ERP systems; most of the firm sample implemented the systems for more than three years, and also the organisational structure of formalisation and centralisation can explain the success.

- The assessment of the measurement model confirms that the measures of all the ten constructs use in the study exhibit uni-dimensionality, construct reliability and validity. The evaluation of the structure model using non-parametric evaluation criteria show that the values of R^2 range within the acceptable value and positive Q^2 results (for both communality and redundancy) for all constructs suggest the study's model has predictive

relevance. Further the results of structure model evaluation indicate no sign of a multicollinearity problem.

- The model results reveal that, among the organisational factors, organisational structure (individual-based), strategy, organisational culture (collaboration), and management support significantly affect the EICPs. Contrary to expectations, organisational size, organisational culture (coordination), structure (formalisation and decentralisation) were not directly significantly related to the EICPs.

- The survey results indicate that among the organisational factors and ERP factors organisational structure (formalisation), organisational culture (coordination), and ERP maturity significantly influence the ERP systems success. however, organisational structure (decentralisation and team-based), strategy, size, management support, organisational culture (collaboration), age of ERP implementation and ERP brand are not significantly affect directly the success of ERP systems.

- The direct and indirect effects of the mediation model confirms that ERP maturity mediate the relationships between the age of ERP implementation and ERP systems success. Additionally, the ERP system success mediates the relationship between structure (formalisation), organisational culture (coordination), ERP maturity and the EICPs.

9.4 Research Contributions

Unlike many of previous studies that use one data collection method, this study uses multiple data collection methods. It utilises both interview and questionnaire instruments for collecting data. The exploratory study is used to understand the research context while a questionnaire survey is used to gather the primary data in order to validate a model using a structural equation modelling approach. Further, this study attempts to close the gaps between the survey findings and unexpected results. Following the suggestion by previous studies, follow-up interviews are conducted to provide some answers for unexpected results. Thus, this study provides a practical example in management accounting research on how exploratory study findings can be used in a primary questionnaire survey to address research problems and questions adequately, and followed by another qualitative data to tackle the survey problems. The study contributes also to knowledge at different levels.

At the literature level, review of the literature indicates that most prior studies use a single indicator for evaluating the quality of ICS. Although, a few studies have evaluated the EICPs by using a comprehensive IC framework like the COSO framework, they do not investigate a large number of organisational factors that may affect the EICPs. Thus this thesis contributes to the management control systems literature by developing a model that explains the influence of organisational factors on the EICPs and measure the ICPs effectiveness by COSO framework.

In addition, with limited research that examines the impact of ERP systems on the EICPs, only the implementation of ERP systems (e.g. Morris, 2011), not the success of ERP system, have been examined. Additionally, there is limited research in investigation the relationships between ERP factors and ERP systems success. Reviewing the literature of the relationship between the ERP systems and ICS, only the impact of a small number of organisational factors is examined in prior research. Therefore, this study contributes to the IS literature by investigating the relationship between the effect of two groups of factors, including organisational factors and ERP factors, on the success of ERP systems.

At the theoretical level, a review of the literature reveals that studies using contingency theory in a system form and SEM form to explain the relationship between ERP systems and EICPs are limited. Thus, this study is attempted to apply different form of fit in structuring the relationships such as system and structure equation modelling form. Further, management accounting studies point to the potential use of technology (i.e. ERP systems) as a mediating variable between contingency factors and organisational effectiveness in systems approach, yet there are few studies pursuing this potential. This thesis develops and validates a mediation model of contingency variables, ERP systems success and EICPs. Therefore, this thesis makes a theoretical contribution by developing a new theoretical framework.

At the empirical level, this thesis enhances the current knowledge by investigating the EICPs in a less developed country, Saudi Arabia. Review of the literature reveals that research in less developed countries remains limited. To the best of the author's knowledge, this study is the first to investigate empirically the ICPs effectiveness and the factors that affect the EICPs in Saudi Arabia. Most prior studies have been

undertaken in developed countries, such as the United States, the United Kingdom and Canada.

The current study context is different from other contexts, particularly, in the area of IC in various aspects. First, regard the IC regulation or requirement, there is no such mandatory regulation for IC in Saudi Arabia, whereas in the United States there is the SOX (2002) Act, which contains 11 sections. SOX lows have been subsequently enacted by other countries such as Japan, Germany and France. Second, the tax system in Saudi Arabia is different than other countries. Instead of tax there is 'Zakah' which is fixed by the Islamic law at 2.5%. Thus, manager has no motivation as in other countries with high tax rates, to manipulate financial statements in order to pay less tax.

In addition, little is known about the success of ERP systems, especially in less developed countries such as Saudi Arabia. That raises a question regarding the variables that can impact the success of the systems. The review of relevant studies has revealed that there are certain ambiguities regarding the relationship between ERP system success and some factors in this context. Further, although, there are a number of Saudi companies have adopted ERP systems, there are still a large number of companies that have not yet implemented the systems. Thus, this study can help them to understand the benefits of ERP systems and their impact on EICP.

9.5 Implications and Recommendations

The study findings provide an overview on the state of EICP and success of ERP systems in Saudi Arabia companies. The study identifies the procedures for an effective ICS in relevant to Saudi Arabia or other less developed countries. Consequently, at the practical level, the results of the study have implications and recommendations for company managers, ERP vendors, government and regulators. This section classifies the implications and the recommendations into managers, ERP vendors, and regulators.

For the company managers, this thesis has implication with respect to the adoption of a successful ERP system and its influence on the EICPs. Managers need to take advantage not only to the implementation of ERP systems but also to the success of ERP systems in order to enhance their companies ICS. There are various frameworks and procedures available for the managers to develop their ICS. The findings of this

study can be also useful for exploring which IC framework can help the managers to improve and develop their ICS.

Companies may find the study results helpful to understand and recognise the practices of other companies. They may recognise the important of ERP systems in improving the EICPs. Accordingly, findings can provide a recommendation for those companies have no ERP systems or they are planning to implement one. Additionally, the study findings have implications for manager to recognise the important of some organisational and ERP factors (conditions) in increasing the level of ICPs effectiveness. They can recognise the link between ERP systems and the structure of centralisation and formalisation explain the EICP more than other structure dimensions.

For ERP vendors, the study findings have implications in relevant to consider the features and tools that can enhance the EICPs. ERP vendors may consider the important of improving the system to support the COSO components. Findings can be useful particularly to un-known ERP vendors for improving their system and to do more advertising after considering some of the study findings.

For government and regulators, this thesis has implication regarding regulatory framework and government reporting requirements. The study reveals that IC regulations and reporting requirements of the study context remain hindrance in improving the EICS. The study findings have implications for regulators such as IIA and SOCPA attempting to increase the quality of IC requirements and financial reporting. In other words, government and regulators may provide more effective legal actions to increase the important of the ICS and to impose penalties on those companies not compiling with these actions.

9.6 Limitations and suggestions for further research

This research has a number of limitations that warrant a further discussion and provide opportunities for future research. This section discusses the limitations and future research from theoretical, methodological and empirical perspectives.

From the theoretical point of view, because of the complexity of the study's theoretical model, the study focus only on the internal organisational factors that are related to success of ERP systems and the EICPs. The researcher was unable to

identified and include all organisational factor that may influence the study's two main constructors. Future research can explicitly include external environmental factors, such as uncertainty (Chenhall and Morris, 1986) and competition (Anderson and Young, 1999) and other organisational factors to addresses the effects of these factors on the relationships between the ERP systems success and EICPs.

Additionally, theoretical framework is based on contingency theory. Although the adaptation of this theory has contributed to developing a comprehensive theoretical framework to address the research objectives, the theory is criticised for ignoring the social power and factors that may affect the choices and practices of an organisation. Thus, using more socially oriented theoretical lenses, such as the institutional theory, for future studies can help to gain insights into the social factors that may impact the study main constructs.

Empirically, this study is limited to a sample of Saudi Arabia ERP implemented quoted companies, which may results in the findings being applicable only to this context. Future research can benefit from conducting comparative studies for different contexts, such as developed and developing context. That would provide a better understanding of the relationship between the study's constructs. In addition, because the sample of companies is drawn from one context, the generalisability of the findings of this thesis over other contexts may not be valid. Therefore, future research should attempt to replicate this study in other national settings.

At methodological level, although the study uses only five dimensions to measure ERP success (system quality, information quality, service quality, individual impact and organisational impact), which are highly recommended by previous researchers, it does not use a measure that assesses the overall satisfaction of the system. Therefore, future study could include a surrogate measure to reflect the overall ERP success and examine its effect.

Further, because of the large number of rejected hypotheses (around 40%) in the current study, the model should be further validated in different contexts and with a larger sample size. It is important for future research to investigate the relevance of the rejected factors in their specific research context. They need also to consider the relevance of other factors which are not included in this study, but may play more critical roles in their context. For example, future research can measure the study

constructs with different indicators (e.g. company size) or with additional indicators (e.g. strategy). Also, because the sample size is not large enough, this study could not test if organisational size, brand of ERP systems and ERP implementation age might significantly affect the hypothesized relationships. The sample size in the current study was restricted by the response rate to the survey. Other methods that are not restricted by response rate (e.g. panel data analysis or longitudinal study) can be used in future research to attract more responses.

9.7 Final Summary

The thesis has made a solid contribution to knowledge in the study field. Consequently, the academic researchers and practitioners, especially in Saudi Arabia and other golf countries, should take action to build on the findings of the current research. The study is significant as it not only increased academic knowledge in the management control system field, but also made a significant contribution to the literature on IS.

Although this thesis has its limitations, such as the focusing on internal organisational factors and small sample size, the study contributes to the literature within the Saudi Arabia context. This study further responds to previous calls in literature to integrate several disciplines by combining the management control system and IS. This thesis opens up an opportunity for future empirical research to cross-validate the model in different context.

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Appendices

Appendix 1: Literature

1.1 COBIT Framework
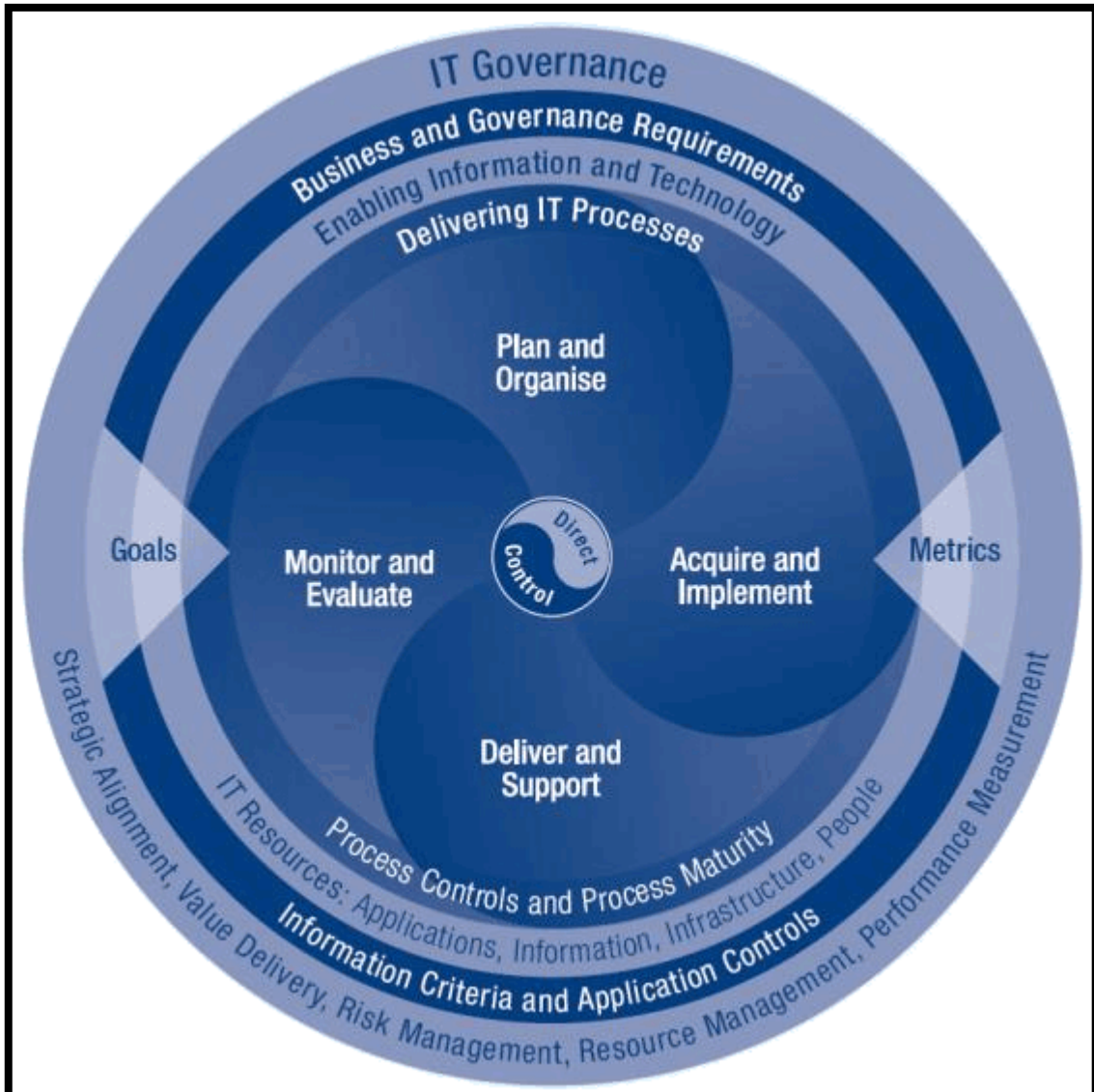
Source: ISACA. (2009). Available at: http://www.isaca.org/Knowledge-Center/cobit/Pages/Overview.aspx, accessed August 21, 2013.

1.2 A generic evidential reasoning model for Sarbanes-Oxley mandated internal control assessment.
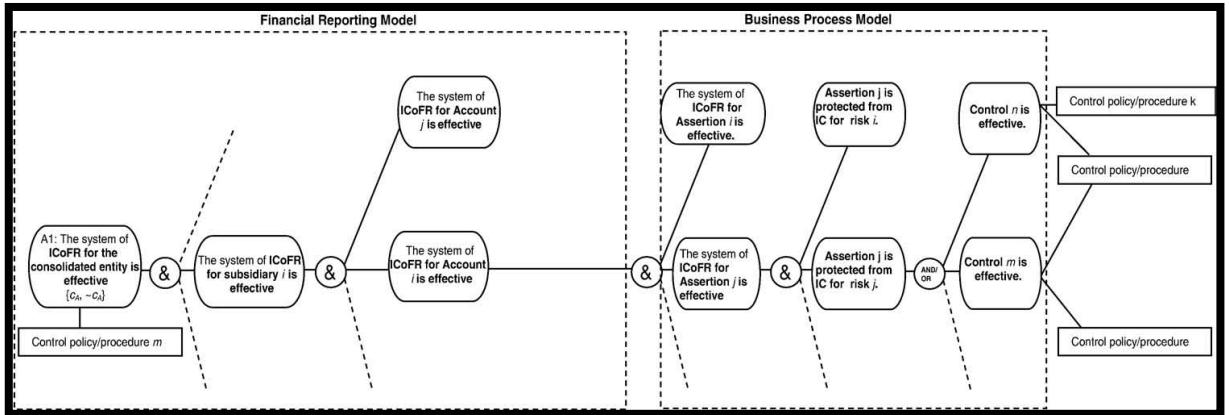
Source: Mock et al (2009)

1.3 The ERP life-cycle framework.
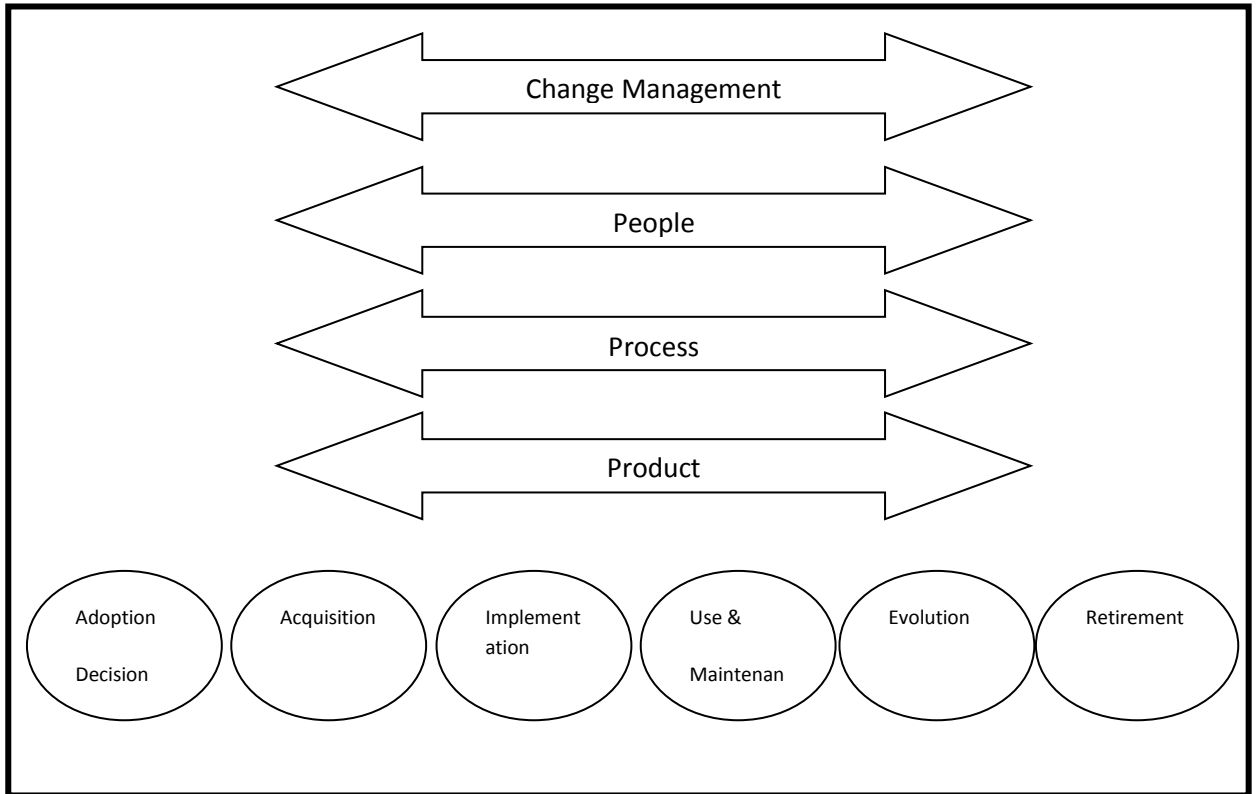
Source: Esteves and Pastor (1999)

1.4 Updated DeLone and McLean IS Success Model
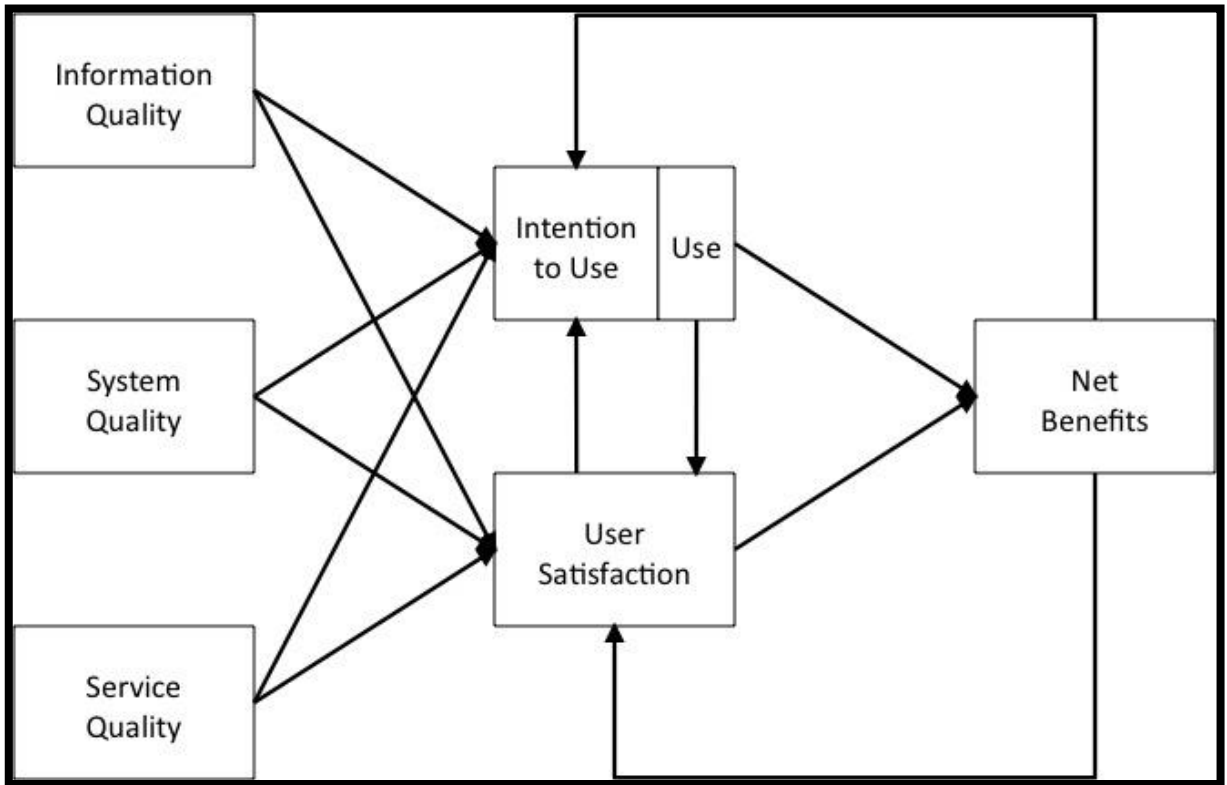
Source: DeLone and McLean (2003, p.24)

1.5 Conceptual ERP success model
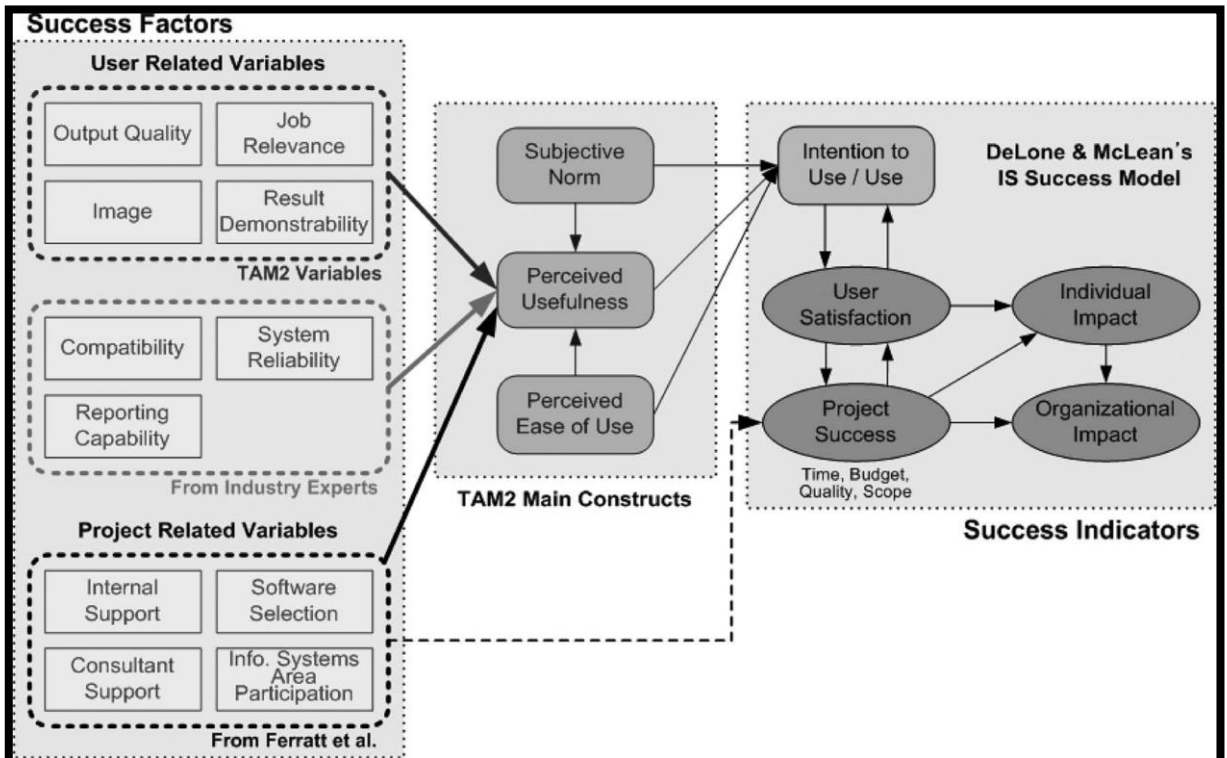
Source: Chung et al. (2009, p.210)

Appendix 2: Methodology

2.1 Comparison between Mainstream, Interpretive and Critical Accounting Research

	Mainstream accounting research	Interpretative accounting research	Critical accounting research
Beliefs about knowledge	Theory and observation are independent of each other, and quantitative methods of data collection are favoured to provide a basis for generalisation	Theory is used to provide explanations of human intentions. Its adequacy is accessed via logical consistency, subjective interpretation.	Criteria for judging theories are always temporal and context bound. Social objects can only be understood through a study of their historical development and change within the totality of relations.
Beliefs about physical and social reality	Empirical reality is objective and external to the researcher. Human actors are essentially passive objects, who rationally pursue their goals.	Reality is socially created and objectified through human interaction. Human action is intentional and has meaning grounded in the social and historical context.	Empirical reality as characterised by objective, real relations, but is transformed and reproduced through subjective interpretation.
Relationship between accounting theory and practice	Accounting is concerned with means, not ends-it is value natural, and existing institutional structures are taken for granted.	Accounting theory seeks to explain action and to understand how social order is produced and reproduced.	Theory has a critical imperative, in particular the identification and removal of domination and ideological practices.

Source: Chua (1986, pp. 611- 622) in Ryan et al. (2002, pp. 41- 43)

Appendix 3: Qualitative Questions

3.1 The Interviews Questions

The Exploratory Study Objectives:

5. Identified the internal control requirements, reports and roles that are require from SA firms.

6. Investigate the correlation between the internal control and risk management.

7. Measure the efficiency of internal control procedures through COSO's ERM components.

8. Investigate whether ERP system (e.g. SAP) can provide an adequate support to the internal control procedures.

9. Develop a theoretical framework that shows the relationships between the ERP system success and internal control.

    The Study Questions:

    - internal control requirements

        1. Does the firm have an internal control job? Does it one of the firm units or a part of anther units?

        2. Are there Saudi Arabia internal control requirements? What are they? If not, what are the internal control requirements that the firm follow (Internal or International)?

        3. What are the documentations (report) that your company have to present to the Minister of Commerce (or other body)? Is there a report specifically for the internal control even a voluntary report (that shows the integrity of the statements)?

        4. What is main role of the internal control unit (auditing the financial transactions, auditing the firm procedures, evaluating the risks)? What are the internal control processes?

    - correlation between the internal control and risk management:

        5. Is the internal control department able to find all the risks that face the entity or there are type of risks that the firm tray to find and treat?

        6. Does the firm have a Risk Management department or unit? If no, who is the responsible for that?

        7. What are the processes for managing the risks?

        8. From your experience what are the possess (sell, purchases, recording....)

or unit (financial, inventory...) that have most risk exposure?

- Measure the efficiency of internal control procedures:

   9. Does the entity have a strategic or philosophy especially for the risk management (include risk appetite)? Are there standards related to professional ethics and behaves? Is there a separation between the entity's board of directors and the executive management?

   10. Do the Enterprise Risk Management's objectives support and align with the firm's mission and strategy? Does that consistent with the risk appetite?

   11. Does the firm identify the internal and external events that may affect the achievement of firm objectives?

   12. Does the firm assess the risks (including analysing the risks and considering the probability and impact)?

   13. Does the firm have actions to align risks with the firm's risk appetite and tolerances (accept-avoid-reduce-share)?

   14. Are there procedures and policies to ensure that the risk responses (accept-avoid-reduce-share) are effectively carried out?

   15. Does the internal control department have all necessary information in the time? How effectively does the internal control department communicate with the entity departments (up, down, across)?

   16. Does the firm have ongoing monitor activities (separate evaluation)?

- ERP system can provide support to the internal control procedures:

   17. Can ERP system (e.g. SAP) provide functions and services for supporting the internal control procedures (or for deducting mistakes and manipulation)? What is it?

   18. Does the ERP system have the functionality to prevent and detect all the risks?

   19. What is the different between the ERP system and previous one?

   20. Is there an evaluation and control to the ERP systems?

3.2 The follow-up interview Questions

Four group of questions:

-Organisational factors and EICPs

1- From your experience, an effective ICS should be supported by decentralisation structure or centralisation structure? Reason?
2- From your experience, an effective ICS should be supported by formalisation structure or un-formalisation structure? Reason?
3- In my study the size of the company has no impact on the EICPs, so to what extent do you think that size is important or not important to EICPs?
4- Is the organisational culture (in terms of organisational culture toward collaboration or toward coordination) an important factor to ICS? Why?

-Organisational factors and ERP success

5- From your experience, a success ERP system should be supported by decentralisation structure or centralisation structure? Reason?
6- From your experience, a success ERP system should be supported by Team-based structure? Reason?
7- In my study the size of the company has no impact on the success ERP, so to what extent do you think that size is important or not important to ERP success?
8- Is the organisational culture (in terms of organisational culture toward collaboration or toward coordination) an important factor to ERP success? Why?
9- My study results show that management support not an important factor for the success of ERP system, from your experience, to what extent do you think that management support is not important?

-ERP factors and ERP success

10- To what extent do you think the brand and the age of ERP system is important to ERP susses?

-ERP success and ICPs

11- Is it right that the main reason of ERPs is to support IC? How?

Appendix 4: The Study Questionnaire

4.1: The Study Questionnaire (English vision)

Survey questionnaire of the relationship between the Enterprise Resource Planning systems (ERP) and Internal Control Procedures (ICP)

Case study of Saudi companies

Thank you for taking the time to complete this survey questionnaire. The main purpose of this survey is to examine the impact of ERP systems' success on the efficiency and effectiveness of internal control procedures. This questionnaire can be answered by the Director of the Internal Audit Department or the Director of the Accounting Department (you have the right to share the answers with other parties).

Your participation in this survey will prove valuable to the researcher, the literature review, the Saudi Arabia Library, and Saudi organizations.

All of the information collected in this survey will remain confidential and will only be reported in aggregate form. You may withdraw from participation at any time. This survey will take approximately 25 minutes.

Thank you again and I appreciate your cooperation

Notes: ERPs= Enterprise Resource Planning system e.g. SAP, Oracle, PeopleSoft...

ICP= Internal Control Procedures

Risk= it refer to any type of risk

Risk appetite= level of risk that an organisation is willing to accept

Entity= company

For more information or question, you can contact the researcher

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Approved by:

- Research Graduate School, University of Bedfordshire
- Deanship of Postgraduate Studies, King Faisal University

Part A: evaluation the Internal Control Procedures

A1. Indicate your agreement or disagreement with the following statements which reflect your assessment of whether or not the internal control components are present and functioning effectively.

Please tick the suitable box next to each statement (ranging from strongly disagree (1) to strongly agree (7)).		Strongly Disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly Agree	Don't know
		1	2	3	4	5	6	7	0
internal environment	1.Our entity has assigned authority and responsibility for internal control and risk management to an executive	❑	❑	❑	❑	❑	❑	❑	❑
	2. The internal auditor is independent.	❑	❑	❑	❑	❑	❑	❑	❑
	3.Our entity identifies specifically its risk appetite	❑	❑	❑	❑	❑	❑	❑	❑
	4. Our entity enhances professional ethics value and a code of conduct in every job.	❑	❑	❑	❑	❑	❑	❑	❑
objective setting	5. Every level in our entity allocate processes to set their objectives	❑	❑	❑	❑	❑	❑	❑	❑
	6. Our entity's objectives support its mission.	❑	❑	❑	❑	❑	❑	❑	❑
	7. Our entity's objectives are aligned with its risk appetite.	❑	❑	❑	❑	❑	❑	❑	❑
event identification	8. Our entity considers all expected internal factors (events) that may influence positively or negatively its objectives	❑	❑	❑	❑	❑	❑	❑	❑
	9. Our entity considers all expected external factors (events) that may influence positively or negatively its objectives	❑	❑	❑	❑	❑	❑	❑	❑
	10. Our entity identifies every factor (event) independently	❑	❑	❑	❑	❑	❑	❑	❑
risk assessment	11. Our entity analyses every risk	❑	❑	❑	❑	❑	❑	❑	❑
	12. Our entity has a professional risk assessment technique	❑	❑	❑	❑	❑	❑	❑	❑
	13. We always assess the "probability" of every risk independently	❑	❑	❑	❑	❑	❑	❑	❑
	14. We always assess the cost impact of every risk independently	❑	❑	❑	❑	❑	❑	❑	❑
risk response	15. Our entity selects a response for each risk (e.g. avoiding, accepting, reducing, or sharing)	❑	❑	❑	❑	❑	❑	❑	❑
	16. We set actions to align the risk response with the entity's risk appetite.	❑	❑	❑	❑	❑	❑	❑	❑
	17. We take steps to consider the effect of risk response on other risks	❑	❑	❑	❑	❑	❑	❑	❑
control activities	18. Our entity has implemented procedures to ensure that the risk responses are effectively carried out	❑	❑	❑	❑	❑	❑	❑	❑
	19. We normally run physical oversight over our entity's resources and assets	❑	❑	❑	❑	❑	❑	❑	❑
	20. Our entity's managers continue to	❑	❑	❑	❑	❑	❑	❑	❑

	run functions to review performance reports								
	21. We have a variety of controls activities to check the accuracy, completeness and authorization of transactions	❏	❏	❏	❏	❏	❏	❏	❏
	22. Our entity uses IT for control	❏	❏	❏	❏	❏	❏	❏	❏
information and communication	23. We ensure that the identified information can be captured, processed and reported effectively by our information system.	❏	❏	❏	❏	❏	❏	❏	❏
	24. Our information system effectively provides information to appropriate personnel so that they can carry out their responsibilities.	❏	❏	❏	❏	❏	❏	❏	❏
	25. Our information system effectively communicates the information and in timely manner.	❏	❏	❏	❏	❏	❏	❏	❏
	26. Our information system has effective communication and in a broad sense (e.g. inside and outside the entity)	❏	❏	❏	❏	❏	❏	❏	❏
monitoring	27. Our internal control system is thoroughly monitored	❏	❏	❏	❏	❏	❏	❏	❏
	28. Our entity ensures that monitoring is accomplished through ongoing activities or separate evaluation	❏	❏	❏	❏	❏	❏	❏	❏
	29. Our management ensures that its internal control system continues to operate effectively	❏	❏	❏	❏	❏	❏	❏	❏
	30. Our entity modifies the process of our internal control system when necessary	❏	❏	❏	❏	❏	❏	❏	❏

Part B: Evaluation of the firm's ERP system's success

B1. To what extent do you agree with the following statements which reflect the evaluation of the firm's ERP system's success?

Please tick the suitable box next to each statement (ranging from strongly disagree (1) to strongly agree (7)).	Strongly Disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly Agree	Don't know
	1	2	3	4	5	6	7	0
System Quality 1. The entity [ERPs] is easy to use	❏	❏	❏	❏	❏	❏	❏	❏
2. The entity [ERPs] is easy to learn	❏	❏	❏	❏	❏	❏	❏	❏
3. The entity [ERPs] meets the users' requirements	❏	❏	❏	❏	❏	❏	❏	❏
4. The entity [ERPs] has good functions and features	❏	❏	❏	❏	❏	❏	❏	❏
5. The entity [ERPs] usually do the job without errors	❏	❏	❏	❏	❏	❏	❏	❏
6. The [ERPs]'s user interface can be easily adapted to one's personal approach	❏	❏	❏	❏	❏	❏	❏	❏
7. The entity [ERPs] requires only a minimum number of computers and equipment to achieve a task	❏	❏	❏	❏	❏	❏	❏	❏
8. The data within [ERPs] are fully integrated	❏	❏	❏	❏	❏	❏	❏	❏
Service Quality 9. [ERP technical support] provides fast and sincere assistance with solving problems (responsiveness)	❏	❏	❏	❏	❏	❏	❏	❏
10. [ERP technical support] is able to perform the promised service dependably and accurately (reliability)	❏	❏	❏	❏	❏	❏	❏	❏
11. The [ERP technical support] staff are well-informed and trustworthy (assurance)	❏	❏	❏	❏	❏	❏	❏	❏
12. The physical facilities (equipment, communication material) provided by [ERP technical support] are visually appealing (tangible)	❏	❏	❏	❏	❏	❏	❏	❏
13. The [ERP technical support] provides the service with personalized attention	❏	❏	❏	❏	❏	❏	❏	❏
Information Quality 14. The entity [ERPs] provide information for users	❏	❏	❏	❏	❏	❏	❏	❏
15. The entity [ERPs] provides usable information	❏	❏	❏	❏	❏	❏	❏	❏
16. The entity [ERPs] provides understandable information	❏	❏	❏	❏	❏	❏	❏	❏
17. The entity [ERPs] provides relevant information	❏	❏	❏	❏	❏	❏	❏	❏
18. The entity [ERPs] provides well formatted information	❏	❏	❏	❏	❏	❏	❏	❏
19. The entity [ERPs] provides concise information	❏	❏	❏	❏	❏	❏	❏	❏

		Strongly Disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly Agree	Don't know
Individual Impact	20. The entity [ERPs] enhances the individual's learning and creativity	❏	❏	❏	❏	❏	❏	❏	❏
	21. The entity [ERPs] enhances the individual's awareness	❏	❏	❏	❏	❏	❏	❏	❏
	22. The entity [ERPs] enhances the quality of the decision making	❏	❏	❏	❏	❏	❏	❏	❏
	23. The entity [ERPs] reduces the time required to complete individual tasks and duties	❏	❏	❏	❏	❏	❏	❏	❏
Organizational Impact	24. [ERPs] reduce the entity's costs	❏	❏	❏	❏	❏	❏	❏	❏
	25. [ERPs] have resulted in reduced staff costs	❏	❏	❏	❏	❏	❏	❏	❏
	26. [ERPs] reduce the overall costs	❏	❏	❏	❏	❏	❏	❏	❏
	27. [ERPs] have improved the outcomes and outputs	❏	❏	❏	❏	❏	❏	❏	❏
	28. [ERPs] support e-government/e-business	❏	❏	❏	❏	❏	❏	❏	❏

Part C: Contingency variables

<u>Structure of the Organisation</u>

C1.To what extent do you agree with the following statements which reflect your organisation's structure?

Please tick the suitable box next to each statement (<u>ranging from strongly disagree (1) to strongly agree (7)</u>).	Strongly Disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly Agree	Don't know
	1	2	3	4	5	6	7	0
1.The entity has diversified occupational specialties	❏	❏	❏	❏	❏	❏	❏	❏
2.A descriptive of the job is presented	❏	❏	❏	❏	❏	❏	❏	❏
3.The employees participate in the firm's decisions	❏	❏	❏	❏	❏	❏	❏	❏
4.The supervisors and staff are friendly towards each other	❏	❏	❏	❏	❏	❏	❏	❏

Organisation Strategy

C2. To what extent do you agree with the following statements which reflect your organisation's strategy?

Please tick the suitable box next to each statement (**ranging from strongly disagree (1) to strongly agree (7)**).	Strongly Disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly Agree	Don't know
	1	2	3	4	5	6	7	0
1. The entity's mission and actions support the development of new products/services	❏	❏	❏	❏	❏	❏	❏	❏
2. The entity lead its sector towards innovation	❏	❏	❏	❏	❏	❏	❏	❏
3. The entity responds quickly to the first signs of opportunity (in the environment)	❏	❏	❏	❏	❏	❏	❏	❏
4. The entity 's actions often lead to new rounds of competitive activities in its sector	❏	❏	❏	❏	❏	❏	❏	❏
5. The Entity promotes long range planning and concentrates on a long term view in all decisions	❏	❏	❏	❏	❏	❏	❏	❏
6. The entity is generally involved in high-risk projects that lie within its mission	❏	❏	❏	❏	❏	❏	❏	❏

Organisation size

C3. What are the total assets of your entity?

❏ Under 50 (SR million)   ❏ 51- 250 (SR million)

❏ 250- 700 (SR million)   ❏ 701- 1000 (SR million)

❏ Above 1001 (SR million)

Organisational Culture

C4. To what extent do you agree with the following statements which reflect your organisation's culture?

Please tick the suitable box next to each statement (**ranging from strongly disagree (1) to strongly agree (7)**).		Strongly Disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly Agree	Don't know
		1	2	3	4	5	6	7	0
1.Orientation towards collaboration	-Employees usually prefer to work in project teams	❏	❏	❏	❏	❏	❏	❏	❏
	-Employees are willing to share information between them	❏	❏	❏	❏	❏	❏	❏	❏
2.Coordination, centralisation and control	-The entity encourages its employees to be free in their thinking and in creating ways to do their job	❏	❏	❏	❏	❏	❏	❏	❏
	-It is difficult to gain access to staff or resources, and the power is centralized	❏	❏	❏	❏	❏	❏	❏	❏

Management support

C5. To what extent do you agree with the following statements which reflect the organisation's attitude towards management support?

Please tick the suitable box next to each statement (**ranging from strongly disagree (1) to strongly agree (7)**).	Strongly Disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly Agree	Don't know
	1	2	3	4	5	6	7	0
1. The top management supports research, development and innovation.	❏	❏	❏	❏	❏	❏	❏	❏
2. The top management likes to take risks	❏	❏	❏	❏	❏	❏	❏	❏
3. The top management helps to provide all of the necessary resources	❏	❏	❏	❏	❏	❏	❏	❏
4. The top management involves the employees in the strategic planning and technical orientation	❏	❏	❏	❏	❏	❏	❏	❏
5. The top management provides adequate direction and motivation for the staffs	❏	❏	❏	❏	❏	❏	❏	❏
6. The top management prefers to delegate tasks to others	❏	❏	❏	❏	❏	❏	❏	❏

<u>ERP System Brand</u>

C6.Which type of ERP software does the entity have?

❑ SAP   ❑Oracle   ❑PeopleSoft   ❑other, please specify:.........................

<u>Maturity of the ERP System</u>

C7. When was the ERP system implemented in the organisation?

❑Less than 1 year ago   ❑1-2 years ago   ❑3-5 years ago   ❑6-8 years ago
❑more than 9 years ago

C8. Indicate your level of agreement or disagreement with the following factors:

Please tick the suitable box next to each statement (**ranging from strongly disagree (1) to strongly agree (7)**).	Strongly Disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly Agree	Don't know
	1	2	3	4	5	6	7	0
1. The number of ERP system users has increased rapidly since the implementation of the system.	❑	❑	❑	❑	❑	❑	❑	❑
2. The ERP system's applications that are used satisfy the Entity's needs	❑	❑	❑	❑	❑	❑	❑	❑
3. We are satisfied with the control processes and standards of our ERP system's resources	❑	❑	❑	❑	❑	❑	❑	❑
4. The budget for the ERP system project and resources has been decreasing since its implementation because of the reduction in problems	❑	❑	❑	❑	❑	❑	❑	❑
5. The responsibility for operating the entity's ERP system has been transferred from the ERP technical support to the users	❑	❑	❑	❑	❑	❑	❑	❑
6. The control of conventional data processing activities has tightened since the implementation of the system	❑	❑	❑	❑	❑	❑	❑	❑

Part D: Demographics

D1. What is the type of your organisation?

❑ Sole Proprietorship   ❑ Partnership
❑Private Limited Company   ❑ Public Limited Company
❑Other, please specify.........

D2. Educational background and relevant training (you can choose more than one)?

❑Degree in Accounting and Finance
❑Degree in Business Management
❑Degree or training in Information System
❑Degree or training for Risk Management
❑Other, please specify......................................

D3. What is your current position at the firm (you can choose more than one)?

❑ Director of accounting department   ❑ Director of internal audit
department
❑Financial Manager   ❑ other, please
specify.........................

D4. If you would be willing to receive a copy of summarised results, please complete the following information:

➕ Your Name: ....
➕ Email Address: ....
➕ Your organisation Name: ....

Thank you for taking the time to tell us your views.

4.2: The Study Questionnaire (Arabic version)

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استبيان دراسة مسحية للعلاقة بين نظم تخطيط الموارد المؤسسية(ERP) وإجراءات الرقابة الداخلية (ICP)

حاله دراسية على الشركات السعودية

أولا أشكرك لإعطاء هذا الاستبيان جزءا من وقتك. إن الغرض الرئيسي من هذا الاستبيان هو فحص مدى تأثير نجاح نظم تخطيط الموارد المؤسسية (ERP) على كفاءة وفعالية إجراءات الرقابة الداخلية. يمكن ان يتم تعبئة هذا الاستبيان من قبل مدير قسم الرقابة الداخلية أو مدير قسم المحاسبة (لك كامل الاحقية في المشاركة في تعبئة الاستبيان مع من ترونه مناسباً).

إن مشاركتكم في هذا الاستبيان سوف تضيف قيمة للباحث، وللدراسات والابحاث العلمية بالمملكة العربية السعودية، وكذلك إلى المنظمات السعودية.

جميع المعلومات التي سوف يتم جمعها من هذا الاستبيان سوف تظل سرية، وسوف يتم عرضها فقط في شكل تقرير بالمجمل، ويمكنكم الانسحاب من اكمال تعبئة الاستبيان متى مارغبت. تستغرق تعبئة هذا الاستبيان حوالي خمس وعشرين دقيقة.

أشكرك مره آخرى وأقدر لك تعاونك،،،،،

ملاحظة:

ERP= يشير الى نظم تخطيط الموارد المؤسسية مثال SAP, Oracle, PeopleSoft ....

ICP= اجراءات الرقابة الداخلية

الخطر= يشير الى اي نوع من انواع المخاطر.

شهية المخاطرة= مستوى الاقدام على المخاطرة (مستوى الرغبة في قبول الخطر)

عند وجود اي سؤال او استفسار فيمكنك الاتصال بالباحث

هاني بن خالد شيتي

طالب دكتوراة في جامعة بيدفوردشير، المملكة المتحدة

محاضر في جامعة الملك فيصل

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قام بالمصادقة على هذا الاستبان كل من:

- كلية الدراسات العليا بجامعة بيدفوردشير
- عمادة الدراسات العليا في جامعة الملك فيصل

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الجزء الاول: تقييم اجراءات الرقابة الداخلية

1.1. أشر الى مدى موافقتك من عدم موافقتك للعبارات التالية، هذه العبارات تعكس تقييم ما إذا كانت مكونات نظام الرقابة الداخلية موجودة وتعمل على نحو فعال.

غير موافق اطلاقا	غير موافق بشدة	غير موافق	الى حد ما غير موافق	محايد	الى حد ما موافق	موافق	موافق بشدة	يرجى اختيار الخيار المناسب امام كل جمله، علماً بأن الخيارات تتدرج من (7) وتعني موافق بشدة الى (1) وتعني غير موافق بشدة.
0	1	2	3	4	5	6	7	
❑	❑	❑	❑	❑	❑	❑	❑	1- قامت الشركة بتفويض سلطة ومسؤولية إدارة الرقابة الداخلية و إدارة المخاطر إلى إدارة تنفيذية
❑	❑	❑	❑	❑	❑	❑	❑	2- هناك استقلالية تامة للمراجع الداخلي
❑	❑	❑	❑	❑	❑	❑	❑	3- تقوم المنشأة بتحديد " شهية المخاطرة " التي ترغب بها على وجه الدقة
❑	❑	❑	❑	❑	❑	❑	❑	4- تقوم المنشأة بتعزيز قيمة آداب المهنة وقواعد السلوك في كل وظيفة.
❑	❑	❑	❑	❑	❑	❑	❑	5- يقوم كل مستوى من مستويات المنشأة بوضع إجراءات لتحديد أهدافه
❑	❑	❑	❑	❑	❑	❑	❑	6- أهداف المنشأه تدعم رؤيتها
❑	❑	❑	❑	❑	❑	❑	❑	7- أهداف المنشأة تتوافق مع "شهية المخاطرة" التي ترغب بها
❑	❑	❑	❑	❑	❑	❑	❑	8- تقوم المنشأة بالأخذ بعين الاعتبار جميع العوامل (الأحداث) الداخلية المتوقعة و التي من الممكن أن تؤثر إيجاباً أو سلباً على تحقيق أهدافها.
❑	❑	❑	❑	❑	❑	❑	❑	9- تقوم المنشأة بالأخذ بعين الاعتبار جميع العوامل (الأحداث) الخارجية المتوقعة و التي من الممكن أن تؤثر إيجاباً أو سلباً على تحقيق أهدافها.
❑	❑	❑	❑	❑	❑	❑	❑	10- تقوم منشأتنا بتحديد كل عامل (حدث) على حدة
❑	❑	❑	❑	❑	❑	❑	❑	11- تقوم منشأتنا بتحليل جميع المخاطر
❑	❑	❑	❑	❑	❑	❑	❑	12- تمتلك منشاتنا أسلوب مهني لتقيم المخاطر
❑	❑	❑	❑	❑	❑	❑	❑	13- تقوم المنشأة دائما بتقيم "الاحتمالية" لكل خطر على حدة
❑	❑	❑	❑	❑	❑	❑	❑	14- تقوم المنشأة دائما بتحديد "تكلفة الأثر" لكل خطر على حدة
❑	❑	❑	❑	❑	❑	❑	❑	15- تقوم المنشأة بتحديد نوع الاستجابة تجاه كل خطر (على سبيل المثال تجنب الخطر، قبوله، الحد منه أو المشاركة)
❑	❑	❑	❑	❑	❑	❑	❑	16- تقوم المنشأة باتخاذ إجراءات لمواءمة الاستجابة للمخاطر مع "شهية المخاطرة" للمنشأة

❑	❑	❑	❑	❑	❑	❑	❑	17- تقوم المنشأة بالأخذ في الاعتبار أثر الاستجابة لكل خطر على المخاطر الاخرى	
❑	❑	❑	❑	❑	❑	❑	❑	18- تقوم المنشاة بتطبيق إجراءات فعالة للتأكد من تنفيذ "الاستجابة للمخاطر"	
❑	❑	❑	❑	❑	❑	❑	❑	19- تقوم المنشأة عادةً بإجراء رقابة مادية على مواردها وأصولها	
❑	❑	❑	❑	❑	❑	❑	❑	20- يقوم مدراء المنشأة باستمرار بوضع مهام لمراجعة تقارير الأداء	الأنشطة الرقابية
❑	❑	❑	❑	❑	❑	❑	❑	21- نمتلك أنشطة رقابية متنوعة للتأكد من مستوى الالتزام بالدقة، والانجاز، والصلاحيات الممنوحة.	
❑	❑	❑	❑	❑	❑	❑	❑	22- تقوم المنشأة باستخدام تقنية المعلومات (IT) في عملية الرقابة	
❑	❑	❑	❑	❑	❑	❑	❑	23- تقوم المنشأة بالتأكد بأن المعلومات التي تم تحديدها يمكن الحصول عليها، وإجراء عمليات عليها و يمكن عرضها بفعالية بواسطة النظام المعلوماتي (IS) الخاص بالمنشأة.	
❑	❑	❑	❑	❑	❑	❑	❑	24- النظام المعلوماتي (IS) للشركة يقوم بتزويد معلومات بشكل فعال الى الأشخاص ذوي الصلة بحيث يمكنهم القيام بمسؤولياتهم	المعلومات والاتصال
❑	❑	❑	❑	❑	❑	❑	❑	25- يقوم نظام المعلومات (IS) الخاص بالمنشأة بتوصيل المعلومات بفعالية وفي إطار زمني مناسب.	
❑	❑	❑	❑	❑	❑	❑	❑	26- يمتلك النظام المعلوماتي (IS) للمنشأة القدرة على التواصل الفعال وعلى نطاق واسع (داخل وخارج المنشأة)	
❑	❑	❑	❑	❑	❑	❑	❑	27- نظام الرقابة الداخلية للمنشأة مراقب بشكل متكامل	
❑	❑	❑	❑	❑	❑	❑	❑	28- تقوم المنشأة بالتأكد من أن متابعة العملية الرقابية تم إنجازها من خلال أنشطة إدارية مستمرة أو تقييم مستقل.	المراقبة
❑	❑	❑	❑	❑	❑	❑	❑	29- تقوم الإدارة بالتأكد من أن نظام الرقابة الداخلي مستمر بالعمل بفعالية.	
❑	❑	❑	❑	❑	❑	❑	❑	30- تقوم المنشأة بالتعديل على نظام الرقابة الداخلية متى ما تطلب الأمر.	

الجزء الثاني: تقييم نجاح نظم تخطيط الموارد المؤسسية (ERP)

2.1. إلى أي مدى توافق على العبارات التالية والتي تعكس تقييم نجاح نظم تخطيط الموارد المؤسسية (ERP)

	لا أعلم	غير موافق بشدة	غير موافق	الى حد ما غير موافق	محايد	الى حد ما موافق	موافق	موافق بشدة	يرجى اختيار الخيار المناسب امام كل جمله، علماً بأن الخيارات تتدرج من (7) وتعني موافق بشدة الى (1) وتعني غير موافق بشدة. يرجى الاجابة على كل عبارة على حدى
	0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	
	❑	❑	❑	❑	❑	❑	❑	❑	1- نظام الـERP للمنشأة سهل الاستخدام
	❑	❑	❑	❑	❑	❑	❑	❑	2- نظام الـERP للمنشأة سهل التعلم
	❑	❑	❑	❑	❑	❑	❑	❑	3- نظام الـERP للمنشأة يلبي متطلبات المستخدمين
	❑	❑	❑	❑	❑	❑	❑	❑	4- نظام الـERP للمنشأة يحتوي على وظائف جيدة وعرض جيد
جودة النظام	❑	❑	❑	❑	❑	❑	❑	❑	5- يقوم نظام الـERP للمنشأة بتأدية العمل من غير أخطاء
	❑	❑	❑	❑	❑	❑	❑	❑	6- واجهة المستخدم لنظام الـERP للمنشأة يمكن تكييفها بسهولة على حسب رغبة كل مستخدم
	❑	❑	❑	❑	❑	❑	❑	❑	7- نظام الـERP للمنشأة يتطلب فقط الحد الأدنى من عدد أجهزة الكمبيوتر والمعدات لتنفيذ المهام
	❑	❑	❑	❑	❑	❑	❑	❑	8- البيانات داخل نظام الـERP للمنشأة مدمجة بشكل متكامل
	❑	❑	❑	❑	❑	❑	❑	❑	10- قسم الدعم التقني لنظام الـERP بالمنشأة يقدم اهتماماً سريعاً وصادقاً في حل المشكلة (الاستجابة)
	❑	❑	❑	❑	❑	❑	❑	❑	11- قسم الدعم التقني لنظام الـERP بالمنشأة قادر على أداء الخدمة التي تم أخذ الوعد بأداءها بثقة وبدقة (الموثوقية)
جودة الخدمة	❑	❑	❑	❑	❑	❑	❑	❑	12- موظفو الدعم التقني لنظام الـERP بالمنشأة على اطلاع تام بالتقنية وجديرون بالثقة (ضمان)
	❑	❑	❑	❑	❑	❑	❑	❑	13- المرافق المادية (المعدات ومواد الاتصال) التي يقدمها قسم الدعم التقني لنظام الـERP في المنشأة جذابة بصريا (محسوسة)
	❑	❑	❑	❑	❑	❑	❑	❑	14- قسم الدعم التقني لنظام الـERP للمنشأة يقدم الخدمة مع اهتمام شخصي (التعاطف)
	❑	❑	❑	❑	❑	❑	❑	❑	15- نظام الـERP للمنشأة يتيح المعلومات للمستخدمين
	❑	❑	❑	❑	❑	❑	❑	❑	16- نظام الـERP للمنشأة يوفر معلومات قابلة للاستخدام
جودة المعلومات	❑	❑	❑	❑	❑	❑	❑	❑	17- نظام الـERP للمنشأة يوفر معلومات مفهومة
	❑	❑	❑	❑	❑	❑	❑	❑	18- نظام الـERP للمنشأة يوفر معلومات ذات صلة
	❑	❑	❑	❑	❑	❑	❑	❑	19- نظام الـERP للمنشأة يوفر معلومات منسقة بشكل جيد
	❑	❑	❑	❑	❑	❑	❑	❑	20- نظام الـERP للمنشأة يوفر معلومات موجزة

❑	❑	❑	❑	❑	❑	❑	❑	21- نظام الERP للمنشأة يعزز ملكية الإبداع لدى الأفراد	الابداع التنظيمي
❑	❑	❑	❑	❑	❑	❑	❑	22- نظام الERP للمنشأة يعزز الوعي لدى الأفراد	
❑	❑	❑	❑	❑	❑	❑	❑	23- نظام الERP للمنشأة يعزز جودة صنع القرار	
❑	❑	❑	❑	❑	❑	❑	❑	24- نظام الERP للمنشأة يقلل الوقت اللازم للمهام والواجبات الفردية	
❑	❑	❑	❑	❑	❑	❑	❑	26- نظام الERP للمنشأة أدى إلى خفض التكاليف للمنشأة	الاداء من الناحية المالية
❑	❑	❑	❑	❑	❑	❑	❑	27- نظام الERP للمنشأة أدى الى تخفيض تكاليف الموظفين	
❑	❑	❑	❑	❑	❑	❑	❑	28- نظام الERP للمنشأة أدى إلى تقليل التكاليف بشكل عام	
❑	❑	❑	❑	❑	❑	❑	❑	30- نظام الERP للمنشأة أدى إلى تحسين النتائج و المخرجات	
❑	❑	❑	❑	❑	❑	❑	❑	33- نظام الERP للمنشأة أدى إلى دعم الحكومة و التجارة الالكترونية (E-Government, E-Business)	

الجزء الثالث: قياس اثر المتغيرات المحتمله

هيكل المنظمة

3.1- إلى أي مدى توافق على العبارات التالية والتي تعكس هيكل المنظمة.

لا أعلم	غير موافق بشدة	غير موافق	الى حد ما غير موافق	محايد	الى حد ما موافق	موافق	موافق بشدة	يرجى اختيار الخيار المناسب امام كل جمله، علماً بأن الخيارات تندرج من (7) وتعني موافق بشدة الى (1) وتعني غير موافق بشدة. يرجى الاجابة على كل عبارة على حدى	
0	1	2	3	4	5	6	7		
❑	❑	❑	❑	❑	❑	❑	❑	تمتلك المنشأة خاصية التنويع في التخصصات المهنية.	1
❑	❑	❑	❑	❑	❑	❑	❑	هناك وصف لكل عمل من الاعمال.	2
❑	❑	❑	❑	❑	❑	❑	❑	يشارك الموظفون في قرارات الشركة.	3
❑	❑	❑	❑	❑	❑	❑	❑	تربط المشرفين مع الموظفين علاقة صداقة.	4

Appendices

استراتيجية المنظمة

2.3- إلى أي مدى توافق على العبارات التالية والتي تعكس استراتيجية المنظمة.

	موافق بشدة	موافق	الى حد ما موافق	محايد	الى حد ما غير موافق	غير موافق	غير موافق بشدة	يرجى اختيار الخيار المناسب امام كل جمله، علماً بأن الخيارات تندرج من (7) وتعني موافق بشدة الى (1) وتعني غير موافق بشدة. يرجى الاجابة على كل عبارة على حدى
	7	6	5	4	3	2	1	0
1	❑	❑	❑	❑	❑	❑	❑	رؤوية المنشأة ونشاطها تدعم تطوير المنتجات او الخدمات الجديدة.
2	❑	❑	❑	❑	❑	❑	❑	تعتبر المنشأة من المنشآت المتقدمة في قطاعها من ناحية التجديد في المنتجات/الخدمات.
3	❑	❑	❑	❑	❑	❑	❑	تستجيب المنشأة بسرعة للفرص عند أول إشارة لبوادر حدوثها (في بيئتها).
4	❑	❑	❑	❑	❑	❑	❑	كثيرا ما يؤدي نشاط المنشأة إلى فتح باب على جولة جديدة من النشاطات التنافسية في قطاعها.
5	❑	❑	❑	❑	❑	❑	❑	تقوم المنشأة بالتشجيع على التخطيط بعيد المدى والتركيز على رؤية بعيدة المدى في جميع القرارات.
6	❑	❑	❑	❑	❑	❑	❑	تقوم المنشأة بشكل عام بالمشاركة في مشروعات محفوفة بالمخاطر وهذا ضمن حدود رؤيتها.

حجم المنظمة

3.3- ماهو اجمالي اصول المنشأة ؟

❑ 51-250 مليون ريال سعودي

❑ أقل من 50 مليون ريال سعودي

❑ 701 – 1000 مليون ريال سعودي

❑ 251-700 مليون ريال سعودي

❑ أكثر من 1001 مليون ريال سعودي

Appendices

ثقافة المنظمة

3.4- إلى أي مدى توافق على العبارات التالية والتي تعكس ثقافة المنظمة.

	لا أعلم	غير موافق بشدة	غير موافق	الى حد ما غير موافق	محايد	الى حد ما موافق	موافق	موافق بشدة	يرجى اختيار الخيار المناسب امام كل جمله، علماً بأن الخيارات تندرج من (7) وتعني موافق بشدة الى (1) وتعني غير موافق بشدة. يرجى الاجابة على كل عبارة على حدى	
	0	1	2	3	4	5	6	7		
	❏	❏	❏	❏	❏	❏	❏	❏	يفضل الموظفون العمل في المشاريع الجماعية.	1-التوجيه للتعاون
	❏	❏	❏	❏	❏	❏	❏	❏	يرغب الموظفون بتبادل المعلومات فيما بينهم.	
	❏	❏	❏	❏	❏	❏	❏	❏	تشجع المنشأة موظفيها على أن لا يكونو مقيدين في التفكير وأحراراً في خلق الوسائل للقيام بعملهم.	2-التنسيق المركزية المراقبة
	❏	❏	❏	❏	❏	❏	❏	❏	مـن الصـعب الوصـول إلـى المـوظفين أو المـوارد، السلطة هنا مركزية	

التصور من عدم الاستقرار البيئي

3.5- إلى أي مدى توافق على العبارات التالية والتي تعكس عدم الاستقرار البيئي.

	لا أعلم	غير موافق بشدة	غير موافق	الى حد ما غير موافق	محايد	الى حد ما موافق	موافق	موافق بشدة	يرجى اختيار الخيار المناسب امام كل جمله، علماً بأن الخيارات تندرج من (7) وتعني موافق بشدة الى (1) وتعني غير موافق بشدة. يرجى الاجابة على كل عبارة على حدى	
	0	1	2	3	4	5	6	7		
	❏	❏	❏	❏	❏	❏	❏	❏	يصعب التنبؤ بعلاقة المنشأة مع موردي المواد الخام.	1
	❏	❏	❏	❏	❏	❏	❏	❏	يصعب التنبؤ بأنشطة الشركات المنافسة.	2
	❏	❏	❏	❏	❏	❏	❏	❏	يصعب التنبؤ بطلب عملاء المنشأة من المنتجات الحالية والجديدة.	3
	❏	❏	❏	❏	❏	❏	❏	❏	يصعب التنبؤ بعلاقة المنشأة مع المورد المالي ونسبة الفائدة.	4
	❏	❏	❏	❏	❏	❏	❏	❏	يصعب التنبؤ بالتغيرات في القوانين واللوائح الحكومية.	5
	❏	❏	❏	❏	❏	❏	❏	❏	يصعب التنبؤ بالتغيرات المتعلقة بالمنتجـات و تكنولوجيا المعلومـات (IT).	6

دعم الادارة

3.6- إلى أي مدى توافق على العبارات التالية والتي تعكس الدعم الاداري.

لا اعلم	غير موافق بشدة	غير موافق	الى حد ما غير موافق	محايد	الى حد ما موافق	موافق	موافق بشدة	يرجى اختيار الخيار المناسب امام كل جمله، علماً بأن الخيارات تندرج من (7) وتعني موافق بشدة الى (1) وتعني غير موافق بشدة. يرجى الاجابة على كل عبارة على حدى	
0	1	2	3	4	5	6	7		
❑	❑	❑	❑	❑	❑	❑	❑	تدعم الإدارة العليا البحث والتطور والتجديد.	1
❑	❑	❑	❑	❑	❑	❑	❑	تميل الإدارة العليا الى المخاطرة.	2
❑	❑	❑	❑	❑	❑	❑	❑	تدعم الإدارة العليا توفير جميع الموارد الضرورية.	3
❑	❑	❑	❑	❑	❑	❑	❑	تشارك الإدارة العليا الموظفين في مجال التخطيط الاستراتيجي و التوجيه التقني.	4
❑	❑	❑	❑	❑	❑	❑	❑	توفر الإدارة العليا للموظفين التوجيه والتحفيز الكافي.	5
❑	❑	❑	❑	❑	❑	❑	❑	تفضل الإدارة العليا تفويض المهام والأعمال إلى الآخرين.	6

العلامة التجارية لنظام ERP

3.7- أي نوع من برمجيات او أنظمة ERP يستخدم من قبل المنشأة ؟

SAP ❑   Oracle ❑

PeopleSoft ❑   أخرى، الرجاء ذكرها...........................❑

نضج نظام تخطيط الموارد المؤسسية

3.8- متى تم تطبيق نظام ERP في المنشأة ؟

❑ أقل من سنة   ❑مابين سنة الى سنتين

❑بين 3 سنوات الى 5 سنوات   ❑بين 6 سنوات الى 8 سنوات

❑أكثر من 9 سنوات

Appendices

9.3ـ أشر الى موافقتك من عدم موافقتك على العوامل التالية:

0	1	2	3	4	5	6	7	يرجى اختيار الخيار المناسب امام كل جمله، علماً بأن الخيارات تندرج من (7) وتعني موافق بشدة الى (1) وتعني غير موافق بشدة. يرجى الاجابة على كل عبارة على حدى	
لا أعلم	غير موافق بشدة	غير موافق	الى حد ما غير موافق	محايد	الى حد ما موافق	موافق	موافق بشدة		
❑	❑	❑	❑	❑	❑	❑	❑	زاد عدد مستخدمي نظام ERP في المنشأة بشكل سريع منذ تطبيقه.	1
❑	❑	❑	❑	❑	❑	❑	❑	إن التطبيقات التابعه لنظام ERP المستخدمة في المنشأة يرضي متطلباتها.	2
❑	❑	❑	❑	❑	❑	❑	❑	نحن راضون عن عمليات ومعايير الرقابة لموارد نظام ERP في المنشأة	3
❑	❑	❑	❑	❑	❑	❑	❑	ميزانية مشروع نظام ERP وموارده آخذة في التناقص منذ تطبيقه بسبب انخفاض المشاكل.	4
❑	❑	❑	❑	❑	❑	❑	❑	مسؤولية تشغيل نظام ERP في المنشأة انتقل من قسم الدعم الفني للنظام إلى المستخدمين في الاقسام	5
❑	❑	❑	❑	❑	❑	❑	❑	لقد زادت الرقابة على أنشطة معالجة البيانات التقليدية بشكل محكم منذ تطبيق النظام.	6

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<u>**الجزء الرابع:**</u> البيانات الديموغرافيه

1.4- من أي تصنيف تندرج منشأتكم ؟

❑ شراكة (Partnership) ❑ ملكية فردية (Sole Trader)

❑ شركة عامة محدودة ❑ شركة خاصة محدودة

❑ أخرى، الرجاء ذكرها.....................

2.4- الخلفية التعليمية والدورات التدريبية ذات الصلة (بامكانك ان تختار اكثر من واحدة).

❑ درجة البكالوريوس في إدارة الأعمال ❑ درجة البكالوريوس في المحاسبة و/أو المالية

❑ درجه علمية أو دورة تدريبية في إدارة المخاطر ❑ درجه علمية أو دورات تدريبية في نظام المعلومات

❑ أخرى، الرجاء ذكرها.....................

3.4- ماهي وظيفتك الحالية في الشركة (بامكانك ان تختار اكثر من واحدة)؟

❑ مدير قسم الرقابة الداخلية ❑ مدير قسم المحاسبة

❑ أخرى، الرجاء ذكرها..................... ❑ مدير قسم إدارة المخاطر

4.4- إذا كانت لديك الرغبة في الحصول على نسخة من نتائج هذه الدراسة ، يرجى استكمال المعلومات التالية:

➕ الاسم: ....
➕ البريد الالكتروني:.....................
➕ اسم الشركة:.....................

هذا ولكم جزيل الشكر والتقدير على وقتكم ،،،

Appendix 5: Ethic Documents

5.1 Letter from King Faisal University

KINGDOM OF SAUDI ARABIA
Ministry of Higher Education
KING FAISAL UNIVERSITY
College of Applied Studies & Community Service

المملكة العربية السعودية
وزارة التعليم العالي
جامعة الملك فيصل
كلية الدراسات التطبيقية وخدمة المجتمع

الرقم: التاريخ: ٨/٤/١٤٣٣م   المرفقات:

السادة شركة /   المحترمين

السلام عليكم ورحمة الله وبركاته وبعد ،،،

أهدي اليكم أطيب التحيات، وأفيد سعادتكم بان المحاضر المبتعث هاني بن خالد شيتي احد منسوبي قسم المحاسبة بجامعة الملك فيصل وهو في مرحله دراسة درجة الدكتوراه في المحاسبة وهو بحاجه الى بعض المعلومات المتعلقة بموضوع بحثه،

آمل من سعادتكم مساعدة المبتعث هاني مع تأكيدنا ان المعلومات التي سيزود بها سوف تستخدم فقط للغرض البحثي وان معلومات الشركة الشخصية سوف تكون سرية ولن يشار اليها في البحث، شاكراً حسن تعاونكم سلفاً.

وتقبلو فائق تحياتي وتقديري ،،،

رئيس قسم المحاسبة

د/ عدنان بن عبدالله الملحم

مطابع جامعة الملك فيصل 2659

الأحساء ـ ص.ب ٥٥١٣٠ تلفون ٥٨٠١٨١٤ أو ٥٨٠٦٩٦٥ أو ٥٨٠٠٠٠٠ تحويلة: ٢٦ فاكس ٥٨٨٦٨٨٣ البريد الاكتروني: commall@kfu.edu.sa
Al-Ahsa. P.O. Box 55130 Tel: 5801814, 5806965, 5800000 Ext: 26 Fax 5886883 e-mail: commall@kfu.edu.sa

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Appendices

5.2 Email to the to the director of human resource department

سعادة الاستاذ المحترم

السلام عليكم ورحمة الله وبركاته وبعد،،،

اهدي اليكم اطيب الامنيات، أنا المحاضر هاني بن خالد شيتي (جامعه الملك فيصل)، أقوم بالوقت الحاضر بتحضير رسالة درجة الدكتوراه (جامعه بيدفوردشير).

لايخفى على سعادتكم أهمية البحث العلمي في تطوير البلدان والشعوب فالدول العظمى مثل الولايات الامريكية المتحدة و المملكة المتحدة لهما مثالين على ذلك، لذلك هدفت في دراستي لمرحلة الدكتوراه ان ابحث في احد المواضيع التي تهم الشركات وقطاع الاعمال في مملكتنا الغالية.

يهدف بحثي هذا الى دراسة العلاقة بين نظام التخطيط المؤسسي (ERP) وبين اجراءات الرقابة الداخلية و اثر بعض العوامل على هذه العلاقة. لذلك ارفق مع هذا الايميل استبيان امل من سعادتكم مساعدتي في تعبئته من قبل المدير المالي او مدير المراجعه الداخليه ليتسنى لى قياس هذه العلاقه.

هذا ولكم جزيل الشكر والتقدير،،،

مع خالص شكري وتقديري

هاني خالد شيتي

Dear Sir

Thank you for your concern; I am Hani Shaiti a lecturer at King Faisal University and a PhD student at University of Bedfordshire (UK).

 You know the important of the research especially for less developed countries (e.g. SA), therefore, I aimed in my research to focus on a topic which is important for these countries. The research aims to study the relationship between the Enterprise Resource Planning system (ERP) and the internal control procedures and the impact of other factors on this relationship. Therefore, I have attached the questionnaire which I hopeFinancial Manager or the Internal Auditing has the time to fill help me.

Thank you again for your time and I wish you the best.

Kind regards

Hani Shaiti

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Appendix 6: SEM

6.1 CB-SEM versus PLS-SEM versus OLS regression

Criteria	CB-SEM	PLS-SEM	OLS regression
Objective of overall analysis	Show that the null hypothesis of the proposed model is plausible, while rejecting path-specific null hypotheses of no effect	Reject a set of path-specific null hypotheses of no effect	Reject a set of path-specific null hypotheses of no effect
Objective of variance analysis	Overall model fit to the data, as represented by various fit indexes	Variance explained (e.g. high R2)	Variance explained (e.g. high R2)
Estimation technique Type of maximization	Maximum likelihood (ML) most widely used Maximizes the reproduction of the covariance among the variables	Ordinary least squares Maximizes the prediction of the original raw scores	Ordinary least squares Maximizes the prediction of the original raw scores
Construct specification	Supports the use of reflective and formative measures for constructs	Supports the use of reflective and formative measures for constructs	Measures are aggregated using a summated scale, index, or other weighting schemes
Dependent variables	Supports multiple dependent variables within a model	Supports multiple dependent variables within a model	Only one dependent variable can be assessed at a time
Mediation tests	Mediating variables are tested as part of the comprehensive model	Mediating variables are tested as part of the comprehensive model	Separate multi-step process for testing for mediators, e.g. Baron and Kenny, 1986.
Moderation tests	Typically performed using a product indicator approach (the moderator is a construct with measures derived from across multiplication of the measures of the latent variables) or by analysis of groups if the moderator is categorical (Sauer and Dick, 1993)	Possible to perform using either the product indicator approach or product of sums approach (moderating construct derived using the sum of the measures from one construct multiplied by the sum of the measures in the second construct). Best results when using the product of	Often performed using product of sums approach (moderator term calculated using the sum of the measures from one construct multiplied by the sum of the measures in the second construct).

		sums approach (Goodhue et al., 2007).	
Assumptions	Typically multivariate normal distribution and independent observations (parametric)	Nonparametric	Typically multivariate normal distribution and independent observations (parametric)
Data sources	Primary data	Primary or secondary data	Primary or secondary data
Sample size	Small samples may not converge, yet large samples may introduce bias in goodness-of-fit statistics	Large samples do not bias statistics.	Large samples do not bias statistics.
e.g. software	LISREL, EQS, AMOS	SmartPLS, PLS-Graph	SPSS, SAS, Excel

Source: Lee et al., 2011 from Gefen et al., 2000; Chin and Newsted, 1999

6.2 The Normality test for the ICPs and success of ERP system

H0= normality

If you accept, then assume normality

If you reject, then do not assume normality

If p> 0.05 then accept the H0 because the test is not significant

If p < 0.05 then reject the H0 because the test is significant

	Tests of Normality for ICPs					
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
M	.275	110	.000	.859	110	.000
InfCO	.268	110	.000	.849	110	.000
CA	.252	110	.000	.839	110	.000
RA	.233	110	.000	.880	110	.000
IE	.302	110	.000	.744	110	.000

	Tests of Normality for ERP system success					
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
SQ	.286	110	.000	.829	110	.000
IQ	.336	110	.000	.760	110	.000
IndIm	.286	110	.000	.803	110	.000
OI	.219	110	.000	.894	110	.000

a. Lilliefors Significance Correction

Appendix 7: Data examination

7.1: Univariate Outliers

	N	Min.	Max.		N	Min.	Max.
1IE	100	-3.43255	.79213	1IQ	108	-4.65195	1.03572
2 IE	104	-3.63386	.83858	2IQ	108	-5.49672	1.05084
3 IE	105	-3.40816	.75297	3IQ	108	-4.91327	1.03776
4 IE	101	-3.07951	1.04922	4IQ	108	-4.98109	1.09753
1OS	107	-3.64446	1.07657	5IQ	108	-3.99505	1.14144
2OS	108	-4.09430	.82980	6IQ	108	-4.07564	1.12321
3OS	101	-3.62638	1.16139	1Indim	107	-3.40956	1.29783
1EI	107	-3.84520	1.06259	2Indim	107	-3.66154	1.27693
2EI	107	-3.44220	1.10490	3Indim	108	-4.06195	1.12965
3EI	107	-3.21111	1.26076	4Indim	108	-4.25310	1.03675
1RA	107	-3.21787	1.17760	1OI	107	-2.95452	1.16896
2RA	107	-2.87431	1.11986	2OI	107	-2.69526	1.31020
3RA	106	-3.29862	1.22276	3OI	108	-2.75102	1.27304
4RA	107	-3.22438	1.19881	4OI	107	-3.59759	1.13530
1RR	105	-3.55262	1.13952	5OI	108	-3.78909	1.20142
2RR	104	-3.27504	1.20659	1Structure	107	-4.15550	.94552
3RR	107	-3.11454	1.15797	2Structure	106	-3.23790	.97336
1CA	106	-3.38773	1.13873	3Structure	106	-2.20423	1.48495
2CA	108	-2.93393	1.10256	4Structure	107	-3.45829	1.09135
3CA	108	-4.25367	.95687	1Strategy	108	-4.18547	.96099
4CA	106	-2.77892	.91856	2Strategy	107	-3.23503	.95563
5CA	108	-4.35908	.93059	3Strategy	107	-2.78580	.99695
1Inf&Co	108	-3.50888	.91047	4Strategy	105	-2.91973	1.26841
2Inf&Co	105	-3.45668	1.01316	5Strategy	107	-3.02095	.97792
3Inf&Co	106	-3.89809	1.15323	6Strategy	100	-2.35238	1.52517
4Inf&Co	107	-3.16963	1.05918	Size	108	-1.93762	.96881
1M	108	-3.10535	1.18337	1Culture	108	-2.69689	1.27129
2M	105	-3.41170	1.15754	2Culture	108	-2.96619	1.19418
3M	107	-4.01064	1.00852	3 Culture	108	-2.13488	1.30642
4M	105	-4.04567	.99143	4 Culture	105	-1.75254	1.96497
1SQ	108	-4.25696	1.10979	5Culture	106	-3.69375	.98598
2SQ	108	-4.02270	1.14934	6 Culture	106	-3.08548	1.12922
3SQ	108	-4.00768	1.13485	1MS	108	-3.13811	.96996
4SQ	108	-4.44707	.93929	2MS	105	-2.01383	1.69586
5SQ	106	-3.12939	1.11430	3MS	108	-3.98499	1.02913
6SQ	104	-3.28870	1.37528	4MS	108	-2.44778	1.28437
7SQ	100	-2.56713	1.30292	5MS	108	-2.69827	1.07814
8SQ	105	-3.55282	1.05269	6MS	104	-2.60965	1.23097
1SerQ	103	-3.08464	1.16103	ERP Brand	108	-.82374	1.74960
2 SerQ	102	-3.24095	1.20627	Age	108	-1.89241	1.05893
3 SerQ	101	-3.18361	1.24132	1Maturity	104	-2.72435	1.16758
4 SerQ	99	-3.53054	1.34653	2Maturity	108	-3.50864	1.51034
5 SerQ	100	-3.04272	1.26301	3Maturity	108	-3.53181	1.52032
				4Maturity	98	-2.65442	1.58688

Appendix 8: Assessing the study measurement

8.1 EFA of the EICP for the first order latent variables (components)

Communalities

	Initial	Extraction
2Internal environment	1.000	.644
3Internal environment	1.000	.746
6Internal environment	1.000	.705
1Objective setting	1.000	.615
2Objective setting	1.000	.672
3Objective setting	1.000	.756
1Event Identification	1.000	.786
2Event Identification	1.000	.835
3Event Identification	1.000	.680
4Event Identification	1.000	.694
1Risk assessment	1.000	.789
2Risk assessment	1.000	.866
3Risk assessment	1.000	.865
1Risk response	1.000	.716
2Risk response	1.000	.838
3Risk response	1.000	.799
2Control Activities	1.000	.790
3Control Activities	1.000	.893
5Control Activities	1.000	.836
2Information&communication	1.000	.855
3Information&communication	1.000	.874
4Information&communication	1.000	.878
2Monitoring	1.000	.823
3Monitoring	1.000	.797
4Monitoring	1.000	.699
4Risk assessment	1.000	.818

Extraction Method: Principal Component
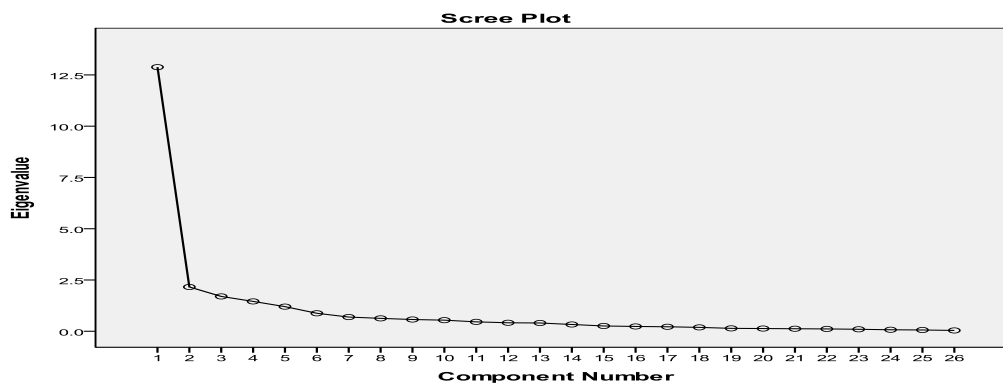
Rotated Component Matrix

	Component					
	1	2	3	4	5	6
2Event Identification	.857					
1Event Identification	.818					
4Event Identification	.711					
3Objective setting	.701					
2Risk response	.690					
3Risk response	.687					
3Event Identification	.630					
2Objective setting	.625					
1Objective setting	.623					
1Risk response	.617					
2Risk assessment		.851				
3Risk assessment		.823				
4Risk assessment		.755				
1Risk assessment		.740				
3Information&communication			.838			
2Information&communication			.832			
4Information&communication			.805			
3Control Activities				.826		
5Control Activities				.795		
2Control Activities				.739		
4Monitoring					.707	
3Monitoring					.661	
2Monitoring			.501		.661	
3Internal environment						.821
2Internal environment						.686
6Internal environment						.633

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax.

- **Results of second round**

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.808
Bartlett's Test of Sphericity	Approx. Chi-Square	220.695
	df	10
	Sig.	.000

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.117	62.347	62.347	3.117	62.347	62.347
2	.720	14.406	76.753			
3	.490	9.795	86.549			
4	.392	7.831	94.380			
5	.281	5.620	100.000			

Extraction Method: Principal Component Analysis.

8.2 CFA of the EICP

	Age	Brand	EICPs	ERPs	MS	Mat	Size	Str.	Coll.	Coo.	Dec	For.	team-based
Msum	0	0	0.7684	0	0	0	0	0	0	0	0	0	0
CAsum	0	0	0.804	0	0	0	0	0	0	0	0	0	0
IEsum	0	0	0.7033	0	0	0	0	0	0	0	0	0	0
IQsum	0	0	0	0.8788	0	0	0	0	0	0	0	0	0
RAsum	0	0	0.7691	0	0	0	0	0	0	0	0	0	0
SQsum	0	0	0	0.8815	0	0	0	0	0	0	0	0	0
OImsum	0	0	0	0.8042	0	0	0	0	0	0	0	0	0
Brand1	0	1	0	0	0	0	0	0	0	0	0	0	0
Culture1	0	0	0	0	0	0	0	0	0.933	0	0	0	0
Culture2	0	0	0	0	0	0	0	0	0.928	0	0	0	0
Culture3	0	0	0	0	0	0	0	0	0	0.862	0	0	0
Culture6	0	0	0	0	0	0	0	0	0	0.836	0	0	0
EIsum	0	0	0.6529	0	0	0	0	0	0	0	0	0	0
INDimsum	0	0	0	0.8825	0	0	0	0	0	0	0	0	0
InfCosum	0	0	0.7542	0	0	0	0	0	0	0	0	0	0
MS1	0	0	0	0	0.8652	0	0	0	0	0	0	0	0
MS3	0	0	0	0	0.8474	0	0	0	0	0	0	0	0
MS4	0	0	0	0	0.8895	0	0	0	0	0	0	0	0
MS5	0	0	0	0	0.8768	0	0	0	0	0	0	0	0
Maturity year	1	0	0	0	0	0	0	0	0	0	0	0	0
Maturity2	0	0	0	0	0	0.8724	0	0	0	0	0	0	0
Maturity3	0	0	0	0	0	0.8689	0	0	0	0	0	0	0
Maturity4	0	0	0	0	0	0.7884	0	0	0	0	0	0	0
Maturity6	0	0	0	0	0	0.7722	0	0	0	0	0	0	0
OSsum	0	0	0.4394	0	0	0	0	0	0	0	0	0	0
RRsum	0	0	0.6737	0	0	0	0	0	0	0	0	0	0
Size1	0	0	0	0	0	0	1	0	0	0	0	0	0
Strategy1	0	0	0	0	0	0	0	0.7405	0	0	0	0	0
Strategy2	0	0	0	0	0	0	0	0.8843	0	0	0	0	0
Strategy3	0	0	0	0	0	0	0	0.9029	0	0	0	0	0
Strategy4	0	0	0	0	0	0	0	0.8062	0	0	0	0	0
Strategy5	0	0	0	0	0	0	0	0.8628	0	0	0	0	0
Structure1	0	0	0	0	0	0	0	0	0	0	0	0.8062	0
Structure2	0	0	0	0	0	0	0	0	0	0	0	0.929	0
Structure3	0	0	0	0	0	0	0	0	0	0	1	0	0
Structure4	0	0	0	0	0	0	0	0	0	0	0	0	1