Evaluating Stakeholders Performance of ERP Systems in Saudi Arabia Higher Education

Submitted in fulfilment of the requirement for the degree of Doctor of Philosophy

BY

MONA ALTHONAYAN

DEPARTMENT OF INFORMATION SYSTEMS AND COMPUTING

BRUNEL UNIVERSITY

MARCH 2013

ABSTRACT

Enterprise resource planning (ERP) systems are complex and comprehensive software packages designed to integrate business processes and functions. Despite the difficulties and risks of implementing such a system, the last decade has seen a remarkable global diffusion of such systems. To cope with technical developments, the Saudi Arabian government is starting to implement them in both private and public organisations, including the higher education (HE). HE in Saudi Arabia applies integrated solutions to replace existing systems, supporting all its business functions and improving effectiveness and efficiency.

Evaluating the impact of ERP adoption on stakeholders' performance is complex and no single existing model was considered adequate. To overcome their various weaknesses, this study integrates three models (Task Technology Fit, the Information Systems Success Model and End User Computing Satisfaction) to produce a new model which offers a comprehensive view of the most important factors affecting stakeholders' performance. This integration results in a theoretical framework that is used as model for empirical investigations of the impact of ERP systems on HE stakeholders. The aim of this research is to assess the impact of ERP systems on Saudi academic institutions, focusing on stakeholders' post-implementation performance. Three case studies are examined, using mixed methods of interviews and questionnaires to collect quantitative and qualitative data. SPSS 20 and analytical techniques were undertaken to analyse case studies data.

While the results varied according to the circumstances of each case, the overall quantitative findings were that there were six significant factors in the system quality dimension (timeliness, flexibility, ease of use, content, currency and authorisation) and two (reliability and responsiveness) in the service quality dimension. These results were consistent with those of the qualitative phase, which identified a number of other factors having a significant impact on stakeholder performance: resistance to change, continuous training and education, appropriate systems customisation and top management support. In general, it was found that ERP systems had a significant of positive and negative nature impact on HE stakeholders' performance and productivity in Saudi Arabia.

DECLARATION

I Mona Althonayan declare that this research, its idea, analysis, findings and conclusions that are included in this PhD dissertation are entirely developed by me for the purpose of this program only and have not been submitted for another qualification.

DEDICATION

This thesis is dedicated, with deepest love and everlasting respect, to my parents

Without your prayers, support and encouragement

I could not have reached this stage

رساله شكر وحب وعرفان إلى من بالحب غمروني وبجميل السجايا ادبوني

إلى أبي الغالي... وامي الحنون...

إلى من اوصاني ربي بطاعتهما والإحسان اليهما

انتم سر السعادة لقلبي... حبكما في قلبي كملىء الارض بما يطاول عنان السماء.

إلى سبب نجاحي وسعادتي في الدنيا والاخرة

أهدي لكم رسالتي هذه وادعو ربي ان يحفظكما ويرزقكما الفردوس الاعلى

منى

ACKNOWLEDGEMENTS

First of all, all thanks and gratitude go to Almighty **ALLAH** for guiding and inspiring me during this research process.

The completion of this research would not have been possible without the help, support and prayers of many individuals, to whom I owe a great deal of thanks.

I wish to express my deepest appreciation to my supervisor, Dr Anastasia Papazafeiropoulou, who supported me throughout my PhD. The accomplishment of this investigation was only possible with her valuable expertise, knowledge and considerate guidance, without which I could not possibly have finished this work.

I would like to express my deep appreciation and gratitude to the managers of Saudi Arabian universities, especially the KSU MADAR systems managers, Professor Abduallah Al-Mudimigh and Mr Yahya Abdahem, who supported me from the beginning and offered me help, advice and information when I needed it. Also many thanks to KFUPM manager Mr Iftikar Nadeem, who helped me through the data collection.

I am appreciative of academic members, administrative staff and colleagues at the Brunel Information System School for all their support during my PhD programme.

I would like to offer deep thanks to all my friends, for their understanding, support, prayers and true and honest feelings.

I mainly want to express my acknowledgements to my entire family (my brothers and sisters) for their unwavering love, prayers and support.

Last but not least, I can't fully express the gratitude and appreciation that I owe to my precious family, my husband Dr Abraham and my children, Yasmin, Juri, Majed and Saif, for their invaluable and unconditional love, their endless encouragement, psychological support and patient understanding during the years of my research, which made me stronger.

Thank you all.

TABLE OF CONTENTS

CHAPTER 1: INTRODUCTION

CHAPTER 2: LITERATURE REVIEW

PAGE

CHAPTER 3: RESEARCH THEORETICAL MODEL

PAGE

CHAPTER 4: *RESEARCH METHODOLOGY*

PAGE

CHAPTER 5: *CASE STUDIES AND RESULTS OF QUANTITATIVE PHASE*

PAGE

CHAPTER 6: *CASE STUDIES' QUALITATIVE ANALYSIS*

PAGE

CHAPTER 7: DISCUSSION

PAGE

CHAPTER 8: CONCLUSIONS

PAGE

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

BSC	Balanced Scorecard
CBA	Cost Benefit Analysis
D&M	DeLong and McLean
ERP	Enterprise Resource Planning
EUCS	End User Computing Satisfaction
HE	Higher Education
IS	Information System
IT	Information Technology
KFU	King Faisal University
KFU of P&M	King Fahd University of Petroleum and Minerals
KSA	Kingdom of Saudi Arabia
KSU	King Saud University
MIS	Management Information Systems
MRP	Material Requirements Planning
ROI	Return on Investment
ROM	Return on Management
MOMC	Multi-Objective, Multi-Criteria
SCM	Supply Chain Management
TAM	Technology Acceptance Model
TQM	Total Quality Management
TTF	Task Technology Fit
VOI	Value on Investment

PUBLICATIONS

1- Althonayan, M., Papazafeiropoulou, A. (2011) Evaluating the Performance of ERP Systems in Saudi Arabian Higher Education: A Stakeholders' Perspective. *Proceedings of the 2nd International Conference on Information Management and Evaluation (ICIME 11)*, April 27-28, pp. 473-82.

2- Althonayan, M., Papazafeiropoulou, A. (2013) Evaluating the Performance on ERP systems in King Saud University (KSU): A Stakeholders' Perspective. *Proceedings of the46 Hawaii International Conference (HICSS),* January 7-10

CHAPTER ONE

INTRODUCTION

PAGE

1.1 Overview

Enterprise resource planning (ERP) systems are complex and comprehensive software packages designed to integrate business processes and functions (Chen and Lin, 2008). Despite the difficulties and risk involved in their adoption, their use is expanding rapidly. Many organisations are adopting ERP systems for different reasons, including legacy systems replacement, cost reductions and faster information transactions (Ifinedo and Nahar, 2006).

Unsurprisingly, universities and academic institutions are seeking to improve and develop their functions by adopting technically advanced measures such as ERP systems and have invested heavily in the development of infrastructure to enhance the application of information technology (IT) in their educational policies and procedures (Rabaa`i, Bandara, and Gable 2009a). Many academic institutions have spent considerable time and money in implementing sophisticated IT systems without following a systematic approach to measure their return on investment. In the case of higher education, ERP systems affect many aspects of both internal and external operations, and their successful deployment and use are critical to universities' performance (Swartez and Origall, 2000).

However, higher education is facing serious challenges in implementing new technology such as ERP systems. Meeting stakeholders' expectations in higher education is one of those challenges, which relates to the unique organizational context of universities. According to Pollock and Cornford (2004), the uniqueness of universities is based on a combination of different characteristics, which, according to Lockwood (1985), include: complexity of purpose; limited measurability of outputs; both autonomy from and dependency on wider society; diffuse structure and authority; and internal fragmentation. These characteristics are fundamental to the implementation of ERP systems in the educational sector.

ERP system designers consider priorities and expectations on one hand, and different stakeholders react differently to the new system on the other, by welcoming, rejecting or adopting the new system in their organization (Boonstra, 2006). This interaction between the systems and humans could act as an indicator to evaluate the post-implementation performance.

Albeit the post-implementation effectiveness of ERP systems is an essential indicator of success, organizations do not discuss whether an ERP system is needed; instead, they focus on how to establish an effective one (Son Yu, 2005). From this viewpoint, ERP post-implementation effectiveness in higher education can be explained by studying the stakeholders' performance and whether the newly adopted systems meet their needs and expectations.

1.2 ERP Systems in Higher Education

ERP systems are used by large corporations around the world, recently replacing management and administration computer systems in the higher education sectors (Rabaa`I, Bandara, and Gable 2009a). ERP has played a significant role in the IT management of higher education. It is important to define ERP systems in higher education as being multiple in scopes, tracking a range of activities including those of human resource systems, student information systems and financial systems (Robert, 2004).

Higher education has always been a sector that proactively adopts advances in technology, particularly IT (Rabaa`i Bandara, and Gable 2009a). One of the prominent trends is the adaptation of the ERP application software (Pollock and Cornford, 2004). Previous studies have identified many similarities between implementing ERP system software in educational institutes and in other organisations (Pollock and Cornford, 2004). It is therefore important to study the implications of using ERP systems in higher education and the necessary information required to avoid the problems caused by legacy systems, in order to address the role of ERP in changing educational organisations and the implications of its use in similar organizational cultures.

Chae and Poole (2005) describe the importance of IT and the role of organizational leadership in its adoption in the education system in terms of "*the value system and long term investment not only financially but also in resources considered as one of the main differences between higher education and other business organisations*". Moreover, "*leadership in the universities' management is based on sharing of ideas and decision making procedures between staff and administrators*" (Okunoye and Folick, 2006). This uniqueness in the applied system is based upon different combinations of certain characteristics, which Okunoye and Folick (2006) identify as: "*complexity of purpose, limited measurability outputs, both autonomy and dependency from wider society, diffused structure of authority, and internal fragmentation*".

Pollock and Cornford (2004) state that ERP in higher education comprises a large, complex database which has all the relevant information on the status of staff members, students, building operations or infrastructure, equipment, documents and financial transactions. The unique situation of universities encourages many companies to produce software dealing with specific functions of universities, such as finance, human resources and project management for keeping and maintaining students' records. While the proponents of ERP systems (e.g. Swartz and Orgill, 2000) have argued that there are many reasons to implement them, such as to improve information access and the effectiveness of workflow within and outside the organizations operating them, Bradley and Lee (2007) warn that universities have problems similar to those of various other organizations, in terms of coordinating resources, controlling costs and motivating and facilitating ERP amongst faculty and staff members.

ERP in higher education is under increasing pressure to function because any implementation project will involve the consideration of a wide variety of factors and stakeholders, including the university management, administrators and software vendors. ERP vendors have found the higher education context to be a lucrative and profitable market for their products in the process of modernizing back offices and administrative functions via integrated technology platforms (Wagner and Newell, 2004).

Rabaa`i (2009b) argues that the most important goal of ERP system implementation in higher education is to integrate different administrative functions into more systematic and cost-effective structures and so gain a strategic advantage, including in the fields of student administration, human resource management, facilities management and financial systems, when these have been supported separately in the legacy systems. The main advantages of ERP for higher education, according to Rabaa`i, Bandara, and Gable (2009a), are: (1) better access to information for planning and managing the institution; (2) improved service for the faculty, students and employees; (3) lower business risk and (4) increased income and decreased expenses due to improved efficiency.

Wagner and Newell (2004) assert that stakeholders are seen as a fundamental factor that distinguishes higher education institutions from other organizations, because each university will have multiple users of its ERP system, varying in terms of their backgrounds, goals, approaches to practice and epistemic culture. Another factor to consider when implementing ERP is the ease with which stakeholders will be able to use, control and improve the system.

1.2.1 ERP Stakeholders

All information system (IS) projects have stakeholders and it is important to define who they are. Boonstra (2009) defines stakeholders as "*any group or individual who can affect or is affected by the achievement of the organization's objectives*".

The individual or group of stakeholders will have different expectations, attitudes, levels of interest and degrees of power and influence (Flower and Gilfillan, 2003). Stakeholders play a significant role in the success of information systems and evidence has shown that failure by stakeholders in the development of an IS can lead directly to system failure (Blyth, 1999). As with any software project, stakeholders are required to make an active contribution, based on their analysis and communication of requirements, since they acquire significant knowledge of the organization and of the new system (Ballejos and Monagna, 2008).

In the higher education context, identifying the stakeholders is important because there is generally a lack of provision for their requirements (Wagner and Newell, 2004). Universities have varied ERP systems users, from different backgrounds, with different goals, education levels and ability to use the system. Seng and Leoid (2003) identify the stakeholders of ERP systems in higher education as government bodies, academic, administrative and support staff, industry and society. However, there is considerable disagreement on identifying all such groups in education. For instance, students are sometimes considered to be stakeholders, because of their participation in learning, whereas graduates are considered products of the education process.

Since any IS will influence many aspects of the organization, such as its strategic position, cost effectiveness, job satisfaction, security, customer satisfaction and commercial success, many parties around the IS can be considered stakeholders (Boonstra, 2009). ERP implementation projects will thus affect various groups, including managers, developers and users.

According to Fowler and Gilfillan (2003), the higher education sector has faced major challenges since ERP systems began to be implemented in universities and colleges; these include assessing the success and improvement of the project, which has two aspects: the product (what has been delivered) and the process (how it was delivered). While researchers such as Lyytinen and Blyth (1987) have argued for allowing stakeholders to be involved in systems development, to reduce the risk of failure, there is also a strong relationship between the improvement of the organisation's IT evaluation and the stakeholder's role during the setting up and successful operation of the system.

Indeed, there are two broad reasons for involving IT stakeholders in the evaluation phase. Khalifa et al. (2001) state that the assessment must take account of costs and advantages for both primary and secondary stakeholders, as the operations of ERP systems are primarily identified by the stakeholders in any organization planning to adopt them in the near future. Boonstra (2009) adds that the significance of the involvement of stakeholders in the evaluation phase is that it strengthens the link between the system and stakeholders, which would lead to systems' overall success in terms of quality of system, user satisfaction, user acceptance and system use. When managers agree on the involvement of the stakeholders in various stages of the project, the degree of this involvement will be crucial.

Stakeholders' satisfaction is considered to be one of the factors affecting the success of an ERP system and evaluating stakeholders' performance would provide evidence of the usefulness and success of any information system.

1.2.2 Evaluating the Performance of ERP Stakeholders

A large number of studies have evaluated various aspects of IS and ERP systems, including consulting, negotiation, productivity, business performance, consumer value, virtual process measurement and business value, some of them adopting acts-oriented and postmodern approaches (Adelakun and Jennex, 2002). However, few have evaluated the performance of ERP stakeholders and those who have done so have categorised this element under the umbrella of IS success factors, as a facet of user satisfaction.

According to Ballantine et al. (1996), Delone and Mclean (1992) have proposed a model of IS success measurement, based on the work of Shannon and Weaver (1949) and of Mason (1978). Their model recognises six dimensions on which to measure IS success: information quality, systems quality, information use, user satisfaction, individual impact and organizational impact. In 2003, Delone and Mclean updated the model by making a series of recommendations for the current and future measurement of IS success in e-commerce. The six dimensions of the updated model are: systems quality, information quality, service quality, users, user satisfaction and net benefits (Delone and Mclean, 2003).

The implementation of ERP systems differs from that of other IT systems in terms of its environment, which has technological, operational, managerial, strategic and organizational components. Therefore, a success measurement model designed for IT systems may not be applicable to evaluate ERP systems (Ifinedo and Nahar, 2007). For Gable, Sedera, and Chan (2003), the evaluation of ERP success should consider five dimensions: systems quality, information quality, individual impact, workgroup impact and organizational impact. These are based on the work of Delone and Mclean (1992) referred to above and of Myers (1997), who considers information quality to be the most important dimension, while organizational impact is rated lowest. The notion of ERP success for Myers (1997) refers to the use of the system to enhance organizational efficiency and effectiveness. Ifinedo and Nahar (2007) have since added vendor/consultant quality to the dimensions of the Gable, Sedera, and Chan (2003) model.

Stakeholders play an essential role in accomplishing the success of ERP systems and in evaluating the perceived benefits arising from their use. Moreover, user satisfaction is often used as an indicator of IS effectiveness (Somers et al., 2003). Several researchers have validated the measurement of stakeholders' perceptions in the context of ERP systems; for instance, Sedera and Gable (2004) identify four dimensions of such a measurement: individual impact, organizational impact, information quality and system quality. Their study analysed data on the basis of a classification of respondents into four employment groups: strategic, management, operational and technical.

Wu and Wang (2006) used interviews and a survey to measure end user satisfaction; their tool categorised 24 factors into four phases to evaluate ERP success. Earlier, Zhang et al. (2005) developed critical success factors and success measures, based on the IS research model of Ives, Olson, and Baroudi (1983) and the Delone and McLean (1992) IS success model. This modification and combination of the two models took organizational environment, user environment, system environment and ERP vendor environment as the basis for independent variables, whereas Delone and McLean (1992) had suggested that user satisfaction, individual impact, organizational impact and intended business performance improvement should serve as dependent variables.

Haab and Surry (2009) studied participation in the implementation of ERP systems. They identified various modes of participation and measured their relationship with level of satisfaction with the implementation of an ERP system in higher education, using a modified version of the measure developed by Doll and Torkzadeh (1988), taking account of content, accuracy, format, ease of use and timeliness (EUCS). Their study examined the ERP systems created specifically for higher education institutions, including BANNER, PeopleSoft and Datatel.

1.3 Research Problem

Although researchers and practitioners consider user satisfaction with information systems to be a fundamental indicator of an information system's success (Aladwani, 2003), the literature published to date reveals that there are significant shortcomings to this assumption, including that IS systems can be viewed from two distinct perspectives: the organizational viewpoint focuses on the quality of the interface and the information provided by IS to help employees to fulfil their tasks, while the socio-technical viewpoint is concerned with individual needs (Au et al., 2002).

Cyert and March (1963) were the researchers who first proposed the concept of user satisfaction as a surrogate of systems success (Au et al., 2002). Recent studies (e.g. Somers et al., 2003; Au et al., 2008; Zviran, 2003; Mohmood et al., 2000; 2002; Hsu et al., 2008) have considered end-users’ satisfaction, but not stakeholders’ performance. Published studies also tend to focus on ERP systems in manufacturing industry, while few have discussed ERP in academic institutions. Despite the rapid current growth of ERP use in higher education, there is lack of scholarly research into its implementation in the sector (Rabaa`I, Bandara and Gable 2009a). Furthermore, investments in information systems are very costly. For instance, Saudi Arabia spends millions of dollars on information systems every year, to develop and improve the higher education system. Investors-particularly the state sector, which generally foots the bill for education worldwide and offers excellent support for innovative technological solutions, as discussed above-require a return on their investment; thus the massive investment in ERP systems by higher education bodies needs to be evaluated in terms of the success of their application.

Effective selection, development and improvement of information systems require systematic evaluation methods and tools. Among the various relevant studies, there is consensus on the need for appropriate evaluation of IS success to help organisations to measure the return on their investments in information systems (Gable et al., 2008). Rabaa`i, Bandara, and Gable (2009) suggest that the methodical evaluation of each IS and of its impact on both organization and individuals is necessary to justify its cost by its contribution to the productivity, quality and competitiveness of the organization. Despite its importance, however, there is no accepted framework or methodology for IS evaluation in higher education (Adelakun and Jennex, 2002).

1.4 Aim and Objectives

The overall aim of this research is to highlight the impact of the ERP systems on the performance of an academic institution and to provide researchers, practitioners and decision-makers with a framework to enhance their evaluation of the performance of ERP system stakeholders in higher education.

Its objectives are:

1- To review existing evaluation frameworks for ERP systems in order to assess the methods used to measure the system.

2- To identify applicable method to evaluate the performance of ERP system stakeholders.

3-To develop a theoretical framework, suitable for evaluating the performance of the ERP systems used in Saudi Arabian higher education, from the perspective of their stakeholders.

4- To collect and analyse case studies data in order to test the theoretical framework

5- To identify the main factors having a significant impact on the ERP system stakeholders’ performance in higher education, and offer recommendations.

1.5 Research Questions

- What is the most effective method of evaluating ERP stakeholders’ performance applicable to higher education?
- How does Saudi Arabian higher education evaluate ERP systems?
- What are the relationships between the quality of the ERP system and stakeholders’ performance?
- What are the relationships between the quality of system technical support for the ERP system and stakeholders’ performance?

1.6. Research Methodology Outline

This section outlines the methodology used in conducting the two phases of this study: desk and field research, each divided into two parts.

1.6.1 Desk Research

Part I: ERP systems in general and in higher education in particular

This involves reviewing existing literature on the role of ERP systems in the higher education sector, using case studies of Saudi Arabian universities. The aim of this part is to gain an understanding of the role of ERP systems in higher education in order to conceptualise the visionary context of the core part of this research: the creation of a model linking ERP systems with stakeholders' performance.

Part II: Evaluating stakeholders' performance

This involves reviewing and analysing existing literature on ERP systems and the performance of stakeholders. The aim is to establish a comprehensive understanding of ERP systems in higher education from a stakeholders' perspective, from which theory-building can proceed.

The underlying epistemological approach of this research is positivist. This is appropriate to the context for a number of reasons. First, positivist studies generally test theory, in an attempt to increase the predictive understanding of phenomena (Myers and Avison, 2002). Secondly, positivism assumes the existence of an objective physical world independent of human observation and of an equivalent social reality independent of individual perception (Orlikowski and Baroudi, 1991). Given that the nature of this research is that it investigates the effectiveness of the adoption of ERP in a large organizational context, in which the existential reality of concern to the research is reflected in the organization's output, removed from the particular perceptions of individuals, the subjective and often highly specific and particular data which characterizes qualitative research is in itself unable to shed light on the problems of concern here. Thus, a mixed-method approach based on the positivist paradigm was deemed necessary, as explained below.

Thirdly, the IS field has seen a shift from technological to managerial and organizational questions (Benbasat et al., 1987). Meanwhile, the behavioural science paradigm, with its roots in natural science research methods, has tried to develop and justify theories that explain or predict organizational and human phenomena surrounding the analysis, design, implementation, management and use of information systems (Hevner et al., 2004). As described previously, there are many social, professional and technical issues influencing the implementation of ERP systems, their success and the performance of their stakeholders in the higher education context. Therefore, a positivist approach to the analysis of the research findings was deemed appropriate.

A case study is particularly well suited to IS research, since the aim is to study information systems in organizations (Myers and Avison, 2002). Thus, analysing a department, information system, systems developer and development project allows the gathering of as much detail as possible in one case of the phenomenon under investigation (Oates, 2006). According to Yin (2009), there are three different types of case study: exploratory, descriptive and explanatory; the choice among them depends on the type of research question posed, on the extent of control that the investigator has over actual behaviour or events and on the degree of focus on contemporary as opposed to historical events. Since the research questions presented above are of the '*how'* and '*why'* types, this research can be classified as explanatory in nature.

Identifying the appropriate research strategy is important in establishing the general framework of the study. The present research is mainly concerned with evaluating the performance of ERP system stakeholders in three universities in Saudi Arabia, where the relationships among these elements is unclear. Therefore, multi-case studies constitute the appropriate research strategy. Yin (2003) defines a case study as: "*An empirical inquiry that investigates contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident*".

This research takes a mixed-method approach, combining quantitative and qualitative data collection and analysis, the principal methods of data collection being interviews and a questionnaire. Interviews are commonly used in case studies because they constitute one of the most common and powerful ways in which the researcher can gather valuable data to understand human beings (Oates, 2006) and their lived experience (Denzin and Lincoln, 2005b). As for the questionnaire method, it is often used to enhance the quality of such research (Bryman and Bell, 2007). Thus, the mixed approach is appropriate in seeking to understand the performance of

ERP system stakeholders within their social context (higher education) (Hirschheim, 1991). The methodology and research design are discussed in greater detail in chapter 4.

1.6.2 Field Research

- ***Saudi Arabian higher education: multiple case studies***

The objective of Saudi educational policy is to ensure that education becomes more efficient, in order to meet the economic and social needs of the country. The Saudi higher education sector has witnessed a rapid expansion during the last four decades. The study of the sector involves empirically investigating the role that technology plays by focusing on the use of ERP systems in different universities from the perspective of their stakeholders' performance. The aim of this part of the field research is to refine the visionary model created in part one of the desk research.

1.7 Novel Contribution

The final element of a doctoral thesis is concerned with aligning the importance of the study to the development of the discipline being researched. Many organizations and higher educational institutions in Saudi Arabia have already implemented ERP systems. Therefore, it will be useful to investigate the post-implementation phase and evaluate the stakeholders' performance, thus helping researchers and practitioners to enhance the performance satisfaction of the stakeholders. The novel contribution of this research is to show how the outcome of ERP systems post-implementation can be affected by the stakeholders' performance.

1.8 Structure of the Thesis

Chapter 1 introduces the thesis, outlining the background to ERP systems and their use in higher education, with brief reference to Saudi Arabia. It sets out the objectives and main contributions of the research, establishes terms of reference and outlines the methodology, while offering contextual information on the use of ERP systems in higher education, associated problems and reasons for choosing the research topic.

Chapter 2 assesses relevant literature covering ERP systems in general and their implementation in various fields, illustrating the different approaches to the evaluation of ERP systems, theories and related models.

Chapter 3 Research theoretical model chapter reviews literature concerning ERP systems, and presents the background to each model and illustrates its relation to ERP systems. This chapter is including the final factors chosen from the three models to evaluate stakeholders' performance on ERP systems in higher education.

Chapter 4 discusses the research methodology, describing and discussing the research process, the problems associated with identifying the most appropriate method and the design of the research, data access and collection procedures.

Chapter 5 presents the case studies of three Saudi Arabian universities, reporting phase two of the research, during which empirical data were gathered by means of a questionnaire. This chapter reports the analysis of data collected from the quantitative phase of the field work (questionnaire).

Chapter 6 This chapter reports the analysis of data collected from the qualitative phase of the field work (interviews).

Chapter 7 reports the discussions based all key sources: literature, documents, questionnaire and interviews. This chapter presents the final evaluation of stakeholders' performance in using ERP systems, and then proposes a research model based on the theoretical framework and the data analysis.

Chapter 8 summarises the research and its contribution to knowledge, theory and contribution practice draws conclusions and offers a set of recommendations for future research.

Part 1: Theoretical

Chapter 1: Introduction, Background

- ERP systems
- ERP systems in higher education, KSA

Chapter 2: Literature Review

- ERP system implementation
- ERP stakeholders' performance
- Approaches to the evaluation of ERP systems

Chapter 3: Research Theoretical Model

- Evaluation of models (D&M, TTF, EUCS)
- Integrating the models and proposing theoretical factors

Chapter 4: Research Methodology

- Research process
- Data access and collection procedure

Part 2: Practical

Chapter 5: Case Studies

- First phase: questionnaire
- Data Analysis

Chapter 6:

- Second phase: interviews
- Data Analysis

Chapter 7: Discussion and Research Final Model

Chapter 8: Conclusions and Recommendations

- Contribution to knowledge
- Recommendations for future research

Figure 1.1: Structure of the Thesis

CHAPTER TWO

LITERATURE REVIEW

PAGE

2.1 Overview

Enterprise resource planning systems have been considered important in the corporate use of information technology since the 1990s. An ERP system is one of the most widely accepted choices to obtain competitive advantage and to enhance organisational cross-functional efficiency and effectiveness through the seamless integration of all information flowing through the organisation. Private and public sector organisations often try to achieve an increase in efficiency through internal improvement.

Despite the significant impact of ERP systems on organisational functions, implementing them is considered complex and costly. Therefore, an organisation needs to evaluate such a system from the stakeholders' perspective, as well as considering the technical aspects.

Given the limitations of previous studies of ERP systems referred to in chapter 1, this chapter offers an analytical overview of existing literature in the five research areas with which this research is concerned: ERP systems in general, evaluation, stakeholders, higher education (HE) and ERP systems in HE. It seeks to position the present research in relation to existing work, within the context of ERP systems in higher education, and to provide the background theory for models and approaches used in carrying out the research presented later in this thesis.

First, this literature review provides an overview of ERP systems in general, covering their evolution, their importance and the reasons for purchasing them. Next, it considers the evaluation of IS and then of ERP systems. There follows a review of the literature dealing with performance measures, with stakeholders in IS/ERP systems and with stakeholders' evaluation. The focus then turns to ERP in HE and to how such systems operate in an academic environment. Finally, there is brief consideration of previous work on ERP system in the Kingdom of Saudi Arabia (KSA).

This review identifies a gap in the literature concerning the impact of ERP systems on stakeholders' performance, which is a central concern of the present study. The chapter discusses ERP systems in Saudi universities and ends with a comprehensive identification of gaps in the research field that this thesis aims to address.

2.2. Enterprise Resource Planning Systems

ERP systems are software packages that have been increasingly adopted by organisations across various industries in both developed and developing counties.

Al-Mashari (2002) consider some of the range of definitions offered by various authors; for instance, Rosemann and Wiese (1999) describes ERP systems as "*customizable, standard application software which includes integrated business solutions for the core processes (e.g. production planning and control, warehouse management) and the main administrative functions (e.g. accounting, human resource management) of an enterprise*". This definition differs slightly from that of Gable (1998), for whom an ERP system is a "*comprehensive packaged software solution seeking to integrate the complete range of business processes and functions in order to present a holistic view of the business from single information and IT architecture*". Alternatively, Zhu et al. (2010) define ERP systems as "*configurable information systems packages that integrate information and information-based processes within and across functional areas in an organization*". The essential ERP architecture is built upon one database, one application and a standard interface across the entire enterprise (Calisir and Calisir, 2004). According to Sane (2005), ERP systems are multi-module application software packages that serve and support multiple business functions.

These software packages are of particular interest to management information systems (MIS) researchers because they can have broad organisational effects, rather than the localized individual and group task-level effects of many smaller packages. Furthermore, ERP systems have become ubiquitous, as indicated by a growth in ERP software licence revenue of 19 percent in 2007 (Strong and Volkoff, 2010). However, packaged software raises important theoretical issues associated with the fact that by definition it is designed to meet generic rather than specific requirements, making it unlikely to be a perfect fit in any particular instance (Strong and Volkoff, 2010).

Recently, ERP systems have been in high demand with both manufacturing and service organisations, because they provide a tightly integrated solution to an organisation's information system needs. During the last decade, ERP systems have received significant attention from researchers and practitioners of IS disciplines.

Therefore, the ERP software market has become one of the largest fields of IT investment worldwide (Shehab et al., 2004).

The above definitions and descriptions will help to track the history of ERP and its evolution in the following subsection.

2.2.1 The evolution of ERP systems

The origin of ERP can be traced back to material requirements planning (MRP) and manufacturing resource planning (MRP-11). The concept of MRP, which emerged during the 1960s, was to use IS to coordinate automatically the activities of the production control, inventory and accounting departments, but such systems were not practical for commercial use (Helo, Anussornnitisarn, and Phusavat, 2008). It became viable to utilise MRP commercially when available computing power (processing capability and storage capacity) increased (McGaughey and Gunasegaram, 2007).

Table 2.1: The evolution of ERP

System	Primary business need(s)	Scope	Enabling technology
MRP	Efficiency	Inventory management and production planning and control.	Mainframe computers, batch processing, traditional file systems.
MRP11	Efficiency, effectiveness and integration of manufacturing systems	Extending to the entire manufacturing firm (becoming cross-functional)	Mainframe and mini computers, real-time (time sharing) processing, database management systems (relational)
ERP	Efficiency (primarily back office), effectiveness and integration of all organisational systems.	Entire organisation (increasingly cross-functional), including manufacturing operations	Mainframe, mini and macro computers, mainframe networks with distributed processing and databases, data warehousing and mining knowledge management
ERP11	Efficiency, effectiveness and integration within and among enterprises.	Entire organisation extending to other organisations (cross-function and cross-enterprise – partners, suppliers, etc.)	Mainframes, client server systems, distributed computing, knowledge management, internet technology (includes web service, intranets and extranets)
IRP, Enterprise system, Enterprise Suite, or whatever label gains common acceptance	Efficiency, effectiveness and integration within and among all relevant constituents (business, government, consumers etc.) on a global scale.	Entire organisation and its constituents (increasingly global) comprising supply chain from beginning to end, as well as other industry and government constituents)	Internet, web service architecture, wireless networking, mobile, warless, knowledge management, grid computing, artificial intelligence.

Source: Adapted from McGaughey and Gunasegaram, (2007) ERP software packages had their roots in MRP and emerged to support a variety of transaction-based back-office systems, because they involved activities and processes in which the customer and general public were not typically involved. Contemporary ERP systems have been designed to streamline and integrate operation processes and information flows within a company in order to promote synergy (McGaughey and Gunasegaram, 2007). Table 2.1 summarises the evolutionary history of ERP and related systems.

Despite the potential advantages of ERP systems, they are considered costly and complex; their implementation is so difficult that it often fails. Nevertheless, many organisations have found numerous reasons to implement ERP systems. The following subsection reviews accounts of these reasons.

2.2.2 Reasons for adopting ERP systems

Elmes, Strong and Volkoff (2005) explain that early ERP research focused on this new IT artefact itself and found that it was different from the legacy systems it was replacing. This led to an understanding of the reasons for organisations deciding to adopt ERP systems; they are motivated to purchase such systems because, among other benefits, they expect enhanced information capture, increased transparency and better information flow.

Many authors (e.g. Nah, 2001; Shehab et al., 2004; Elmes, Strong and Volkoff, 2005) have listed the most important attributes of ERP systems and their ability to improve organisational effectiveness and efficacy, including:

- The ability to implement all variations of best business practice with a view to enhancing productivity.
- The sharing of common data and practice across the entire enterprise in order to reduce errors.
- The production and accessing of information in a real-time environment to facilitate rapid and better decision making and cost reductions.
- Improved efficiency.
- Increased customer responsiveness.
- Better performance control and increased data visibility.
- The novel integration of business management and IT concepts.

- Automation and integration of business processes across organisational functions and locations.

Shang and Seddon (2000) classify the benefits of ERP implementation into five groups:

- Operational: relating to cost reduction, productivity improvement, quality improvement and customer service improvements;
- Managerial: relating to better resource management, improved decision making and planning, and performance improvement;
- Strategic: supporting business growth, supporting business alliance, building business innovations, building cost leadership, generating product differentiation and building external linkages;
- IT infrastructural: building business flexibility, IT cost reduction and increased IT infrastructural capability;
- Organisational: relating to supporting organisational changes, facilitating business learning, empowering and building a common vision.

Despite these significant benefits that ERP systems can provide, they are very expensive even under ideal circumstances, with costs ranging from hundreds of thousands of dollars to several million dollars. Thus, cost is the first point listed by Markus and Tanis (1999), when they assert that ERP implementation is an important and challenging decision to organisations, outlining potential failures due to:

1 Financial costs and risk: installing an ERP system is an expensive and risky venture.

2 Technical issues: ERP systems are technically challenging; therefore the most important technical area of research around ERP is ‘development and reference models’.

3 Managerial issues: ERP projects are managerially challenging, since they may involve parties from many different organisations and cut across organisational political structures. Furthermore, ERP has important implications for how companies should organise and manage their IS functions.

4 IT adoption, use and impacts: ERP systems have been widely adopted across organisations and have large potential impacts at all levels of analysis, such as individual and social, work system, organisational and inter-organizational.

5 Integration. According to Beretta (2002), in order to be effective, integration has to be leveraged along three dimensions:

- Information integration. One dimension of integration has to do with the ability to transfer information efficiently throughout the organisation through data and objects; the connection of the information generated in different parts of the organisation is a basic component of its integration capabilities.

- Cognitive integration. Effective integration requires that the different perspectives related to the various professional realms involved in the process are matched; so that each professional in the process is matched (i.e. each professional should understand the points of view of other professionals). This does not mean that any perspective has to be accepted uncritically. The point is that in functional organisations, the simple understanding of different needs is quite often made difficult by the cognitive filters that permeate the borders of functional units. Reciprocal understanding may help each manager to take into consideration solutions that can be mutually satisfactory.

- Managerial integration. The personal commitment of each manager must be affected. The nature and relevance of the economic responsibilities assigned to managers and of the connected incentive systems play a significant role in enabling or opposing organisational integration.

ERP systems can be implemented in any organisation in a series of steps. Tsai et al. (2007) list some different ways that this can be done. Some companies adopt *phased* implementation, while others use a *big bang* implementation. Many implement *pre-packaged* ERP systems, while others use *non-packaged* ones, derived from the evolution of legacy systems, self-development, or outsourcing. They may select an *integrated planning approach,* whilst others adopt the *step-by-step planning* method, allowing the evaluation of the benefits accrued by implementing ERP systems.

According to Bakry and Bakry (2005), the objective of an ERP system is to automate the business processes of an enterprise, in order to support e-business implementation, leading to better performance. Therefore, McGaughey and Gunasekaran (2008) note that organisations nowadays seem more focused on external aspects, as they look for ways to support and improve relationships and integration between stakeholders (e.g. customers, suppliers and partners).

In short, the ERP phenomenon has strong conceptual links with just about every major area of IS research. In addition, the phenomenon suggests the potential value of entirely new research directions. Research into the adoption of new technology must consider the evaluation phase, which is fundamental in terms of the technical, financial and human aspects. The following section discusses published work on evaluation in IS in general, as well as the different aspects of evaluation.

2.3 Evaluation in IS

Despite having long been recognised as a critical process for the successful adoption and implementation of information systems, IS evaluation is an area that has received limited attention. Nevertheless, it has been examined from different perspectives by a number of researchers. The literature suggests that managers and IS professionals recognise IT evaluation as one of the concerns of IS management.

Evaluating IS in organisations is not easy; it requires a clear, documented, systematic, analytical and formal approach (Jones, 2008, p. 241). Moreover, it is important that attention is given to the purpose, relevance and contribution of the evaluation. The first step is therefore to understand more about the context in which the evaluation is taking place (Farbey, Land and Targett, 1993). Stockdale et al. (2008, p. 36) assert that the purpose of an evaluation tends to be to assess value, measure success or identify benefits, while for Farbey, Land and Targett (1992), the role of the evaluation is related to the time and the level at which it is carried out. Both have a bearing on the questions that need to be answered.

Evaluation, appraisal and measurement are interrelated concepts. Farbey, Land and Targett, (1999) distinguish between the first and second of these by noting that the term ‘evaluation’ is often used imprecisely, sometimes referring to an event taking place at the commencement of a project in order to decide whether it should go ahead, but usually being reserved for a post-implementation review of benefits achieved, whereas ‘appraisal’ tends to refer to a decision point. However, in both theory and practice, the concept of evaluation is much broader. Farbey, Land, and Targett (1999) define it as "*A process, or group of parallel processes, which take place at different points in time or continuously, for searching and for making explicit, quantitatively or qualitatively, all the impacts of an IT project and the programme and strategy of which it is a part*". Irani and Love (2008) adopt a slightly simplified version of the same definition.

Alyassen et al. (2008, p. 134) state that the priority in evaluation is to gauge the direction of the IS project. Using financial and other quantitative estimates, 'predictive evaluation' is performed to forecast the impact of the project. Evaluation provides support and justification for the investment by forecasting the projected baseline indicators such as payback, net present value or internal rate of return. 'Formative evaluation' or, as referred to here, the 'prior operational use' form of evaluation guides the project in important ways and may lead to changes in how the system is structured and the way in which it functions. It does not, however, give any feedback beyond the design, implementation and delivery of the project outcome.

Alyassen et al. (2008, p. 135) consider evaluation in terms of the 'effectiveness' of IS. This form of evaluation draws on real rather than projected data and can be used to justify adoption, estimate the direct cost of IS, estimate its tangible benefits, ensure that it meets requirements, measure its effectiveness and efficiency, and measure the quality of programs. This type of evaluation should be performed during the operational phase of the project. This is referred to as post-implementation evaluation. Figure 2.1 shows these forms of evaluation with respect to the lifecycle of a system from inception to the end of its useful life.

On the basis of the definitions above, different aspects of the IS can be evaluated. For example, Adelakun and Jennex (2002) classify the most prevalent approaches to IS/IT evaluation into four major categories: (1) financial, usually focused on money and quantification; (2) functional, the purpose of which is to estimate the complexity of systems during the development process and determine a cost per unit of complexity (technical stakeholders often employ this model to evaluate system development projects); (3) strategic measure, based on the position that strategic IS is indispensable and hence must be developed; and (4) subjective measure, which emphasises the value added by IS.

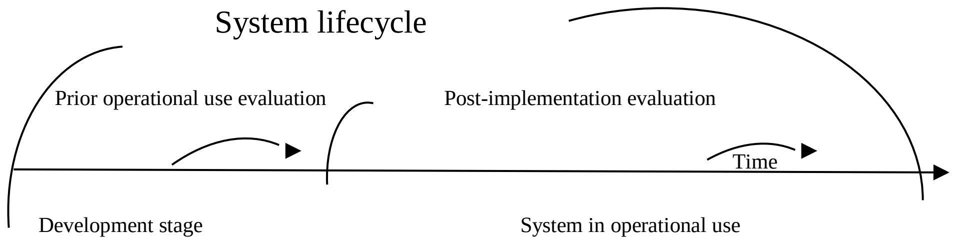


Figure 2.1: IS an evaluation type in the system's lifecycle. Source: adapted from Alyassen et al. (2008)

Similarly, Farbe, Land, and Targett (1993) illustrate some approaches to evaluating IS: cost/ revenue analysis, return on investment (ROI) appraisal, cost-benefit analysis, and return on management (ROM) and information economics. In addition, Farbey, Land, and Targett, (1993, p. 108) list a number of techniques focusing more on the process:

- Multi-objective, multi-criteria methods: often regarded as alternatives to cost-benefit analysis.
- Value analysis, experimental methods: another way of attempting to establish a value for the outputs of the system, the method emphasises benefits rather than cost, and is used primarily for evaluating concepts such as 'better information'.
- Composite ad hoc methods: many organisations combine parts of a number of methods and vary the methods to suit the situation, often using short-cuts or approaches they have developed themselves.

Measuring the functional performance of systems is a method followed by Stoak and William (1992), who define 'systems' as "all groups and departments within the organisation".

Saunders and Jones (1992) found that several aspects of the IS functions were highly ranked in terms of importance: its impact on strategic direction, the integration of IS function planning with corporate planning, the quality of information outputs, and its contribution to organisational financial performance. They also note that as the IS function matures, the measurement focus shifts from operational efficiency and user satisfaction to a more unstructured concern for its impact on strategic direction.

Serafeimidis and Smithson (2003) state that IS evaluation can be formal or informal, can use diverse criteria (e.g. financial, technical, social), can follow rigorous methodologies or ‘gut feeling’, and can often become a political instrument that influences the balance of organisational power and stimulates organisational change. In other words, formal evaluation practices are promoted by organisational rules and structures, informal practices implemented by the stakeholders involved, and finally academic recommendations, which in many cases recognise the delicate nature of evaluation, but are not used in practice.

Irani et al. (2002) advocate the decoupling of relative dimensions of the project and its division into four ranked levels of evaluation: strategic, tactical, operational and financial. The proposed framework of Peter Irani (2004) is divided into five aspects of information technology investment, each of which has its own set of objectives and expectations:

1 Managers of the organisation are interested in the gains (financial and other) generated by the investment. They seek to ensure that the project is implemented on time, within budget and according to user requirements.

2 Users’ requirements should be met by the technology while integrating flexibility to adapt to the changing requirements of users/customers.

3 Project team members (implementers) focus on short-term criteria set by sponsors (used to judge their performance).

4 Supporters (subcontractors) focus on short-term criteria.

5 Stakeholders (non-benefiting, non-influencing) consist of many groups, each with its own goals and objectives. They may support or oppose the investment, possibly in the form of resistance.

If the evaluation of IS investment is purely financial and centred on the use of traditional appraisal techniques, the process serves only the management objectives. This means neglecting other objectives and accordingly failing to incorporate important factors that might affect the willingness of the actors concerned to cooperate in realising the objective of the investment. Jones (2008, p. 245) refers to formal IS evaluation methods that are primarily concerned with monetary costs and benefits as the mechanistic approach.

Farbey (1992) affirms that multiple evaluation methods or approaches are available, each with its own characteristics and focus. The first method is ROI, which is based on evaluating the current value of estimated future cash flows on the assumption that future benefits are subject to some discount factor. The main strength of this method is that it permits decision makers to compare the estimated returns on different investments. Its weakness is that some good investment possibilities are withheld because the benefits are difficult to assess in cash flow terms.

Cost benefit analysis (CBA) is an approach that attempts to find (or compute) a monetary value for each element contributing to the costs and benefits of a development project. The main weakness of classic CBA is the artificiality of some of the surrogate measures. In practice, the recommendations arising from CBA are often overturned by decision makers who cannot accept the values assigned by analysts.

Multi-objective, multi-criteria (MOMC) methods start from the assumption that the value of a project can be measured in terms other than money. This allows decision makers to appraise the relative value of different outcomes in terms of their own preferences: they can rank goals by applying a preference weight to each. Another way of applying this technique is to provide a scale with which to assess applications.

Return on management is the value attributable to an information system as an incremental change to an already established level of management productivity. Value analysis attempts to evaluate a wide range of benefits, including intangible ones. The use of experimental methods is a recent development in the context of project evaluation. Farbey, Land, and Targett (1999) notes that information economics is a method relying on quantitative assessment of costs, benefits and risks. There are also ‘softer’ methods for identifying and assessing benefits, including MOMC methods and those based on modelling and experiment, such as systems dynamics models.

In brief, the current and dominant IS evaluation methods are primarily based on economic and technical factors. However, these are problematic and largely inappropriate for use in the public sector, because of difficulties in defining productivity, cost-saving and value in the non-profit sector, where the remit is to serve the public (Jones, 2008, p. 237). Hence, IS researchers facing a challenge regarding evaluation: it is difficult and considered problematic. Land (2001) argues that the problem lies in predicting IS cost, risk, benefits, impact and lifetime. Myers (1997) argue that IS managers are under pressure to justify the contribution of IS expenditure to the productivity, quality and competitiveness of the organisation and that IS evaluation/assessment is thus crucial to provide the feedback needed for the effective management and continuous improvement of the IS function.

According to Land (2001), there is little agreement amongst researchers and practitioners as to which approach or methodology is appropriate for IS evaluation, especially in the public sector. Similarly, Jones (2008, p. 244) reports that many models have been devised and developed in an attempt to evaluate and measure IS efficiency and effectiveness in both public and private sector organisations. Irani (1998) and Land (2001) classify more than 50 methods intended to assist with this process. Stockdale et al. (2008, p. 36) assert that a major challenge for IS evaluation is to develop frameworks that are sufficiently generic to be applicable to a wide range of circumstances, but also sufficiently detailed to provide effective guidance. Heo and Han (2003) summarise the IS evaluation literature by stating that current evaluation approaches and practice are based on TQM, information economics, project management, or cognitive theories. To conclude, it is obvious that IS evaluation is focused almost exclusively on operational and transactional systems (Stoak and William, 1992).

Agourram and Ingham (2007) asserts that the problem of measuring IS can be traced back to many factors. The first is the mixture of technical and social aspects of IS. Secondly, IS and work practices are now so intertwined that it is difficult to identify their individual contributions to success. Finally, some researchers link the difficulty to the methodological aspects of measuring IS success. On the other hand, many IS observers (Checkland, 1981; Walsham, 1993; Introna, 1997; Mumford and Weir, 1997; Hirschheim and Smithson, 1999; Avison and Elliot, 2006) have argued that ISs are predominantly social systems; therefore their social aspects are significant. Some authors (Hirschheim and Smithson, 1999; Walsham, 1999; Serafeimidis and Smithson, 2000; Irani, Sharif1, and Love 2005) have also argued that evaluation would be improved by adopting an approach based on interpreting and understanding social and organisational aspects of IS.

Therefore, Serafeimidis and Smithson (2003) propose an alternative, interpretive approach to understanding IS evaluation, based on the notion of stakeholders. Peter et al. (2004) agree that evaluation must be multifaceted and seek to include the various stakeholders and to consider their agendas. In other words, a limited consideration of the organisational and institutional context in which evaluation is integrated (e.g. the system’s development lifecycle, the IS management practices and processes), compounded with a limited understanding of stakeholders’ behaviour (socialisation), leads to mismatches between theory and practice.

Irani (1998) argues that much of the problem lies in the very nature of deploying IT, as the use of prescriptive appraisal guidelines ignores the wider human and organisational implications of developing an infrastructure. However, although such factors are unique to companies, with an appropriate investigative methodology, much can be researched and extrapolated from the organisation’s idiosyncratic decision-making processes. This can contribute towards identifying criteria for making investment decisions, which can be translated into a model that others can use as a frame of reference.

Treating IS as a technical problem can lead to meaningless conclusions that overlook the social activity inherent in the evaluation process and ignore the socio-political environment of an organisation (Stockdale et al., 2008, p. 36). The benefits associated with IT implementation tend to be qualitative and often intangible. Consequently, the evaluation process must look beyond a narrow quantification of cost and benefits to an analysis of opportunities presented by IT together with potential constraints on its application.

Moreover, Alyassen et al. (2008, p. 135) caution that the study of IS evaluation has been dominated by a positivist scientific paradigm. The traditional (formal/rational or functionalist) conception sees evaluation as the external judgment of an IS, which is treated as if it existed in isolation from its human effects. It also places excessive emphasis on the technological and accounting/financial aspects, at the expense of the organisational and social aspects. In general, attention has been focused over the years on prescribing how to carry out evaluations, rather than analysing and understanding their role, interactions, effects and organisational impacts.

Irani (1998) notes that searching for a single 'best' appraisal technique that addresses all project considerations is fruitless, because strategic investments in IT/IS are aggregates of complexity and notably different from each other. The circumstances where an appraisal technique would be applied are so wide and varied that no single method can cope with all or even most of the possible variations. Khalifa et al. (2001) agree that no single evaluation method can be applied to all situations in the IT industry, while Farbey, Land, and Targett (1993) suggest that evaluation can contribute to IT systems when the appropriate method is applied to a given organisational context.

Many authors argue that an organisation-wide participatory stakeholder analysis is the first essential step to the formulation of the 'evaluation party' and then the evaluation itself. Most of the techniques described involve a wide range of individuals (stakeholders) who are involved in the project as sponsors, designers, implementers, users and operators, as well as those who are affected by the system under review in a more indirect way. Farbey, Land, and Targett (1993) believe that all the methods are potentially valuable. The contribution of evaluation as a social learning mechanism is likely to be significant when objectives are relatively clear. It is also an opportunity for stakeholders to enhance their common understanding of the issues, and perhaps to gain new skills and competencies.

It can be concluded from the above discussion that the literature in this field has focused on the financial and technical aspects of IS evaluation, neglecting the human aspects. The following section discusses previous work on evaluation in ERP systems in particular, as well as different aspects of evaluation.

2.4 Evaluation of ERP systems

Enterprise resource planning systems are complex and comprehensive software packages designed to integrate business processes and functions. Despite the difficulties and risks in adopting ERP systems, their use is expanding rapidly. Therefore, researchers have attempted to find appropriate methods to evaluate them from various perspectives.

Chen and Lin (2008) identify two broad approaches to ERP evaluation. The first is to investigate the financial performance of the organisation which has invested in an ERP system and the second is that favoured by the majority of researchers: to investigate the manipulations of critical factors/items that can be obtained in various ways, including by literature review or by questionnaire, using the data envelopment analysis approach to evaluate the relationship between continuous investment in ERP and technical efficiency. Chen and Lin (2008) have also utilized regression analysis to investigate the relationship between efficiency scores and the continuous investment in ERP, based on the concept of total cost ownership. Another form of heuristics is the method used in the work of Chand et al. (2005), who provide a framework based on the balanced scorecard (BSC) to evaluate the strategic performance of ERP systems. Wieder et al. (2006) conducted a study to identify the impact of ERP systems from the perspective of business process performance (organisational performance) by using an IT measure, while Argyropoulou et al. (2008) introduce a new framework called the ‘six imperatives’, which they claim provides a solid methodology for the identification and incorporation of the necessary metrics for the post-implementation review of ERP systems.

Although the above methods were developed to evaluate the performance of ERP systems, they seldom put emphasis on the extent to which training and user familiarity with these systems influence their performance. Indeed, as was noted in the previous section regarding IS evaluation in general, financial and technical methods are the most popular in ERP systems evaluation. Chun-Chin Wei (2008) lists various methods that have been applied to evaluate the performance of ERP or other ISs, including financial analysis. However, financial analysis will seldom suffice, as it ignores other critical qualitative factors such as the quality of the system and its impact on the organisation and on individuals.

According to Beretta (2002), the measurement of the financial returns of this kind of investments is quite controversial. Despite a number of methodologies proposed to evaluate ERP based on the calculation of the return on capital employed or on expected cash flows, all present severe limitations and consistent drawbacks. Nonetheless, the impact of their implementation on the operating performance of a company can be appreciated by focusing the measurement process on the improvements that they produce in the performance of business processes.

The output of an IS or ERP system can be measured in terms of critical success factors (CSFs) in three areas: technical, effectiveness and users' experience (Chun-Chin Wei, 2008). A great deal of effort has been put into the systems and information quality assessment of IS. Quality assessment reflects the engineering-oriented performance characteristics of the system itself and the quality of information and data. Information quality describes the clarity, accuracy, timeliness and content of the IS. Researchers believe that a thorough system development process leads to a high quality IS whose use has a positive impact on the organisation (Chun-Chin Wei, 2008).

Despite the ability of the CSF approach to assess ERP systems, it does not guarantee success or provide a means of evaluation. Al-Mashari, Al-Mudimigh, and Zairi (2003) believe that ERP projects can be considered successful: (1) where there is a match between the ERP system and the stated objectives of implementation (correspondence success); (2) when the system is implemented within time and budget (process success); (3) when users' attitudes toward ERP are positive (interaction success); and (4) where the ERP systems matches users' expectations (expectation success). According to Sakris and Sundarraj (2000), strategic systems need to be evaluated on strategic metrics that are linked to the organisation's strategy. Sakris and Sundarraj distinguish between two evaluations—operational and financial—that organisations may apply, both of which need to be active.

The following section focuses on performance measures of IS, how they have been investigated and from what perspectives.

2.5 Performance measures

The terms ‘performance management’, ‘appraisal’ and ‘assessment’ tend to be used synonymously. Lansbury (1988) presents a comprehensive definition of performance management as “The process of identifying, evaluating and developing organisational goals and objectives are effectively achieved, while at the same time benefiting employees in terms of recognition, receiving feedback, catering for work needs and offering career guidance”.

According to Beretta (2002), performance measures are relevant both to internal decision makers (as they supply information that facilitates their decision making and motivates their actions and behaviour) and to the whole organisation (as they address people’s efforts in ways that promote the efficiency of the organisation). Performance measures promote integration by facilitating communication inside the organisation. They support vertical communication in two ways:

1- The principal, through the choice of performance measures and by determining their standard value, exercises his/her influence by expressing his/her expectations.
2- The subordinate can use both the objective-setting and the result measurement phase in order to build a constructive and living dialogue with his/her principal. Performance measures can be an important basis for internal discussions.

Performance measures also support horizontal communication, helping members of certain units to establish useful interaction with units that provide inputs to their activities, and with the units which are the receivers of their output, so performance measures are conceived as a signal of requested behaviour and can be powerful pedagogical instruments to clarify areas of responsibility for different players and management expectation. They also stimulate players to improve their knowledge of their sphere of activity and its economic structure. Performance measures contribute to the accumulation of knowledge, by stimulating learning about how efficiency and effectiveness can be improved. They also stimulate inquiry by formulating questions, investigating problems, finding answers, and providing knowledge about the contribution of each single unit to the firm’s goals. Moreover, they can support process management both on the operational side (connecting activities along the work flow) and on the cognitive side (developing integration knowledge).

According to Umble, Haft, and Umble (2003), evaluation measures must be included from the beginning of the project. Furthermore, performance measures that evaluate the impact of the new system must be built carefully; the evaluation should clearly indicate how the system is performing and encourage the desired behaviours by all functions and individuals.

Recently, a few popular techniques for measuring the performance of an IS have been reported. Hagood and Friedman (2002) implemented the BSC measures from five perspectives strategic planning, finance, customers, internal business and innovation and used learning-based performance measurement systems to assess the performance of human resource information systems. Stensrud and Myrtveit (2003) applied Data Envelopment Analysis to model the productivity measurement of outstanding ERP projects. Lin et al. (2006) applied statistical methods to ERP implementation by providing a pair of performance indicators.

As mentioned earlier, previous literature has provided many useful performance indicator systems for IS performance evaluation. However, the most frequently adopted performance indicators systems refer to the common indices without developing tailor-made measures which reflect the objectives of the ERP implementation project.

Bititci and Turner (2000) propose an integrated performance measurement systems (IPMS) model to investigate the structure and relationships within performance measurement systems and claim to have developed a reference model and an audit method for IPMS. In addition, Bititci and Turner (2000) discuss a number of performance measurement frameworks and models, such as:

- BSC (Kaplan and Norton, 1996);
- SMART- strategic measurement for world-class manufacturers (Maskel, 1989);
- Performance measurement questionnaire (Dixon et al., 1990);
- Performance criteria systems (Globerson, 1996);
- Cambridge performance measurement design process (Neely et al., 1995);

- IPMS reference model (Bititci and Carrie, 1998; Bititci, Carrie, and McDevitt 1998a).

Heo and Han (2003) explain how a model was developed and tested to determine which measures are appropriate in an evolving IS environment. Their objective was to examine the relationship between IS structure and appropriate measures of IS evaluation that stem from the rationale of the previous researchers. Chen and Lin (2008) used a method based on a stochastic-flow network model to evaluate the performance of an ERP system, depending upon the results of the ERP examination of the users involved.

Chun-Chin Wei (2008) aimed to construct a framework to elaborate the development of ERP process improvements and to link the content of ERP performance measurement with consideration of ERP implementation. The study adopted performance measures such as data accuracy, believability of output, system accuracy and usefulness of output from the relevant literature. Many companies devote their attention to selecting and implementing an ERP system, but then fail to evaluate the effectiveness of the adopted ERP system. Unfortunately, information managers are often swamped by the diverse requirements of users, instead of evaluating the advantages and drawbacks of the ERP system and further improving its performance.

The reasons why organisations should assess the performance of their ERP systems are (Chun-Chin Wei, 2008):

- Installing an ERP system requires large investments of money, time and energy.
- The adopted system will influence all future business operations and strategies.
- Implementing an ERP system requires the work process to be customized and tailored to the business practices of the company.
- A successful system should meet the current and future requirements in a context of continuous upgrade; consideration of its maintenance is very important.

According to this perspective, instead of aiming at measuring the end result of an ERP implementation at the bottom line of profit and loss statements, the impact could be appreciated at the business process level by measuring the improvements generated along various dimensions of performance (e.g. quality, timeliness and efficiency). Sometimes the measured technical improvements after ERP implementation are quite poor, because ERP systems, like other management systems such as total quality management (TQM) or ABM, are potential value generators: their physical implementation is simply not enough to activate their inner potentialities (Chun-Chin Wei, 2008).

Fraser and Fraser (2003) criticise earlier performance measurement tools that normally depend on output measures such as completing projects on time or on budget, meeting sales targets, or fulfilling production quotas. They argue that such methods are not able to isolate the contribution of individuals from the effect of inessential variables such as bad weather, market fluctuations or political events.

Ifinedo and Nahar (2007) distinguish between ERP systems and other IT implementations, noting that ERP implementation has technological, operational, managerial, strategic and organisational components, so success measurement models used for the evaluation of other IT systems may not be adequate. Gattiker and Gattiker and Goodhue (2005) are also concerned with organisational components; they propose a model focussing on the subunit level of the organisation, assuming that the impact of ERP systems integration and standardization will be influenced by the interdependence and differentiation between subunits.

Kvavik et al. (2002) argue that measuring the success of ERP systems goes beyond simple measures of efficiency, while Rabaa`i, Bandara, and Gable (2009) assert that evaluating the impact of ERP systems is difficult, as it is often indirect and influenced by human, organisational and environmental factors. Similarly, Fowler and Gilfillan (2003) state that measuring the benefits achieved by a completed project can be problematic, as many of these benefits are intangible and difficult to quantify. Chien and Hu (2009) conducted a study designed to build a better understanding of the social factors that contribute to successful ERP implementation by examining the role that employee self-efficacy plays in ERP effectiveness. They report that ERP systems training and learning significantly improved ERP effectiveness.

Heo and Han (2003) assert that it is important to determine empirically the effects of contingency factors suggested by previous researchers, including several potential normative factors, such as external environmental variables (industry, competitive environment, culture etc.) and organisational variables (mission, size, goal, IS maturity, structure, evaluator perspective etc.).

2.6 Stakeholders in IS/ERP systems

Freeman (2001) defines a stakeholder as "any group or individual who is affected by or affects the achievement of an organisation's objectives". According to Adelakun and Jennex (2002), stakeholders can be categorized as either internal or external to an organisation. The concept thus covers a broad set of groups or individuals, including customers, suppliers, owners, employees, local people and other private and public sector bodies in the business environment. Figure 2.2 illustrates the stakeholder concept.

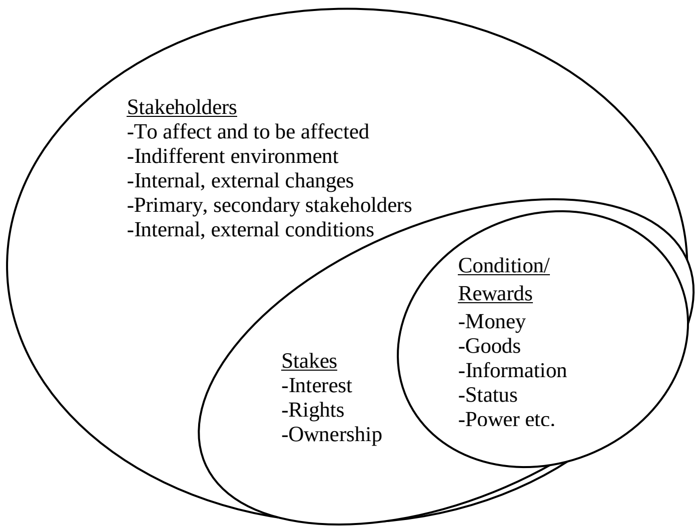


Figure 2.2: The stakeholder concept. Source: adapted from Nasi (1995)

A large number of studies of IS/ERP systems focus on 'user satisfaction' as a measure of the human aspect of system success; indeed, it has been described as the most widely used indicator of IS success (Myers, Kappelman, and Prybutok 1997). As suggested by the difficulties referred to in the previous section, directly measuring the success of an IS has been found to be unworkable, because of the intangibility of costs and the difficulty of first recognizing the benefits and then converting values to their financial equivalent (Holsapple et al., 2005). Therefore, some researchers have considered user satisfaction to be a good surrogate measure of IS success (Seddon and Kiew, 1994). However, measuring user satisfaction in the ERP context requires different methods from those used to develop conventional data processes; Wu and Wang (2005) distinguish between two main types of ERP system users: (1) *key users*, selected from the operating department, generally familiar with the business and having knowledge of their own domain; and (2) *end-users*, for whose requirements the system was ultimately developed. Wu and Wang believe that key users have a crucial role in the systems' success. Therefore, they focus on them to evaluate user satisfaction as means of determining system success, by developing a set of 21 items in a framework of three dimensions: professional capabilities of consultants/suppliers, technical competence of contractors/suppliers and training.

It is five decades since Cyert and March (1963) proposed the concept of user satisfaction as a surrogate of system success (Au, Ngai and Cheng, 2002). According to Wu and Wang (2006), user satisfaction is the extent to which users believe that the IS available to them meets their information requirements. It is also assumed that improved performance will automatically follow if the system meets information needs. This does not mean that satisfaction causes performance; performance and user satisfaction are both caused by the extent to which requirements are met.

User satisfaction and usage are still critical issues. Relevant studies have evaluated IS performance using the experience and perspective of various users, such as employees, middle managers, top managers and system engineers. Perceived satisfaction is a dominant requisite for the final success of an IS, including overall satisfaction, information satisfaction, software and hardware satisfaction and decision-making satisfaction (Chun-Chin Wei, 2008).

The Bailey and Pearson (1983) model of end-user satisfaction (EUS) is considered one of the oldest and most frequently used in IS studies. It consists of 39 factors that contribute to satisfaction with IS. Mahmood et al. (2000) reviewed 45 EUS studies published between 1986-1998, focusing on the relationship between EUS and nine variables: perceived usefulness, ease of use, user expectations, users skills, user involvement in systems development, organisational support, perceived attitude of top management to the project and user attitude to IS in general. The results of this analytical study showed a positive impact of all of the variables, but to varying degrees.

Seddon, Graeser, and Willcocks (2002) conducted a study of IT evaluation and the benefits that IT provides to the organisation. They elicited the views of 80 senior IT managers from Europe (including the UK) about IT evaluation approaches and the benefits that IT provided for their organisations, using a custom-designed questionnaire based on three dimensions: evaluating the overall IT portfolio, evaluating individual projects and applications, and evaluating the IT function.

After reviewing earlier studies and identifying the strengths and weaknesses of current IS EUS measurements, Au et al. (2002) developed a framework based on the equity and needs theories. The purpose of this model was to generate reliable and valid instruments to assess the performance of IS; in other words, to evaluate current applications rather than to predict behaviour.

Moshe (2003) adopted a different point of view of user satisfaction, examining the level of satisfaction with ERP systems and comparing them to those obtained in traditional IS studies. Furthermore, Moshe examined a set of hypotheses regarding possible relationships between user satisfaction and six user characteristics: functional department, position in organisational, formal education, age, computer experience and gender.

Bradley and Lee (2007) chose training to measure one aspect of user satisfaction, by considering gender, educational level and job type. Moreover, the study conducted an extension of the technology acceptance model (TAM) for ERP projects, incorporating satisfaction with training as a factor in perceived ease of use of ERP systems.

In a continuation of their earlier research and to extend their understanding of the antecedents of EUS, Au, Ngai and Cheng (2008) propose a new model that integrates three well-founded theories, namely expectation theory, need theory and equity theory. The importance of this model is to recognize that each individual has needs that he or she seeks to fulfil (e.g. work performance, relatedness and self-development). The authors conducted a survey of workers in the hotel and airline sector (n=922) and found that IS end-users have different needs, concluding that earlier studies focusing on the technical aspects of the IS, the employees or the users might not be sufficient.

Calisir and Calisir (2004) examine several usability factors affecting end-user satisfaction in the ERP systems environment, including systems capability, compatibility, and perceived ease of use, flexibility, user guidance, learnability, perceived usefulness and minimal memory load. Similarly, Longinidis and Gotzamani (2009) explore the key factors that constitute users' satisfaction (department of employment, formal education, age, computer experience and gender), in order to determine whether satisfaction with ERP varies according to users' profiles.

By integrating the innovation of diffusion theory with the DeLone and McLean (D&M) IS success model, Hsu, Lai, and Weng (2008) attempt to measure the success factors for ERP implementation and the extent of user satisfaction in the measurement of system success. They report three important results concerning the implementation of ERP systems: (1) user participation and observability strongly influence user satisfaction; (2) user satisfaction has a strong correlation with individual performance; (3) individual performance has a positive association with organisational performance.

To continue their earlier research, Wu and Wang (2006) conducted a study using a reliable and valid instrument (with 23 items) to evaluate ERP ultimate user satisfaction, while Aladwani (2003) attempted to identify links between attitude, behaviour and consistency of assumptions, and to explore their relevance to information satisfaction.

Despite user satisfaction being widely used by the abovementioned researchers to evaluate IS success; Doll, Deng, and Raghunathan (2004) argue that characteristics of subgroups have not been adequately examined. Using their End-user Computing Satisfaction (EUCS) model, they tested the correspondence of the factor loading and the structural weight of the subgroups based on the positions of respondents, types of application, hardware platforms and modes of development.

Users' adoption is another aspect of the behaviour of IS stakeholders. Beaudry and Pinsonneault (2005) contend that there is a need to develop a framework able to integrate approaches to the study of antecedence, behaviours and outcomes of user adoption. They claim to have taken the study of user adoption a step further by developing an integrative model, the coping model of user adoption.

Lim, Pan, and Tan, (2005) conducted a case study of users' motivational dynamics from an expectancy perspective, arguing that since researchers are particularly keen to understand the utilization of ERP amongst organisational members, the study of their expectations and motivation often remains at a perfunctory level.

Holsapple et al. (2005) empirically studied user characteristics (age, education level, management level, IS experience) and fitness factors (package localization, compatibility, task relevance) as determinants of ERP user satisfaction (project team, product knowledge and involvement).

ERP systems have been studied from other perspectives. For instance, Low and Ngai (2007) explored the relationships between the extent of business process improvement (BPI) success and organisational performance, and those between the outcomes of these initiatives and such organisational factors as strategic intent, as well as the possible effects of organisational variables on these constructs. Aladwani (2001) explored yet another aspect of ERP systems, concluding that marketing ideas and ERP implementation strategies can together help to overcome workers' resistance to the adoption and use of ERP systems.

Identifying the factors that lead to the success or failure of ERP systems is both critical and very difficult. Having conducted a case study of four firms which had implemented ERP systems, Motwani, Subramanian, and Gopalakrishna (2005) suggest that a cautious, evolutionary, bureaucratic implementation process, change management, network relationships and cultural readiness can all have positive impacts on ERP implementation.

Having reviewed the relevant literature on social aspects of IS, it remains to highlight the gaps. There is a shortcoming in the IS literature regarding user/stakeholder performance. On the basis of the discussion above, there is need for more focus on the social aspects in evaluating ERP systems; this is crucial not just from the satisfaction point view, but also from the stakeholders' performance perspective.

2.7 Stakeholders’ Evaluation

There is a broad divergence of views in the literature as to who should be considered stakeholders. Different researchers and practitioners use stakeholders’ analysis for different purposes in different contexts. Thus, in education, Seng, and Leonid (2003) argues that it is difficult to identify a unique role for a given group of people. For example, students are sometimes seen as stakeholders because of their participation in learning, while graduates are considered products/services of the education process. However careful and detailed the approach to identification of stakeholders, it will eventually come up with different groups, depending on which organisations’ or systems’ stakeholders one seeks to identify. The domain in which an organisation or system operates will also determine to some extent the set of stakeholders. Freeman (1984) and Eden and Heijden (1993) use the concept of stakeholders primarily as a tool for examining the external environment of a given organisation; this is expected to assist managers with strategic decision making.

The use of the term ‘stakeholder’ in the information systems field is relatively recent; therefore there is some confusion about the notion in IS research (Pouloudi, 1999). Nevertheless, the need to involve certain types of stakeholders in IS decision making has been emphasised in the literature for some time. Among the important categories referred to in the IS literature are primary stakeholders, internal stakeholders, system suppliers and user groups, because IS is at the centre of their attention. Pouloudi and Whitley (1997) state that the difference between the participants in the IS development process and stakeholders is that the former are taken to be individuals, groups or organisations who take part in a development process, whereas the latter includes participants whose actions can influence or be influenced by the development and use of the systems, whether directly or indirectly.

The most fundamental aspects of IS are the gathering and validating of requirements. Requirements can be seen as applying to one of two domains: the technical and the social. IS stakeholders may be involved with different aspects, such as development or satisfaction (Blyth, 1999). Fowler and Gilfillan (2003) state that it is important to clearly identify the stakeholders in any IS project and to ensure that their needs are met. Similarly, Ballejos and Montagna (2008) state that stakeholders are the first emerging challenge in any software project. In addition, they make an active contribution to the elicitation, analysis and communication of requirements, since they have valuable knowledge. Therefore, identification is a critical factor in success.

Improving human performance in organisational tasks remains a primary goal for modern organisations in order to increase competitiveness. They therefore expend considerable resources on improving employees' task and job performance (Marshall et al., 2002). Despite the attempts of previous studies to show the important role of evaluation from the perspectives of different people (Matin, 1977; Hamilton and Charvany, 1981; Wilkes and Dickson, 1987), Stoak and William (1992) contend that IS evaluation from the 'people' perspective is insufficient, because (for example) managers in different functional areas and at different organisational levels have divergent perspectives on IS performance.

Preston and Sapienza (1990), Freeman (1993), Goodpaster (1993), Jones (1995) and others argue that stakeholder analysis is an ethical alternative to serving exclusively the interests of an organisation's shareholders. Wood et al. (1995) recommended the use of stakeholder analysis in combination with other analytical approaches as part of an interpretive framework for business process re-engineering. According to Pouloudi (1999), the IS literature concentrates on how stakeholder analysis can support planning and strategy formulation or the successful development or implementation of information systems. It often emphasises communication problems within the organisational environment; hence many authors refer to the different objectives of systems developers and other user groups (the stakeholders) that they consider.

Park, Suh, and Yang (2007) examine the effect of the absorptive capacity of users on their use of ERP in a Korean context. The propose five measures of improved performance when using an ERP system: the degree of improvement in job performance, enhancing the speed of task performance, enhancing job productivity and making it easier to perform tasks, in addition to the degree of overall satisfaction with the system. Taking a rather different line, Zhang et al. (2005) assert that the success of ERP implementation can be measured in four dimensions: user satisfaction, individual impact, organisational impact and intended business performance improvement. According to Chang et al. (2008), the methods for evaluating ERP performance are limited by the departments of the company. They therefore propose a conceptual model to evaluate the performance and competitive advantage associated with ERP systems from a supply chain management (SCM) perspective.

Ifinedo and Nahar (2006) conducted research in two small Northern European countries to investigate the measurement of ERP success from the perspective of top and middle managers, adapting the model of Gable Sedera, and Chan, (2003), adding the notion of workgroup impact derived from Myers, Kappelman, and Prybutok (1996) and incorporating a novel dimension: vendor/consultant quality. Using a hierarchical analytic process, Islam and Rasad (2005) conducted an evaluative study of a service company to evaluate employee performance based on the criteria of the quality and quantity of work, planning and organisation, initiative and commitment, teamwork and cooperation, communication, and external factors. Wang and Huang (2006) offer evidence from an empirical study of how engineers evaluate project success and to what extent key project stakeholders' performance correlates with project success. The results show that engineers use relations with key stakeholders as the most important criterion of project success and that stakeholders' project performances positively correlate with each other.

Albeit the study of Abreu and Conrath (1993) is considered old, their integrating framework of IS implementation success remains significant. The uniqueness of this framework is its focus on stakeholders' expectations as predictors of IS implementation outcomes. The framework underpins the literature on IS implementation, especially those studies that explain or predict the outcomes of this process. Its authors attempt to integrate the existing research streams of factor studies, process studies and expectancy studies. Their model uses a multi-perspective approach, taking into consideration different stakeholders' views of the process.

Fraser and Fraser (2003) conducted a study using a multi-rater evaluation method known as 360-degree feedback, which was developed from an innovative technique administrated only to the most senior levels as a must-have tool for integration into overall performance and human resources management strategy (Church and Bracken, 1997). The 360-degree feedback method has been extensively used in research and practice for measuring managers' performance. It is efficient and equitable, and is becoming increasingly widespread (Fraser and Fraser, 2003), being considered one of the more promising approaches to assessing subjective competencies (Wood et al., 2004). This method is widely used to evaluate managerial aspects of stakeholders' performance, but not to measure that of stakeholders in IS/ERP systems.

Boonstra (2006) asserts that "information systems are both a product of human action and an influence on human action. People initiate, design, and use an IT system". Therefore, it would be of interest to study how the outcome of ERP implementation can affect the interests of ERP stakeholders and how they might react by influencing the project. Ifinedo and Nahar (2007) measured ERP success by focusing on the utilization of the ERP systems to enhance organisational effectiveness from the perspective of the two key organisational groups: business managers and IT managers/professionals. Mehlinger (2006) observes that numerous ERP system implementations have been unsuccessful in the past few years due to poor preparation, planning and resistance to change. Moreover, lack of evaluation in the post-implementation phase, of both technical and social aspects, has been highly problematic.

2.8 ERP systems in higher education

Among the major challenges facing the HE sector has been that of updating its systems in line with the development of new technology. Meanwhile, one of the most noteworthy aspects of current ERP use is that it is much more than manufacturing resource planning, having become popular with non-manufacturing operations in service organisations such as universities, hospitals and airlines, where both the back and front office are important, as are efficiency and effectiveness (McGaughey and Gunasekaran, 2008).

Lockwood (1985) lists some similarities and differences between universities and business organisations, which include: complexity of purpose, limited measurability of output, autonomy and dependency from wider society, diffuse structure of authority and internal fragmentation. The author classifies universities as organisations, facing the same problems as any other, such as co-coordinating resources, controlling costs, and simulating and facilitating enterprise among staff.

In a university, there are multiple users of an ERP coming from varied backgrounds with different goals and approaches to practice, including different epistemic cultures. In Wagner and Newell's study (2004), users included both dispersed faculty members and central administrators. Hence, the study contrasted the cultures of administration (both central and departmental) and faculty as the newly developing ERP systems were implemented. This proved difficult, because of the variety of cultures present in this context, rendering it challenging to suit the different purposes and agendas of all the different stakeholders (Wagner and Newell, 2004).

According to Wagner and Newell (2006), the university context is a valuable analytical focus for the study of ERP, because its structure is designed to meet the needs of multiple stakeholders. Historically, a plethora of functional information systems existed throughout universities with limited standardization of data, which required aggregation and consolidation for university-wide reporting. This context creates challenges to the adoption of an interested ERP.

Despite the similarities and differences between universities and business organisations, over the past decade ERP systems have played a remarkable role in both, in the recent history of IT management in higher education and in the history of HE itself (Kvavik et al., 2002). According to Cameron (2008), today's globally competitive environment requires technical professionals to move beyond technical expertise and contribute to the strategy and development of dynamic IT systems that are able to support the chaining of business objectives. Thus, Spathis and Ananiadis (2005) report that universities have recently turned to ERP systems as a means of replacing existing management and administration computer systems. Kitto and Higgins (2010) specify that such systems are aimed primarily at mitigating risks while simultaneously enabling universities to remain competitive in a global HE marketplace. The consequent difficulties in implementing ERP systems in HE has led to a focus on SCM to help the education system reduce or close the existing gap between its outcomes and job market needs (Alturki, Duffuaa, S., Demiral, 2008).

Zornada et al. (2005) assert that due to the increasing number of higher education institutions (HEIs), there is a need to introduce ERP systems in order to improve their operations and make them manageable and more transparent. ERP vendors are aware of this fact, which is why they have already expanded their solutions in order to satisfy the needs of HEIs. The purpose for an HEI of implementing an ERP system is to develop the direction of support for key administrative and academic services. Moreover, ERP usually supports minimal student administration (enrolment procedures and student enrolment, financial support for students, students' data etc.), human resource management (monitoring of employees) and finance (accounting, payments, investments, budget etc.). By implemented such a system, users expect to improve organisational efficiency and consequently to improve quality, productivity and profitability. Kitto and Higgins (2010) contend that ERP systems play a specific and important role in government within the HE sector; their study explores the implementation of a type of ERP software in online educational technology at an Australian university.

According to Rabaa`i, Bandara, and Gable (2009a), the main advantages of ERP for HEIs are: (1) improved information access for planning and managing the institution; (2) improved services for the faculty, students and employees; (3) lower business risks and (4) increased income and decreased expenses due to improved efficiency. The benefits of ERP are also the topic of a study by Spathis and Ananiadis (2005), based on users' expectations and perceptions, focusing on three dimensions in the following order: managerial, operational and IT infrastructure. The research concerned the impact in relation to accounting information and management of an ERP system implemented at a large public university in Greece.

Indeed, numerous studies have explored the advantages for administrative systems infrastructure to be gained from ERP, identifying criteria that need to be met by administrative systems in terms of computing infrastructure in order to enable successful adoption (ECAR, 2002; Pegah et al., 2003; Bologa and Romania, 2007; Lupu et al., 2008). According to these studies, the main advantages of implementing ERP in HEI are:

- Improved information access for planning and managing the institutions.
- Improved service for the faculty, students and employees.
- Increased income and decreased expenses due to improved efficiency.
- Secure data from the top security risks.
- Unlimited access to authorized users.
- Maintainability of the system.

- High performance and reliability.
- Scalability/adaptability.
- Unifying information and processes related to students, faculty and staff.
- Better decision making.
- Meeting compliance and governance.
- Promoting relationships.
- Providing greater flexibility to users.
- Easier and quicker access to data for reporting and decision making.

Correspondingly, Swartz and Orgill (2001) summarise the advantages of implementing ERP in higher education as improved access to information, improved workflow and efficiency, and the ability to improve controls and to programme alerts. They add that an exciting development in modern ERP systems is the availability of easy-to-use web interfaces. Finally, they note that ERP helps the individual within the project to develop a new work ethic and to disseminate positive attitudes in the workplace. Therefore, universities have focused their efforts on implementing ERP systems in response to calls for HEIs to improve operational efficiency, to reduce duplication of resources by implementing advanced information systems that span the institution and improve processes, to address the growing governmental information requirements and to improve competitiveness (Allen, Kern and Havenhand, 2002).

In a case study of Cranton University, Kittner and Slyke (2000) assess the importance of IT support for both the academic and the administrative functions of the university. In another study, Klaus, Rosemann and Gable (2000) argue that the importance of ERP systems to academia lies in supporting communication amongst researchers and practitioners, informing the development of teaching materials on ERP and related concepts in university curricula and in commercial education and training, and improving communication with clients, consultants and vendors.

Allen, Kern, and Havenhand, (2002) adopt Holland and Light’s CSF model to investigate whether ERP systems offer a feasible IS strategy for HEIs, considering four in-depth case studies conducted in HEIs that were in the process of implementing ERP systems. Atari et al. (2008) also report a study of ERP systems in higher education and propose a model for higher education to emulate business

SCM. Their study focuses on the role of SCM as a solution for the HE system to reduce or close the existing gap between its outcomes and job market needs. In related work, Sabau et al. (2009) propose a framework to examine the technical aspects of the application of ERP systems in Romanian universities. Another such framework is that developed by Fowler and Gilfillan (2003), designed to help and guide HEIs in improving the implementation and development of large and complex ERP systems. Their aim was to provide general guidance and links for co-operation between different stakeholder groups involved in such efforts, including senior university management, project teams and systems vendors. Hayes and Utecht (2009) also conducted a case study of the implementation of an ERP system by a university, measuring the return on investment in an HEI and managing organisational change. Taking Monash University in Australia as a case study, Seng and Leonid (2003) present their model developed for process-oriented HEIs and discusses the implications for information support in this environment. The elements of this model consist of stakeholders and their objectives, resources and products/services.

Bradley and Lee (2007) note a lack of existing studies examining the effectiveness of training and education in ERP systems, responding with another case study, of a mid-sized university, to explore the importance of training and to investigate the relationship between training and satisfaction on one hand and perceptions of use, usefulness, effectiveness and efficiency on the other. They argue that universities face many of the same problems as for-profit organisations in installing ERP, such as coordinating resources, controlling costs and facilitating enterprise among staff. Many universities turn to ERP systems to improve efficiency and responsiveness to student needs; HEIs are no more exempt from implementation difficulties than conventional business organisations. An earlier study by Pollock and Cornford (2004) of a particular case in the UK focuses on how the development, implementation and use of both general and university-specific functionality are mediated and shaped by fundamental and long-standing tension within universities. These authors also attempt to demonstrate the value of discussing the similarity of relationships involving universities and other organisations.

Bologa et al. (2009) classify the success of ERP implementation under two headings: *internal*, related to the duration, costs and scope of the implementation, and *external*, oriented towards increasing client satisfaction and systems quality. In contrast to the two studies reported in the previous paragraph, they point to significant differences in implementing ERP systems between industry and universities, including those regarding communication structures, management involvement, organisation, implementation team competences, legacy systems, user training, interdepartmental communication, supplier/customer partnerships and external consultants. Notwithstanding such differences, the authors conclude that the success of any ERP implementation project is represented by delivery on time and on budget.

Wagner and Newell (2004) analyse the strategic partnership between a multinational software vendor and a university, which together designed a 'best practice' ERP package for the higher education sector. One of the purposes of this study was to explore the gap between the adopted theory of software design and its use within an organisation over time.

According to Jorgenson, Ho, and Stiroh (2003), based on data on the sources of growth for the US economy between the period 1977-2000, economic growth is controlled by investments in IT and education, both for individual industries and the economy as a whole. Moreover, there is a jump in IT investment and gains in the employment of college-educated workers.

Okunoye and Folick (2006) focus on the pre-implementation phase of ERP systems in HE, using the case study of Agora University, covering the key stages of implementation. Particular emphasis is given to the selection of the ERP systems and the organisational dynamics involved. The aim of a study by Rabaa`i, Bandara, and Gable (2009a) was to advance understanding of the phenomena of ERP adoption and evaluation in HE in the Australasian region. It presents a descriptive case study conducted at Queensland University of Technology and covering many aspects, including ERP selection, customisation, integration, evaluation and the role of consultants in the HE sector. Mehlinger (2006) chose a higher education setting for their study of the successful adoption of ERP systems from the perspective of the characteristics of transformational leadership theory and its significance in predicting performance within an organisation. They found that the use of transformational culture was a predictor of the level of success of an ERP implementation.

A few researchers have focused on ERP systems in HEI from the perspectives of curriculum, students and teachers (e.g. Waston, 1999; Cameron, 2008). Value on investment (VOI) is a new research tool in the HE sector, pioneered by Norris (2003), which measures the total value of 'soft' or intangible benefits derived from technology initiatives in addition to the 'hard' benefits measured by ROI. VOI is critical to the kinds of competitive differentiation that will be important to colleges and universities over the coming years.

The modules usually included in university ERP systems are illustrated in Figure 2.3, taking as an example SAP for HE.

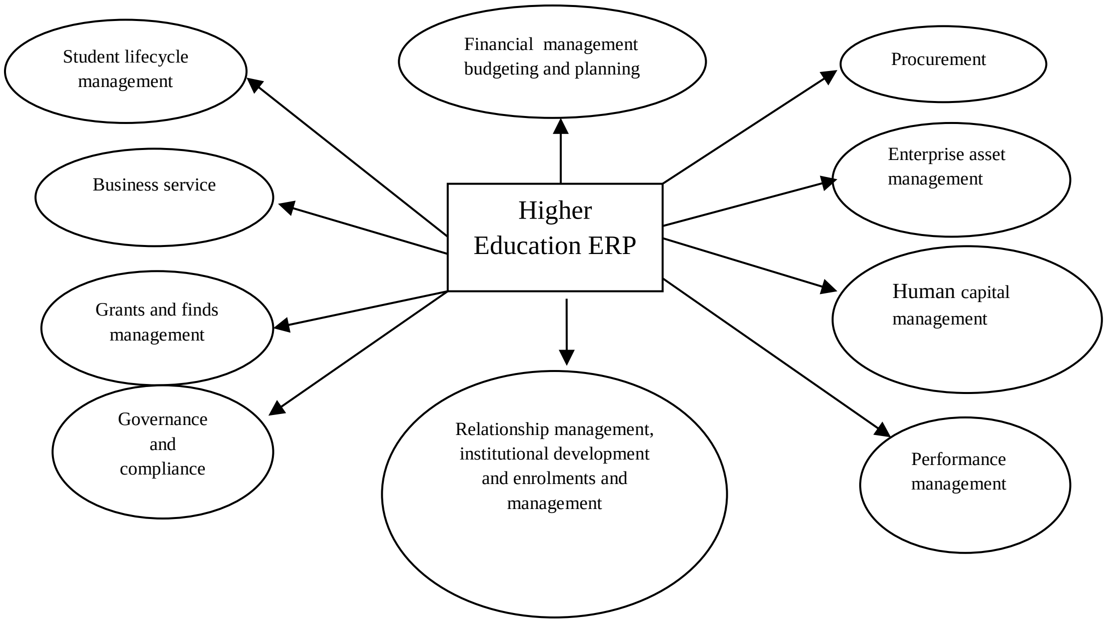


Figure 2.3: Process in SAP for HEI and research. Source: Bologa and Romania (2007)

Moon (2007), having reviewed work published between January 2000 and May 2006 about ERP systems in various journals, reports that there is a lack of publications on ERP systems in education. He argues that given the existence of some vendor-sponsored university programmes, a significant amount of experience must have been collected; however, he concludes that it might take some time for teachers and scholars to reflect on their experiences and start publishing.

Similarity, Esteves and Pastor (2001) present an annotated/interpreted bibliography of the important journals and conferences concerning IS during the period 1997-2000. They provide a brief summary with complete references for 189 articles and classify the publications into phases; for example, general, adoption, acquisition, implementation, usage, evolution, retirement and education. They note the number of publications in each category as a percentage. The authors report that the number of publication phases is greater than the number of other phases. Furthermore, the study reveals a serious lack of publications concerned with stakeholders' performance. Finally, a high proportion of publications related to university education focused on aspects of teaching and the curriculum. Genoulaz and Millet (2005) present an analysis of the ERP literature for the period 2003-2004 and identify six categories of topics: implementation of ERP systems, optimisation of ERP, management through ERP, the ERP software, ERP for supply chain management, and case studies. To summarise, Bologa et al. (2009) argue, based on the previous literature, that organisational aspects are more important than technological aspects.

Chae and Poole (2005) note that ERP design and implementation in HE is challenging and complex, due to unique factors in the public sector, including state mandates and requirements. Similarly, Wagner and Newell (2006) argue that despite the importance of implementing ERP systems, organisations doing so face serious challenges, which are associated with high levels of failure. They take a narrative approach to their study of the implementation of the IVY system in one of the largest universities in the USA, focusing on controversial episodes during the IVY implementation and on what helped to move the stalled project forward. Rabaa`i, Bandara and Gable (2009a) also notes the difficulties and high failure rate in implementing ERP systems in the HE environment which are cited in the literature. Moreover, the critical success factors in ERP systems in HE are also limited. Rabaa`i, Bandara and Gable (2009a) aims to contribute to developing the understanding of ERP implementation in HE and of evaluation in HE to fill this gap and to guide researchers and practitioners who seek to identify the reasons for the failure of ERP systems**.** Umble, Haft, and Umble (2003) summarise the reasons for project failure in ten categories:

- Strategic goals are not clearly defined.
- Top management is not committed to the system.
- Implementation project management is poor.
- The organisation is not committed to change.
- A great implementation team is not selected.
- Inadequate education and training results in users being unable to satisfactorily run the system.
- Data accuracy is not ensured.
- Performance measures are not adapted to measure the organisation change.
- Multi-site issues are not properly resolved.
- There are technical difficulties.

Park, Suh, and Yang (2007) support users' demand for customisation, especially when their tasks and business processes are different from those of the standardised package.

2.9 ERP systems in Saudi Arabia

During the last decade in the KSA, ERP systems have been established in many different organisations in both the private and public sectors. Some have simply implemented packaged software systems (e.g. SAP, ORACLE, PeopleSoft), while others have developed new local ERP systems (e.g. MADAR).

Some researchers in Saudi Arabia have focused on the area of ERP systems and their investigations in this field have emphasised the general technical aspects (e.g. Al-Mashari, 2001; Al-Mashari, 2003; Al-Mashari and Al-Mudimigh, 2003; Al-Mashari and Zairi, 2006; Al-Mudimigh, Zairi and Al-Mashari, 2001). On the other hand, researchers at King Saud University (KSU) have devoted particular efforts to developing and implementing a local ERP system called MADAR. Prof. Abdullah Al-Mudimigh, as project manager, has co-authored several papers on the project (Al-Mudimigh and Ullah, 2001; Al-Mudimigh and Ullah, 2011; Al-Shamlan and Al-

Mudimigh, 2011; Al-Mudimigh and Ullah, 2009; Al-Hossan, Al-Mudimigh, 2011; Al-Mudimigh, Ullah, Saleem and Al Aboud, 2009). Therefore, based on the above literature analysis, there appears to have been a shortage in Saudi Arabia of ERP system evaluations from the stakeholders' perspective, as of the time at which the present evaluation was conducted.

2.10 Gap in ERPs performance evaluation, stakeholders' prospective

The reviews of the relevant literature in this chapter and the next highlight some of the gaps in the field of ERP evaluation studies in higher education from a stakeholder perspective that this thesis aims to tackle. While there are available models for measuring / evaluating IS, most of these have been used on technical rather than social aspects.

Almshari (2002) asserts that having ERP systems frequently topping the list of themes in major academic IS studies reflects the dire need for research in this rapidly field. Indeed, as ERP systems continue to spread more widely, the need for new research to address various issues in this context has become even more urgent. In addition, Howcroft and Wagner (2004) emphasise that it is essential to focus research on the design, implementation, use and evaluation of ERP systems within and across contexts. Thus, researchers should examine the ways that such systems are shaped by individuals and groups as well as by organizational and social structures and cultures. Therefore, there is no doubt that concentrating on these aspects will affect the development and use of ERP, which will shape the behaviour and attitudes of the stakeholders.

On other hand, Khalifa et al. (2001) argue that there is sufficient evidence in the IT literature to suggest that IT system users are excluded from the evaluation process, especially when traditional methods focus on technical factors and direct costs rather than on human aspects. Therefore, researchers like Pouloudi and Serafeimidis (1999) argue for matching the IT evaluation approach with the culture of the organisation in order to achieve successful development of systems in line with the needs of stakeholders as individuals, groups, organisations and societies.

A review of the literature also suggests that most existing ERP research focuses on selection and implementation, not on post-implementation impact, although a number of studies suggest that ERP systems go through a post-implementation breaking-in phase, in which the organisation may not experience the hoped-for performance. However, the ultimate impact of ERP systems on organisations once implemented and ‘shaken down’ has not been as thoroughly researched (Gattiker and Goodhue, 2005; Somers, Nelson, and Ragowsky 2000).

Despite the fact that ERP has been developed, evolved and implemented around the world for almost two decades, Helo, Anussornnitisarn and Phusavat (2008) note that there are still many recently published reports of difficulties in its implementation. Many have reported that ERP implementations failed to achieve the organisation’s targets and expectation, because a project is not complete without post-implementation evaluation (Finney and Corbett, 2007).

Consequently, Spathis and Ananiadis (2005) identify the under-representation and inadequacy of performance evaluation in IS in general and ERP systems in particular, in both public and private sectors. Advancing the field of IS/ERP evaluation requires giving appropriate attention to the evaluation of stakeholders’ performance and developing a framework for the post-implementation phase.

Tables 2.2, 2.3 and 2.4 list more than 150 studies extracted by the researcher from the body of previous research into ERP systems, showing the different aspects investigated in studying various related topics ERP system. In particular, Table 2.2 highlights the lack of literature on stakeholders’ performance evaluation, while Table 2.3 shows an obvious gap in post-implementation studies. Table 2.4 offers examples of ERP systems in higher education in general and KSA in particular. This a brief review of the literature shows that there is a gap, which the present study seeks to address.

Table 2.2: Examples of technical, social and financial aspects investigated in studies of ERP systems in the literature

ERP systems evaluation	Visionary
Technical	Al-Mashari et al., (2002); Rosemann, (1999); Calisir and Calisir, (2004); Strong and Volkoff, (2010); Shehab et al.,(2004); Helo, (2008); McGaughey, (2007); Elmes, (2005); Nah, (2001); Shehab et al., (2004); McGaughey and Gunasekaran (2008); Chun-Chin Wei (2008); Umble et al., (2003); Stensrud and Myrtveit, (2003); Chen and Lin, (2008); Chang et al., (2008); Sabau et al., (2009); Al-Mashari,(, 2001); Al-Mashari, (2003); Al-Mashari and Al-Mudimigh, (2003); Al-Mashari and Zairi, (2006); Al-Mudimigh, Zairi and Al-Mashari, (2001); Olhager and Selldin(2003); Luo and Strong (2004); Volkoff et al (2005);Beretta, (2002); Stefanou, (2001); Aral et al.,(2006);
Social	**Satisfaction:** Wu and Wang, (2005); Wu and Wang, (2006); Moshe, (2003); Bradley and Lee., (2007); Calisir and Calisir, (2004); Longinidis and Gotzamani, (2009); Hsu et al., (2008); Aladwani, (2003); Ozen and, Basoglu., (2006); Hess and Hightower, (2002); Somers et al., (2003); Rodecker and Hess, (2001); Roses, (2011); Hsu et al., (2008); Longinidis and Gotzamani, (2009); Zviran, (2003); Verdaasdonk and Oomen, (2001).
	Stakeholders’ role in ERP system efficiency: Chien and Hu, (2009); (utilization of the ERP systems) Ifinedo and Nahar, (2007); explains the complexity of an (ERP) to general and project managers, Marnewick and Labuschagne, (2005); reasons of lack of success Skok and Legge, (2002).
	Stakeholders’ performance evaluation: Evaluate employee performance based on the criteria of the quality and quantity of work, Islam and Rasad, (2005); ERP success from the perspective of top and middle managers, Ifinedo and Nahar, (2006); impact individual performance when using (ERP) systems, Kositanurit et al., (2006).
Financial	Chen and Lin, (2008); Wieder et al., (2006); Beretta, (2002); Fraser and Fraser, (2003); Sakris and Sundarraj, (2000); Nicolaou and Bhattacharya, (2006); Hunton et al., (2003); Wei et al., (2005); Cebeci, (2009); Nicolaou and Bhattacharya, (2006); Hunton, (2002); Hendricks et al., (2007); Bingi et al., (1999); Hayes et al ., (2001); Themistocleous et al., (2001);

Source: Originated by the researcher

Table 2.3: Examples of pre-implementation, implementation and post-implementation aspects used in studying ERP systems in the literature

ERP systems implementation	
Pre- implementation	Helm et al (2003); Olhager and Selldin (2003); Mandal (2003); Mabert et al (2003).
Implementation	Motwani et al., (2005); Aladwani, (2001); Low and Ngai., (2007); Yusuf et al., (2004); Umble et al., (2003); Mandal, (2003); Rajagopal, (2002); Chang et al., (2000); Mabert et al., (2003); Aladwani, (2001); Gyampah and Salam, (2003); Genoulaz and Millet, (2005); Zhang, et al., (2003); Nah and Zuckweiler, (2003); Somers and Nelson,(2001); Nah and Lau,(2001); Shanks et al., (2000); Sun et al., (2005); Olhager and Selldin., (2003); Tsai et al., (2005); Murray and Coffin, (2001); Donovan, (2001); Willis and Brown, (2002); Plant and Willcocks, (2007); Joseph and Li, (2008); Osman et al., (2006); Esteves and Pastor., (2001); Bhatti, (2005); Woo, (2007); Kamhawi, (2007); Bradley,(2008); Kim et al., (2005); Françoise and Bourgault, (2009); Bradford and, (2003); Al-Mudimigh, (2001); Fok et al., (2010); Lapiedra et al., (2011); Ahmed et al., (2006).
Post- implementation	Argyropoulou et al., (2008); examines the long-term financial performance, Nicolaou and Bhattacharya, (2006); operating effectiveness aspects Chian-Son Yu, (2005); Training users is critical to the success of ERP, Scott, (2001).
Critical Success Factors	Finney and Corbett, (2007); Møller, (2005); Motwani et al., (2005); Umble et al., (2003); Mandal, (2003); Nah and Lau, (2001); Bingi et a.l., (2006); Akkermans and Helden, (2002); Genoulaz and Millet, (2005); Shanks et al., (2000); Somers and Nelson,(2001); Nah and Zuckweiler, (2003); Zhang, et al., (2003); Sun et al., (2005); Tsai et al., (2005); Murray and Coffin, (2001); Plant and Willcocks, (2007); Allen et al., (2002); King and Burgess, (2006); Sumer, (2000); Soliman et al., (2001); Huang et al., (2004); Soja, (2006); Plant and Willcocks, (2007); Jarrar et al., (2000); Ngai, et al., (2008); Osman et al., (2006); Mutschler and Reichert (2008); Esteves and Pastor (2001); Bhatti (2005); Woo, (2007); Kamhawi, (2007); Olson and Zhao, (2007); Sánchez, (2007); Gargeya and Brady, (2005); Willcocks and Sykes, (2000); Bradley, (2008); Ehie and Madsen, (2005); Al-Fawaz et al., (2008); Lu et al., (2006); Spathis, (2003); Mashari et al., (2006); Mendoza et al., (2006); Françoise and Bourgault, (2009); Buonanno et al., (2005); Bradford and (2003); Wang et al., (2008); Remus, (2006); Wilson et al., (2002); Par and Shanks (2003); Gyampah (2004); Chien and Tsaur, (2007); Sedera and Gable, (2003); Sedera and Gable, (2004).

Source: Originated by the researcher

Table 2.4: Aspects of ERP systems in higher education in general and KSA in particular used in studies in the literature

ERP systems in higher education	
General	Wagner and Newell, (2006); Wagner and Newell, (2004); Kvavik et al., (2002); Spathis and Ananiadis, (2005); Kitto and Higgins, (2010); Alturki et al., (2008); Zornada et al., (2005); Spathis and Ananiadis, (2005); Rabaa`i et al., (2009); ECAR, (2002); Pegah et al., (2003); Bologa and Romania, (200); Lupu et al., (2008); Swartz and Orgill (2001); Allen et al., (2002); Kittner and Slyke, (2000); Klaus et al., (2000); Atari et al., (2008); Sabau et al., (2009); Fowler and Gilfillan, (2003); Hayes and Utecht (2009); Seng and Leonid, (2003); Bradley and Lee (2007); Pollock and Cornford, (2004); Bologa et al., (2009); Jorgenson et al., (2003); Okunoye et al., (2006); Mehlinger (2006); Waston, (1999); Cameron, (2008); Chae and Poole, (2005).
ERP system in Saudi Arabia higher education	**Technical** Al-Mudimigh and Ullah, (2001); Al-Mudimigh and Ullah, (2011); Al-Shamlan and Al-Mudimigh, (2011); Al-Mudimigh and Ullah, (2009); Al-Hossan, Al-Mudimigh, (2011); Al-Mudimigh, Ullah, Saleem and Al Aboud, (2009). **Social** **No literature available / found**
Stakeholder performance evaluation in higher education in the KSA	**No literature available / found**

Source: Originated by the researcher

2.11 Summary

This chapter has given a general overview of the theoretical background to the evaluation of the performance of ERP stakeholders and a detailed description of the background of each separate aspect. In chapter 1, the shortage of research on the evaluation of stakeholders who use ERP systems daily was made evident. It was also shown that many studies have indicated the importance of the social aspects of IS and in particular of ERP systems. This chapter has discussed the available literature relating to IS models and ERP system models. Particular emphasis was placed on the evaluation of stakeholders' performance.

The review undertaken in this chapter has identified gaps in the literature that this thesis aims to address, guided by the literature review and critical analysis of previous work in this field, identifying the research potential around three models:

D&M, Task Technology Fit (TTF) and EUCS. The following chapter proposes a theoretical framework based on these models, aiming to evaluate the impact of ERP systems on stakeholders' performance.

CHAPTER THREE

RESEARCH THEORETICAL MODEL

PAGE

3.1 Overview

Since the value of IS evaluation and the impact of ERP systems on both organization and individuals reflect the importance to the organization of productivity, quality and competitiveness, the aim of this chapter is to offer a critical analysis of the literature on the impact of stakeholders' performance on the implementation of ERP systems, in the context of higher education.

The review also helps in developing a conceptual framework whose theoretical underpinnings are derived from the findings and the results of the literature synthesis. This review attempts to integrate three models referred to in the relevant literature: the D&M IS success model (DeLone and McLean, 1992), the TTF model (Goodhue 1995) and the EUCS model (Doll and Torkzadeh, 1988), to produce a new construct offering a more comprehensive view of the most important factors by which to evaluate stakeholders' performance on ERP systems in higher education. This chapter presents the background to each model and illustrates its relation to ERP systems. It also illuminates the strengths, shortcomings and implications of the three models in the current literature, identifying gaps and possible areas for further contributions. In addition, the chapter enumerates the factors selected from the three models for application in the present research and discusses their theoretical background and empirical validation by previous studies.

Having summarised the main factors and the proposed framework, including the final factors chosen from the three models to evaluate stakeholders' performance on ERP systems in higher education, the chapter ends with a discussion of the contributions made by this research.

3.2. Evaluation of Stakeholders' Performance

The following subsections discuss the abovementioned three models and their use to evaluate ERP system stakeholders' performance.

3.2.1 Task-Technology Fit

Task-technology fit is defined by Goodhue (1995) as "the extent that technology functionality matches task requirements and individual abilities", while Goodhue and Thompson (1995) identify it as *"the degree to which a technology assists an individual in performing his or her portfolio of tasks*". The concept was derived originally from work adjustment theory (Dishaw and Strong, 1999).

Chang (2008) explains that the TTF model is concerned with the degree to which the capabilities of the technology match the demand of the task and that it interrelates four main constructs: task technology and individual characteristics together affect the construct of TTF itself, which in turn affects the outcome variable, either utilization or performance (Dishaw, Strong and Bandy, 2002). In addition, Goodhue, Klein and March, (2000) state that TTF presumes that the performance impacts upon the fit between the first three constructs: technology characteristics, task requirements and individual abilities. The TTF model, illustrated in Figure 3.1, posits that IT will be used if the functions available to the user support (fit) the activities of the user.

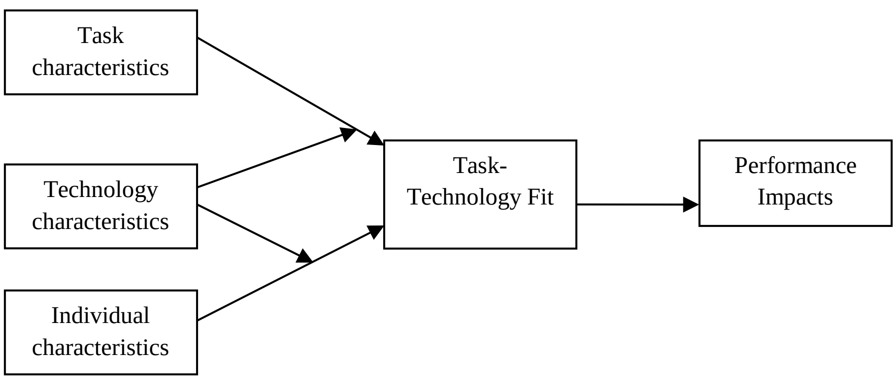


Figure 3.1: The Model of Task-Technology Fit, *Source:* Goodhue, (1995)

Since the measurement of system success is difficult, many MIS researchers depend on user evaluation of systems as a surrogate for MIS success, which means that the assessment must be made by a user, as shown in Figure 3.2 (Goodhue, 1995).

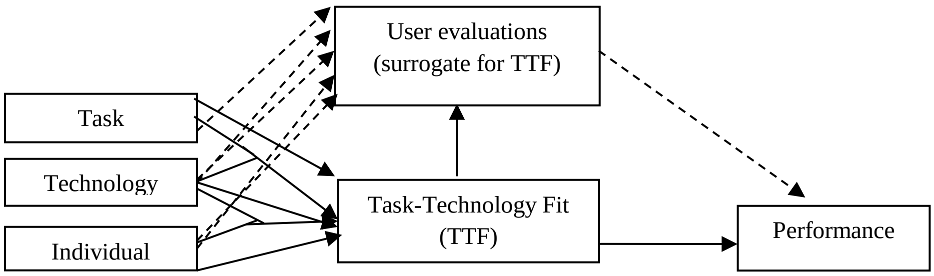


Figure 3.2: TTF Model and User Evaluation, *Source:* Goodhue, (1995)

The TTF instrument is conceptually based on task-technology fit theory, according to which the correspondence between IS functionality and task requirements leads to positive user evaluations and a positive impact on performance (Goodhue, 1998). Goodhue and Thompson (1995) argue that greater use leads to better performance only when there is task-technology fit. They designed a new model, the Technology-to-Performance Chain (TPC), to demonstrate the link between IT and individual performance. This connection draws on insights from two complementary areas of research: user attitudes as predictors of utilization and task-technology fit as predictor of performance. The TPC model states that for IT to have a positive impact on individual performance, the technology must be utilized and must be a good fit with the tasks it supports.

Although Kositanurit, Ngwenyama, and Bryson (2006) explored the factors that can impact individual performance when using enterprise resource planning (ERP) systems. Starting from the plan that organizational performance depends on individuals' task accomplishments; they tested a structural model of task–technology fit, ERP user satisfaction, and individual performance in ERP environments. They asserted that the TTF model does not answer the question of what characteristics of IS lead to the highest levels of user performance, it does suggest some constructs that are relevant to the investigation.

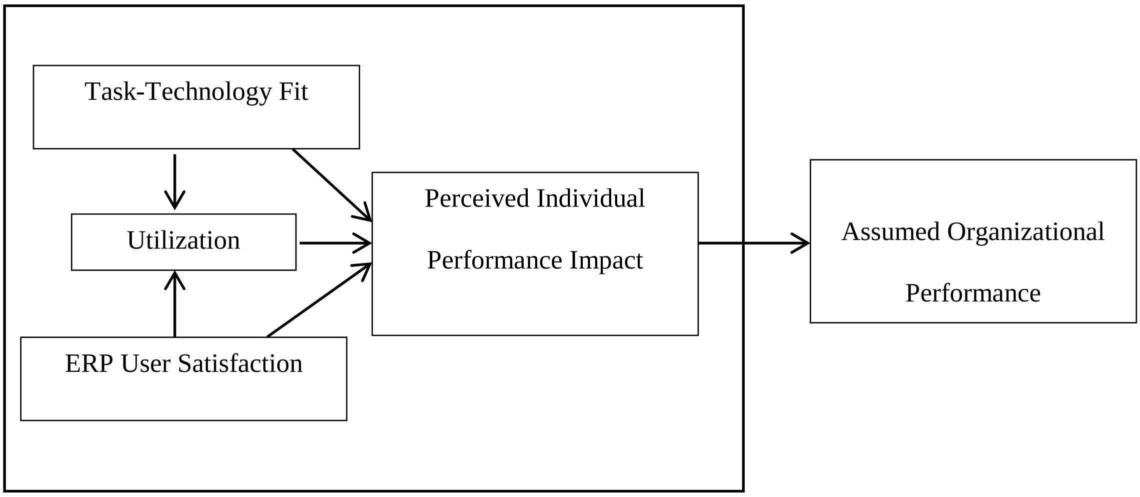


Figure 3.3: A structural model of TTF, ERP User Satisfaction, and Individual Performance Impact, *Source:* Kositanurit et al. (2006).

Researchers have attempted to integrate the TTF model with others. For instance, Dishaw and Strong (1999) conducted a study to integrate it with the TAM, with the aim of providing a theoretical basis for exploring the factors that explain software utilization and its link with user performance. Dishaw and Strong (2002) extended their work by investigating the relationship between computer self-efficacy and the combined TAM/TTF model. Continuing their effort to combine models, Dishaw and Strong (2004) integrated TTF with the unified theory of acceptance and use of technology, while Gros, Mueller, and Lovis, (2005) support the combination of TTF with other models by arguing that while it is important to consider how systems help or impede the user, this alone is not sufficient to explain a system's success or satisfaction with it.

3.2.2 D&M IS Success Model

DeLone and McLean's (1992) IS success model is widely cited and has made a valuable contribution to the literature on IS success measurement. According to Ballantine et al. (1996), it was based largely on the work of Shannon and Weaver (1949) and Mason (1978), although DeLone and McLean (1992) reviewed a large number of studies (180) in the academic literature covering the period 1981-1987. Theirs is considered the first study that tried to impose some order on developing a comprehensive IS model and instrument for a particular context (Gable, Sedera, D., and Chan, 2008), attempting to identify those factors that contribute to the success of information systems.

Based on these studies, six major dimensions or categories of IS successes were defined: systems quality, information quality, use, user satisfaction, individual impact and organisational impact. The relationships among these categories are illustrated in Figure 3.3. The three main contributions made by DeLone and McLean (1992) to our understanding of IS success evaluation are that they provide a method for classifying the large number of IS success measures described in the literature into six categories, that their approach begins to identify relevant stakeholder groups in the process of evaluation and that they suggest a model of "temporal and causal" interdependencies between these categories (Seddon and Kiew, 1994; Ballantine et al., 1996., Myers, Kappelman, and Prybutok, 1997; Seddon, 1997).

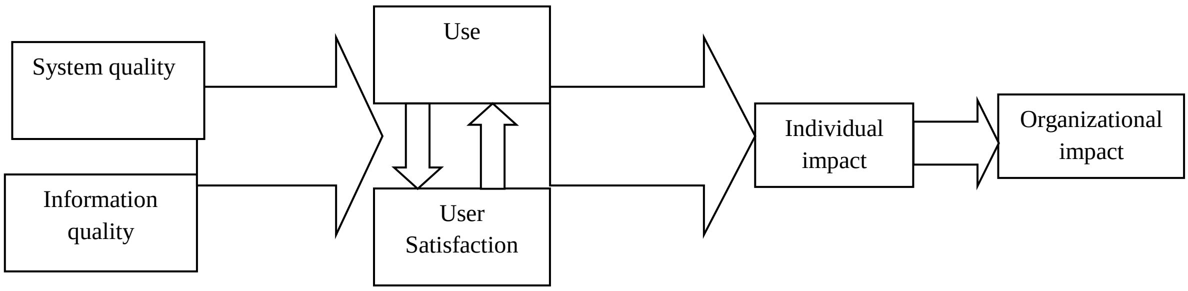


Figure 3.4: D&M IS success model, *Source:* DeLone and McLean, (1992)

Sabherwal, Jeyaraj, and Chowa, (2006) note that DeLone and McLean (1992) did not empirically test their proposed IS success model, but many studies have since attempted to test, modify, develop and validate it. Seddon and Kiew (1994) were the first to empirically test the causal/process nature of the model, then Seddon (1997) re-specified and extended the D&M model and presented an alternative model of IS success. Rai et al. (2002) and Sabherwal, Jeyaraj, and Chowa, later (2006) built further on DeLone and McLean's (1992) model.

Seddon (1997) argues that DeLone and McLean attempted to do too much by combining both the process and causal explanation of IS success in their model and that as a result the model is confused and mis-specified. Seddon's (1997) study is important because he adopts a theoretical approach to modify the D&M model, because he distinguishes between actual impact and expected impacts, and because he incorporates the additional construct of perceived usefulness (Sabherwal, Jeyaraj, and Chowa 2006). Seddon (1997) argues that successful systems will provide benefits such as helping the user to do more or better work in the same time, or to take less time to achieve as much work of the same quality as was done in the past.

The focus in Seddon's (1997) paper is on individual impact, which is defined by DeLone and McLean (1992) as "*the effect of information on the behaviour of the recipient of all the measure of IS success*". Gable, Sedera, and Chan, (2008) identify individual impact as the "*measure of the extent to which the [IS] has influenced the capabilities and effectiveness, on behalf of the organization, of key users*". The reason for choosing individual impact is practicality, because impact is closely related to performance, meaning, according to DeLone and McLean (1992), that impact could be an indication that the information system has given the user a better understanding of the decision context, has improved the user's decision-making and productivity, and has brought about a change in the user's activity or changed the decision-maker's perception of the importance or usefulness of the IS. Usefulness is the degree to which a person believes that using particular system enhances his or her job performance (Seddon, 1997).

Pitt, Watson, and Kavan, (1995) augment DeLone and McLean's model to include service quality as a measure of IS success, arguing that the D&M model needs to be expanded to reflect the IS department's service role. Moreover, the basis of DeLone and McLean's categorization theory is communication; thus, the IS department is not just a provider of products, it is also a service provider. According to Petter, Delone, and McLean, (2008), many researchers have suggested that service quality is an important factor to be added to DeLone and McLean's IS success model, because it is salient to IS success. In addition, there is a danger of mis-measuring IS effectiveness if researchers do not include an assessment of service quality. Petter, Delone, and McLean, (2008) define service quality as "*the quality of the support that systems users receive from the IS department and IT support personnel*". Moreover, it measures the service quality of IT departments as opposed to individual IT applications, by measuring and comparing user expectation and their perceptions of the IT department (Petter, Delone, and McLean, 2008).

There is support for this argument in the IS literature. For example, Conrath and Mignen (1990) report that the second most important component of user satisfaction, after general quality of service, was the match between user's expectations and actual IS service, while Rushinek and Rushinek (1986) found that fulfilled user expectations had a strong effect on overall satisfaction. Pitt, Watson, and Kavan, (1995) propose that service quality can be assessed by measuring customer expectations and perceptions of performance level for a range of service attributes. The difference between expectation and perceptions of actual performance can then be calculated and averaged across attributes.

Almost a decade later, DeLone and McLean (2003) reviewed and evaluated this argument before updating the IS success model, based on a review of more than100 articles of the empirical conceptual literature on IS success published during the same period. Petter, Delone, and McLean, (2008) explain the utility of the updated D&M IS model and evaluate its usefulness in light of dramatic changes in IS practice, especially the explosive development of e-commerce. The update study was conducted on six dimensions: systems quality, information quality, service quality, use, user satisfaction and net benefits. The updated model is shown in Figure 3.5.

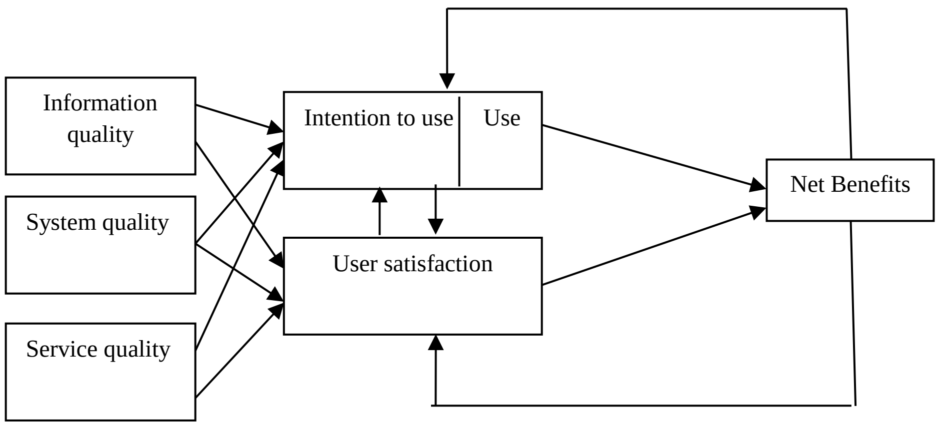


Figure 3.5: Updated D&M IS Success Model, *Source:* DeLone and McLean, (2003)

This research focuses on service quality, which is considered an important dimension of IS success measurement, because it suggests that there is a correlation between stakeholders' expectations of service quality and their performance level. Therefore, considering the service quality dimension for measuring stakeholders' performance of ERP systems in higher education is essential. Table 3.1 lists the service quality factors in the D&M model, as proposed by Pitt et al. (1995) and confirmed in DeLone and McLean’s (2003) update.

Table 3.1: Service quality factors, D&M IS success model.

Service quality
-Reliability -Assurance -Tangibles -Responsiveness

Source: DeLone & McLean, (2003)

Sedera and Gable (2004) attempted to build upon their previous work (2003) and to derive a standardized instrument for measuring the success of enterprise systems, based on the research cycle developed by Mackenzie and House (1979) and McGrath (1979), which entails two main phases: exploratory and confirmatory. They report that the results of confirmatory factor analysis utilizing structural equation modelling techniques confirm the existence of four distinct and individually important dimensions of ERP systems: individual impact, organisational impact, system quality and information quality (Figure 3.6). Chien and Tsaur (2007) later adapted and re-examined the updated D&M model in the ERP systems environment. Their results indicate that systems quality, service quality and information quality are the most important success factors.

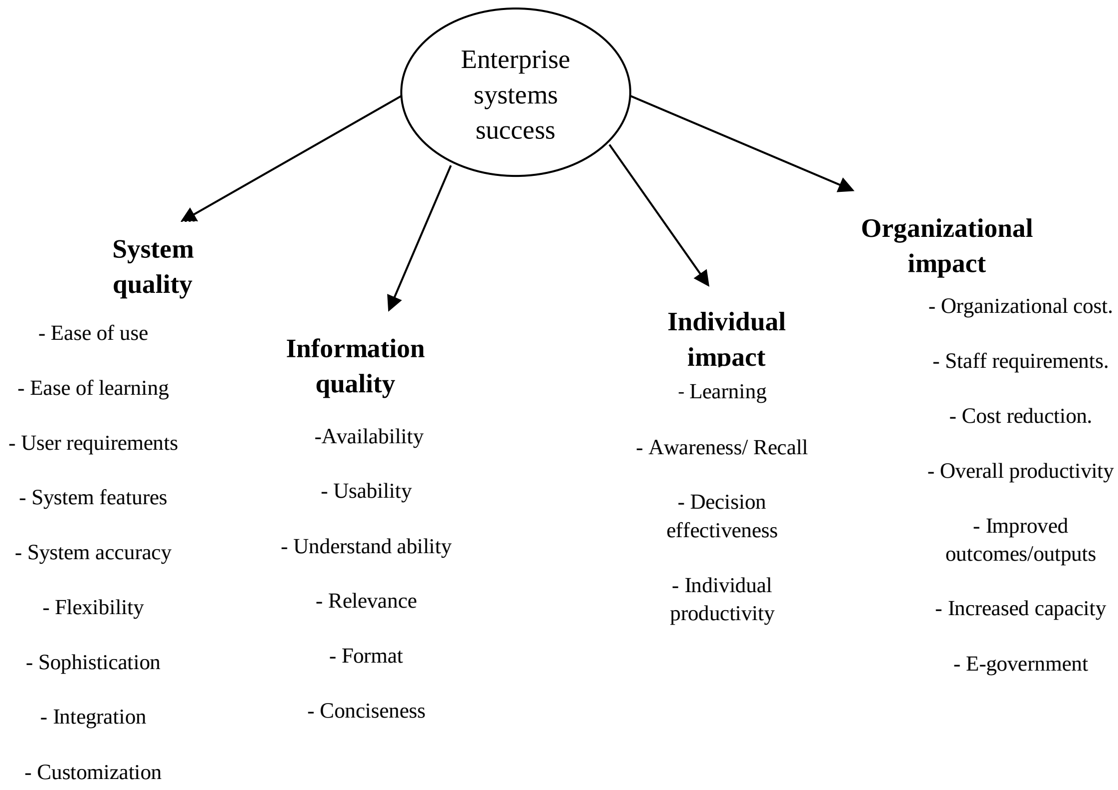


Figure 3.6: Validated Measures of ERP, *Source:* Sedera and Gable, (2004)

Petter (2008) asserts that Sedera and Gable's (2004) modified model, particularly the instrument for evaluating IS success, is unique, for two reasons: first, the model captures the multidimensional and complex nature of IS success by measuring four dimensions; its second strength is that the instrument was tested within the context of ERP systems to ensure its validity. In contrast, Darmawan (2001) argues that combining two or more levels into a single level analysis causes the aggregation or disaggregation of data collected at the lower (individual) to the higher (organisation) level and could introduce bias, meaning an over- or under-estimation of the significance of effects associated with variables that are aggregated or disaggregated.

Bernroider (2008) conducted a study to investigate the role of IT governance in driving the success of ERP projects. Since the assessment of economic and organizational benefits is a difficult task, Bernroider adopted DeLone and McLean's updated model (2003). His study examined ERP success at the usage stage, after its implementation. Important social actors at this stage are end-users, technical, administration, and business and IT management personnel. All of these are involved in DeLone and McLean's updated IS success model (2003).

Ballantine et al. (1996) extended the work of DeLone and McLean by evaluating their model and proposing a new one based on it. The resulting 3D model attempted to improve the understanding of the concept of IS success by dividing success into three levels: technical development, deployment to the user and delivery of business.

Abugabah, Sanzongni and Poropat (2010) integrate the TTF, TAM and D&M models to evaluate the impact of IS/ERP systems on end users' performance. While attempting to find the most suitable factors to evaluate this performance, they consider only the SQ and IQ dimensions from the D&M model. In other words, they do not focus on the performance characteristics in detail.

Finally, in the work of Rabaa'i and Gable (2009) (research in progress) the authors extend the D&M IS-impact measurement model in the context of higher education, to describe the current state of administrative systems and to evaluate existing practices in Australasian Universities, intending to evaluate different administrative systems.

3.2.3 End-user Computing Satisfaction

The EUCS model designed by Doll and Torkzadeh (1988) is a potentially measurable surrogate for utility in decision-making, whereby users interact directly with the application software to enter information or prepare output reports. The utility of the end-user application in decision-making is enhanced when the output meets the user's requirements. End-user computing satisfaction is conceptualized as the effective attitude towards a specific computer application by someone who interacts with the application directly (Doll and Torkzadeh, 1988).

The EUCS instrument consists of five factors: content, format, timeliness, ease of use/efficiency and accuracy. Although this model focuses on end-user computing satisfaction, it includes factors which could be useful for IS/ERP systems measurement. EUCS was designed for a conventional computing environment; therefore, performance was excluded, since, as Doll and Torkzadeh (1991) explain, performance-related behaviours may be application-specific, making it difficult to develop generalizable measure of EUCS success (Amoli and Farhoomand, 1996). Doll and Torkzadeh (1991) retested the reliability of the EUCS instrument by assessing the short- and long-range stability of a 12-item scale for measuring end-user computing satisfaction. The results generally confirm the stability of the 12-item EUCS instrument in both the short and long term (Torkzadeh and Doll, 1991).

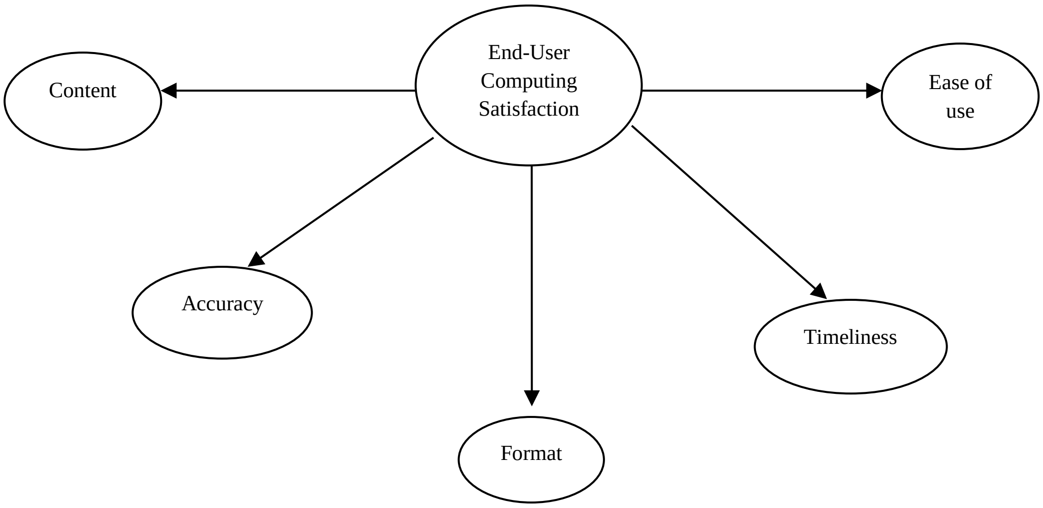


Figure 3.7: End-user Computing Satisfaction model, *Source:* Doll and Torkzadeh, (1988)

Interestingly, Amoli and Farhoomand (1996) attempted to find the relationship between EUCS and user performance using structural model techniques. Twenty-seven items were generated to explore this relationship.

In the ERP systems domain, Somers, Nelson, and Karimi, (2003) adopted the EUCS model to measure end-user satisfaction in ERP systems, further examining the theoretical meaning, structure, dimensionality, reliability and validity of EUCS when used with ERP software applications. Their study confirms that the EUCS instrument can be better understood and applied as a standardized measure of advanced information technology, for instance in ERP systems application.

Haab and Surry (2009) studied participation in the implementation of ERP systems. They identified various modes of participation and measured their relationship with level of satisfaction with the implementation of an ERP system in higher education, using a modified version of the measure developed by Doll and Torkzadeh (1988), taking account of content, accuracy, format, ease of use and timeliness (EUCS).

3.3 Proposed Framework

Academics and practitioners have continually sought a reliable and valid measure of IS success. Ideally, success measures focus on user behaviour or measure decision outcome, rather than what users consider value in a system, which is linked to how it helps them to achieve their goals (Torkzadeh, Koufterosb, and Doll, 2005). Thus, Abugabah, Sanzongni, and Poropat (2009b) reviewed previous IS studies in terms of the factors having the greatest impact on users' performance and productivity. Despite the importance of the TAM, TTF and D&M models, using these models separately produced results which were not totally consistent or clear. Abugabah, Sanzongni, and Poropat, (2009b) argue that the significant variables are not included in these models; they should be integrated and need to include variables related to technology, systems and humans at the same time.

The framework proposed for the present study therefore incorporates elements of three existing models. The factors listed in Table 3.2 are derived from the D&M (individual impact factors), TTF and EUCS models and are based on their relevance to the performance and system quality. Asterisks (*) denote the factors chosen for inclusion in the new framework. The reason for selecting the individual impact dimension from DeLone and McLean's IS success model (1992) and the service quality impact from the updated model is that both dimensions can help this research to discover whether or not ERPs improve stakeholders' performance and how the former meet the requirements of the latter.

Table 3.2: Factors from the D&M, TTF and EUCS models

D&M IS success factors	TTF	EUCS
-Time taken to complete a task* -Improved personal productivity* -Time efficiency of task accomplishment* -Interpretation accuracy* -Computer awareness* -Confident on performance* -User confidence* -Quality of decision analysis -Efficient decisions -Time to arrive at a decision -Time to make pricing decision -Extent to which users analyze charges and investigate budget variance -Quality of career plans -Number of objectives and alternatives generated -User adherence to plan decision quality, forecast accuracy -Decision quality -Cost awareness -Change in decision behaviour -Value in assisting decision-making -Number of alternatives considered -Time to make decision -Task performance -Confidence in decision* -Ability to identify solutions* - Ability to identify strategic opportunities or problems* -Amount of data considered -Precision of decision maker's forecast - Dollar value of information - Time to reach decision - Management takes investigative action -Ability to forecast firm performance* -Worth of information system -Quality of policy decision - Time to solve problem* -User understanding of inventory problem - Power of IS department -Influence of IS department - Accuracy of problem solution* - Efficiency of effort* -Effectiveness in supporting decision - Time savings* -Personal effectiveness* -Decision-making efficiency and effectiveness - Effectiveness of personal DSS - Problem identification* - Generation of alternatives - Charge in commitment of time and money -Immediate recall of information* -Delayed recall of information* -Recognition and use of modern software practices - Decision accuracy -Decision confidence	-Lack of confusion* -Level of detail -Locatability -Meaning -Right data* -Accessibility* -Assistance* -Authorization* -Ease of use* -Flexibility* -System reliability* -Training* -Accuracy* -Compatibility* -Currency* -Presentation	-Content* -Format* -Timeliness* - Ease of use* -Accuracy*

Source: Originated by the researcher

The selected factors are listed in Table 3.3, where the asterisk (*) now denotes those factors most related to performance and (Q) marks those most closely related to the quality of the system, while (R) refers to factors repeated in TTF, EUCS and D&M models.

Table 3.3: Factors selected from the three models

D&M IS success factors	Task technology Fit	End-user Computing Satisfaction
-Time taken to complete a task* -Improved personal productivity* -Time efficiency of task accomplishment* -Interpretation accuracy* -Computer awareness* -Confident on performance* -User confidence* -Task performance* -Confidence in decision* -Ability to identify solutions* - Ability to identify strategic opportunities or problems* -Ability to forecast firm performance* - Time to solve problem* - Accuracy of problem solution* - Efficiency of effort* - Time savings* -Personal effectiveness* - Problem identification* -Immediate recall of information* -Delayed recall of information*	-Lack of confusion(Q) -Right data(Q) -Accessibility (Q) -Assistance(Q) -Authorization(Q) -Ease of use (Q) -Flexibility (Q) -System reliability(R) -Training (Q) -Accuracy (Q) -Compatibility (Q) -Currency (Q)	-Content(Q) -Format (Q) -Timeliness(Q) -Ease of use(R) -Accuracy(R)

Source: Originated by the researcher

The factors in Table 3.3 derived from the TTF and EUCS models, when combined, can help to evaluate performance from a technical perspective. Moreover, the selected factors are the most suitable in the ERP environment and aim to measure how ERP systems enhance individual performance. This study excludes some of the factors in the TTF model. Goodhue (1998) asserts that ‘presentation’ and ‘level of detail’ have similar meanings to ‘content’ and ‘format’ in the EUCS model. In contrast, ‘locatability’ and ‘meaning’ will not help to evaluate ERP systems from the stakeholders’ performance perspective, together with the individual impact, because Goodhue (1998) argues that TTF measures are intended to evaluate all systems and services of the IS department, whilst the EUCS focuses on individual applications.

Table 3.4 shows how the number of factors in the D & M IS success models were further reduced by condensing groups of factors with similar meanings. Thus, ‘time taken to complete task’, ‘improved stakeholder productivity’, ‘immediate recall of information’, ‘stakeholders’ confidence in performance’ and ‘ability to identify problems and solutions' are derived from factors listed in the left column of Table 3.4, initially based on a comprehensive study conducted by DeLone and McLean (1992) under the dimension of 'individual impact'. Computer awareness is an important factor in measuring stakeholders' knowledge of systems in general and ERP in particular. When the individual has the appropriate knowledge and experience required to use the system, better performance should result. It is important to add service quality from DeLone and McLean's (2003) updated IS success model to the factors to measure the quality of support that ERP stakeholders receive from the IT department and its impact on individual performance.

Table 3.4: Factors with the same meanings condensed into single factors

Information Systems Success Factors	Condensed Factors
- Time taken to complete a task -Time efficiency of task accomplishment -Task performance	Time taken to complete task
-Improved personal productivity - Efficiency of effort -Personal effectiveness -Effectiveness in supporting decision	Improved stakeholder productivity
-Immediate recall of information -Delayed recall of information	Immediate recall of information
-Confident on performance -User confidence -Confidence in decision	Stakeholders' confidence in performance
- Ability to identify strategic opportunities or problems -Ability to identify solutions - Accuracy of problem solution - Time to solve problem - Time savings	Ability to identify problems and solutions
-Computer awareness	Computer awareness

None of *Source*: Originated by the researcher

the three models (TTF, EUCS or D&M) provides effective evaluation of stakeholders' performance when applied separately, since TTF and EUCS evaluate the technical aspects of the systems, and the individual impact in the D&M model focuses on the human/social aspects. However, when the three models are integrated, this will effectively evaluate the stakeholders' performance. There is a need to develop measures that are easy to implement and understand. Myers et al. (1997), building on previous research, insist that any evaluation system should have a basis of measurement that is "*readily understood, simple to implement, easy to administer,* *and clearly cost effective*". They combined the dimensions of IS success of DeLone and McLean (1992) and the contingency framework developed by Saunders and Jones. However, these and other contingency studies have only suggested those factors of IS evaluation that should be included, not how to apply them.

Gable, Sedera, and Chan, (2008) argue that a holistic measure for evaluating an IS should consist of dimensions that together look both backward (impact), representing the net benefits, and forward (quality), representing the best surrogate measure of probable future impact. The combination of impact and quality represents a complete measure of the information system (Figure 3.7).

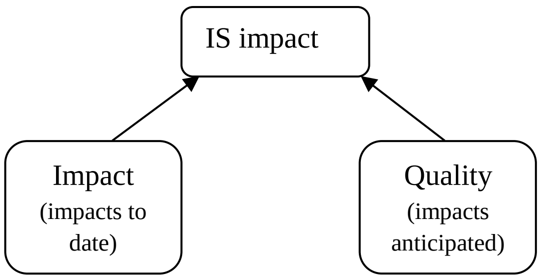


Figure 3.8: Conceptual model, *Source:* Gable et al.,(2008)

Therefore, to overcome the shortcomings of earlier models, this research aims to integrate all three models to create a new synthesized model which has a more comprehensive view of the most important factors that affect stakeholder performance, by adopting the conceptual model developed by Gable, Sedera, and Chan, (2008), combining impact and quality, then selecting the appropriate factors (Figure 3.8).

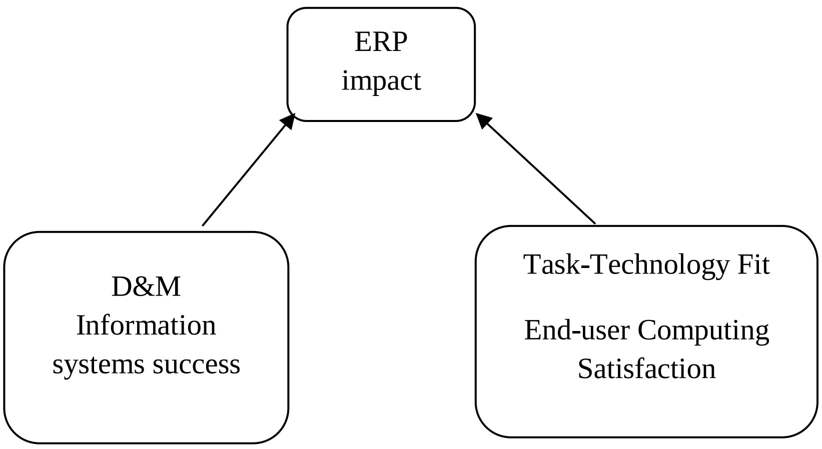


Figure 3.9: ERP impact, *Source:* adapted from Gable et al., (2008)

The outcome is that the factors derived from DeLone and McLean’s (1992) IS success model are used to measure impact, while those derived from the TTF and EUCS models measure quality and are used to evaluate stakeholders’ performance. It is important and helpful to have a framework within which to classify benefits, for two reasons: first, having such a framework helps to organise the list of benefits; secondly, the framework acts as a prompt (Farbey, Land, and Targett, 1993).

Individual performance is an essential indicator of organizational performance; consequently, studying the impact of ERP systems on stakeholders’ performance is a significant way to assess the utility of this software for HEIs and its contribution to performance, efficiency and effectiveness, as shown in Table 3.5.

Table 3.5: The final factors chosen from the three models

Performance	**Systems Quality**		**Service quality**
D&M ISS	**TTF**	**EUCS**	**D&M ISS**
-Time taken to complete task -Improve stakeholders’ productivity -Immediate recall of information -Stakeholders’ confidence and performance - Ability to identify problem and solutions - Computer awareness	-Lack of confusion -Right data -Accessibility -Assistance -Authorization -Ease of use -Flexibility -Training -Accuracy -Compatibility -Currency	-Content -Format -Timeliness	-Reliability -Assurance -Responsiveness -Tangible

Source: Originated by the researcher

Moreover, the significance of the chosen factors, as apparent from Table 3.6, is ascertained in order to highlight and analyse their impact and influence on the satisfaction of IS/ERP system users/stakeholders; they have been used repeatedly and accepted theoretically and empirically in many studies in IS/ERP disciplines (Appendix: C).

Table 3.6: The literature review evaluation

	Factors	Title of the study	Authors	Year	Type of the study	Sample	ERPs environment	Focus of the study
1	Improve stakeholders' productivity, ease of use, reliability, authorization,	An exploration of factors that impact individual performance: an analysis multiple analytical techniques	Boontaree Kositanurit, Ojelanki Ngwenyama and Kweku-Muata Osei-Bryson	2006	On line survey	(255) ERP users and (95) non ERP users	Yes	TTF – User satisfaction
2	Compatibility, Training, assistance, accuracy, timeliness, ease of use, accessibility.	Enterprise Resource Planning Systems (ERP) and user performance: A literature Review.	Ahed Abugabah, Louise Sanzogni.	2009	Comprehensive literature Review (proposed model)	---------	Yes	TAM, TTF and D&M
3	Compatibility, Training, assistance, accuracy, ease of use, error recovery, currency, format, experience, flexibility, timeliness, accessibility	The impact of information Systems on user Performance: A critical review and theoretical model	Ahed Abugabah, Louise Sanzogni, and Arthur Poropat	2009	Comprehensive literature Review (proposed model)	---------	No	TAM, TTF and D&M
4	Service quality, training, accuracy, reliable, timeliness, time taken to complete task, immediate recall, easy to use, improve productivity.	ERP user satisfaction issues insights from a Greek industrial giant	Pantelis Longinidis and Katerina Gotzamani	2009	Questionnaire and interview	68 users and personal interview	Yes	Measure ERP users' satisfaction using 19 items, examined the existence of deviation in satisfaction levels among ERP users with five different characteristics, department of employment, gender, age, education, and IT experience.
5	Information quality, systems quality, service quality	Investigating the success of ERP systems case studies in three Taiwanese high tech industries	Shin-Wen Chien and Shu-Ming Tsaur	2007	Survey	Multiple case study	Yes	Propose a success model for ERP systems and empirically investigate the multi-dimensional relationships among the success measures

6	Content, accuracy, format, timeliness, ease of use	ERP systems adoption An expiratory study of the organisational factors and impacts of ERP success	Chuck C. H. Low and Erick W. T. Ngai	2007	Interview and Survey	Multiple case study	Yes	Examine the relationship of success factors ERP and BPI
7	System quality, training, accuracy	A framework of ERP systems implementation success in China: empirical study	Zhe Zhang, Matthew K.O.Lee, Pei Huang, Liang Zhang, Xiaoyuan Huang	2005	Interview	Multiple case study	Yes	Improve critical factors that affect ERP implementation success.
8	Time, flexibility, reliability, service	Evaluating the performance of an ERP system based on the knowledge of ERP implementation objectives	Chun- Chin Wei	2008	Survey	Case study	Yes	Evaluating the performance of an ERP
9	Task relevance, compatibility.	Empirically Testing User Characteristics and Fitness Factors in Enterprise Resource Planning.	Clyde W. Holsapple, Yu-Min Wang and Jen- Her Wu.	2005	Questionnaire	617 candidate	Yes	User characteristics and faintness factors.
10	Ease of use, user performance, and support.	A structural model of end user computing satisfaction and user performance	Jamshid Etezadi- Amoli and Ali Farhoomand	1996	Questionnaire	341EUC end user	No	EUCS and user performance

Source: Originated by the researcher

3.4 Research Hypothesis

In order to achieve our research objectives and answer the questions of this research, the conceptual model is introduced in table 3.5 which offers a source of foundation for the research hypotheses. The following hypotheses are developed for testing this research:

Performance in IS environment has been defined by Au et al. (2008) as “the perceived outcome from IS use” for ERP systems; higher performance level of ERP systems will lead to higher level of stakeholders’ performance. For IS to be considered successful, it must be both effective (in terms of outcome) and efficient (in terms of process). Both process and outcome are considered to be essential in users’ needs. Expectable ERP Systems Performance refers to the stakeholders’ expectations and needs that can be enabled by using an ERP system at the workplace (i.e. university). This considers basic needs that the stakeholders demand, for example developing performance and functional effectiveness.

H1: ERP system quality variables have a significant impact on stakeholders’ performance variables.

H1.1: "Content" has a significant impact on stakeholders’ performance variables

H1.2: "Format" has a significant impact on stakeholders’ performance variables

H1.3: "Timeliness" has a significant impact on stakeholders’ performance variables

H1.4: "Accessibility" has a significant impact on stakeholders’ performance variables

H1.5: "Assistance" has a significant impact on stakeholders’ performance variables

H1.6: "Authorization" has a significant impact on stakeholders’ performance variables

H1.7: "Ease of use" has a significant impact on stakeholders’ performance variables

H1.8: "Flexibility" has a significant impact on stakeholders’ performance variables

H1.9: "Training" has a significant impact on stakeholders’ performance variables

H1.10: "Accuracy" has a significant impact on stakeholders’ performance variables

H1.11: "Compatibility" has a significant impact on stakeholders' performance variables

H1.12: "Currency" has a significant impact on stakeholders' performance variables

H1.13: "Right data" has a significant impact on stakeholders' performance variables

H1.14: "Lack of confusion" has a significant impact on stakeholders' performance variables

In addition, some IS researchers (e.g. Pitt et al., 1995) found it important to include service quality measure as part of the IS success, which has been considered by Delone and Mclean (2003). The service support that stakeholders have from their ERP system team can lead to higher performance. The service can support stakeholders, answering their questions and solving any problems they may face, and provide the latest hardware and software. Expectable ERP systems of technical support performance refer to the stakeholders' expectations and needs that are satisfied by using ERP system in the workplace. This considers basic needs that the stakeholders demand, for example developing performance, functional effectiveness and service quality.

H2: ERP service quality variables have a significant impact on stakeholders' performance variables.

H2.1: "Tangible" has a significant impact on stakeholders' performance variables
H2.2: "Reliability" has a significant impact on stakeholders' performance variables
H2.3: "Responsiveness" has a significant impact on stakeholders' performance variables
H2.4: "Assurance" has a significant impact on stakeholders' performance variables

Table 3.7: Performance impact dimension and factors Definitions

Dimension	Factors	Brief Description	Representative Literature
Stakeholders' Performance impact *Is concerned with the effect of the ERP system on the individual, and assesses how the use of the adopted ERP systems has increase individual's productivity, capabilities and effectiveness.*	Time taken to complete task	The maximum time allowed to complete the task.	(Delone and Mclean, 1992; Gable et al.,2008; Ifinedo and Nahar, 2007)
	Improve stakeholders' productivity	Productivity is the relationship between the systems response time and user performance.	(Gable et al.,2008; McGill and Hobbs, 2003;Torkzadeh et al.,2005)
	Immediate recall of information	Enhance stakeholders' awareness and recall of job related information.	(Gable et al.,2008)
	Stakeholders' confidence and performance	Stakeholders' must be convinced of the advantages and improvements that the ERP system provides them and to the organisation.	(Berchet and Habchi, 2004)
	Ability to identify problem and solutions	When it is easy to detect possible errors, identify and find solution to any problem in the ERP systems.	(Kositanurit et al., 2006; Gable et al., 2008)
	Computer awareness	Stakeholders' knowledge and understanding of the systems.	(Wu and Wang, 2006)

Source: Originated by the researcher

Table 3.8: Systems quality impact dimension and factors Definitions

Dimension	Factors	Brief Description	Representative Literature
Systems Quality *It is refer to the performance characteristics of the ERP systems. It is measure the performance of the ERP systems from technical and design perspective* *Source*: Originated by the researcher	Timeliness	The ERP system provide up- to date information, and get the information stakeholders' need in time.	(Delone and Mclean, 2003; McGill and Hobbs, 2003 Delone and Mclean, 1992; Kositanurit et al., 2006; Ifinedo and Nahar,2007; Doll and Torkzadeh, 1988; Somers, et al., 2003)
	Format	The ERP systems output is presented in a usual and clear format	(Delone and Mclean, 2003; McGill and Hobbs, 2003 Delone and Mclean, 1992; Kositanurit et al., 2006; Somers. et al., 2003; Doll and Torkzadeh, 1988)
	Content	The ERP system provides reports, sufficient and precise information to meet stakeholders'' need.	(Somers. et al., 2003Doll and Torkzadeh, 1988)
	Flexibility	ease to change the content or format of the data to meet changing task needs	(Goodhue, 1995)
	Accuracy	Correctness of date, the data is accurate enough for stakeholders'' purposes.	(Somers. et al., 2003;Goodhue et al., 2000; Goodhue, 1995)
	Ease of use	Ease of doing what I want to do using the system hardware and software for accessing and analysing data.	(McGill and Hobbs, 2003; Somers. et al., 2003; Goodhue, 1995)
	Assistance	Ease of getting help on problems with the data.	(Goodhue, 1995)
	Training	Training is how to find, understand, access or use corporate divisional data.	(Bradley and lee, 2007; Goodhue et al., 2000; Goodhue, 1995)

	Compatibility	Ease with which data from different sources can be aggregated compared inconsistencies without Inconsistencies.	(Somers. et al., 2003)
	Currency	Data is current enough to meet stakeholders' needs	(Googhue, 1998)
	Lack of confusion	When it is hard to use data effectively because it is stored in different files.	(Googhue, 1998)
	Authorization	Getting authorization to access to the data,	(Goodhue, 1995; Somers. et al., 2003)
	Right data	Maintaining data at the right levels of detail	(McGill and Hobbs, 2003;Goodhue et al.,2000;Googhue, 1998)
	Accessibility	Ease of access to desired data	(Goodhue et al., 2000;Goodhue, 1995)

Source: Originated by the researcher

Table 3.9: Service quality impact dimension and factors Definitions

Dimension	Factors	Brief Description	Representative Literature
Service Quality *The quality of the support that system users receive from the IS/ERP department and IT technical support*	Reliability	Ability to perform the promised service dependably and accurately.	(Delone and Mclean, 2003; Pitt et al.,1995; Petter et al.,2008; Kettinger and Lee 1994)
	Assurance	Knowledge and courtesy of employee and their ability to inspire trust and confidence.	(Delone and Mclean, 2003; Pitt et al.,1995; Petter et al.,2008; Kettinger and Lee 1994)
	Responsiveness	Willingness to help customers and provide prompt service.	(Delone and Mclean, 2003; Pitt et al.,1995; Petter et al.,2008; Kettinger and Lee 1994)
	Tangible	Tangible is measure the update of the hardware and the software of the system.	(Delone and Mclean, 2003; Pitt et al.,1995; Petter et al.,2008; Kettinger and Lee 1994)

Source: Originated by the researcher

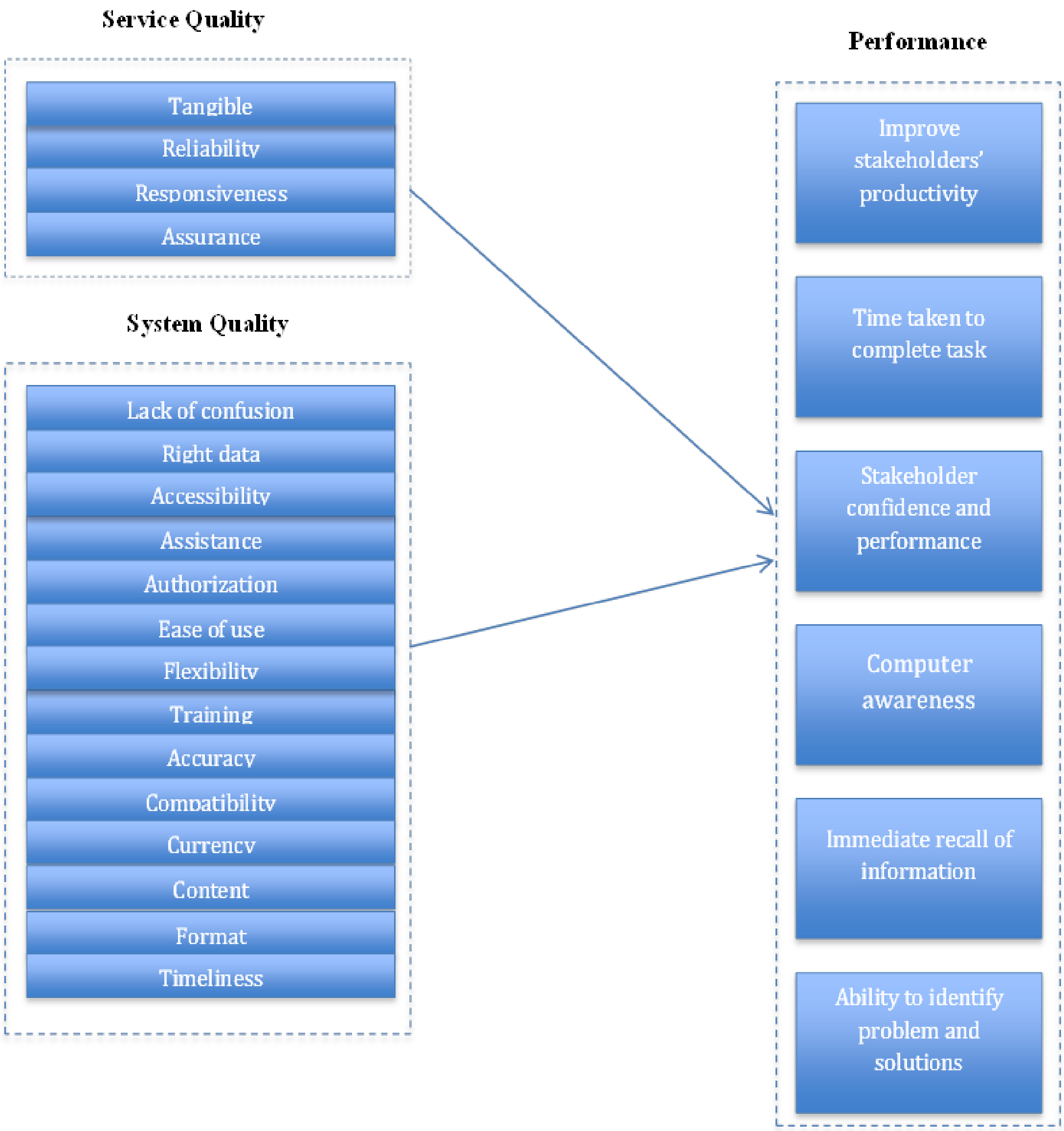


Figure 3.10: ERP System Impact on Stakeholders' Performance Framework

3.5 Summary

Advancing the field of ERP studies requires that appropriate attention be given to the evaluation of stakeholders' performance using factors that are associated with systems implementation in higher education. Theoretical and empirical efforts in this domain are necessary to reduce the uncertainties and failures associated with such systems. There are several conclusions that can be drawn from this chapter with critical relevance to this field.

- Several widely used instruments have been tested for user satisfaction in IS in general and ERP systems in particular, although few studies have discussed ERP systems from the stakeholders' point of view. The literature review reveals that many authors have addressed the importance of ERP at technical and organisational levels, while social and individual factors have been ignored.
- Stakeholders are the central elements creating value through their interaction with ERP systems, so there is a need for ERP evaluations focusing on how human factors influence success and how ERP systems can improve stakeholders' performance.
- There a need to develop an integrated framework derived from the three most widely used models, D&M, TTF and EUCS, which measure different sets of factors affecting individual performance in the ERP environment. This study proposes a theoretical framework that aims to evaluate the impact of ERP systems on stakeholders' performance. By selecting the most appropriate factors among these models and by focusing on Saudi Arabian higher education, it will help researchers and practitioners to evaluate stakeholders' performance in ERP systems.

CHAPTER FOUR

RESEARCH METHODOLOGY

PAGE

PAGE

4.1 Overview

The study of information systems is a multidisciplinary field; thus the nature of IS research is complex and the selection of the appropriate research methods is not straightforward. Such concerns have long preoccupied many IS researchers and have played a major role in developing the discipline, resulting in rich discussion of different approaches (Mathiassen, 2002). There is agreement that no single approach will fit all studies and that a variety of research approaches, methods and techniques can be employed in different situations.

The previous chapters have reviewed various definitions, concepts, approaches and models associated with IS, ERP systems and related subjects. The integration of IS success models has been discussed and the literature has been critically evaluated, covering the key studies of ERP systems and their impact on performance evaluation. In chapter 3, a model for ERP performance evaluation was proposed, based on the shortcomings identified in the literature on existing models.

This chapter presents the research approach adopted in the present study. The focus in the first part of the chapter is to highlight the research problem and main research approaches. The next part explores the development of the research design, the selection of research methods, the research process and its component steps. Subsequent sections discuss the various methods of data collection and analysis, sample composition and size. The chapter ends with a summary.

4.2 Selection of an appropriate research approach

The field of IS research has evolved over more than three decades, firmly establishing the discipline and resulting in rich discussion about which research paradigm and methodology are most appropriate for IS studies (Mingers, 2001). Since there is no universally appropriate paradigm, a number of approaches, methods and techniques should be considered, depending on the particular features of the research at hand. Thus, Benbasat and Weber (1996) refer to a threefold diversity: “(a) the diversity in the problems addressed, (b) theoretical foundations and reference disciplines, (c) diversity of the methods that we use in IS research”. The major concern has been with how diversity might affect progress in the IS field.

Having such a variety of approaches and diversity of backgrounds in the IS discipline appears to divide researchers into two groups, one of which is worried about diversity and the other of which finds it appealing. For example, Robey (1996) argues that diversity positively strengthens and enriches IS research. He asserts that variety creates flexibility and motivates creativity. Mingers (2001) agrees with this, in terms of the potential for combining methods to enhance the value and benefits of IS research. In contrast, Benbasat and Weber (1996) warn that the disciplines involved in the IS field require uniformity, otherwise it will shatter or be taken over, while Vessey, Ramesh, and Glass, (2002) argue that IS will continue to change and develop year after year, so researchers must seek to build a cumulative research tradition, because IS will progress only by developing fundamental theories that endure.

Therefore, the following section explores the research paradigms in IS studies in order to determine which paradigm is appropriate to guide the development of an ontological approach to the study of ERP system stakeholders' performance evaluation. There is then a discussion of the rationale for the selection of the positivist paradigm.

4.3 Research paradigms in IS research

The set of beliefs or the underlying perspective and assumptions which guide the actions and the activities that researchers conduct throughout the research process can be defined as the research paradigm (Denzin, 1998; Mingers, 2001). Based on the work of Devers (1999), Orlikowski and Baroudi (1991) and Lincoln and Guba (1994), three questions are believed to be important in defining a paradigm, as they reflect the underlying beliefs of researchers:

- What is the form and nature of the reality that is addressed, or what is assumed? (*The ontological question*);
- What is the nature of true knowledge? (*The epistemological question*);
- What is the best approach, or set of guidelines, to help in generating the desired knowledge and understanding in a valid, reliable manner? (*The methodological question*).

Thus, Orlikowski and Baroudi (1991) classify the basic beliefs underlying research as beliefs about physical and social reality, beliefs about knowledge and beliefs about the relationship between knowledge and the empirical world.

4.3.1 *Beliefs about physical and social reality*

∗ *Ontological* beliefs have to do with the essence of phenomena under investigation; that is, whether the empirical world is assumed to be objective and hence independent of humans in creating and recreating it;

* *Human rationality* beliefs deal with the intentions ascribed by various researchers to the humans they study;

∗ *Social relations* beliefs refer to how people interact in organisations, groups and society.

Beliefs about knowledge

∗ *Epistemological* assumptions concern the criteria by which valid knowledge about a phenomenon may be constructed and evaluated;

∗ *Methodological* assumptions indicate which research methods and techniques are considered appropriate for gathering valid empirical evidence.

4.3.2 *Beliefs about the relationship between knowledge and the empirical world*

This third set of beliefs concern the role of theory in the world of practice and reflect the values and intentions researchers bring to their work; in other words, what researchers believe it is appropriate to accomplish with their research work and what they intend to achieve with a given research study.

The epistemological choice between interpretive, positivist and critical paradigms is an important issue for IS researchers (Walsham, 1995). Various differences exist between these approaches, as shown in Tables 4.1 and 4.2, and as identified by researchers such as Hirschheim (1991), Orlikowski and Baroudi (1991), Walsham (1995), Myers and Avison (2002), Chen and Hirschheim (2004) and Paré (2004).

Table 4.1: Basic beliefs of the three main research paradigms

Underlying Beliefs	Positivist	Interpretive	Critical
Physical and social reality	-World exists independently of humans (ontology); -Human action is intentional and (bounded) rational; -Social relations are generally stable, conflict is dysfunctional.	-World is produced and reinforced by humans through interaction; -Humans interpret (rather than discover) the world; -Meanings are negotiated, so interpretations may shift over time.	- Social reality is historically and culturally constituted; - Belief in human potentiality; -Social relations are constantly undergoing change.
Knowledge	-Universal law and principles, lower level hypotheses derived; -Goals: explanation, prediction, control (prescription); -Survey, experiments, case studies.	- Explain how meanings created and sustained in specific settings; -Goals: explanation, insight; -Case studies.	-Phenomena can only be understood historically; - Goal: critique (interpretation is not enough); -Generally longitudinal studies, ethnographies.
Relationship between theory and practice	-Focus on means to desired end; -Aim to inform/improve (objective of study)	-Weak and strong constructionist views; -Complements positivism or replaces it (objective of study)	-Initiate process of self-reflection among actors; - Some require transformation of self and social reality.

Table 4.2: Assumptions and objectives of the three main research paradigms

Assumptions & objectives	Positivist	Interpretive	Critical
Worldview	-Objective rational view: *Technology is natural; *Value consensus on its benefits exists.	-Subjective view: *Addresses different interpretations of actors; *A socially constructed view.	-Based on examining the different interests involved: *Oriented towards a cause.
Aims	-Either to measure so as to predict (predictive intent); - Or to describe, so as to inform/improve (normative/prescriptive intent).	-Understand meanings people assign to phenomena; -Use insight to inform other settings.	-Expose deep-seated, structural contradictions in social systems; -Transform these alienating and restrictive social conditions.
Accounts	-Description presented as fact, not value judgment	-Address how IS influences and is influenced by context; -Local circumstances are important.	-Challenges assumptions about IS, strategy, organisations and management.

Many researchers (Orlikowski and Baroudi, 1991; Walsham, 1995; Klein and Myers, 1999; Myers and Avison, 2002; Chen and Hirschheim, 2004) have described the three research philosophies (positivist, critical and interpretive) in relation to the IS field research can be described as:

- ***Positivist*** if there is evidence of formal propositions, hypotheses, quantifiable measures of research variables (dependent and independent), testing and the drawing of inferences about a phenomenon from a representative sample to a stated population, and finally the drawing of inferences and conclusions about the examined phenomenon from a sample representing the research population (Orlikowski and Baroudi, 1991).

- ***Interpretive*** if it is assumed that knowledge of reality is shaped through social context; for instance, language, consciousness, shared meanings, documents and tools. Interpretive research does not predefine dependent and independent variables, but focuses on the complexity of human sense-making as the situation emerges (Kaplan and Maxwell, 1994). Walsham (1993, pp. 4-5) state that interpretive research methods in IS research aim at the "*understanding of the context of the information system and the process whereby the information system influences and is influenced by the context*".

- ***Critical*** if the main aim of the research is considered to be social critique, seeking to assist in eliminating the causes of unwarranted alienation and domination. This kind of research seeks to be emancipatory, in that it aims to help eliminate the causes of unwarranted alienation and domination and thereby to enhance opportunities for realising human potential (Hirschheim and Klein, 1994). Critical research assumes "*that social reality is historically constituted and that it is produced and reproduced by people*" (Avison and Pries-Heje, 2005, p. 244).

Chen and Hirschheim (2004) illustrate the threefold differences between positivism and interpretivism in terms of ontology, epistemology and methodology. Ontologically, positivists believe that reality exists objectively and independently from human experience, whereas interpretivists emphasize the meaning of the reality that is constructed through human and social interaction. Epistemologically, positivists are concerned with the hypothetical deductive testability of theories and researchers seek generalizable results. Moreover, a causal relationship is usually presented, and predication and control are expected (Orlikowski and Baroudi, 1991). In contrast, interpretivists assume that scientific knowledge should be obtained through the understanding of human and social interaction, by which the subjective meaning of reality is, constructed (Walsham, 1995). Methodologically, positivists contend that to test hypothetic-deductive theory, research should take a value-free position and employ objective measurement to collect research evidence. A typical positivist instrument is the survey, as part of a quantitative method. Interpretivists, on the other hand, argue that to understand the meaning in human and social interactions, researchers need to be involved in the social setting investigated and learn how the interaction takes place from the participants' perspective. More appropriate methods for generating interpretive knowledge are therefore field studies that engage researchers in real social settings (Orlikowski and Baroudi, 1991).

Myers and Avison (2002) adopt the definition of Orlikowski and Baroudi (1991) of positivist methods of research in IS:

> "*Positivists generally assume that reality is objectively given and can be described by measureable properties, which are independent of the observer (researcher) and his or her instruments. Positivists studies generally attempt to test theory, in an attempt to increase the predictive understanding of phenomena".*

Hirschheim (1991) states that positivism is an epistemology which: "*seeks to explain and predict what happens in the social world by searching for regularities and causal relationships between its constituent elements*".

4.4 The positivist philosophy in IS research

According to Orlikowski and Baroudi (1991), the positivist research perspective is dominant in information systems research. Using this approach, researchers examine the effects of one or more variables on one another (Kaplan and Duchon, 1988). The knowledge that develops through a positivist lens is based on careful observation and measurement of the objective reality that exists 'out there' in the world; thus developing numeric measures of observations and studying the behaviour of individuals becomes dominant for a positivist (Creswell, 2009). With roots in logical positivism, this perspective reflects the precepts informing the study of natural phenomena. The following subsections examine the assumptions underlying the positivist research philosophy.

4.4.1 Beliefs about physical and social reality

Ontologically, positivist researchers assume an objective physical and social world that exists independently of humans and whose nature can be relatively unproblematically apprehended, characterized and measured.

4.4.2 Beliefs about knowledge

The ***epistemological*** belief of the positivist is concern with the empirical testability of theories, to determine whether a theory is true or false. According to Paré (2004), positivist studies are epistemologically premised on the existence of prior fixed relationships with the phenomena capable of being identified and tested via hypothetic-deductive logic and analysis. Causal relationships, the basis for generalized knowledge, can predict patterns of behaviour across situations. Furthermore, positivist researchers believe that scientific inquiry is ‘value-free’ and hence see themselves as impartial observers who can evaluate or predict actions or processes objectively.

4.4.3 Beliefs about the relationship between theory and practice

The relationship between theory and practice in positivist philosophy is primarily technical. Because positivists believe that scientific inquiry is value-free, what such a desired state of affairs is cannot be resolved scientifically. It is believed that as impartial observers, researchers can objectively evaluate or predict actions or processes, but that they cannot involve themselves in moral judgments or subjective opinions.

4.4.4 Selecting the positivist research approach

Based on the diversity of research paradigms, the selection of the appropriate approach for the present study is a complex task. The researcher’s efforts have been concentrated on:

- Obtaining the necessary *knowledge* of the existing research approaches in order to make an informed choice (Orlikowski and Baroudi, 1991; Galliers, 1992).

- Accommodating *ethical decisions* by making more pragmatic choices given time, cost and other resource constraints, rather than choices closer to the researcher's value systems and the phenomena studied, which require deeper immersion in social settings for longer periods of time (Miles and Huberman, 1994).

- Using the researcher's *intuitiveness* to match the research problem to a particular research approach (Walsham, 1995).

- Considering the research *question and the nature of the phenomenon* when choosing between the interpretive and positivist approaches (Orlikowski and Baroudi, 1991).

From the above considerations, for the purposes of the research reported in this thesis, the fundamental epistemology is *positivist* and positivism was selected as the underlying assumption. There are two reasons for this choice. First, the review reported in the two previous chapters illustrates the existence of many social and technical issues related to ERP systems; as a result, the evaluation of ERP stakeholders' performance in Saudi HEIs cannot easily be separated from the expectations of universities and users.

Additionally, it is important to mention the relationship between positivist and interpretivist theories; although the emphasis in this thesis is on a positivist view of the evaluation of stakeholders' performance in the ERP system, the importance of the interpretive approach is also acknowledged, as it can enhance the use of positivist research methods. Specifically, interpretive approaches to IS evaluation that integrate the recognition of IS in both social and technical terms have increased since the late 1980s; moreover, treating the technical aspects of IS evaluation alone leads to pointless conclusions that overlook the social aspects of the evaluation process and ignore the social and political environment of organisations (Stockdale and Standing, 2006).

Having established the reasons for selecting the positivist research approach, the discussion turns to the theoretical foundations of this approach, in order to identify their implications for the design of this research. In the next section, quantitative and qualitative researches are compared; in the following section, the nature of quantitative research is described in order to justify its relevance to the study.

4.5 Quantitative and qualitative research compared

Both qualitative and quantitative research methods have advantages and disadvantages; consequently, researchers choose the approach (i.e. one or a combination of both) which they believe to be more suitable to fulfil their research purpose. The various advantages and disadvantages of the different approaches, as identified by previous researchers (Kaplan and Duchon, 1988; Guba and Lincoln, 1994; Amaratunga and Baldry, 2002; Denzin and Lincoln, 2005; Creswell, 2009), are shown in Table 4.3.

Table 4.3: Advantages & disadvantages of quantitative & qualitative research

Advantages of quantitative research	**Disadvantages of quantitative research**
• Methods allow accurate measurement of variables • Methods are structured, standard • Provides wide coverage of the range of situations • Large sample of population • Used more in IS studies • Statistical analysis • Generalisations are possible • Can be fast and economical	• Use of inflexible methods • Deterministic character • Disregards some important factors • Misses subjective aspects of human existence • Assumption of an objective truth • Generation of incomplete understandings • Inapplicable to some immeasurable phenomena • Not very helpful in generating theories
Advantages of qualitative research	**Disadvantages of qualitative research**
• Methods enhance description and theory development • Describes theories and experience • Allows deep understanding and insight • Holistic and humanistic • Exclusion of meaning and purpose • Flexible methods • Value placed on participants’ views and empowering participants • Inductive data analysis • Subjective dimensions are explored	• No hard data or clear measuring • Subjective, ‘non-scientific’ • Deep involvement of researchers increases risk of bias • Small samples • Generalisation is limited to similar contexts and conditions • Analysis and interpretation of data may be more difficult • Policymakers may give low credibility to results from qualitative approach

4.6 Quantitative research

Qualitative methods provide less explanation of variance in statistical terms than quantitative methods, which have greater dependence on laboratory studies and surveys. Although practiced and advocated in IS studies, qualitative methods have not been as visible in this field as in others (Kaplan and Duchon, 1988); quantitative research still dominates the discipline.

Once the appropriate research approach has been identified, it is important to review the definition and the criteria which should apply to the data in the quantitative research method. The terms ‘positivist’ and ‘quantitative’ are frequently used interchangeably in relation to research. Creswell (2009) defines quantitative research as a “*means for testing objective theories by examining the relationship among variables, which, in turn, can be measured, typically on instruments, so that numbered data can be analyzed using statistical procedures*”. He adds that quantitative researchers make “assumptions about testing theories deductively, building in protections against bias, controlling for alternative explanations, and being able to generalize and replicate the findings”.

The reasons for selecting the quantitative research approach for the present study include the fact that its main assumption is that human behaviour can be explained by what may be termed ‘social facts’, which can be investigated by methodologies that utilise “the deductive logic of the natural” (Amaratunga and Baldry, 2002). Additionally, quantitative research is appropriate for:

- Comparison and replication studies;
- Research independent of the subject being observed;
- Research focusing on a subject under analysis measured through objective methods rather than subjective inference (e.g. sensation, reflection or intuition);
- Research that determines reliability and validity;
- Research that measures descriptive aspects of behavioural elements;
- Research emphasising the need to formulate a hypothesis for subsequent verification.
- Research that seeks causal explanations and fundamental laws, reducing the whole to the simplest possible elements in order to facilitate analysis.

This study can be categorised as research that measures descriptively and formulates hypotheses for subsequent verification (i.e. examining the impact of ERP systems on stakeholders' performance). Finally, it is useful to note that the quantitative approach has been used in a number of studies related to this research, reviewed in chapters 2 and 3, examining various aspects of IS and ERP systems using quantitative methods of data collection and analysis.

Thus, the adoption of quantitative methods seemed the most useful approach to the evaluation of stakeholders' performance in a large sample from three universities in the KSA. In addition, there is a need to mix a quantitative and qualitative methods in the data collection (interview) phase of the study; according to Yin (2009), the interview is the most important source of case study information. The remainder of this chapter discusses the mixed-method approach and the research strategy adopted in the study. This design is based on the research assumptions and approaches chosen above.

4.7 The mixed-method approach

The use of a combination of quantitative and qualitative methods within mixed-method studies is becoming increasingly prevalent in research practice, so that mixed methods is now considered to be the third major approach. Johnson, Onwuegbuzie, and Turner (2007) note nineteen definitions of the approach, each of which is subtly different, although all emphasise three points: the use of more than one approach, data collection and data analysis.

Teddlie and Tashakkori (2006) furnish a comprehensive definition of the mixed approach as "*research in which the investigator collects and analyses data, integrates the findings, and draws inferences using both qualitative and quantitative approaches and methods in a single study or program of inquiry*", while Johnson, Onwuegbuzie, and Turner, (2007) note that the mixed-methods approach combines qualitative and quantitative methods in different aspects of the research, e.g. in viewpoints, data collection, analysis and inferences.

Recently, the number of mixed-method studies has increased, especially when the research questions could not be answered by one paradigm alone (Leech and Onwuegbuzie, 2009). Kelle (2006) gives two reasons for researchers to choose mixed methods. First, applying methods from the alternative methodological tradition can help researchers to discover and to handle threats to validity arising from the exclusive use of either qualitative or quantitative research, thus ensuring good scientific practice by enhancing the validity of methods and research findings; secondly, the mixed approach helps researchers to gain a fuller picture and deeper understanding of the phenomenon being investigated by relating complementary findings to each other, which results from the use of methods from the different methodological traditions of qualitative and quantitative research.

Although most studies of computer systems are based on methods that measure quantitative outcomes, information systems also need studies focusing on concepts with attributes and meaning (Kaplan and Cincinnati, 1988). Bryman (2011) supports the idea of using mixed methods in the field of evaluation research in general. In particular, the evaluation of medical information systems focuses on factors such as costs and benefits, timeliness, completeness and user satisfaction. Quantitative methods are excellent for studying such evaluation questions. They are helpful when evaluating computer information systems, where contextual issues include the social, cultural, organizational and political concerns surrounding IT, the processes of IS development, installation and use, and how all these are conceptualized and perceived by the participants in the research setting (Kaplan and Maxwell, 2005). In addition, Irani and Love (2008) assert that the use of qualitative and quantitative approaches, and their mixing, involves philosophical assumptions. Thus, mixed research is more than simply collecting and analysing both kinds of data: it also involves the use of both approaches in tandem, so that the overall strength of the study is greater than that of either qualitative or quantitative research.

The term 'qualitative techniques' is frequently used in the social sciences and there has been growing interest in the use of qualitative techniques in the administrative sciences; this interest has been sparked by a general dissatisfaction with the type of data generated by quantitative techniques (Banbast, Goldstein, and Mead, 1987). In the case of the present research, using quantitative methods in general and a mixed-method approach in the data collection phase (triangulation) was considered helpful to obtain a fuller picture of the three cases being studied and to gain a deeper understanding of the phenomenon. The use of mixed methods would provide more complete data about the cases, mitigating the potential biases and weaknesses associated with using a single method; the sum of the data would increase, making it more helpful, richer and ultimately more useful in answering the research questions (Johnson, Onwuegbuzie, and Turner 2007). Besides, adopting a mixed-method approach in the field of evaluation seems to lend strong support to the study and to increase both the validity and reliability of the evaluation data (Tashakkori and Teddlie, 2003).

Finally, according to Galliers (1992, p. 148), the IS field is essentially a pluralistic scientific field which "*can best be understood and analysed only with the help of pluralistic models*". Hirschheim (1991) argues that information systems are fundamentally social rather than technical. Furthermore, they are seen as social communication systems, embedded in a cultural context; multiple perspectives and interpretations must be taken into consideration when researching this field, where the use of multiple of research techniques is crucial.

Additionally, the focus in IS evaluation on technical problems can led to meaningless data and overlooking social aspects, although the benefits associated with IT implementation tend to be qualitative and often intangible; thus, the evaluation process must look beyond a quantification of cost and benefits (Stockdale et al., 2008). Conducting mixed-method research in IS evaluation can cover the two aspects simultaneously.

4.7.1 Planning mixed-method procedures

Creswell (2009) identifies four aspects that must be considered when using mixed research methods: timing, weighting, mixing and theorizing (Table 4.4).

Timing. To conduct research, the researcher needs to consider the timing of qualitative and quantitative data collection: whether it will be in phase (sequential) or gathered at the same time (concurrent). It is important to identify when the data are collected in phase and whether the qualitative or the quantitative data come first.

Weighting. Weight or priority may be given to either qualitative or quantitative research in a particular study, or they may receive equal attention. The priority decision depends on the interests of the researcher, the audience for the study and what the investigator seeks to emphasize.

Mixing. Mixing quantitative and qualitative data is difficult, posing two questions: '*When* does a researcher mix in a mixed-method study?' and *'How* does mixing occur?' Mixing the two types of data might occur at several stages: the data collection, the data analysis, interpretation, or in all three phases. Mixing means either that qualitative and quantitative data are kept separate but connected, that the two datasets are integrated by actually merging the quantitative data with the qualitative data, or that the researcher embeds a secondary form of data within a larger study having a different form of data as primary database.

Theorizing or transforming perspective. All researchers bring theories, frameworks and hunches to their enquiries and these theories may be made explicit, implicit or not mentioned. In mixed-method research, theories are typically found in the opening sections as an orienting lens that shapes the types of questions asked who participates in the study, how data are collected and the implications of study findings.

Table 4.4: Aspects to consider in planning a mixed-method design

Timing	Weighting	Mixing	Theorizing
No sequence: concurrent	Equal	Integrated	Explicit
Sequential: qualitative first	Qualitative	Connecting	Implicit
Sequential: quantitative first	Quantitative	Embedding	

Source: adapted from Creswell et al. (2003)

In the present research, the choices made were that the quantitative data would come first, priority would be given to quantitative over qualitative research and the mixing of data would occur in the discussion chapter. Finally, as for theory, this research is based on the three models discussed in chapter 3: D&M, TTF and EUCS.

In general, the four factors discussed above help to shape the procedures of mixed-method study. While there would in theory be more than fifty possible combinations of the factors in Table 4.4, there are in practice six major strategies for inquirers to choose from in designing research, described below.

The sequential exploratory strategy, conversely, is characterized by the collection and analysis of qualitative data in a first phase of research, followed by the collection and analysis of quantitative data in the second phase, building on the results of the first phase.

***Sequential transformative strategy*.** In a two-phase project with a theoretical lens, there is an initial phase (either quantitative or qualitative) followed by a second phase.

***Concurrent triangulation strategy*.** The researchers collect both quantitative and qualitative data concurrently and then compare the two datasets to determine if there is convergence, differences, or some combination of the two.

The concurrent embedded strategy can be identified by its use of one data collection phase, during which both quantitative and qualitative data are collected simultaneously.

The concurrent transformative strategy is guided by the researcher’s use of a specific theoretical perspective as well as the concurrent collection of both quantitative and qualitative data.

The sequential explanatory strategy, illustrated in Figure 4.1, is popular for mixed-method design and often appeals to researchers with a strong quantitative leaning. It is characterized by the collection and analysis of quantitative data in a first phase of research, followed by the collection and analysis of qualitative data in a second phase that builds on the results of the first.

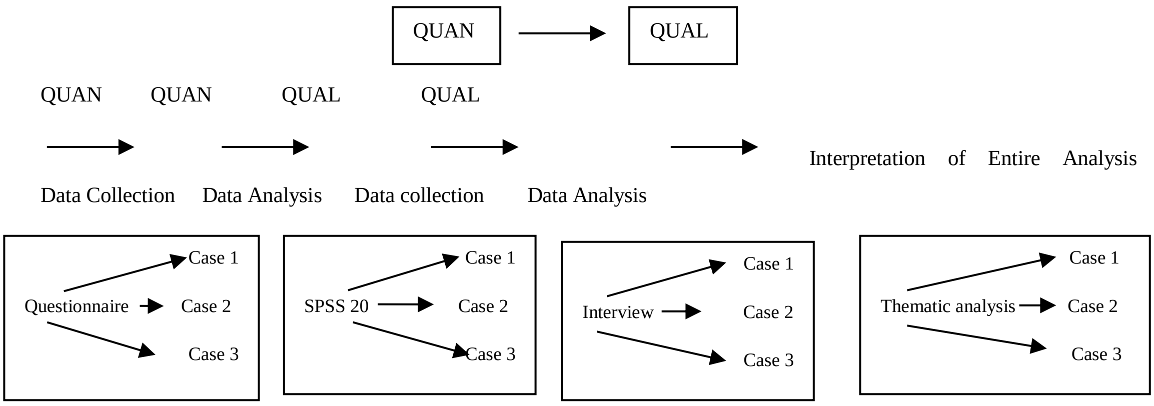


Figure 4.1: Sequential explanatory strategy. Adapted from Creswell (2009)

The present research, in line with the sequence of Yin's (2009) case study, follows the sequential explanatory strategy, whereby first quantitative and then qualitative data were collected.

4.7.2 Triangulation

Triangulation is defined by (Yin, 2009) as:

> "*The practice of employing several research tools within the same research design ... the procedure allows the researcher to view a particular point in research from more than one perspective and hence to enrich knowledge and/ or test validity. Triangulation can be applied in all of the research process".*

Some researchers have used triangulation for one or more of the following purposes (Sarantakos, 2005, p. 146):

- To be thorough in addressing all possible aspects of the topic;
- To increase the amount of research data and so to increase knowledge;
- To enrich the nature of research data;
- To facilitate a study where one procedure serves as a stepping stone for another;
- To allow comparisons;
- To achieve stronger validity, credibility and research utility;
- To overcome the deficiencies of single method studies.

The simple and common idea about triangulation is to use a combination of methods in order to achieve quality in research that cannot be guaranteed by using a single method (Sarantakos, 2005, p. 145; Bryman and Bell, 2007; Flick, 2009, p. 444). Denzin (2005) traces the origin of the concept of triangulation to the 1970s and lists four types of triangulation for social research. Flick (2009, p. 444) also distinguishes four different types:

Data triangulation involves using different data sources in order to increase the validity of a study. Moreover, Denzin (2005) makes a distinction between time and space, suggesting that phenomena be studies on different dates and in different places, by different people.

Investigator triangulation involves using different investigators in the analysis process to detect or minimize biases resulting from the researchers as persons.

Theory triangulation means taking multiple perspectives, or what Sarantakos (2005, p. 146) calls "paradigm triangulation", where a study employs different paradigms (positivist and interpretive) to study the same phenomena.

Methodological triangulation (Sarantakos, 2005 p. 146; Flick, 2009) involves the use of multiple qualitative and quantitative methods, either between or within methods or both. This combination allows several methods to be applied simultaneously. Moreover, it employs a mixed-method design to investigate different aspects of the same phenomena.

Sarantakos (2005, p. 146) describes two more commonly used types of triangulation:

Time triangulation entails the use of research at different times. It is considered a successive approach in contrast to concurrent triangulation, where diverse methods are used to study the same topic at one point in time.

Sampling triangulation is when two or three samples are employed within the same project. In this kind of triangulation, experimental and control groups are treated in a distinct manner that allows the testing of causal relationships.

To summarise the contributions of four researchers in this area (Denzin, 2005; Sarantakos, 2005; Flick, 2009; Yin, 2012), triangulation can also be comprehensive or multiple, meaning that the researcher uses a combination of many types of triangulation. This was the strategy chosen for the present study, which applied the following types of triangulation:

Between methods. The data were generated by means of semi-structured questionnaires, semi-structured interviews, documentation and archival review.

Theory triangulation. The theoretical underpinning of this research is an integrative conceptualisation of literature on a number of domains: ERP systems, higher education, stakeholders' performance and performance evaluation.

Credibility triangulation. One of the main purposes of triangulation is to test and develop the validity of the research (Sarantakos, 2005). Therefore, this study applied many techniques and procedures to ensure the validity and credibility of the research. These techniques are: multiple analysts, data triangulation and methods triangulation.

Data triangulation. Using three case studies.

4.8. Ethical considerations

The researcher followed three steps in order to have permission to start the empirical research. The first step was getting an authorisation letter from Saudi embassy, to authorize the empirical research in public organisations (see Appendix A). The researcher then contacted the Saudi Universities; KSU, KFU and KFUP&M as a second step in order to seek their approval to facilitate and get their help to contact participants. The final step involved filling Brunel University ethical form (see Appendix A) including the three universities' approval.

As part of the ethics the researcher attached the consent form with the questionnaire and explained the role of the participants so that participants can participate voluntarily. The researcher ensured that anonymity of the participants was maintained; as the researcher promised that the name of the participant and identity is ensure to be kept confidential. To make the process flexible for all participants the researcher provided both Arabic and English versions of the questionnaire and interview questions.

The next section explains the data collection methods used.

4.9 Data Collection methods

4.9.1 Questionnaire

According to Gable (1994), the survey approach refers to a group of methods which emphasize quantitative analysis, whereby data on a large number of organizations are collected through methods such as postal questionnaires, telephone interviews or published statistics, then analysed using statistical techniques.

A questionnaire can be used to help policymakers, programme planners, evaluators and researchers (Fink and Kosecoff, 1985). It can be described as a written form of questioning, where the pre-defined set of questions, assembled in a pre-determined order, may be closed (inviting e.g. yes/no answers), or open (e.g. 'What are you feeling?' or 'What is your opinion?'). Respondents are asked to answer the questions, thus providing the researcher with data that can be analysed and interpreted. Questionnaires can be self-administered, where participants respond without the researcher being present, or researcher-administered, where the researcher asks interviewees each question in turn and writes their responses (Thomas, 2011; Oates, 2006).

The present research used self-administered questionnaires, which were sent to participants and followed up by the researchers, to give them time to complete them and return them. This was a practical decision, due to the gender separation in Saudi Arabian universities.

4.9.1.1 Questionnaire design

The Likert scale is a means of measurement that is frequently used in survey questionnaires as an attitude scale and for situations where agreed-upon criteria for prediction do not exist. It consists of declarative statements and an instruction for respondents to state the extent to which they agree with each one. Likert-type scales have been used in IS research for over 20 years (Chin, Jonson, and Schwarz, 2008). Based on the nature of this research, the researcher found it useful to use five-item Likert scales (e.g. strongly agree, agree, don't know, disagree, strongly disagree) in questionnaire items designed to understand and measure the opinions of ERP end-users regarding the impact of the systems on their performance.

The questionnaire (reproduced in Appendix B1) consisted of four parts: part 1 comprised demographic questions designed to solicit general information about the respondents, their organisations (universities) and the extent of their roles in the systems; part 2 concerned stakeholders' impact; part 3 addressed systems quality and part 4 was about technical support. The questionnaire can be described as semi-structured, comprising 31 items, including 3 open questions at the end of each part, while the remainder required responses on a five-point Likert-type scale where 1=strongly disagree and 5=strongly agree.

The questions were derived from three models used in prior studies. Thus, questions concerning the D&M model were adapted from Gable et al. (2004) and Kositanurit, Ngwenyama, and Bryson, (2006) for individual performance, while questions on service quality (technical support) were adapted from the D&M update (2003). For EUCS (Doll and Torkzadeh, 1988), questionnaire items were adapted from the work of Somers, Nelson, and Karimi, (2003). Finally, items from the questionnaire on the TTF model by Goodhue (1995) were adapted to address systems quality.

Questionnaire responses were received from a total of 169 participants at three sites: 60 in KSU, 55 in KFU OF P&M and 45 in KFU.

4.9.2 Interview

Interviews constitute one of the most important and essential sources of case study information (Yin, 2009). Denzin and Lincoln (2005) list several different types, each having advantages and disadvantages, depending upon the nature of the research, including structured, unstructured, group, postmodern, gender, framing and interpreting interviews. Thomas (2011) focuses on the most popular types: *structured* interviews, which ask a determined list of questions, *unstructured* or open-ended interviews, where interviewees are responsible for determining the direction of the interview, and *semi-structured* interviews, a combination of the above two types, where the researcher has the freedom to follow up points as necessary within a given structure.

As this research follows the case study structure of Yin (2009), the researcher decided to design interview questions according to one of the three following styles:

- *In-depth interview.* The researcher asks participants about the facts of a matter and their opinions; they may propose their insights into certain occurrences. The interviews may take place over an extended period of time and interviewees can suggest other people or sources.

- *Focused interview*. Each person is interviewed for a short period of time (e.g. an hour). In such cases, the interviews may remain open-ended and assume a conversational manner, but the researcher is more likely to be following a certain set of questions derived from the case study protocol.

- *Structured questions*. Along the lines of a third type of formal survey, such interviews could be designed as part of an embedded case study and produce quantitative data as part of the case study evidence.

However, interviews are usually associated with the survey method. Hence, structured questions were considered the most suitable option for this research, because the researcher would be gathering quantitative data as part of the case study evidence. Moreover, choosing this type of interview would clarify any quantitative information or data emerging during the analysis of questionnaire results.

A total of 25 participants at the managements and administrative stakeholder level, (9=KSU, 8=KFU, and 8=KFUOF P&M, discussed in detail in chapter 6), underwent structured interviews conducted by telephone. The procedures undertaken before, during and after each interview are detailed in Appendix B2. Each interview lasted (on average) 30-40 minutes. Interviews were recorded and subsequently transcribed. Validity of findings after each interview was applied (Lincoln and Guba, 1986).

4.9.3 Documentation

According to Thomas (2011, p. 164) gathering data from documents is completely different from gathering data from people, since specialised reading skills are necessary to understand certain kinds of words. Yin (2009, p. 101) argues that documents are likely to be relevant to every case study topic. This source of information can take many forms, e.g. letters, email, other personal documents, agendas, announcements, administrative documents, formal studies or evaluations of the same case setting.

Many types of documents were found to be helpful and interesting for this study and added value to its data collection phase. Those reviewed were administrative documents (concerning the first time the ERP systems were implemented, for how long, which department implemented them and the implementation phase), annual reports, training courses, evaluation methods and written reports of events. It is important for the researcher to be aware of the initial aims and objectives of those documents reviewed, as reviewing documents without recognising and considering their purpose might result in collecting and relying on irrelevant or misleading data (Yin, 2009, p. 105).

4.9.4 Archives

Archival records are another source of data collected in this study, especially university records, statistical data produced by IT departments and documents referring to courses conducted by the departments, indicating the numbers of employees who had been trained.

However, using archival records sometimes causes confusion for researchers. Yin (2009, p. 106) advises them to "ascertain the conditions under which [an archival record] was produced as well as its accuracy. Sometimes, the archival records can be highly quantitative, but numbers alone cannot automatically be considered a sign of accuracy".

4.9.5 Strengths and Weaknesses

Table 4.4 below lists the strengths and weaknesses of the types of data-gathering instruments used in this study (Fink and Kosecoff, 1985; Gable, 1994; Yin, 2009; Thomas, 2011; Yin, 2012).

Table 4.5: Strengths & weaknesses of data-gathering instruments used in this study

	Strengths	**Weaknesses**	**Use in the study**
Questionnaire	*Most appropriate when information should come directly from people *Quick and economical *Works better in areas where field methods are weak *Questionnaires can accurately document the norm *Identify extreme outcomes *Delineate associations between variables in sample *Easy to score and summarise *Can be sent by post, email, face to face or presented online *Provides generalizable statements	*Provides a snapshot of the situation at a certain point in time *Yields little information on the underlying meaning of the data *Some variables may not be measurable by this method *Usually low response rate if sent by mail or email *Responses might be subject to response sets, such as acquiescence	*Self-administered questionnaire
Interview	*Targeted: focuses directly on case study topics *Insightful: provides perceived causal inferences and explanations	*Bias due to poorly articulated questions *Response bias *Inaccurate due to poor recall *Reflexivity: interviewee gives what interviewer want to hear	*Structured interview questions
Documentation	*Stable: can be reviewed repeatedly *Unobtrusive: not as a result of the case study *Exact: contains exact names, references and details of an event *Broad coverage: long span of time, any events and many settings	*Retrievability: can be difficult to find *Biased selectivity: if collection is incomplete *Reporting bias: reflects (unknown) bias of author *Access: may be deliberately withheld	*Administrative *Annual reports *Training courses *Evaluation methods *Written report for events
Archival	*Same as those for documentation *Precise and usually quantitative	*Same as those for documentation *Accessibility limited for privacy reasons	*Universities' records

4.10 Pilot Study

Pilot studies in social science research generally have one of two functions: feasibility studies ("small scale versions, or trial runs, done in preparation for the major study"), or the pre-testing of a particular research instrument (Teijlingen and Hundley, 2001). Lancaster (2010) defines a pilot study a "small study for helping to design a further confirmatory study".

4.10.1 Why a pilot study is important

A pilot study is important in any research. It is considered an essential step before going further in testing the research hypotheses, for many reasons: it refines the data collection plan, it helps the researcher to develop a relevant line of questions and it provides some conceptual clarification of the research. Indeed, a pilot study can be so important that more resources may be devoted to this phase of the research than to the collection of data from any of the actual cases during the 'real' research (Yin, 2009, p. 92). It provides a vital opportunity for the researcher to make modifications and revisions before going further, investing in a large study and possibly incurring heavy losses in terms of time, effort and money, especially when the scope of the research is wide, the sample is large and quantitative measures are used. It is then important to run a test with a smaller sample, to help the researcher to ensure the validity of the study design and its ability to capture the required data, as well as to ascertain the reliability of the measuring instruments used in testing the research hypotheses. In addition, a pilot study may give advanced warning of where the main research project could fail (Teijlingen and Hundley, 2001). The difference between a pilot report and an actual study report is that the former should be clear about the lessons learned for both research design and field procedures (Yin, 2009).

Therefore, the researcher conducted a pilot study as a preliminary 'prototype model', to evaluate the efficacy of the instruments to be used in testing the hypotheses and to evaluate the utility of the study design, with a view to changing the hypotheses to be tested if needed, although all the questions in the research questionnaire had already been validated in prior studies, albeit in different settings. The participants in the pilot study were 15 employees of the administration and management departments of the three participating Saudi Arabian universities: six from KSU, five from KFU and four from KFU OF P&M. All participants were cooperative in answering the questionnaire. The researcher intended to test and ensure the reliability of the methods and procedures of data collection in order to be more efficient in collecting data from the full sample, considering the comments and changes made as a result of the pilot phase.

4.10.2 Content validity, construct validity and reliability

Although the questionnaire items were derived from previous studies and therefore validated to some extent, they had been adapted to suit the research objectives, so it was decided to undertake further validation. Their validity was ascertained through pilot work on the research instrument with an academic from a Saudi university who was expert in the field of ERP systems and who checked the relevance and appropriateness of the instrument to achieve the research objectives, providing evidence of face validity. Content validity was ensured by the procedures used to develop the research instrument: (a) conducting a thorough examination of the previous empirical and theoretical work of researchers within the field, upon which the operational definition of each variable was based; (b) conducting a pilot study before starting the fieldwork.

4.11 Data analysis

As this research has adopted various data-gathering approaches, data analysis was accordingly driven by both quantitative and qualitative elements. The main analysis of quantitative data was done by means of the SPSS program (version 20). According to Yin (2009), research based on case studies should build clearly on analysis and the analytical technique sometimes known as ‘thematic analysis’, defined by Braun and Clarke (2006) “*a method for identifying, analysing and reporting patterns within data*”. Therefore, this research has built its own analysis plan and data processing practice regarding the analytical techniques applied to the qualitative and quantitative parts of the data.

4.12 Sample

The researcher chose to limit data collection to three universities, while the nature of the research into stakeholders' experience and of the ERP systems implemented at each university meant that the size of the sample was limited to those administrative officials and managers who used these systems in their daily work. A major concern in the design of any research is the sampling technique used to obtain a representative subset of the population under study. Choosing the right technique depends on the nature of research method; Teddlie and Yu (2007) thus list four types of sampling. The first is probability sampling, a technique often used in quantitative research. The second type is purposive sampling, primarily used in qualitative studies. The third type is convenience sampling, which involves identifying participants who are both easily accessible and willing to participate. Finally, there are mixed-method sampling strategies, which were considered appropriate because this research takes a mixed-method approach to data collection; these are discussed in the following subsection.

4.12.1 Mixed-method sampling

Teddlie and Yu (2007) explain that mixed-method sampling strategies "involve the selection of units or cases for research study using both probability sampling to increase external validity, and purposive sampling strategies to increase transferability". They propose a fourfold typology of basic, sequential, concurrent and multilevel mixed-method sampling. Given the scope of the present research, it was decided to use concurrent mixed-method sampling, which utilizes a single sample generated through the joint use of probability and purposive techniques to generate data for the quantitative and qualitative strands respectively. Table 4.6 sets out the characteristics of mixed-method sampling strategies.

Table 4.6: Characteristics of mixed-method sampling strategies

Dimension of contrast	Mixed-method sampling
Overall purpose of sampling	Designed to generate a sample that will address research questions
Issue of generalizability	For some strands of a research design, there is a focus on external validity. For other strands, the focus is on transferability issues.
Number of techniques	All those employed by both probability and purposive sampling
Rationale for selecting cases/units	For some strands of a research design, there is a focus on representativeness. For other strands, the focus is on seeking out information-rich cases.
Sample size	There are multiple samples in the study. Samples vary in size dependent on the research strand and question.
Depth/breadth of information per case/unit	Focus on both depth and breadth of information across the research strands.
When the sample is selected	Most sampling decisions are made before the study starts, but QUAL-oriented questions may lead to the emergence of other samples during the study.
How selection is made	There is a focus on expert judgment across the sampling decisions, especially because they interrelate with one another. Some QUAN-oriented strands may require application of mathematical sampling formulae.
Sampling frame	Both formal and informal frames are used.
Form of data generated	Both numeric and narrative data are typically generated. Occasionally, mixed-method sampling strategies may yield only narrative or only numeric data.

Source: adapted from Teddlie and Yu (2007)

The case study procedures recommended by Yin (2009) require structured questions to be used to generate quantitative data, while interviews are used to collect qualitative data. The data collection procedures outlined by Creswell (2009) involve the collection of quantitative data followed by data analysis, then qualitative data collection and data analysis. Therefore, to maintain the sequence of the research, the researcher used the first type of concurrent mixed-method sampling to obtain two different samples: a probability sample to test the quantitative research hypotheses and a purposive sample to answer the qualitative research questions.

As the main data sources were questionnaires and interviews, identifying who would be questioned and justifying the selection of the participants were critical steps and an integral part of the case study protocol. Because the unit of analysis in this study was the evaluation of stakeholders rather than of their organisations, the focal point was the performance of those stakeholders.

The data collection was limited to three Saudi Arabian universities: KFU OF P&M, KSU and KFU. The participants in the research were management and administrative employees of the universities, because the universities used ERP systems in those departments.

4.13 Research strategy

4.13.1 Case study methodology

According to Yin (2009), any research method can be used for three purposes: exploratory, descriptive and explanatory. The present research is explanatory and uses positivist case study techniques.

Although there is no standard definition of a case study (Benbasat, Goldstein, and Mead, 1987), several researchers have given definitions, including Yin (2009, p. 18), who defines it as "*an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and the context are not clearly evident*". Benbasa, Goldstein, and Mead (1987) define a case study as one which "*examines a phenomenon in its natural setting, employing multiple methods of data collection to gather information from one or a few entities (people, groups, or organizations*", while Gerring (2004) proposes a simpler definition: "*an intensive study of single unit for the purpose of understanding a larger class of similar units*".

Gerring (2004) outlines five characteristics of the case study: (a) the method is qualitative; (b) the research is ethnographic, clinical, participant-based or observational in the field; (c) the research is characterised by process-tracing; (d) the research investigates the properties of a single case; (e) the research investigates a single phenomenon, for instance the most common usage.

For the last two decades, case study research has been increasingly accepted in IS studies (Benbasat, Goldstein, D., and Mead, 1987; Orlikowski and Baroudi, 1991; Klein and Myers, 1999). Therefore, IS researchers find themselves trailing behind practitioners in proposing changes or evaluating methods for developing new systems; they believe that the case study is well suited to capturing the knowledge of the practitioners and developing theories from it. Moreover, the IS field has shifted from technological to managerial and organizational questions with consequently more interest in how context and innovation interact, according to Benbasat et al. (1987), who, list three reasons for IS researchers to choose a case study research strategy:

- The researcher can study information systems in a natural setting, learn about latest practice and generate theories from practice.
- The case method allows the researcher to answer ‘how’ and ‘why’ questions; that is, to understand the nature and complexity of processes taking place.
- It is an appropriate way to research an area in which few previous studies have been carried out.

4.13.2 Types of case study

According to Bryman and Bell (2007), before starting any research, it is important to consider a distinction between different types of case study:

- The critical case: the researcher has a clearly specified hypothesis, and a case is chosen on the grounds that it will allow a better understanding of the circumstances in which the hypothesis will and will not hold.
- The unique case: the unique or extreme case is often the focus of clinical studies.
- The revelatory case: the basis of the revelatory case exists “*when the investigator has an opportunity to observe and analyse phenomena previously inaccessible to scientific investigation*”.
- The representative or typical case: this type seeks to explore a case that exemplifies an everyday situation or form of organization.
- The longitudinal case: this is concerned with how a situation changes over time.

4.13.3 Multiple case studies

There is a continuing debate among researchers concerning whether single or multiple case studies are better. According to Yin (2009, p. 47), case study research is not confined to the study of a single case. Nonetheless, a single case may be a useful choice in specific situations. A single case study is appropriate if:

- It is a critical case for testing a well-formulated theory;
- It is a revelatory case;
- It is an extreme or unique case;
- It is a representative or typical case; or
- It is a longitudinal case.

Conducting multiple-case study designs has become increasingly common in IS. According to Benbasat, Goldstein, and Mead (1987), multiple case designs are desirable when the intent of the research is description, theory building, or theory testing. Moreover, multiple case designs allow for cross-case analysis and the extension of theory. Additionally, multiple cases yield more general research results. Yin (2009) and Komier, Cooper and Geurts (2000) explain the rationale for multiple case studies as shown in Table 4.7, while Table 4.8 compares the case study with other strategies.

Table 4.7: Comparison between multiple and single case study

	Multiple case study	**Single case study**
Holistic	-Each individual case may consist of multiple holistic cases or multiple embedded cases. -The difference between these two depends upon the type of phenomenon being studied and the research questions. - Conducting multiple case studies cannot be taken lightly.	-The holistic design is advantageous when no logical subunits can be identified. -When the relevant theory underlying the case study is itself of a holistic nature.
Methodology	-Multiple case study is adequate to answer *when, how* and *why* questions.	
Embedded	-In embedded design, a study may call for the conduct of a survey at each case study site.	-When the case study focuses only on the subunit level and fails to return to the larger unit of analysis.
Replication	-Multi-case study design should follow replication, not sampling logic. -Each case must be chosen carefully.	-Replication with single case study is not possible.
Flexibility	-Case study design should be modifiable by new information or discovery during data collection.	-Case study design should be modifiable by new information or discovery during data collection.
Resources	-Require extensive resources -The evidence is considered more compelling and the overall study is therefore more robust - Multiple experiment or multiple survey are considered	-Extensive resources not required. -Single experiment.
Data analysis	-Will be more powerful, substantial and stronger in effect, because of contrasting (comparable) situations. - Cases do not represent a ‘sample’; they are generalizable to theoretical propositions, not to populations	-Single case designs are vulnerable. -The results may be viewed with scepticism.

Table 4.8: Comparison of the case study with other forms of inquiry

	Case Study	**Experiment**	**Survey**
Investigate	Single or small number of cases	Relatively large number of cases.	Relatively large number of cases.
Data collected and analysed about	Large number of features of each case	A small number of features of each case.	Few features of each case.
Study of	Naturally occurring case where the aim is not to control variables.	Case where aim is to control important variables	Naturally occurring case selected to maximise sample's representativeness of wider population.
Quantification of data	Not a priority.	Priority.	Is a priority.
Using	Many methods and sources of data.	One method.	One method.
Aiming to	Look at relationships and processes.	Look at causation.	Look for generalisation.

Source: Adapted from Thomas (2011)

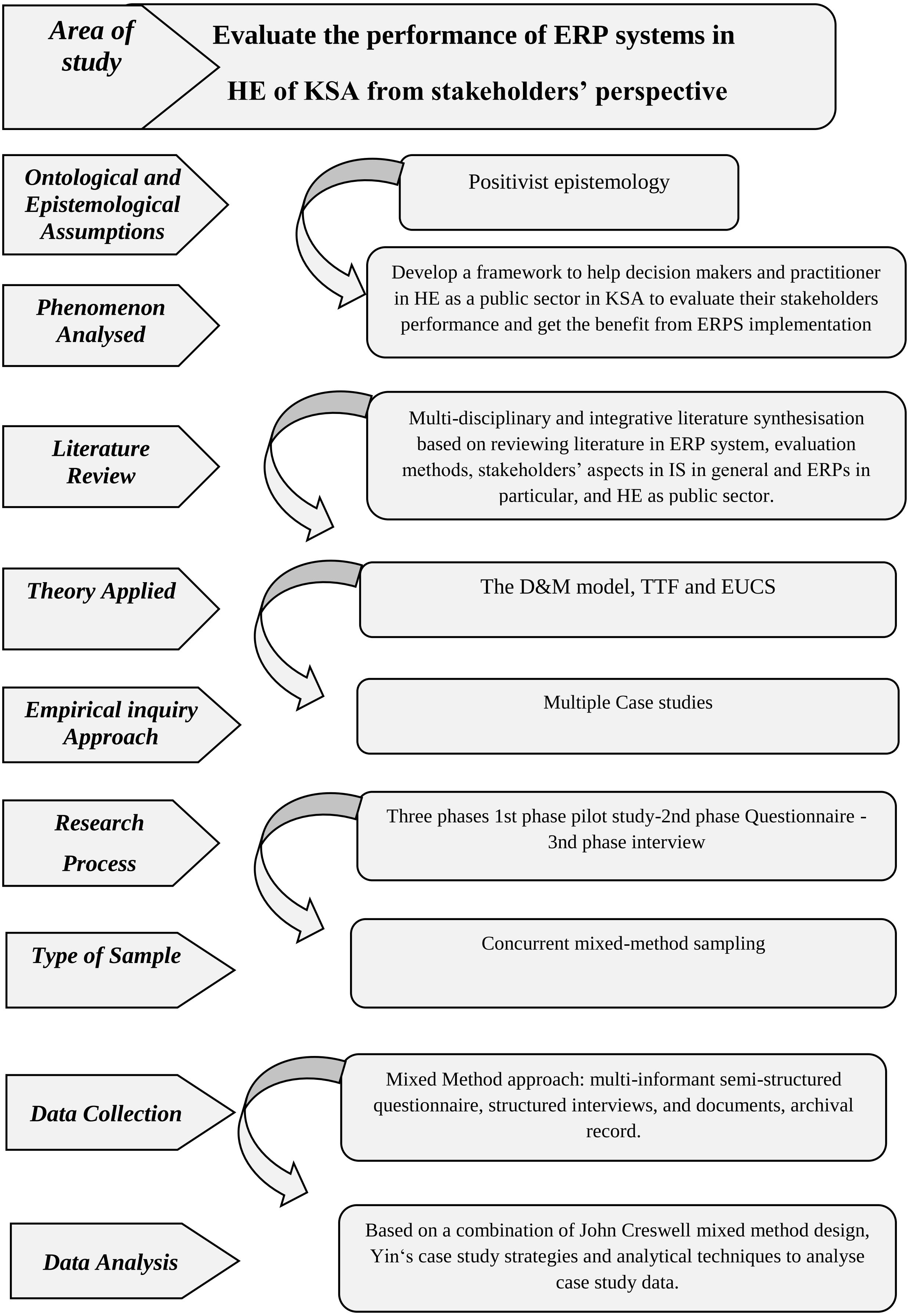
4.13.4 The reasons for choosing the cases

There were three main reasons for choosing the particular cases: the chosen universities were the largest and oldest in the KSA; they are all public universities; they had all been using ERP systems for more than three years; implemented ERP system in similar departments; and they were similar in certain important characteristics (e.g. number of students, staff, faculty and departments which had implemented the systems concerned).

4.13.5 Research strategy and design

This research applies a quantitative paradigm, using a multiple case studies from the HE as a public sector in KSA as the main approach of enquiry. The researcher therefore perceives reality as something developed through an interaction between different variables in the context. As discussed in section 4-4.4, this ontological stance leads to the epistemological perspective that assumes positivisting phenomena to understand quantitatively rather than measure such an evaluation qualitatively. The main area of the research is ERP system evaluation from stakeholders' aspects in KSA HE; in particular, the cases are from technological-driven changes in the public sector. It is found that that an integrative approach based on a multi-disciplinary review of the literature can help in developing an in-depth understanding of the phenomenon being researched. The initial finding from this review was the need to bridge gaps in knowledge in terms of the ERP systems evaluation from the social aspects, and therefore, there is a need to accumulate a theory and practice in this filed. To do so, this research applies the D&M, TTF and EUCS, models and validates and modifies these models. Other components and the main dimensions of the research strategy are encapsulated in Figure 4-8

Figure 4.8: Research process



4.13.6 Research process

The research is divided into three main sections and/or steps as shown in Figure 4-8, starting with the main structuring of the idea and developing the '*what'* question about the research. The second phase was the data collection stage and the *''how''* part of the study, and finally comes the interpretation, explanation and analysis of the collected data, or the *''why''* part of the phenomenon. The research structure begins with a literature review of in ERP system and evaluation methods in the public sector of KSA HE. The researcher decided to study this phenomenon by integrating three IS models into a theoretical model. Consequently, a data collection strategy built base on both quantitative and qualitative paradigm was developed, based on the objective of the research, which is focused on understanding and analysing the phenomenon. The data collection strategy was divided into a pilot exploratory stage and the main fieldwork. Data analysis and interpretation were conducted as a final stage through applying well-structured strategies based on the work of Creswell (2009) and (Yin (2009; 2010).

4.14 Summary

This chapter has explained the methodology in detail. It began by considering the ontological, epistemological and theoretical foundation of the positivist approach, which forms the basis of this research, and the justification for its selection. The quantitative paradigm was found to be applicable because it matched the researcher's ontological and epistemological stances. A hybrid data technique (mixed-method approach) was adopted as appropriate to the research context. Focusing on a social phenomenon that involves the performance of stakeholders in ERP systems, multiple perspectives must be taken into account. The use within the two phases of the research of data-gathering instruments from both quantitative and qualitative strands was justified, including the use of a questionnaire, semi-structured interviews, documentation and archival research.

The data analysis techniques used in the quantitative and qualitative phases were also explained and justified. There was then a discussion of the research credibility issue, through amplification of the triangulation method used in the research. Numerous types of triangulation were considered for use in this research; for example, data theory, methodological and multidiscipline triangulations were discussed with reference to supporting the validity, reliability and potential for generalisation of the research findings. This chapter also justified the use of the concurrent mixed-method sampling technique and explained its relation to the mixed-method research approach. Finally, the chapter justified the choice of multiple case studies and of the specific cases.

The next chapter describes the fieldwork, including a comprehensive description of each case study. It presents the findings of the quantitative phase and compares these with reports from the relevant literature.

CHAPTER FIVE

CASE STUDIES AND RESULTS OF QUANTITATIVE PHASE

PAGE

PAGE

5.1 Overview

This chapter reports the results of the three case studies. The method of triangulation of data is used to investigate the theory established for this research regarding the impact of ERP systems on stakeholders' performance. The chapter is organized as follows: it begins with an introduction to the Kingdom of Saudi Arabia, then discusses the growth there of higher education and of the adoption of IS in general and ERP systems in particular in Saudi Arabian universities. Responding to the need for a better understanding of the post-implementation impact of ERP systems, it then reports on quantitative and qualitative case studies of three of the largest and oldest universities in Saudi Arabia, with a brief history of each university and of the ERP systems which they have adopted.

The quantitative method of data analysis is applied to the results in three steps: presenting the result of each case separately, then comparing the cases and finally considering all of the results together to assess the impact of the ERP systems on performance in general. The chapter ends with a summary of the main results of the quantitative phase of the study.

5.2. Kingdom of Saudi Arabia

The Kingdom of Saudi Arabia extends to approximately 2,250,000 square kilometres between the Arabian Gulf on the east and the Red Sea on the west. With the United Arab Emirates, Qatar and Bahrain to the east, Saudi Arabia shares borders with Kuwait, Iraq and Jordan in the north and Yemen and Oman in the south. The largest country in the Middle East, it occupies four-fifths of the Arabian Peninsula. More than 95% of the territory is desert and semi-desert. Figure 5.1 shows a map of the country.

King Abdulaziz Al Saud, who by 1932 had succeeded in unifying the country into a Kingdom, founded modern Saudi Arabia. He died in 1953, but his legacy lives on in his direct descendants, who rule Saudi Arabia to this day. The country has made considerable progress under their reign and today, travellers to Saudi Arabia can experience both new and old civilizations side by side.

The greatest prophet of Islam, Mohammed (peace be upon him) was born in Arabia, and Islam subsequently spread from Arabia throughout the world. Therefore, this religion is the foundation of Saudi culture. Millions of pilgrims visit the holy cities of Makkah and Madinah (Mecca and Medina) each year as part of their religious observance.

Turning to the economic sphere, Saudi Arabia has played a significant role in international trade for centuries because of its strategic location near the sea trade routes which were used to transport goods between India, China and Europe. A flourishing trade in incense, spices and myrrh (used in medicine and cosmetic balms) was also conducted by the ancient inhabitants of the Arabian Peninsula, the Egyptians and the Phoenicians.

Oil was first discovered in Saudi Arabia in 1936, and by 1950 the country had become a major oil producer. The Kingdom has at least 25% of the world’s oil reserves and is the undisputed leader of the international oil industry. Its oil revenues have been used to diversify the economy, reclaiming land from the desert and establishing the infrastructure (roads, telephone systems, modern cities, hospitals, and power stations) needed for further development (Saudi Arabian map, 2012).

Figure 5.1: The Kingdom of Saudi Arabia

5.3. Higher education in Saudi Arabia

Comprehensive development work is taking place across the Kingdom in all fields, and higher education is no exception; it is a pillar of the successful development of any country. Therefore, Saudi Arabia began focusing on higher education when the country entered a new epoch of rapid development in the early 1970s. A royal decree numbered 1/236 in 8/5/1395 AH (AD 1975) established the Ministry of Higher Education to foresee the execution of the national higher education (HE) policy.

The Higher Education Council is the supreme authority for higher education affairs, with the specific task of supervising, planning and coordinating the activities of universities and other HE institutions, with the sole exception of military education. It is also responsible for the execution of the government's HE policy by formulating rules and regulations for compliance by all institutions of higher learning in the Kingdom, in order to achieve the goals of national development, to make sure that the Saudi educational system provides the highly skilled manpower the Kingdom needs to run its increasingly sophisticated economy and to prepare a national cadre specialized in the administrative and scientific fields. The Council also proposes the establishment of HEIs and authorizes them to offer special programmes in accordance with the country's needs. A further aim is to encourage scientific departments to award higher degrees and to conduct scientific research. Finally, the Council is charged with representing the government abroad in all educational and cultural affairs, through various cultural and educational offices in 32 countries.

The higher education system in Saudi Arabia is, to a certain degree, similar to that of the United States, although its patterns and procedures have been adapted in accordance with Islamic systems, traditions and customs. Higher education in Saudi Arabia has undergone rapid growth over the last five decades. Hence, higher education specialists recognize that the field is characterized by continuous change, from privatization to financing, foreign competition and the fluctuating requirements of the labour market. This has made it necessary to prepare for change by careful planning and well-thought handling of these parameters, resulting in expansion, self-evaluation, the initiation of programmes and the creation of organizations that focus on local and global endeavours. As a consequence of generous state support and huge budget allocations, it has been possible to establish many new universities and colleges of science. Thus, the Saudi higher education system, which is based on diversification, has expanded to include 24 government universities, six private universities and colleges, 18 primary teachers' colleges for men and 80 for women, 37 colleges and institutes of health, 18 private colleges and 12 technical colleges. This diversity allows students to study a very wide range of disciplines, not all of them purely academic. The Ministry of Higher Education follows contemporary trends in scientific research and strategic planning. Most of the universities and colleges offer graduate study programmes which grant masters and doctoral degrees in some fields. Like other elements of the educational system in the Kingdom, higher education is designed and evaluated in relation to the overall national development plan, and is considered essential for fulfilling the potential of the Kingdom's greatest resource: its people.

5.3 Case study one

5.3.1 King Saud University

The progress of any nation has always been strongly associated with knowledge and learning. King Saud University (KSU), the premier institution of higher education in the Kingdom of Saudi Arabia, was established in 1957 (as the first university in the Kingdom) to enhance the nation's growth and respond to the educational needs of a new generation. Through strong government support and many highly qualified professionals and administrators, KSU has supplied the Saudi people and market with years of invaluable service and served as a traditional source of the skilled professionals and academics needed to meet the nation's growing needs in the areas of medicine, engineering, agriculture, science and development, the humanities and language.

KSU is not limited to teaching and research, however, but extends its practical and vital academic functions to the development of Saudi health care and the needs of the private sector. The University seeks to become a leader in educational and technological innovation, scientific discovery and creativity through fostering an atmosphere of intellectual inspiration and partnership for the prosperity of society. It aspires to meet the educational and development needs of society by providing high quality academic programmes, pioneering innovative research and creative articulation, and through active involvement in the community for the cultural development and economic prosperity of the country. Among the many departments established since the university was founded, the Department of Computer and Information Science, Architecture and Planning was established in 1984, (King Saud University's history 2012).

5.3.2 The MADAR system

MADAR is an enterprise system used by King Saud University to meet all of its administrative software needs (Al-shamlan and Al-mudimigh, 2011). The MADAR project is responsible for developing, implementing and maintaining ERP projects within KSU and has experience of implementing many projects for other organisations in Saudi Arabia. Its strengths are integration and collaboration and these organisations are very contented with the results of integration (Al-mudimigh and Ullah, 2011). Table 5.1 lists the departments which have implemented the MADAR system at KSU.

Table 5.1: KSU Departments implementing MADAR

System	Implementation status	Users	Year implemented
Administration communications	Implemented completely	2648	2008
Warehouse	Implemented completely	341	2008
Warehouse surveillance	Implemented completely	74	2008
Finance	Implemented completely	49	2009
Purchases	Implemented completely	252	2009
Human resources	Implemented completely	927	2009
Budget	Partially implemented	----	----

Source: http://erp.ksu.edu.sa

Table 5.2: shows in detail the number of participants (employees) at KSU and the departments they work in.

Table 5.2: Profiles of the participants at KSU

Case	Participant	Role	System
KSU	Employee 1to 10	Employee affairs	**MADAR SYSTEM**
	Employee 11 to 15	Financial department	
	Employee 16 to 25	Human Resource	
	Employee 26 to 37	Procurement department	
	Employee 38 to 45	Warehouse department	
	Employee 46 to 50	Inventory management	
	Employee 51to 60	Purchasing department	

Source: Originated by the researcher

5.3.3 Quantitative analysis

This section explains the method of data collection and the process of preparing and analysing it so as to test the proposed hypotheses and answer the research questions.

5.3.3.1 *Reverse coding of negatively worded items*

Reverse coding was applied to eight items in the system quality impact section of the questionnaire (flexibility, training, compatibility, lack of confusion; see appendix B1). This step was essential because these questions had been negatively worded to help prevent response bias. Therefore, their polarity had to be reversed before a total score could be calculated for the scale (Pallant, 2010). It is important to ensure that all questions are scored so that high scores indicate high levels of whatever is being measured by the scale. As I indicated in chapter 4, the questionnaire responses were on a five-point Likert-type scale, where 1=strongly disagree and 5=strongly agree. There are two ways to apply reverse coding, either by rescoring the variables concerned under the same names or by creating new variables, rather than overwriting the existing data. The latter was adopted as a much safer option, which retained the original data unchanged.

5.3.3.2 *Factor analysis*

Factor analysis is a technique which can be employed to investigate the ability of a predefined factor model to fit an observed set of data. It is also used to establish the validity of each individual factor separately. The collected data were statistically analysed using principal component factor analysis with a varimax orthogonal rotation technique through SPSS. A principal component factor analysis was executed separately on each of the research dimensions (i.e. Stakeholder performance, System quality and Service quality) comprising 6, 14, and 4 items respectively on each of the scores for all the universities combined together. The items were allocated to a particular construct in case their factor loadings exceeded 50% each. It is notable that the stakeholders' performance and service quality dimensions of our research model were left unchanged, whereas for the system quality dimension, three factors (system quality1, system quality2 and system quality3) were extracted. Loadings of variables on factors, the percentage of explained variance and eigenvalues are reported in Table 5.3.

Table 5.3: Factor analysis of the research items

Constructs and Items	Eigenvalue	% explained variance	Factor loadings
STAKEHOLDER PERFORMANCE	3.906	65.105	
SH1 Improve stakeholder productivity			0.8
SH2 Time taken to complete task			0.879
SH3 Confidence & performance			0.874
SH4 Computer awareness			0.833
SH5 Immediate recall of information			0.647
SH6 Ability to identify problems and solutions			0.784
SYSTEM QUALITY1	4.914	27.711	
SQ1 Content			0.775
SQ2 Format			0.79
SQ3 Timeliness			0.785
SQ4 Accessibility			0.829
SQ5 Assistance			0.582
SQ7 Ease of use			0.525
SQ10 Accuracy			0.511
SQ12 Currency			0.585
SYSTEM QUALITY2	2.094	19.667	
SQ6 Authorization			0.709
SQ8 Flexibility			0.7
SQ11 Compatibility			0.587
SQ13 Right data			0.668
SQ14 Lack of confusion			0.718
SYSTEM QUALITY3	1.062	10.264	
SQ9 Training			0.866
SERVICE QUALITY	2.396	59.91	
SVQ1 Tangible			0.729
SVQ2 Reliability			0.783
SVQ3 Responsibility			0.819
SVQ4 Assurance			0.762

As can be seen, the eigenvalue for stakeholders' performance is equal to 3.906 and corresponds to 65% of the variance in the original data, while the eigenvalue for service quality is equal to 2.396, corresponding to 59.910% of the variance in the original data. For the system quality dimension, the first eigenvalue is equal to 4.914, corresponding to 27.711% of the variance in the original data. The second eigenvalue is equal to 2.094 and associated with 19.667% of the variance in the original data. The third eigenvalue is equal to 1.062 and corresponds to 10.264% of the variance in the original data. Together, the three factors explain 57.642% of the variance in the original data.

It is worth mentioning that although the principal component analysis results recommended the clustering of the system quality factors into three categories, the original model will be kept as it is for three reasons: first, the purpose of the factor analysis is to take a large set of variables (50 or more) and summarise or reduce them to a smaller set of components, whereas the number of variables measured in this research is less than this. The second reason is that the larger the research sample, the better the results, because factors obtained from small datasets do not generalise as well as those derived from larger samples (Pallant, 2010, p 183). Finally, all factors under the dimension of systems quality are referred to in the literature as having been previously used in one component (e.g. Petter et al., 2008; Abougabah et al., 2009; DeLone & McLean, 2003; Sedera and Gable, 2003; Sedera and Gable, 2004; Zhang et al., 2005; Ifinedo and Nahar, 2006; Calisir and Calisir, 2004; Chin and Tsaur, 2007). To conclude, for the purpose of evaluating the stakeholders' performance in this study, the researcher decided to keep the original model with three components: performance impact, system quality and service quality.

5.3.3.3 *Data preparation*

To avoid making mistakes when entering the data, it was crucial for the researcher to prepare the data, ensuring that it was clean and ready before proceeding with the analysis. Hence, the researcher conducted data screening to make sure that data were normally distributed, missing values were dealt with and outliers were omitted for all three cases. This enhanced the accuracy and quality of the results. Missing data is one of the most general problems in data analysis (Tabachnick and Fidell, 2007). It is very important to examine data files for missing data, because it is very rare to find complete data, especially if the research involves human participants. Moreover, missing values can happen either randomly or where there is some systematic pattern (Pallant, 2010). When the data were therefore examined carefully, three questionnaires (5% of the 60 which were suitable for data analysis after the initial screening) were found to have data missing from them. These missing values were found to be distributed randomly, so no bias was to be expected; thus, the excluded cases pairwise method was applied to treat missing values, as recommended by Tabachnick and Fidell (2007) and Pallant (2010).

5.3.3.4 *Reliability test*

Internal consistency within the research instrument was assessed by measuring the reliability coefficient known as Cronbach's alpha, which refers to the level of homogeneity among the measured items in one or more sets. The items were clustered into particular dimensional groups and Cronbach's α was calculated. The total questionnaire, which consisted of 24 questions, had a coefficient score of 0.931, which is considered to represent high internal consistency. In addition, the performance, system quality and service quality constructs had Cronbach's α scores of 0.899, 0.865 and 0.792 respectively, indicating strongly acceptable levels of internal consistency. According to Nunnally (1978), reliability coefficients equal to or exceeding 0.5 are considered sufficient for research that is exploratory in nature. The Cronbach's α result for the KSU questionnaire data are shown in Table 5.4.

Table 5.4: Reliability test on KSU data

Construct	Number of items	Cronbach's Alpha	Reliability
Total KSU questionnaire	24	0.931	Excellent
Performance	6	0.899	High
System quality	14	0.865	High
Service quality	4	0.792	High

5.3.3.5 *Multiple regressions*

Multiple regressions is not just one technique but a set of statistical techniques, popular in many disciplines, that can be used to explore and assess the relationship between one continuous dependent variable and a number of independent variables or predictions (Tabachnick and Fidell, 2007, p.117). Multiple regression is based on correlation, but allows a more sophisticated exploration of the interrelationship among a set of variables (Pallant, 2010).

5.3.3.5.1 *System quality*

To more thoroughly test H1, multiple regressions was used to assess the relative importance of the system quality variables in explaining differences in attitudes towards stakeholder performance. Standard multiple regression (the Enter method) was conducted, with the six stakeholder performance variables posited as the dependent variables and the fourteen ERP system quality variables posited as the independent variables.

The R^2 values show that the fourteen system quality variables, as a group, explained 50.4% of the variation in improved stakeholder productivity, 68.5% of the variation in time taken to complete task, 63.8% in stakeholder confidence and performance, 64.8% in computer awareness, 48.3% in immediate recall of information and 59.9% in the ability to identify problems and solutions. According to Pallant (2006), these are acceptable levels of accuracy for academic research, which rarely achieves the high levels of variance required in real world research (e.g. medicine or marketing).

The F values show that there were highly significant relationships ($p<.001$) between the fourteen ERP system quality variables and each of the stakeholder performance variables. The model for time taken to complete a task had the largest F value, $F(14, 59) = 7.004$, $p<.001$, indicating that it was the most significant model, followed by computer awareness $F(14, 59) = 5.906$, $p<.001$; stakeholder confidence and performance, $F(14, 59) = 5.656$, $p < .001$; then ability to identify a problem and solution, $F(14, 59) = 4.808$, $p<.001$; improved stakeholder productivity $F(14, 59) = 3.269$, $p<0.01$; and finally immediate recall of information $F(14, 59) = 2.999$, $p<.01$. Turning now to the importance of each predictor, the standardised beta coefficient (β) statistics were calculated to assess the unique contribution of each predictor to the outcome and what effect a one standard deviation increase in each predictor would have on the outcome.

Hypothesis 1: MADAR systems quality variables have a significant impact on KSU stakeholders' performance variables (H1.1 - H1.14)

Improved stakeholder productivity: Table 5.5 shows that among the 14 variables of system quality, only timeliness had a significant impact on improving stakeholder productivity, with a standardised beta coefficient of $\beta = 0.501$ at $p<0.01$. For every one standard deviation increase in timeliness, improved stakeholder productivity will increase by 0.501 points. Thus, the regression equation to predict improved stakeholder productivity is:

B_1 Timeliness = 0.561 Timeliness.

Time taken to complete task: Table 5.5 also shows that only timeliness had a significant impact on time taken to complete task (β = 0.588). For every one standard deviation increase in timeliness, time taken to complete task will increase on average by 0.588 points. Thus, the regression equation to predict time taken to complete task is: ***B_1 Timeliness = 0.691 Timeliness.***

Table 5.5: Regression models for improved stakeholder productivity and time taken to complete task influenced by system quality at KSU

Model	USTD CO		STD CO	t	Sig.	Model	USTD CO		STD CO	t	Sig.
ISP	B	Std. Error	Beta			TCT	B	Std. Error	Beta		
(Constant)	0.186	0.751		0.248	0.805	(Constant)	-0.796	0.627		-1.269-	0.211
Accessibility	-.222-	0.204	-.226-	-1.089-	0.282	Accessibility	-.154-	0.17	-.149-	-.904-	0.371
Assistance	-.084-	0.159	-.082-	-.529-	0.599	Assistance	-.148-	0.132	-.138-	-1.119-	0.269
Ease of Use	0.29	0.178	0.245	1.629	0.11	Ease of Use	0.079	0.149	0.064	0.534	0.596
Accuracy	0.227	0.168	0.23	1.351	0.184	Accuracy	0.186	0.14	0.18	1.327	0.191
Currency	0.155	0.146	0.152	1.059	0.295	Currency	0.132	0.122	0.124	1.084	0.284
Content	-.055-	0.207	-.048-	-.266-	0.791	Content	0.335	0.173	0.277	1.935	0.059
Format	-.164-	0.213	-.137-	-.771-	0.445	Format	-.160-	0.178	-.127-	-.900-	0.373
Timeliness	0.561	0.2	0.501	2.807	0.007	Timeliness	0.691	0.167	0.588	4.139	0
Authorization	-.029-	0.108	-.034-	-.264-	0.793	Authorisation	-.119-	0.09	-.133-	-1.315-	0.195
Training	0.04	0.12	0.045	0.331	0.742	Training	-.074-	0.1	-.080-	-.738-	0.465
Right Data	0.049	0.177	0.054	0.279	0.781	Right Data	0.09	0.148	0.094	0.609	0.545
Lack of Confusion	0.054	0.142	0.062	0.384	0.703	Lack of Confusion	-.097-	0.118	-.105-	-.822-	0.415
Compatibility	0.048	0.207	0.041	0.232	0.817	Compatibility	0.244	0.173	0.198	1.415	0.164
Flexibility	0.157	0.149	0.174	1.053	0.298	Flexibility	0.237	0.125	0.25	1.901	0.064
UNSTD CO-Unstandardized Coefficient STD CO-Standarized Coefficients											
ISP=Improve Stakholders' Productivity, TCT= Time Tacken to Complete Task											

Stakeholder confidence and performance: Table 5.6 shows that only two of the fourteen system quality variables had a significant and negative impact on stakeholder confidence and performance. These were timeliness (β = 0.399) and flexibility (β = 0.393), indicating that for every one standard deviation increase in timeliness and system flexibility, stakeholder confidence and performance will increase on average by 0.399 and 0.393 points respectively. Thus, the regression equation to predict stakeholder confidence and performance is:

B_1 Timeliness + B_2 Flexibility = 0.459 Timeliness + 0.364 Flexibility.

Computer awareness: Table 5.6 also shows that content and currency had a significant positive impact on computer awareness, while format had a significant negative impact on it, with β = 0.308, 0.275 and -0.429 respectively at $p<0.05$. Thus, the regression equation to predict computer awareness is:

B_1 Content + B_2 Currency + B_3 Format = 0.395 Content + 0.312 Currency – 0.571 Format.

Table 5.6: Regression models for confidence and performance and computer awareness influenced by system quality at KSU

Model	USTD CO		STD CO	t	Sig.	Model	USTD CO		STD CO	t	Sig.
CP	**B**	**Std. Error**	**Beta**			**CA**	**B**	**Std. Error**	**Beta**		
(Constant)	-.083-	0.659		-.126-	0.9	**(Constant)**	-.317-	0.704		-.450-	0.655
Accessibility	0.018	0.179	0.018	0.101	0.92	**Accessibility**	0.358	0.191	0.328	1.876	0.067
Assistance	-.154-	0.139	-.147-	-1.110-	0.273	**Assistance**	-.168-	0.149	-.148-	-1.128-	0.265
Ease of Use	0.252	0.156	0.207	1.61	0.114	**Ease of Use**	0.177	0.167	0.135	1.064	0.293
Accuracy	-.018-	0.148	-.017-	-.119-	0.906	**Accuracy**	0.245	0.158	0.224	1.556	0.127
Currency	0.217	0.128	0.207	1.691	0.098	**Currency**	0.312	0.137	0.275	2.276	0.028
Content	0.206	0.182	0.174	1.134	0.263	**Content**	0.395	0.194	0.308	2.034	0.048
Format	-.179-	0.187	-.145-	-.958-	0.343	**Format**	-.571-	0.199	-.429-	-2.866-	0.006
Timeliness	0.459	0.176	0.399	2.616	0.012	**Timeliness**	0.209	0.187	0.168	1.118	0.269
Authorisation	-.173-	0.095	-.197-	-1.816-	0.076	**Authorization**	-.155-	0.102	-.163-	-1.523-	0.135
Training	-.117-	0.105	-.130-	-1.112-	0.272	**Training**	-.184-	0.112	-.189-	-1.638-	0.108
Right Data	0.153	0.156	0.162	0.982	0.331	**Right Data**	-.031-	0.166	-.030-	-.184-	0.855
Lack of Confusion	-.148-	0.124	-.163-	-1.189-	0.241	**Lack of Confusion**	-.148-	0.133	-.150-	-1.111-	0.272
Compatibility	0.17	0.182	0.141	0.939	0.353	**Compatibility**	0.289	0.194	0.221	1.491	0.143
Flexibility	0.364	0.131	0.393	2.782	0.008	**Flexibility**	0.263	0.14	0.262	1.885	0.066
UNSTD CO-Unstandardized Coefficien STD CO-Standarized Coefficients											
CP=Confidence and Performance,CA = Computer Awareness											

Immediate recall of information: Table 5.7 shows that only system ease of use had a significant impact on immediate recall of information, with a standardised Beta coefficient of β = 0.329. Thus, the regression equation to predict immediate recall of information is:

B_1 Ease of use = 0.402 Ease of use.

Ability to identify problem and solution: Table 5.7 also shows that none of the fourteen system quality variables had a significant impact on stakeholders' ability to identify problems and solutions, hence, there are no influential predictors.

Table 5.7: Regression models for ability to identify problems and solutions and immediate recall of information influenced by system quality at KSU

Model	USTD CO		STD CO	t	Sig.	Model	USTD CO		STD CO	t	Sig.
AIP	B	Std. Error	Beta			IMI	B	Std. Error	Beta		
(Constant)	-.235-	0.631		-.373-	0.711	(Constant)	0.488	0.792		0.616	0.541
Accessibility	0.138	0.171	0.15	0.805	0.425	Accessibility	-.011-	0.215	-.011-	-.051-	0.96
Assistance	-.008-	0.133	-.009-	-.062-	0.95	Assistance	-.021-	0.167	-.020-	-.126-	0.9
Ease of Use	0.01	0.15	0.009	0.07	0.944	Ease of Use	0.402	0.188	0.329	2.14	0.038
Accuracy	0.057	0.141	0.062	0.404	0.688	Accuracy	0.17	0.177	0.167	0.96	0.342
Currency	0.211	0.123	0.222	1.717	0.093	Currency	0.205	0.154	0.195	1.327	0.191
Content	0.236	0.174	0.219	1.354	0.182	Content	0.344	0.219	0.289	1.571	0.123
Format	-.036-	0.179	-.032-	-.199-	0.843	Format	-.377-	0.225	-.304-	-1.677-	0.1
Timeliness	0.12	0.168	0.115	0.715	0.478	Timeliness	0.349	0.211	0.301	1.653	0.105
Authorisation	-.123-	0.091	-.154-	-1.353-	0.183	Authorisation	0.005	0.114	0.005	0.042	0.967
Training	0.016	0.101	0.02	0.16	0.873	Training	-.194-	0.126	-.214-	-1.533-	0.132
Right Data	-.015-	0.149	-.018-	-.101-	0.92	Right Data	-.257-	0.187	-.270-	-1.371-	0.177
Lack of Confusion	0.097	0.119	0.118	0.817	0.418	Lack of Confusion	0.097	0.15	0.107	0.652	0.518
Compatibility	0.11	0.174	0.1	0.633	0.53	Compatibility	0.146	0.218	0.12	0.67	0.506
Flexibility	0.191	0.125	0.226	1.524	0.134	Flexibility	0.087	0.157	0.093	0.55	0.585

UNSTD CO-Unstandardized Coefficients, STD CO-Standarized Coefficients
AIP= Ability to Identify Problem, IMI=Immediate Recall of Information

5.3.3.6 *Multiple regressions*

5.3.3.6.1 *Service quality*

To test H2 more thoroughly, multiple regression was used to assess the relative importance of the service quality variables in explaining differences in attitudes towards stakeholder performance. Standard multiple regression (Enter method) was conducted, with the six stakeholder performance variables posited as the dependent variables and the four ERP service quality variables as the independent variables.

The R^2 values show that the four service quality variables together explained 30.5% of the variation in improved stakeholder productivity, 44.4% of the variation in time taken to complete task, 49.25% in stakeholder confidence and performance, 47.0% in computer awareness, 16.6% in immediate recall of information and 50.2% in the ability to identify problems and solutions. The percentage of variance explained by service quality variables is substantially lower than the systems quality variables seen in H1 above. As discussed above, part of the variance may be due to error measurement, but the lower variance suggests that other unknown factors must play a part in determining these stakeholder performance attitudes (Field, 2009).

The F values reveal highly significant relationships at the $p<0.05$ level between the four ERP service quality variables and all stakeholder performance variables. The model for ability to identify problems and solutions had the largest F value, $F(4, 59) = 13.885$, $p<.001$, indicating that this was the most significant model, followed by stakeholders' confidence and performance, $F(4, 59) = 13.479$, $p<.001$; then computer awareness, $F(4, 59) = 12.204$, $p<.001$; time taken to complete task, $F(4, 59) = 10.990$, $p<.001$; improved stakeholder productivity, $F(4, 59) = 6.030$, $p<0.001$ and finally immediate recall of information, $F(4, 59) = 2.730$, $p<0.05$.

β statistics were again calculated to assess the unique contribution of each predictor on the outcome and what effect a one standard deviation increase in each would have on the outcome.

Hypothesis 2: MADAR Service quality variables have a significant impact on KSU stakeholders' performance variables (H2.1 - H2.4)

Improved stakeholder productivity: Table 5.8 shows that among the four variables of service quality, only tangibility had a significant impact on improving stakeholder productivity, with $\beta = 0.356$ at $p<0.05$. For every one standard deviation increase in tangibility, improved stakeholder productivity increased on average by 0.356 points. Thus, the regression equation to predict improved stakeholder productivity is:

$$B_0 + B_1 \, Tangible = 2.113 + 0.330 \, Tangible.$$

Time taken to complete task: Table 5.8 also shows that among the four variables of service quality, only reliability had a significant impact on time taken to complete task, with $\beta = 0.447$ at $p<0.01$. For every one standard deviation increase in reliability, time taken to complete task increased on average by 0.447 points. Thus, the regression equation to predict time taken to complete task is:

$$B_0 + B_1 \, Reliability = 1.318 + 0.438 \, Reliability$$

Table 5.8: Regression models for improved stakeholder productivity and time taken to complete task influenced by service quality at KSU

Model	USTD CO		STD CO	t	Sig.	Model	USTD CO		STD CO	t	sig
ISP	B	Std. Error	Beta			TCT	B	Std. Error	Beta		
(Constant)	2.113	0.462		4.575	0	(Constant)	1.318	0.433		3.044	0.004
Tangible	0.33	0.135	0.356	2.448	0.018	Tangible	0.135	0.126	0.139	1.07	0.289
Reliability	0.296	0.154	0.317	1.926	0.059	Reliability	0.438	0.144	0.447	3.036	0.004
Responsiveness	-.062-	0.115	-.084-	-.540-	0.591	Responsiveness	0.151	0.108	0.195	1.403	0.166
Assurance	-.046-	0.128	-.051-	-.362-	0.719	Assurance	-.018-	0.12	-.019-	-.152-	0.88

UNSTD CO-Unstandardized Coeffici STD CO-Standarized Coefficients

ISP=Improve stakeholders' Productivity, TCT= Time Taken to Complete Task

Stakeholder confidence and performance: Table 5.9 shows that of the four variables of service quality, only tangibility and responsiveness had a significant impact on stakeholder confidence and performance, with β values of 0.345 and 0.287

respectively at p<0.05. For every one standard deviation increase in tangibility and responsiveness, stakeholder confidence and performance increased on average by 0.345 and 0.287 points respectively. Thus, the regression equation to predict stakeholder confidence and performance is:

B_0 + B_1 Tangible + B_2 Responsiveness = 1.374 + 0.329 Tangible + 0.218 Responsiveness.

Computer Awareness: Table 5.9 also shows that of the four variables of service quality, only tangibility and responsiveness had a significant impact on stakeholder computer awareness: β = 0.265 and 0.304 respectively at p<0.05. For every one standard deviation increase in these variables, stakeholder confidence and performance increased on average by 0.265 and 0.304 points respectively. Thus, the regression equation to predict computer awareness is:

B_1 Tangible + B_2 Responsiveness = 0.273 Tangible + 0.250 Responsiveness

Table 5.9: Regression models for confidence and performance and computer awareness influenced by service quality at KSU

Model	USTD CO		STD CO	t	Sig.	Model	USTD CO		STD CO	t	sig
CP	B	Std. Error	Beta			CA	B	Std. Error	Beta		
(Constant)	1.374	0.404		3.399	0.001	(Constant)	0.817	0.448		1.824	0.074
Tangible	0.329	0.118	0.345	2.784	0.007	Tangible	0.273	0.131	0.265	2.085	0.042
Reliability	0.261	0.135	0.272	1.94	0.057	Reliability	0.267	0.149	0.256	1.786	0.08
Responsiveness	0.218	0.101	0.287	2.169	0.034	Responsiveness	0.25	0.112	0.304	2.241	0.029
Assurance	-.094-	0.112	-.102-	-.840-	0.404	Assurance	0.001	0.124	0.001	0.011	0.991
UNSTD CO-Unstandardized Coefficie STD CO-Standarized Coefficients											
CP=Confidence and Performance,CA = Computer Awareness											

Ability to identify problem and solution: Table 5.10 shows that of the four variables of service quality, only reliability and assurance had a significant impact on ability to identify problems and solutions, with β values of 0.340 and 0.364 at p<0.05. For every one standard deviation increase in reliability and assurance, ability to identify problems and solutions increased on average by 0.340 and 0.364 points respectively. Thus, the regression equation to predict stakeholder's ability to identify problems and solutions is:

B_1 Reliability + B2 Assurance = 0.297 Reliability + 0.307 Assurance.

Immediate recall of information: The analysis revealed, as shown in Table 5.10, that none of the four variables of service quality had a significant impact on immediate recall of information and hence that there were no influential predictors of this dependent variable.

Table 5.10: Regression models for ability to identify problems and solutions and immediate recall of information influenced by service quality at KSU

Model	USTD CO		STD CO	t	Sig.	Model	USTD CO		STD CO	t	Sig.
AIP	B	Std. Error	Beta			IMI	B	Std. Error	Beta		
(Constant)	0.632	0.365			0.089	(Constant)	2.558	0.523		4.894	0
Tangible	0.182	0.107	0.21	1.709	0.093	Tangible	0.17	0.153	0.178	1.114	0.27
Reliability	0.297	0.122	0.34	2.442	0.018	Reliability	0.21	0.174	0.217	1.206	0.233
Responsiveness	-.026-	0.091	-.037-	-.283-	0.778	Responsiveness	0.007	0.13	0.009	0.05	0.96
Assurance	0.307	0.101	0.364	3.031	0.004	Assurance	0.082	0.145	0.088	0.563	0.576
UNSTD CO-Unstandardized Coefficie STD CO-Standarized Coefficients											
AIP= Ability to Identify Problem, IMI=Immediate Recall of Information											

The factors selected from the above models have been shown to provide effective evaluation of stakeholders' performance. KSU is a pioneer among Saudi universities in implementing local ERP systems. Not surprisingly, the results show that six of the 14 quality system factors (flexibility, currency, ease of use, format, content and timeliness) were positively significant, while all four service quality factors (tangibility, reliability, responsiveness and assurance) were also found to have a significant impact on stakeholder performance.

None of the remaining eight variables (lack of confusion, accessibility, assistance, authorization, right data, compatibility, training and accuracy) predicted stakeholder performance. However, the results of the significant factors (system quality and service quality) were as expected. According to Rabaa`i, Bandara, and Gable, (2009), the main aims of ERP system implementation in HE are to integrate different administrative functions into a more systematic and effective approach, to improve information access for planning and managing the institution, to improve service for the faculty, students and employees, to increase income and to reduce expenses by improving efficiency.

In contrast, the results regarding insignificant factors (e.g. accuracy, assistance, training, authorization and accessibility) were unexpected. Possible reasons for these results include the fact that MADAR was a new local ERP system which was implemented by KSU in 2007-2008 in a limited number of departments; thus, the system was being used only for administrative and financial tasks. However, a more likely reason for the factors being insignificant in multiple regressions is to do with the sample size of the study. It is also possible that those factors did not meet stakeholders' needs and expectations, especially those related to assistance with working on the system, focused training rather than short sessions, and more authorization. In general, the results are considered to constitute a substantial achievement for KSU, since the 14 system quality factors as a group explained 50.4% of the variation in improved stakeholder productivity, 68.5% of the variation in time taken to complete task, 63.8% in stakeholder confidence and performance, 64.8% in computer awareness, 48.3% in immediate recall of information and 59.9% in the ability to identify problems and solutions. According to Pallant (2010), these are acceptable levels of accuracy for academic research. The significant factor results for the KSU case indicate that both system quality and service quality factors play major roles in the perception of stakeholders' performance. In addition, the MADAR system meets stakeholders' needs and expectations.

Based on the above discussion, Figure 5.1 shows a conceptual model of the relationship between ERP system quality variables, ERP service quality variables and overall stakeholder performance.

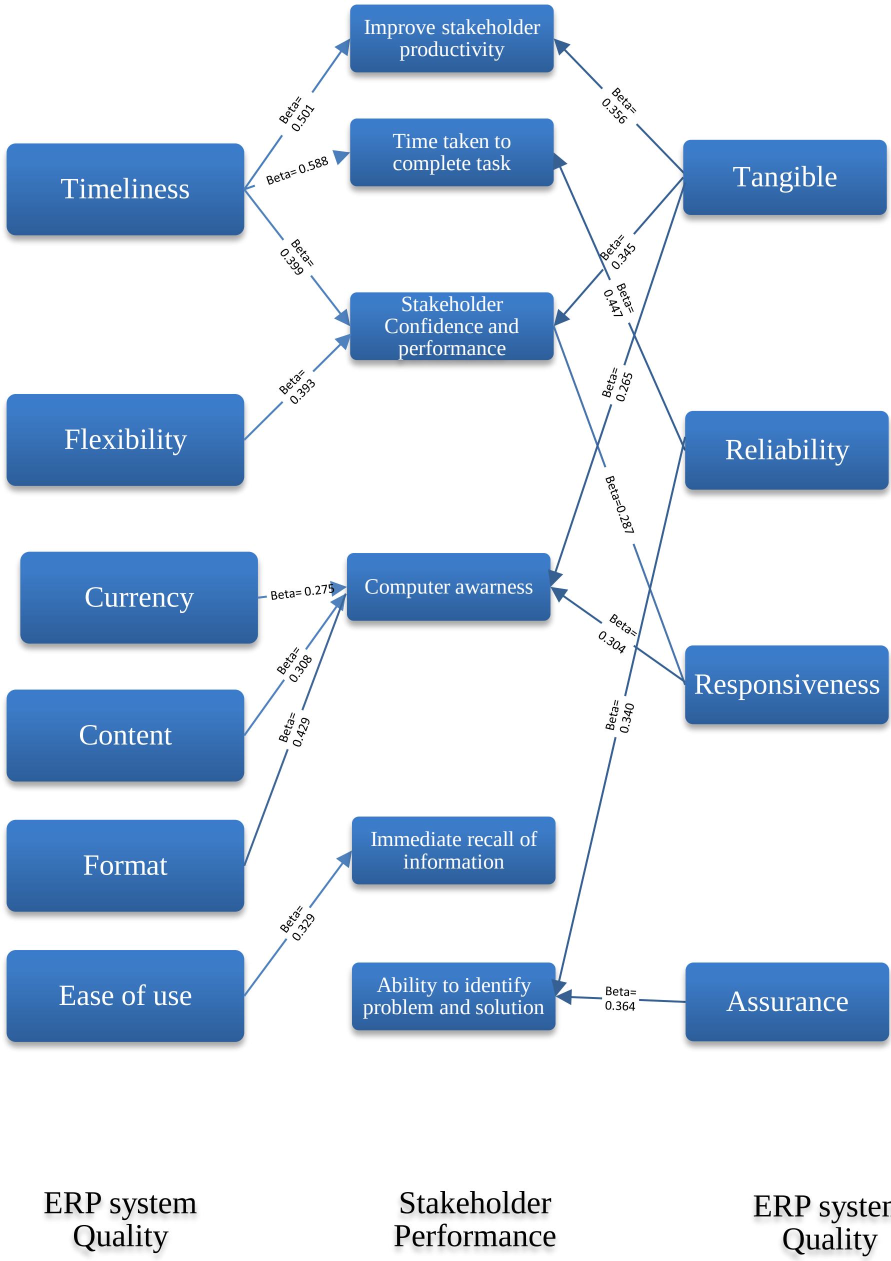


Figure 5.2: Conceptual Model Results for KSU

5.4 Case study two

5.4.1 King Fahd University of Petroleum and Minerals

The King Fahd University of Petroleum & Minerals (KFUPM) was officially established by royal decree on 23 September 1963. Since that time, the University has grown to a level where enrolment was expected to exceed 8,000 by the 2009-2010 academic years. The rapid growth of KFUPM is related to the rapid economic and technical development of the Kingdom. It also reflects the rising expectations of the people of Saudi Arabia, the expanding opportunities for the country's young men and the increasing importance of the Kingdom as a major source of the world's energy.

The vast petroleum and mineral resources of the Kingdom pose a complex and exciting challenge for scientific, technical and management education. To meet this challenge, the University has adopted advanced training in the fields of science, engineering and management as one of its goals, in order to promote leadership and service in the Kingdom's petroleum and mineral industries. The University also furthers knowledge through research in these fields. In addition, because it derives a distinctive character from being a technological university in the land of Islam, the University is unreservedly committed to deepening and broadening the faith of its Muslim students and to instilling in them an appreciation of the major contributions of their people to the world of mathematics and science. All areas of KFUPM—facilities, faculty, students and programmes—are directed to the attainment of these goals (KFUPM history, 2012).

5.4.2 Oracle system

Oracle is an enterprise system in use at KFUPM since March 2006. The ERP system project managers believed that implementing Oracle would be a pioneering, visionary and creative move, bringing a positive change which would improve the efficiency and effectiveness of KFUPM processes. In addition, through its integrated applications, it would provide accurate and reliable data and information to all users, in order to serve its mission to improve, enable and integrate the academic and administrative processes of the University. The project has six declared goals:

- to improve the effectiveness and efficiency of academic and administrative processes,
- to improve support for decision making,
- to enhance the availability of and access to timely and reliable information,
- to enhance the professional capabilities of human resources,
- to improve the quality of services for all stakeholders and
- to enhance the accountability of personnel and the integrity of processes and information.

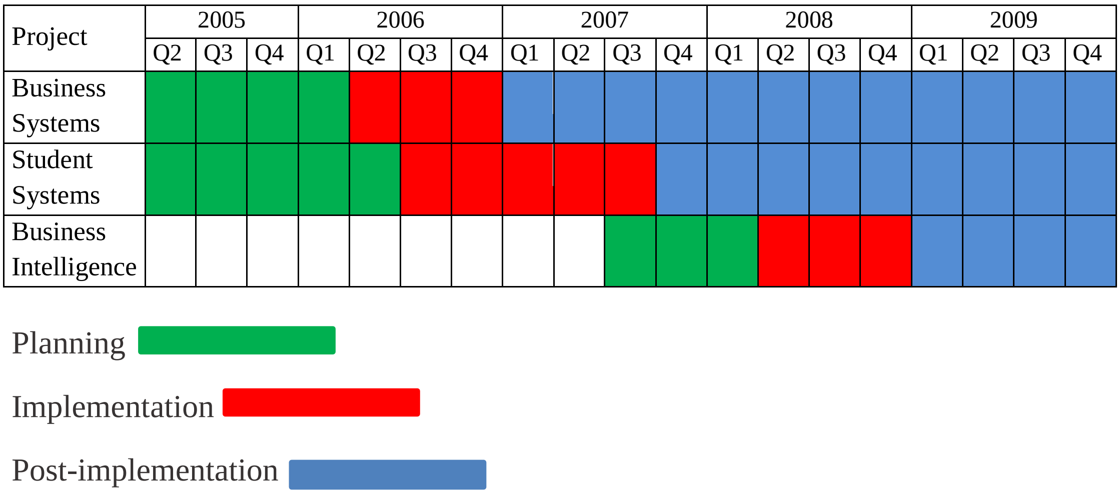


Figure 5.3: Project schedule at KFUPM

Table 5.11: shows in detail the number of participants (employees) at KFUPM and the departments they work in.

Table 5.11: Profiles of the participants at KFUPM

Case	Participant	Role	System
KFU PM	Employee 1to10	Maintenance management	**ORACLE SYSTEM**
	Employee 11 to 15	Procurement department	
	Employee 16 to 22	Human Resource	
	Employee 23 to 30	Financial department	
	Employee 31 to 37	Inventory management	
	Employee 38 to 41	Warehouse department	
	Employee 42 to 48	Purchasing department	
	Employee 48 to 55	Employee affairs	

Source: Originated by the researcher

5.4.3 Quantitative analysis

5.4.3.1 *Data preparation: Missing values*

Following the same process as in case study one, the KFUPM data were examined carefully, revealing that data were missing from three of the 58 questionnaires (5%), leaving 55 questionnaires suitable for data analysis after the initial screening. The missing values were found to be distributed randomly. Therefore, no bias was to be expected and the excluded cases pairwise method was applied to treat missing values, as recommended by Tabachnick and Fidell (2007) and by Pallant (2010).

5.4.3.2 *Reliability test*

Internal consistency within the research instrument was again assessed by clustering items into dimensional groups and calculating Cronbach's α. The total questionnaire, which consisted of 24 questions, had a coefficient score of 0.905, representing impressive internal consistency. In addition, the performance, system quality and service quality constructs had respective coefficient scores of 0.854, 0.846 and 0.727, all of which are strongly acceptable (Nunnally, 1978). The Cronbach's α results for the KFUPM questionnaire are shown in Table 5.12.

Table 5.12: Reliability test for KFUPM

Constructs	Number of items	Cronbach's Alpha	Type
Total KFU of P&M questionnaire	24	0.905	Excellent reliability
Performance	6	0.854	High reliability
System Quality	14	0.846	High reliability
Service Quality	4	0.727	High reliability

5.4.3.3 *System quality*

5.4.3.3 .1 *Multiple regressions*

To more thoroughly test H1, multiple regression was used to assess the relative importance of the system quality variables in explaining differences in attitudes towards stakeholder performance. Standard multiple regression (Enter method) was conducted, with the six stakeholder performance variables posited as the dependent variables and the 14 ERP system quality variables as the independent variables.

The R^2 values show that the fourteen system quality variables, as a group, explained 57.3% of the variation in improved stakeholder productivity, 59.6% of the variation in time taken to complete task, 41.9% in stakeholder confidence and performance, 50.1% in computer awareness, 52.9% in immediate recall of information and 65.3% in the ability to identify problems and solutions. According to Pallant (2006), these are acceptable levels of accuracy for academic research.

The F values show there were highly significant relationships ($p<.05$) between the fourteen ERP system quality variables and the six stakeholder performance variables. The model for ability to identify a problem and solution had the largest F value, $F(14, 54) = 5.372$, $p<.001$, indicating that it was the most significant model, followed by time taken to complete tasks $F(14, 54) = 4.222$, $p<.001$, improved stakeholder productivity $F(14, 54) = 3.833$, $p < .001$, then immediate recall of information $F(14, 54) = 3.209$, $p<.01$, computer awareness $F(14, 54) = 2.87$, $p<.01$ and finally, stakeholder confidence and performance, $F(14, 54) = 2.065$, $p<0.05$.

As for case study one, β statistics were used to calculate the unique contribution of each predictor to the outcome and the effect of a one standard deviation increase in each predictor.

Hypothesis 1: Oracle system quality variables have a significant impact on KFUPM stakeholders' performance variables (H1.1 - H1.14)

Improved stakeholder productivity. Table 5.13 shows that among all the 14 variables of system quality, only ease of use had a positive significant impact on improving stakeholder productivity (β = 0.486 at $p<0.01$). Thus, the regression equation to predict improved stakeholder productivity is:

B_0 + B_1 Ease of use = 1.408 + 0.292 Ease of use.

Table 5.13: Regression models for improved stakeholder productivity and time taken to complete task influenced by system quality at KFU of P&M

Model	USTD CO		STD CO	t	Sig.	Model	USTD CO		STD CO	t	Sig.
ISP	B	Std. Error	Beta			TCT	B	Std. Error	Beta		
(Constant)	1.408	0.602		2.341	0.024	(Constant)	0.866	0.602		1.437	0.159
Format	-2.848	0.127	0	0	1	Format	-.125-	0.127	-.164-	-.980-	0.333
Timeliness	0.106	0.15	0.137	0.707	0.484	Timeliness	-.116-	0.151	-.146-	-.772-	0.445
Accessibility	0.001	0.149	0.001	0.004	0.997	Accessibility	0.258	0.149	0.273	1.736	0.09
Assistance	0.126	0.099	0.181	1.27	0.211	Assistance	-.010-	0.099	-.014-	-.098-	0.922
Ease of Use	0.292	0.083	0.486	3.511	0.001	Ease of Use	0.234	0.083	0.38	2.819	0.007
Accuracy	0.044	0.114	0.064	0.383	0.704	Accuracy	-.083-	0.115	-.117-	-.723-	0.474
Currency	0.076	0.099	0.114	0.768	0.447	Currency	0.12	0.1	0.174	1.205	0.235
Authorisation	-.033-	0.086	-.059-	-.384-	0.703	Authorisation	-.113-	0.086	-.196-	-1.313-	0.197
Training	-.101-	0.08	-.179-	-1.267-	0.212	Training	-.032-	0.08	-.056-	-.404-	0.688
Right Data	0.105	0.115	0.163	0.913	0.367	Right Data	0.036	0.115	0.054	0.312	0.756
Lack of Confusion	0.005	0.106	0.009	0.044	0.965	Lack of Confusion	0.077	0.106	0.152	0.73	0.47
Content	0.118	0.169	0.114	0.698	0.489	Content	0.586	0.169	0.551	3.466	0.001
Flexibility	0.019	0.107	0.026	0.176	0.861	Flexibility	-.051-	0.107	-.068-	-.470-	0.641
Compatibility	0.005	0.102	0.008	0.049	0.961	Compatibility	0.029	0.102	0.044	0.286	0.777
UNSTD CO-Unstandardized Coefficients STD CO-Standarized Coefficients											
ISP=Improve stakeholders’ Productivity, TCT= Time Taken to Complete Task											

Time taken to complete task. Table 5.13 also shows that among the fourteen variables of system quality, only ease of use and content had a positive significant impact on time taken to complete task, with β values of 0.38 and 0.551 respectively at p<0.01. For every one standard deviation increase in ease of use and content, time taken to complete task will increase on average by 0.38 and 0.551 points respectively. Thus, the regression equation to predict time taken to complete task is:

B_1 Content + B_2 Ease of use = 0.586 Content + 0.234 Ease of use.

Stakeholder confidence and performance: Table 5.14 shows that only ease of use among the fourteen system quality variables had a significant and positive impact on stakeholder confidence and performance, with β = 0.364, which indicates that for every one standard deviation increases ease of use, stakeholder confidence and performance will increase on average by 0.364 points. Thus, the regression equation to predict stakeholder confidence and performance is:

B_0 + B_1 Ease of use = 1.917 + 0.212 Ease of use.

Computer Awareness: Table 5.14 also shows that none of the fourteen variables of system quality was a significant or influential predictor of computer awareness.

Table 5.14: Regression models for confidence and performance and computer awareness influenced by system quality at KFU of P&M

Model	USTD CO		STD CO	t	Sig.	Model	USTD CO		STD CO	t	Sig.
CP	B	Std. Error	Beta			CA	B	Std. Error	Beta		
(Constant)	1.917	0.68		2.818	0.007	(Constant)	0.362	0.933		0.388	0.7
Format	-.031-	0.144	-.043-	-.213-	0.832	Format	-.370-	0.197	-.349-	-1.876-	0.068
Timeliness	0.084	0.17	0.112	0.493	0.625	Timeliness	0.116	0.233	0.104	0.497	0.622
Accessibility	0.112	0.168	0.126	0.669	0.508	Accessibility	0.249	0.23	0.189	1.079	0.287
Assistance	0.109	0.112	0.161	0.969	0.339	Assistance	0.201	0.154	0.202	1.306	0.199
Ease of Use	0.212	0.094	0.364	2.254	0.03	Ease of Use	0.211	0.129	0.245	1.636	0.11
Accuracy	0.069	0.129	0.103	0.531	0.598	Accuracy	0.207	0.177	0.21	1.167	0.25
Currency	0.014	0.112	0.021	0.121	0.904	Currency	0.239	0.154	0.249	1.552	0.129
Authorisation	-.184-	0.098	-.337-	-1.885-	0.067	Authorisation	-.012-	0.134	-.015-	-.090-	0.929
Training	0.027	0.09	0.05	0.301	0.765	Training	-.070-	0.124	-.087-	-.567-	0.574
Right Data	0.157	0.13	0.252	1.208	0.234	Right Data	-.079-	0.178	-.085-	-.442-	0.661
Lack of Confusion	-.133-	0.119	-.278-	-1.113-	0.272	Lack of Confusion	-.134-	0.164	-.189-	-.818-	0.418
Content	0.11	0.191	0.11	0.577	0.567	Content	0.398	0.262	0.269	1.52	0.136
Flexibility	-.069-	0.121	-.099-	-.571-	0.571	Flexibility	0.108	0.166	0.104	0.648	0.521
Compatibility	0.042	0.115	0.066	0.362	0.719	Compatibility	-.265-	0.158	-.286-	-1.680-	0.101
UNSTD CO-Unstandardized Coefficient STD CO-Standarized Coefficients											
CP=Confidence and Performance,CA = Computer Awareness											

Immediate recall of information: Table 5.15 shows that of the fourteen variables of system quality, only currency had a significant positive impact on immediate recall of information (β = 0.499, p<0.01). For every one standard deviation increase in currency, immediate recall of information will increase on average by 0.499 points. Thus, the regression equation to predict immediate recall of information is:

$B_0 + B_1$ Currency = 1.526 + 0.382 Currency.

Ability to identify problem and solution: Table 5.15 also shows that none of the fourteen variables of system quality were significant or influential predictors of the ability to identify problems and solutions.

Table 5.15: Regression models for immediate recall of information and identifying problems and solutions influenced by system quality at KFU of P&M

Model	USTD CO		STD CO	t	Sig.	Model	USTD CO		STD CO	t	Sig.
IMI	B	Std. Error	Beta			AIP	B	Std. Error	Beta		
(Constant)	1.526	0.725		2.106	0.042	(Constant)	-1.240-	0.75		-1.654-	0.106
Format	0.141	0.153	0.166	0.919	0.364	Format	-.026-	0.158	-.025-	-.164-	0.871
Timeliness	0.264	0.181	0.298	1.46	0.152	Timeliness	0.193	0.187	0.18	1.03	0.309
Accessibility	0.155	0.179	0.147	0.867	0.391	Accessibility	0.006	0.185	0.005	0.033	0.974
Assistance	-.081-	0.12	-.102-	-.680-	0.5	Assistance	0.132	0.124	0.138	1.071	0.291
Ease of Use	0.168	0.1	0.245	1.683	0.1	Ease of Use	0.105	0.104	0.127	1.014	0.317
Accuracy	-.134-	0.138	-.170-	-.975-	0.336	Accuracy	0.263	0.143	0.277	1.844	0.073
Currency	0.382	0.12	0.499	3.194	0.003	Currency	0.222	0.124	0.24	1.791	0.081
Authorisation	-.134-	0.104	-.208-	-1.289-	0.205	Authorisation	0.041	0.108	0.053	0.384	0.703
Training	0.088	0.096	0.136	0.915	0.366	Training	-.001-	0.1	-.002-	-.014-	0.989
Right Data	0.22	0.139	0.299	1.59	0.12	Right Data	0.091	0.143	0.103	0.636	0.528
Lack of Confusion	0.061	0.127	0.108	0.479	0.635	Lack of Confusion	-.021-	0.132	-.030-	-.158-	0.876
Content	-.079-	0.203	-.066-	-.386-	0.701	Content	0.228	0.211	0.159	1.081	0.286
Flexibility	-.234-	0.129	-.283-	-1.812-	0.078	Flexibility	0.073	0.134	0.073	0.546	0.588
Compatibility	-.230-	0.123	-.310-	-1.876-	0.068	Compatibility	-.040-	0.127	-.045-	-.319-	0.751
UNSTD CO-Unstandardized Coefficien STD CO-Standarized Coefficients											
AIP= Ability to Identify Problem, IMI=Immediate Recall of Information											

5.4.3.4 *Service quality*

5.4.3.4.1 *Multiple regression analysis:* To more thoroughly test H2, multiple regression was used to assess the relative importance of the service quality variables in explaining differences in attitudes towards stakeholder performance. Standard multiple regression (Enter method) was performed, with the six stakeholder performance variables posited as the dependent variables and the four ERP service quality variables as the independent variables.

The R^2 values show that the four service quality variables, as a group, explained 29.2% of the variation in improved stakeholder productivity, 14.0% of the variation in time taken to complete task, 9.2% in stakeholder confidence and performance, 9.5% in computer awareness, 29.8% in immediate recall of information and 34.4% in ability to identify problems and solutions.

The F values show that there were highly significant relationships ($p<.01$) between the four ERP service quality variables and only three of the stakeholder performance variables. The model for ability to identify a problem and solution had the largest F value, $F(4, 54) = 6.551$, $p<.001$, indicating that it was the most significant model, followed by immediate recall of information $F(4, 54) = 5.307$, $p<.01$, then improved stakeholder productivity: $F(4, 54) = 5.158$, $p<.01$.

Standardised β statistics were again used to assess the unique contribution of each predictor and the effect on the outcome of a one standard deviation increase.

Hypothesis 2: Oracle service quality variables have a significant impact on KFUPM stakeholders' performance variables (H2.1 - H2.4)

Tables 5.16, 5.17 and 5.18 show that none of the four service quality variables was found to be significant and hence that none was an influential predictor of any of the six stakeholder performance variables.

Table 5.16: Regression models for improved stakeholder productivity and time taken to complete task influenced by service quality at KFU of P&M

Model	USTD CO		STD CO	t	Sig.	Model	USTD CO		STD CO	t	Sig.
ISP	B	Std. Error	Beta			TCT	B	Std. Error	Beta		
(Constant)	2.268	0.563		4.025		(Constant)	2.715	0.64		4.245	0
Tangible	0.028	0.109	0.035	0.256	0.799	Tangible	0.05	0.124	0.061	0.404	0.688
Reliability	0.272	0.149	0.251	1.832	0.073	Reliability	0.206	0.169	0.185	1.222	0.227
Responsiveness	0.098	0.101	0.168	0.976	0.334	Responsiveness	0.158	0.114	0.263	1.386	0.172
Assurance	0.167	0.118	0.243	1.415	0.163	Assurance	-.023-	0.134	-.032-	-.168-	0.867
UNSTD CO-Unstandardized Coeffici		STD CO-Standarized Coefficients									
ISP=Improve stakeholders' Productivity, TCT= Time Taken to Complete Task											

Table 5.17: Regression models for confidence and performance and computer awareness influenced by service quality at KFUPM

Model	USTD CO		STD CO	t	Sig.	Model	USTD CO		STD CO	t	Sig.
CP	B	Std. Error	Beta			CA	B	Std. Error	Beta		
(Constant)	3.027	0.619		4.893	0	(Constant)	2.187	0.914		2.393	0.02
Tangible	-.056-	0.12	-.074-	-.470-	0.641	Tangible	0.265	0.177	0.235	1.502	0.139
Reliability	0.221	0.163	0.211	1.356	0.181	Reliability	0.168	0.241	0.108	0.696	0.49
Responsiveness	0.108	0.111	0.19	0.975	0.334	Responsiveness	0.03	0.163	0.035	0.181	0.857
Assurance	0.012	0.13	0.019	0.096	0.924	Assurance	-.015-	0.191	-.015-	-.077-	0.939
UNSTD CO-Unstandardized Coefficie			STD CO-Standarized Coefficients								
CP=Confidence and Performance,CA = Computer Awareness											

Table 5.18: Regression models for immediate recall of information and identifying problems and solutions influenced by service quality at KFU of P&M

Model	USTD CO		STD CO	t	Sig.	Model	USTD CO		STD CO	t	Sig
IMI	B	Std. Erro	Beta			AIP	B	Std. Erro	Beta		
(Constant)	2.132	0.644		3.313	0.002	(Constant)	0.61	0.75		0.814	0.42
Tangible	0.209	0.124	0.231	1.677	0.1	Tangible	0.238	0.145	0.219	1.644	0.106
Reliability	-.031-	0.17	-.025-	-.181-	0.857	Reliability	0.161	0.198	0.108	0.814	0.419
Responsiveness	0.136	0.115	0.203	1.183	0.242	Responsiveness	0.142	0.134	0.176	1.06	0.294
Assurance	0.208	0.135	0.264	1.542	0.129	Assurance	0.255	0.157	0.27	1.627	0.11
UNSTD CO-Unstandardized Coeffic		STD CO-Standarized Coefficients									
AIP= Ability to Identify Problem, IMI=Immediate Recall of Information											

The factors selected from the above models, however, proved able to provide an effective evaluation of stakeholders' performance. KFUPM is a pioneer among Saudi universities in implementing a well-known ERP system (Oracle). Not surprisingly, the results show that three of the 14 system quality factors (currency, ease of use and content) were positively significant, whereas all four service quality factors (tangibility, reliability, responsiveness and assurance) were found have an insignificant impact on stakeholder performance. None of the remaining 11 variables (lack of confusion, accessibility, assistance, authorization, right data, compatibility, flexibility, format and training, timeliness and accuracy) predicted stakeholder performance.

The results for some of these system quality factors (e.g. flexibility, timeliness, accuracy, training and authorization) were unexpected, as were those for the service quality factors, especially given that the system had been implemented for sufficient time for users to have gained enough experience to serve the system's stakeholders.

Possible reasons for other results regarding insignificant factors (e.g. accuracy, assistance, training, authorization and accessibility) are that the system did not meet the stakeholders' needs and expectations, and that they resisted the change to the new system because they were more familiar with the legacy systems that they had worked on for a long time.

Given that the Oracle system had begun to be implemented at KFUPM in 2006-2007, the limited significance of many factors was unexpected. However, the system was being used only by a limited number of departments. In general, the results may be considered a substantial achievement for KFUPM, since the 14 system quality factors as a group explained approximately 57.3% of the variation in improved stakeholder productivity, 59.6% of the variation in time taken to complete task, 41.9% in stakeholder confidence and performance, 50.1% in computer awareness, 52.9% in immediate recall of information and 65.3% in ability to identify problems and solutions. According to Pallant (2006), these are acceptable levels of accuracy for academic research. In contrast, the four service quality variables, as a group, explained only 29.2% of the variation in improved stakeholder productivity, 14.0% in time taken to complete task, 9.2% in stakeholder confidence and performance, 9.5% in computer awareness, 29.8% in immediate recall of information and 34.4% in ability to identify problems and solutions.

Figure 2 shows a conceptual model derived from the above results and representing the relationships between ERP system quality variables and stakeholder performance at KFUPM.

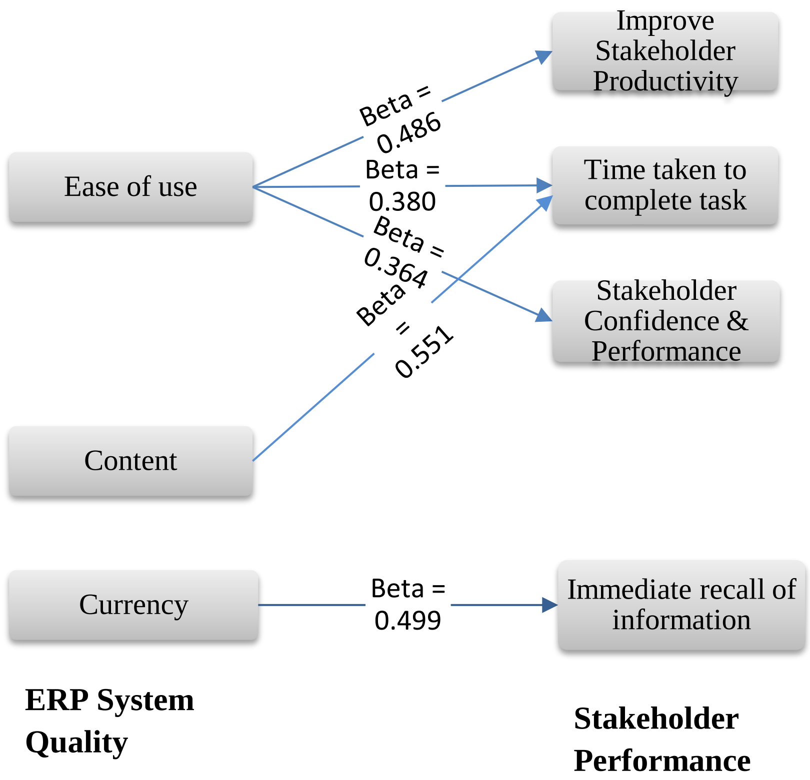


Figure 5.4: Conceptual model results for KFUPM

5.5 Case study three

5.5.1 King Faisal University

King Faisal University (KFU) was established in 1395 AH, in Hofuf, Al-Ahsa Governorate, in the Eastern Province, initially in rented premises. In subsequent years it used prefabricated buildings to house some of its colleges, beginning with the College of Agricultural and Food Sciences and the College of Veterinary Medicine and Animal Resources. Following the completion and integration of the existing colleges, it was decided to establish the College of Education in 1401/1402 AH and the College of Business Administration Sciences and Planning in 1404/1405. The number of students has increased from 170 in 1395/1396 AH to more than 23,909 (male and female) in 1431/1432 AH.

The first batch of Saudi university graduates comprised nine students in 1398/1399 AH, increasing by the year 1430/1431 to 13,876 male and female graduates in disciplines including medicine, agricultural science, administration, architecture and food, veterinary medicine and animal resources, as well as other disciplines in the colleges of education and business.

The university has eleven independent deanships: Student Affairs; Admission and Registration: Library Affairs; Graduate Studies; Faculty Affairs; Scientific Research; Higher Education Development; Information Technology; E-learning and Distance Education; Quality Assurance and Academic Accreditation; and Preparatory Year.

The university seeks to provide opportunities for graduate studies, so 505 students were enrolled in graduate programmes for the year 1431-1432 AH. Despite the slowness of starting these graduate programmes, the University is proud of what has been achieved so far, seeing it as a pioneering educational achievement. Furthermore, the number of scholarships for postgraduate studies has been increased from 15 in 1395/1396 AH to 205 in 1431-1432 AH. These scholarships are awarded to both males and females studying for masters' degrees and doctorates in many prestigious universities in Saudi Arabia and abroad.

The number of faculty members, lecturers and teaching assistants has increased from 46 to 1379, including 651 Saudis, representing 51% of the total. Meanwhile, the number of administrators, technicians and labourers has increased from 166 to 1387 in 1431/1432 AH (2011 AD).

The University has paid special attention to conferences and scientific research, organizing more than 66 local and global conferences and symposia at KFU, in addition to the participation of the University in numerous local and external conferences and seminars where it has been represented by faculty members, including more than 300 conferences and scientific symposia at home and abroad, (KFU history, 2012).

5.5.2 Oracle System

KFU chose to implement the Oracle enterprise system in early 2008, deploying it as a single entity in different departments. The implementation was divided into two phases (Appendix x details the components implemented at each stage).

The KFU project managers believed that implementing Oracle would be a major positive step towards improving the efficiency and effectiveness of the university's processes. In addition, through its integrated applications, it would provide accurate and reliable data and information to all users, in order to serve its mission to improve, enable and integrate KFU's academic and administrative functions.

The project managers believed that implementation would help them to achieve the following:

- to improve the effectiveness and efficiency of academic and administrative processes,
- to support decision making,
- to improve human resource capabilities,
- to increase the quality of services for all stakeholders,
- to improve the accountability of personnel and the integrity of processes and information, and
- to ensure timely access to reliable information.

Table 5. 19: Profiles of the participants at KFU

Case	Participant	Role	System
KFU	Employee 1 to 7	Financial department	**ORACLE SYSTEM**
	Employee 8 to 17	Inventory management	
	Employee 18 to 25	Human Resource	
	Employee 26 to 35	Purchasing department	
	Employee 36 to 40	Employee affairs	
	Employee 41 to 46	Warehouse department	
	Employee 47 to 54	Procurement department	

Source: Originated by the researcher

5.5.3 Quantitative analysis

5.5.3.1 *Data preparation: Missing values*

Following same process as in the other case studies, the KFU data were examined and three of the 57 questionnaires (5%) were found to have missing data, leaving (54) questionnaires suitable for data analysis after the initial screening. These missing values were found to be distributed randomly, so no bias was to be expected and the excluded cases pairwise method was applied to treat missing values (Tabachnick and Fidell, 2007; Pallant, 2010).

5.5.3.2 *Reliability test*

Internal consistency was again assessed by means of Cronbach's alpha. The total questionnaire, which consisted of 24 questions, had a coefficient score of 0.152, indicating low internal consistency. In addition, the performance and service quality constructs had respective reliability coefficient scores of 0.57 (acceptable) and 0.736 (strongly acceptable), whereas the system quality construct had a reliability coefficient of 0.133, representing low internal consistency, well below the 0.5 cut-off recommended by Nunnally (1978). The Cronbach's α result for the KFU questionnaires are shown in Table 5.20.

Table 5.20: Reliability test for KFU

Constructs	Number of items	Cronbach's Alpha	Type
Total KFU questionnaire	24	0.152	Low reliability
Performance	6	0.57	High reliability
System Quality	14	0.133	Low reliability
Service Quality	4	0.736	High reliability

5.5.3.3 *System quality*

5.5.3.3.1 *Multiple regressions*

To test H1 more thoroughly, standard multiple regression (Enter method) was again used, to assess the relative importance of the system quality variables in explaining differences in attitudes towards stakeholder performance, with the six stakeholder performance variables posited as the dependent variables and the fourteen ERP system quality variables as the independent variables.

The R^2 values show that the fourteen systems quality variables, as a group, explained 28.4% of the variation in improved stakeholders' productivity, 73.7% of the variation in time taken to complete task, 66.8% in stakeholder confidence and performance, 61.7% in computer awareness, 66.5% in immediate recall of information and 72.8% in ability to identify problems and solutions. According to Pallant (2006), these are acceptable levels of accuracy for academic research. Part of the variance may be due to error measurement; however, it suggests that other unknown factors must play some role in determining these stakeholder performance attitudes (Field, 2009).

The F values show that there were highly significant relationships ($p<.001$) between the fourteen ERP system quality variables and only five of the stakeholder performance variables. The model for time taken to complete a task had the largest F value, $F(14, 53) = 7.808$, $p<.001$, indicating that it was the most significant model, followed by ability to identify a problem and solution, $F(14, 53) = 7.459$, $p < .001$, then stakeholder confidence and performance, $F(14, 53) = 5.602$, $p<.001$, immediate recall of information $F(14, 53) = 5.521$, $p<.001$ and computer awareness $F(14, 53) = 4.484$, $p<.001$, while improved stakeholder productivity was not significant: $F(14, 53) = 1.106$, $p<0.4$.

Again, β statistics were used to assess the unique contribution of each predictor and the effect on the outcome of a one standard deviation increase.

Hypothesis 1: Oracle system quality variables have a significant impact on KFU stakeholders' performance variables (H1.1 - H1.14)

Improved stakeholder productivity: Table 5.21 shows that among the 14 variables of system quality, only lack of confusion had a significant negative impact on improving stakeholder productivity, with $\beta = -0.409$ at $p<0.05$. Although there was no Spearman correlation between lack of confusion and improved stakeholder productivity, it turned out to be a significant predictor with the existence of other variables in the regression model. Thus, the regression equation to predict improved stakeholder productivity is:

$B_0 + B_1$ Lack of Confusion = 7.903 – 0.17 Lack of Confusion,

Where the values of B_0 and B_1 are the unstandardized coefficients B in the regression analysis as listed in Table 5.21

***Time taken to complete task**:* Table 5.21 also shows that only six system quality variables had a significant impact on time taken to complete task. The highest positive significance was for format ($\beta = 0.448$), followed by content ($\beta = 0.324$), then training ($\beta = 0.257$), while the highest negative significance was for accuracy ($\beta = -0.324$), followed by authorization ($\beta = -0.260$), then ease of use ($\beta = -0.239$).

Thus, for every one standard deviation increase in format, content and training scores, time taken to complete task will increase on average by 0.448, 0.324 and 0.257 points respectively, while for every one standard deviation increase in accuracy, authorization and ease of use, time taken to complete task will decrease on average by 0.324, 0.260, 0.239 points respectively. It is worth mentioning that although there was no Spearman correlation between authorisation or training and time taken to complete task, they turned to be significant predictors with the existence of other variable in the regression model. Thus, the regression equation to predict time taken to complete task is:

B_0 + B_1 Format + B_2 Content + B_3 Training + B_4 Accuracy + B_5 Authorisation + B_6 Ease of use,

where the values of B_0, B_1, B_2, B_3, B_4, B_5 and B_6 are 3.791, 0.282, 0.301, 0.094, -0.186, -0.098 and -0.173 respectively, as listed in Table 5.21.

Table 5.21: Regression models for improved stakeholder productivity and time taken to complete task, influenced by system quality at KFU

Mdel	USTD CO		STD CO	t	Sig.	Model	USTD CO		STD CO	t	Sig.
ISP	B	Std. Error	Beta			TCT	B	Std. Error	Beta		
(Constant)	7.903	1.581		4.999	0	(Constant)	3.791	0.915		4.145	0
Lack of Confusion	-.170-	0.076	-.409-	-2.225-	0.032	Lack of Confusion	-.012-	0.044	-.030-	-.267-	0.791
Right Data	0.044	0.065	0.12	0.683	0.499	Right Data	-.008-	0.038	-.023-	-.211-	0.834
Accessibility	-.088-	0.152	-.117-	-.577-	0.567	Accessibility	-.088-	0.088	-.122-	-.997-	0.325
Assistance	0.072	0.108	0.112	0.665	0.51	Assistance	-.062-	0.063	-.101-	-.997-	0.325
Authorization	0.009	0.061	0.023	0.15	0.882	Authorization	-.098-	0.035	-.260-	-2.753-	0.009
Ease of Use	-.091-	0.122	-.120-	-.744-	0.461	Ease of Use	-.173-	0.071	-.239-	-2.451-	0.019
Flexibility	-.132-	0.093	-.263-	-1.419-	0.164	Flexibility	0.058	0.054	0.121	1.081	0.286
Training	0.105	0.068	0.276	1.557	0.128	Training	0.094	0.039	0.257	2.399	0.021
Accuracy	-.047-	0.1	-.078-	-.468-	0.642	Accuracy	-.186-	0.058	-.324-	-3.201-	0.003
Compatibility	-.163-	0.101	-.306-	-1.611-	0.115	Compatibility	-.018-	0.059	-.035-	-.305-	0.762
Currency	0.06	0.105	0.106	0.573	0.57	Currency	0.065	0.061	0.119	1.063	0.295
Content	-.166-	0.21	-.171-	-.788-	0.435	Content	0.301	0.122	0.324	2.472	0.018
Format	0.019	0.117	0.028	0.158	0.875	Format	0.282	0.068	0.448	4.154	0
Timeliness	-.183-	0.148	-.244-	-1.235-	0.224	Timeliness	-.028-	0.086	-.039-	-.324-	0.747

UNSTD CO-Unstandardized Coefficien STD CO-Standarized Coefficients
ISP=Improve stakeholders' Productivity, TCT= Time Taken to Complete Task

Stakeholder confidence and performance: Table 5.22 shows that only two of the fourteen system quality variables had a significant negative impact on stakeholder confidence and performance. These were authorisation (β = -0.423) and ease of use (β = -0.433), indicating that for every one standard deviation increase in authorisation and ease of use, stakeholder confidence and performance will decrease on average by 0.423 and 0.433 points respectively. Thus, the regression equation to predict stakeholder confidence and performance is:

B_0 + B_1 Authorisation + B_2 Ease of use,

Where the values of B_0, B_1 and B_2 are 4.735, -0.191 and -0.378 respectively, as listed in Table 5.22

Computer awareness: Table 5.22 also shows that content, assistance and currency had significant positive effects on computer awareness, while timeliness and accuracy had significant negative effects, with respective β values of 0.620, 0.447, 0.401, -0.333 and -0.436. It is worth mentioning that although there was no Spearman correlation between timeliness, content or currency and computer awareness, they turned out to be significant predictors with the existence of other variables in the regression model. Thus, the regression equation to predict computer awareness is: ***B_1 Content + B_2 Assistance + B_3 Currency + B_4 Timeliness + B_5 Accuracy,***

Where the values of B_1, B_2, B_3 and B_4 are 0.849, 0.405, 0.320, -0.351 and -0.368 respectively, as shown in Table 5.22

Table 5.22: Regression models for confidence and performance and for computer awareness influenced by system quality at KFU

Model	USTD CO		STD CO	t	Sig.	Model	USTD CO		STD CO	t	Sig.
CP	B	Std. Error	Beta			CA	B	Std. Error	Beta		
(Constant)	4.735	1.239		3.822	0	(Constant)	1.655	1.627		1.017	0.315
Lack of Confusion	0.077	0.06	0.161	1.291	0.204	Lack of Confusion	-.051-	0.079	-.086-	-.642-	0.524
Right Data	-.001-	0.051	-.002-	-.017-	0.987	Right Data	0.089	0.067	0.172	1.331	0.191
Accessibility	0.057	0.119	0.066	0.479	0.635	Accessibility	-.271-	0.157	-.256-	-1.731-	0.091
Assistance	-.008-	0.085	-.011-	-.099-	0.922	Assistance	0.405	0.111	0.447	3.641	0.001
Authorization	-.191-	0.048	-.423-	-3.977-	0	Authorisation	0.11	0.063	0.2	1.751	0.088
Ease of Use	-.378-	0.096	-.433-	-3.946-	0	Ease of Use	0.112	0.126	0.105	0.893	0.377
Flexibility	0.052	0.073	0.09	0.711	0.481	Flexibility	0.063	0.096	0.089	0.658	0.514
Training	0.102	0.053	0.233	1.929	0.061	Training	0.047	0.07	0.087	0.672	0.505
Accuracy	-.139-	0.079	-.201-	-1.767-	0.085	Accuracy	-.368-	0.103	-.436-	-3.565-	0.001
Compatibility	0.056	0.079	0.091	0.705	0.485	Compatibility	-.159-	0.104	-.212-	-1.524-	0.135
Currency	0.067	0.082	0.103	0.814	0.421	Currency	0.32	0.108	0.401	2.964	0.005
Content	0.065	0.165	0.058	0.391	0.698	Content	0.849	0.217	0.62	3.919	0
Format	0.183	0.092	0.242	1.995	0.053	Format	-.110-	0.121	-.119-	-.916-	0.365
Timeliness	-.021-	0.116	-.025-	-.185-	0.854	Timeliness	-.351-	0.152	-.333-	-2.305-	0.027
UNSTD CO-Unstandardized Coefficient STD CO-Standarized Coefficients											
CP=Confidence and Performance,CA = Computer Awareness											

Immediate recall of information: Table 5.23 shows that lack of confusion, timeliness and compatibility had significant negative effects on immediate recall of information, while authorization had a significant positive effect: β = -0.429, -0.295, -0.292 and 0.277 respectively. Although there was no Spearman correlation between authorisation or timeliness and immediate recall of information, they turned to be significant predictors with the existence of other variables in the regression model. Thus, the regression equation to predict immediate recall of information is:

B_0 + B_1 Lack of confusion + B_2 timeliness + B_3 compatibility + B_4 authorisation,

Where the values of B_0, B_1, B_2, B_3 and B_4 are 4.561, -0.315, -0.389, -0.273 and 0.192 respectively (Table 5.23)

Ability to identify problems and solutions: Table 5.23 also shows that content, currency and assistance had significant positive effects on the ability to identify problems and solutions, while accessibility and accuracy had significant negative effects on it: β = 0.776, 0.281, 0.216, -0.462 and -0.438 respectively. Again, although there was no Spearman correlation of either accessibility or assistance with ability to identify problems and solutions, they turned to be significant predictors with the existence of other variables in the regression model. Thus, the regression equation to predict ability to identify problems and solutions is:

B_0 + B_1 Content + B_2 accessibility + B_3 Accuracy + B_4 currency + B_5 Assistance,

Where the values of B_0, B_1, B_2, B_3, B_4 and B_5 are 1.171, 1.114, -0.513, -0.388, 0.235 and 0.205 respectively (Table 5.23)

Table 5.23: Regression models for immediate recall of information and identifying problems and solutions influenced by system quality at KFU

Model	USTD CO		STD CO	t	Sig.	Model	USTD CO		STD CO	t	Sig.
IMI	B	Std. Error	Beta			AIP	B	Std. Error	Beta		
(Constant)	4.561	1.903		2.397	0.021	(Constant)	1.171	1.437		0.815	0.42
Lack of Confusion	-.315-	0.092	-.429-	-3.415-	0.002	Lack of Confusion	0.058	0.07	0.094	0.827	0.413
Right Data	0.034	0.078	0.052	0.433	0.667	Right Data	-.068-	0.059	-.124-	-1.145-	0.259
Accessibility	0.311	0.183	0.234	1.694	0.098	Accessibility	-.513-	0.138	-.462-	-3.706-	0.001
Assistance	0.18	0.13	0.159	1.383	0.174	Assistance	0.205	0.098	0.216	2.087	0.043
Authorization	0.192	0.074	0.277	2.595	0.013	Authorization	-.090-	0.056	-.154-	-1.607-	0.116
Ease of Use	0.041	0.147	0.031	0.281	0.78	Ease of Use	0.18	0.111	0.16	1.615	0.114
Flexibility	-.106-	0.112	-.120-	-.947-	0.349	Flexibility	0.126	0.084	0.171	1.497	0.142
Training	-.094-	0.081	-.140-	-1.154-	0.255	Training	-.035-	0.061	-.062-	-.565-	0.575
Accuracy	-.232-	0.121	-.219-	-1.918-	0.062	Accuracy	-.388-	0.091	-.438-	-4.258-	0
Compatibility	-.273-	0.122	-.292-	-2.243-	0.031	Compatibility	0.073	0.092	0.093	0.795	0.431
Currency	0.157	0.127	0.157	1.238	0.223	Currency	0.235	0.096	0.281	2.464	0.018
Content	0.316	0.253	0.185	1.249	0.219	Content	1.114	0.191	0.776	5.822	0
Format	0.033	0.141	0.029	0.234	0.816	Format	-.157-	0.107	-.162-	-1.476-	0.148
Timeliness	-.389-	0.178	-.295-	-2.183-	0.035	Timeliness	5.35E-05	0.134	0	0	1

UNSTD CO-Unstandardized Coefficier STD CO-Standarized Coefficients

AIP= Ability to Identify Problem, IMI=Immediate Recall of Information

5.5.3.4. *Service quality*

5.5.3.4.1 *Multiple regressions*

To test H2 more thoroughly, standard multiple regression was again used to assess the relative importance of the service quality variables in explaining differences in attitudes towards stakeholder performance, with the six stakeholder performance variables posited as the dependent variables and the four ERP service quality variables as the independent variables.

The R^2 values show that the four service quality variables together explained 12.5% of the variation in improved stakeholder productivity, 59.8% of the variation in time taken to complete task, 55.2% in stakeholder confidence and performance, 13.0% in computer awareness, 39.3% in immediate recall of information and 27.3% in ability to identify problems and solutions. The percentage of variance explained by service quality variables is thus substantially lower than for the systems quality variables discussed under H1 above. Again, part of the variance may be due to measurement error, but the lower variance suggests that other unknown factors must play a part in determining these stakeholder performance attitudes (Field, 2009).

The F values reveal highly significant relationships at the $p = 0.001$ level between the four ERP service quality variables and the four stakeholder performance variables. The model for time taken to complete a task had the largest F value, $F(4, 53) = 18.250$, $p<.001$, indicating that this was the most significant model, followed by stakeholders' confidence and performance, $F(4, 53) = 15.108$, $p<.001$, then immediate recall of information, $F(4, 53) = 7.943$, $p<.001$ and ability to identify problem and solution, $F(4, 53) = 4.606$, $p<.001$, while computer awareness, $F(4, 53) = 1.825$, and improved stakeholders productivity, $F(4, 53) = 1.747$, were not significant and are not influential predictors.

Again, β statistics were used to assess the unique contribution of each predictor and the effect on the outcome of a one standard deviation increase.

Hypothesis 2: Oracle service quality variables have a significant impact on KFU stakeholders' performance variables (H2.1 – H2.4)

Improved stakeholder productivity: Table 5.24 shows that of the four variables of service quality, only responsiveness had a negative significant impact on improving stakeholder productivity ($\beta = -0.642$, $p<0.05$). Thus, for every one standard deviation increase in responsiveness, improved stakeholder productivity will decrease on average by 0.642 points and the regression equation to predict improved stakeholder productivity is:

$$B_0 + B_1 \text{ Responsiveness} = 5.917 - 0.415 \text{ Responsiveness},$$

where the values of B_0 and B_1 are the unstandardized B coefficients in the regression analysis, as shown in Table 5.24.

Time taken to complete task: Table 5.24 also shows that assurance and reliability were the only service quality variables to have a significant negative impact on time taken to complete tasks, with respective β values of -0.597 and -0.568 at $p<0.01$, meaning that for every one standard deviation increase in assurance and reliability, time taken to complete a task will decrease on average by 0.597 and 0.568 points respectively. Thus, the regression equation to predict time taken to complete task is:

B_0 + B_1 Reliability + B_2 Assurance,

where the values of B_0, B_1 and B_2 are 6.139, -0.358 and -0.251 respectively, as listed in Table 5.24.

Table 5.24: Regression models for improved stakeholder productivity and time taken to complete task influenced by service quality at KFU

Model	USTD CO		STD CO	t	Sig.	Model	USTD CO		STD CO	t	Sig.
IMP	B	Std. Error	Beta			TCT	B	Std. Error	Beta		
(Constant)	5.917	0.562		10.537	0	(Constant)	6.139	0.363		16.906	0
Tangible	-.033-	0.078	-.069-	-.427-	0.671	Tangible	0.034	0.051	0.073	0.663	0.51
Reliability	-.023-	0.099	-.035-	-.230-	0.819	Reliability	-.358-	0.064	-.568-	-5.572-	0
Responsiveness	-.415-	0.162	-.642-	-2.555-	0.014	Responsiveness	0.16	0.105	0.26	1.528	0.133
Assurance	0.215	0.121	0.489	1.771	0.083	Assurance	-.251-	0.079	-.597-	-3.191-	0.002
UNSTD CO-Unstandardized Coeffici STD CO-Standarized Coefficients											
ISP=Improve stakeholders' Productivity, TCT= Time Taken to Complete Task											

Stakeholder confidence and performance: Table 5.25 shows that only reliability among the four variables of service quality had a significant negative impact on stakeholder confidence and performance (β = - 0.731, p<0.001), so that for every one standard deviation increase in reliability, stakeholder confidence and performance will decrease on average by 0.731 points. Thus, the regression equation to predict stakeholder confidence and performance is:

B_0 + B_1 Reliability = 6.66 – 0.555 Reliability,

where the values of B_0 and B_1 are the unstandardized B coefficients in the regression analysis shown in Table 5.25.

Computer awareness: The analysis revealed that no service quality variable was significant and hence an influential predictor of computer awareness (Table 5.25).

Table 5.25: Regression models for confidence and performance and computer awareness influenced by service quality at KFU

Model	USTD CO		STD CO	t	Sig.	Model	USTD CO		STD CO	t	sig
CP	B	Std. Error	Beta			CA	B	Std. Error	Beta		
(Constant)	6.66	0.462		14.411	0	(Constant)	4.761	0.788		6.044	0
Tangible	0.013	0.064	0.024	0.203	0.84	Tangible	-.054-	0.11	-.080-	-.496-	0.622
Reliability	-.555-	0.082	-.731-	-6.791-	0	Reliability	0.089	0.139	0.096	0.637	0.527
Responsiveness	0.117	0.134	0.158	0.878	0.384	Responsiveness	0.111	0.228	0.122	0.486	0.629
Assurance	-.069-	0.1	-.137-	-.693-	0.492	Assurance	-.270-	0.17	-.436-	-1.583-	0.12
UNSTD CO-Unstandardized Coefficie STD CO-Standarized Coefficients											
CP=Confidence and Performance,CA = Computer Awareness											

Immediate recall of information*:* Table 5.26 shows that only responsiveness among the variables of service quality had a significant negative impact on immediate recall of information (β = - 0.633, $p<0.01$). Thus, for every one standard deviation increase in responsiveness, immediate recall of information will decrease on average by 0.633 points and the regression equation to predict immediate recall of information is:

B_0 + B_1 Responsiveness = 6.213 – 0.719 Responsiveness,

where the values of B_0 and B_1 are the unstandardized B coefficients in the regression analysis, as shown in Table 5.26.

Ability to identify problems and solutions*:* The analysis revealed that none of the service quality variables was significant and hence an influential predictor of the ability to identify problems and solutions, as shown in Table 5.26.

Table 5.26: Regression models for immediate recall of information and identifying problems and solutions influenced by service quality at KFU

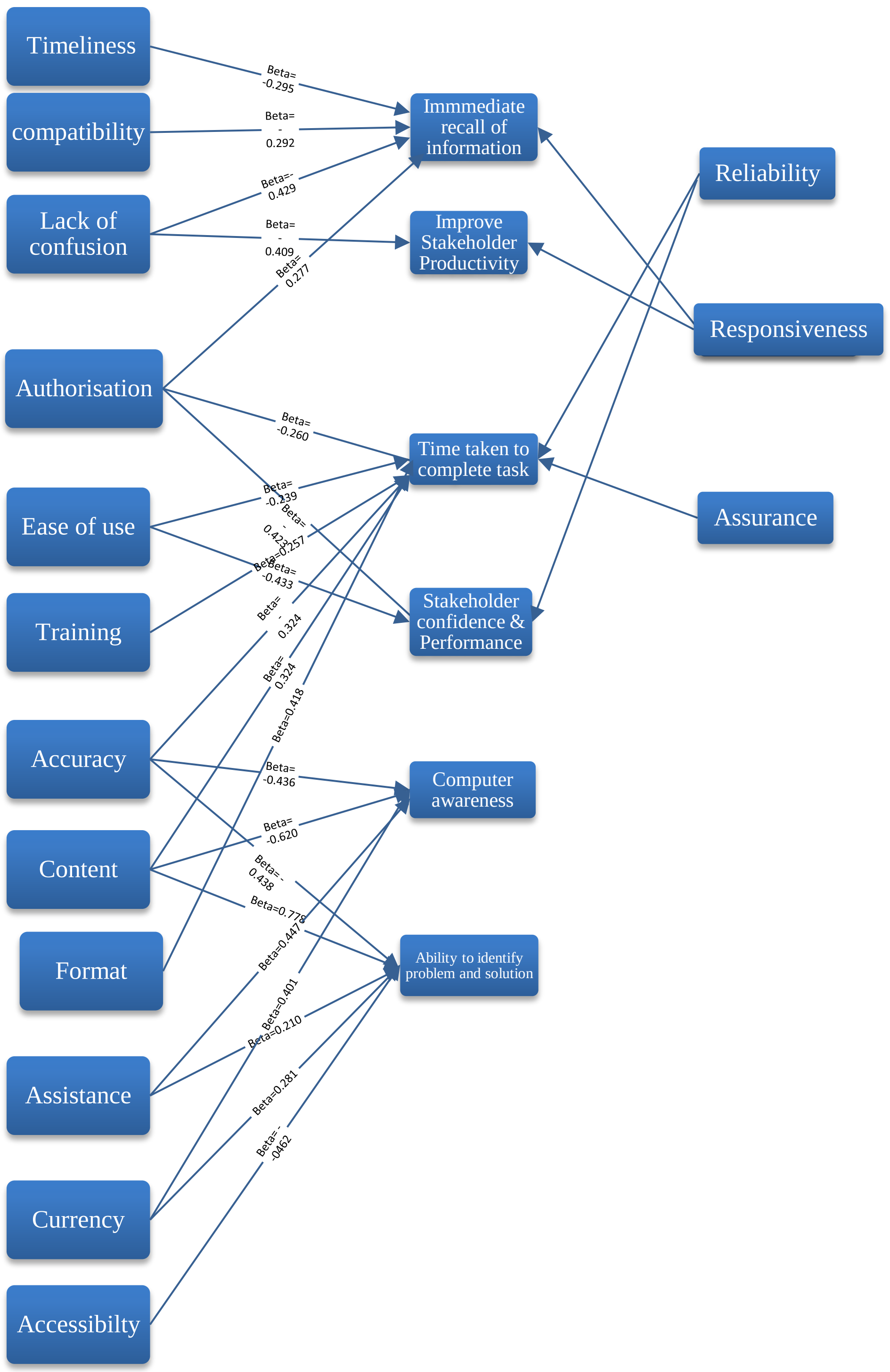
Model	USTD CO		STD CO	t	Sig	Model	USTD CO		STD CO	t	Sig.
IMI	B	Std. Error	Beta			AIP	B	Std. Error	Beta		
(Constant)	6.213	0.822		7.555	0	(Constant)	6.026	0.755		7.984	0
Tangible	-.055-	0.115	-.066-	-.484-	0.63	Tangible	-.031-	0.105	-.044-	-.295-	0.769
Reliability	0.276	0.145	0.237	1.896	0.064	Reliability	-.183-	0.133	-.188-	-1.369-	0.177
Responsiveness	-.719-	0.238	-.633-	-3.025-	0.004	Responsiven	0.121	0.218	0.128	0.557	0.58
Assurance	0.02	0.178	0.026	0.113	0.91	Assurance	-.324-	0.163	-.499-	-1.983-	0.053
UNSTD CO-Unstandardized Coefficie			STD CO-Standarized Coefficients								
AIP= Ability to Identify Problem, IMI=Immediate Recall of Information											

The factors selected from the above models proved able to provide an effective evaluation of stakeholders' performance. KFU is a pioneer in implementing local ERP systems among Saudi universities. Not surprisingly, the results show that 12 of the 14 system quality factors were positively significant; these were compatibility, accuracy, ease of use, timeliness, accessibility, lack of confusion, content, format, currency, assistance, training and authorization. Unexpectedly, however, the remaining two variables, flexibility and right data, were found not to be significant predictors of stakeholder performance, despite flexibility being an important factor in evaluating the system.

Among the service quality factors, reliability, responsiveness and assurance were found to have a significant impact on stakeholder performance, while only tangibility had no significant effect.

In general, the results represent a substantial achievement for KFU, since the 14 system quality factors as a group explained approximately 28.4% of the variation in improved stakeholder productivity, 73.7% of the variation in time taken to complete tasks, 66.8% in stakeholder confidence and performance, 61.7% in computer awareness, 66.5% in immediate recall of information and 72.8% in the ability to identify problems and solutions. According to Pallant (2006), these are acceptable levels of accuracy for academic research. These results regarding the significance of system quality and service quality factors in the KFU case indicate that they played a major role in perceptions of stakeholders' performance and that the Oracle system met stakeholders' needs and expectations.

Based on the above analysis, Figure 5.3 shows a conceptual model of the relationship between ERP system quality variables, ERP service quality variables and stakeholder performance at KFU.



ERP System Quality

Stakeholder Performance

Service Quality

Figure 5.5: Conceptual model of results for KFU

5.6 Universities compared

In line with our research methodology, this section focuses on the differences between KSU, KFUPM and KFU as perceived by the participants, with regard to the variables of stakeholders' performance, ERP system quality and service quality.

The data collected through the ERP survey were analysed using SPSS (version 20). All tests were set at the significance level of .05. A result of 0.05 is significant, while a result of 0.001 is highly significant. The choice of statistical methods, particularly of non-parametric ones (Kruskal-Wallis and Mann-Whitney U) was made because the assumption of homogeneity was violated and because the data were from ordinal Likert scales, which in turn means that the distributions were highly skewed (Norman, 2010), so that parametric tests such as ANOVA could not be used (Bernstein & Bernstein, 1999). Nonparametric tests (e.g. Kruskal-Wallis) have few constraints and allow researchers to test their hypotheses on small and poorly distributed samples (Nachar, 2008, p.13). The non-normal distributions were not transformed, as the value of transforming Likert-scale variables is doubtful; therefore the researcher decided to leave the natural variability in the data (participants' valid responses) (Tabachnick & Fidell, 2001). Similarly, outliers found on many variables, due to the natural variation of responses within the 1 to 5 Likert scale range, were also left at their original values.

Next, a post hoc power analysis was conducted using the G*Power 3.1 software, to determine if the sample size of 169 was large enough to conduct these tests, in order to avoid making a Type II error (false negative). (Details are tabulated in appendix G.). The sample size of 169 (the three university datasets combined) was found to be large enough for Kruskal-Wallis tests (comparing three groups) and for Mann-Whitney tests (similar to *t*-tests) with 80% power. However, the number of participants in each university group was too small for correlation and standard multiple regression. This may affect the accuracy of the results and external validity is a concern (Norman, 2010).

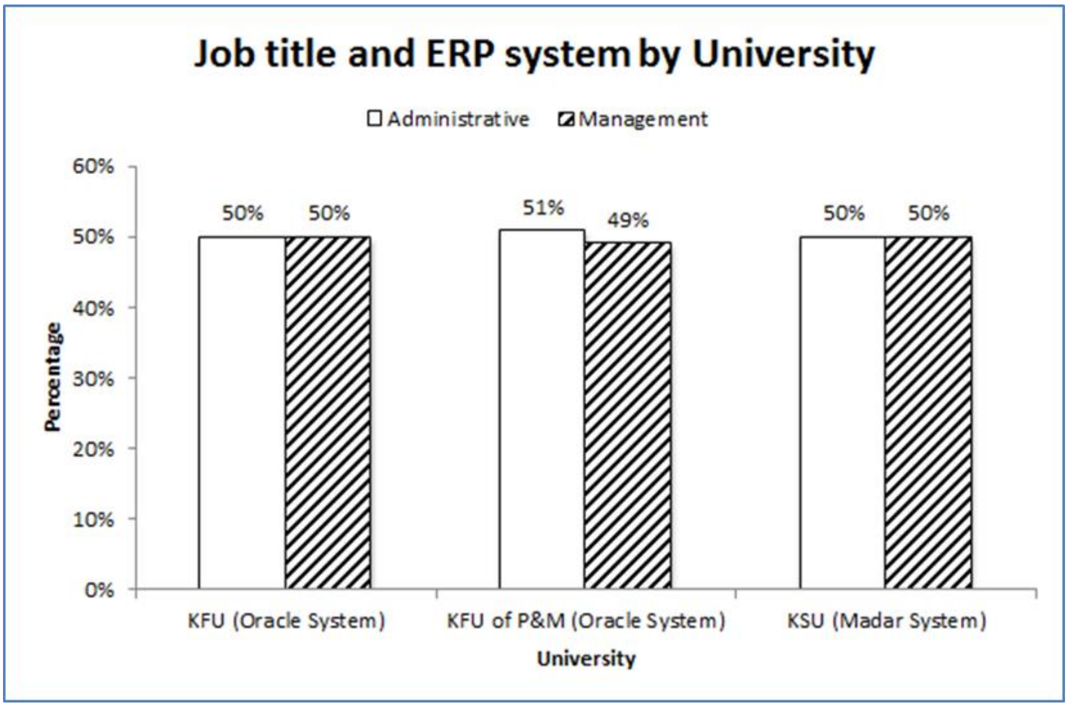


Figure 5.6: Participants' job titles and name of ERP system, by University

5.6.1 KSU, KFU and KFUPM

5.6.1.1 *Analysis of differences in outcome measures*

In order to assess whether there were differences in perceived stakeholder performance, ERP system quality and ERP service quality between KSU, KFU and KFUPM, we first investigated the descriptive statistics for each variable (Table 5.27).

Table 5.27: Descriptive statistics for each variable at KSU, KFUPM and KFU

Stakeholder performance variables	KFU		KFU of P&M		KSU	
	M	*SD*	*M*	*SD*	*M*	*SD*
Time taken to Complete task	4.39	0.359	4.23	0.622	3.67	1.05
Improve stakeholders Productivity	4.83	0.376	4.47	0.604	3.82	0.99
Immediate recall Of information	4.43	0.662	4.04	0.693	4.13	1.03
Stakeholder confidence and performance	4.46	0.433	4.16	0.586	3.73	1.03
Ability to Identify Problem and Solution	4.38	0.555	3.62	0.835	3.24	0.934
Computer awareness	4.39	0.529	3.91	0.867	3.45	1.11
ERP systems quality variables						
Lack of Confusion	3.57	0.903	3.38	1.23	2.93	1.13
Right data	3.41	1.02	3.47	0.94	3.03	1.09
Accessibility	4.57	0.499	4.11	0.658	4.02	1.02
Assistance	4.13	0.584	3.85	0.87	3.58	0.98
Flexibility	3.89	0.75	3.28	0.838	2.72	1.11
Authorisation	2.91	0.957	2.75	1.08	2.68	1.18
Ease of Use	3.98	0.495	3.85	1.01	3.78	0.846
Training	2.56	0.984	2.69	1.07	2.77	1.14
Accuracy	4.28	0.627	3.93	0.879	3.58	1.01
Compatibility	3.02	0.707	3.07	0.935	2.7	0.85
Currency	4.3	0.662	3.67	0.904	3.45	0.982
Content	4.46	0.387	4.02	0.585	3.6	0.867
Format	4.22	0.572	3.82	0.819	3.52	0.833
Timeliness	4.56	0.502	4.05	0.78	4.02	0.892
ERP systems service quality variables						
Tangible	3.74	0.782	3.69	0.767	3.3	1.08
Reliability	4.43	0.57	4.15	0.558	3.33	1.07
Responsiveness	4	0.583	3.53	1.03	3.35	1.35
Assurance	3.72	0.856	3.76	0.881	3.58	1.11

It is clear that stakeholder performance variables were on average less positive for KSU than for the other two universities. As table 5.28 shows, the mean scores for KFU were all greater than 4 (ranging from 4.38 to 4.83). For KFUPM the mean scores were also mainly greater than 4 (ranging from 3.62 to 4.46), whereas for KSU they were mostly lower than 4 (ranging from 3.24 to 4.13). We can conclude that stakeholder performance was most effective at KFU and least effective at KSU.

The analysis also revealed that on average, system quality variables were more positive for KFU than for the other university samples, except for training and compatibility, which were both, more negative for KFU than elsewhere.

Table 5.28 shows that ERP service quality variables were on average less positive for KSU than in the other two cases. The mean scores for KFU were the most positive, ranging from 3.72 to 4.43, while those for KFUPM were also close to 4 (from 3.52 to 4.13), indicating consistency between KFU and KFUPM, whereas those for KSU ranged from 3.30 to 3.58. We can conclude that ERP service quality was most effective at KFU and least effective at KSU.

5.6.1.2 *Nonparametric analysis of outcome*

To address the third and fourth research questions and to assess whether there were significant differences in overall perceived stakeholder performance, ERP system quality and ERP service quality, the Kruskal-Wallis test (the nonparametric alternative to ANOVA) was used to compare the output measures in the three universities. The mean rank values, chi-squared and significance level for each variable are listed in Table 5.28.

From the data it can be concluded that there was a statistically significant difference between the three universities' median test scores for all the six stakeholder performance variables as perceived by the participants, at $p = 0.000$. Because the overall test was significant, pairwise comparisons among the three groups were conducted.

Similarly, at the $p = 0.05$ level of significance, there exists enough evidence to conclude that there was a difference in the median test scores (and hence in the mean test scores) among the three university groups with respect to the ERP system quality variables, except in flexibility, ease of use and training. Therefore, pairwise comparisons among the three groups were conducted.

Finally, the Kruskal-Wallis test revealed a significant difference in median scores among the three university groups and the service quality variables at $p = 0.05$, except for tangibility and assurance.

Table 5.28: Kruskal-Wallis results for the three universities

Stakeholder performance	KSU (n=60)	KFU (n=54)	KFU of P&M (n=55)	X2	P Value
	Mean Rank	Mean Rank	Mean Rank	X2	P Value
Time taken to Complete task	65.56	101.25	90.25	17.401	0
Improve stakeholders Productivity	57.14	113.25	87.65	46.79	0
Immediate recall of information	84.26	98.06	72.99	8.625	0
Stakeholder confidence and performance	67.65	106.57	82.75	20.255	0
Ability to Identify Problem and Solution	60.08	120.57	77.25	46.356	0
Computer awareness	65.68	107.93	83.57	25.709	0
ERP system Quality					
Content	59.88	116.57	81.41	41.789	0
Format	66.88	105.52	84.62	23.143	0
Timeliness	76.08	105.28	74.83	17.43	0
Accessibility	77.58	104.42	74.04	15.773	0
Assistance	72.83	98.06	85.46	10.24	**0.006**
Authorisation	80.65	90.94	83.92	1.456	0.483
Ease of Use	80.43	86.94	88.09	1.204	0.548
Flexibility	60.98	113.11	83.6	34.364	0
Training	89.02	80.73	84.81	0.89	0.641
Accuracy	69.83	101.55	85.31	14.727	**0.001**
Compatibility	72.94	89.99	93.25	6.09	**0.048**
Currency	69.12	109.96	77.82	26.232	0
Right Data	73.07	90.86	92.26	6.556	**0.038**
Lack of Confusion	70.17	96.83	89.56	9.865	**0.007**
Service Quality					
Tangible	74.84	90.8	90.39	4.595	0.101
Reliability	57.16	109.48	91.34	40.836	0
Responsiveness	78.26	98.43	79.17	7.199	**0.027**
Assurance	82.1	85.09	88.07	0.54	0.763

Further analysis was done using Mann-Whitney U tests to determine which of the three universities was different from the other two.

5.6.2 KSU and KFU

5.6.2.1 *Stakeholder performance variables*

The Mann-Whitney U test found no differences between KSU and KFU in the immediate recall of information ($p = 0.064$). Therefore, at the $p = 0.05$ level of significance, there is enough evidence to conclude that there was a difference in the median scores in the two universities with respect to all stakeholder performance variables except for immediate recall of information. In addition, the fact that the mean rank for KFU was higher than KSU in relation to all six stakeholder performance variables indicates that KFU stakeholders perceived better performance than those in KSU (Table 5.29).

5.6.2.2 *ERP system quality variables*

The Mann-Whitney U test (Table 5.29) also indicated no differences between KSU and KFU in authorization, ease of use or training ($p>0.05$). In other words, at the $p = 0.05$ level of significance, there is enough evidence to conclude that there was a difference in median scores between the two universities with respect to all ERP system quality variables except for authorization, ease of use and training. In addition, the fact that the mean rank was higher for KFU than KSU in relation to all fourteen ERP system quality variables indicates that KFU stakeholders perceived better system quality than did those at KSU.

5.6.2.3 *ERP service quality*

The Mann-Whitney U test results listed in Table 5.29 also indicate a meaningful difference in terms of system reliability and responsiveness between KSU and KFU. In addition, the mean rank for KFU was higher than KSU in relation to all four ERP service quality variables, which indicates that KFU stakeholders perceived better service quality than did those at KSU.

Table 5.29: Mann-Whitney results (KSU and KFU)

Stakeholder performance	KSU (n=54)	KFU (n=54)	Mann Whit. U	Z	P Value
	Mean Rank	Mean Rank	U	Z	P Value
Time taken to Complete task	41.78	67.22	771	-4.39	**0**
Improve stakeholders Productivity	36.92	72.08	508.5	-6.49	**0**
Immediate recall of information	49.36	59.64	1180.5	-1.85	0.064
Stakeholder confidence and performance	42	67	783	-4.31	**0**
Ability to Identify Problem and Solution	35	74	405	-6.53	**0**
Computer awareness	41.44	67.56	752.5	-4.72	**0**
ERP system Quality					
Content	36.8	72.2	502	-6.05	**0**
Format	42.63	66.37	817	-4.43	**0**
Timeliness	45.5	63.5	972	-3.33	**0.001**
Accessibility	46.16	62.84	1007.5	-3.06	**0.002**
Assistance	45.06	63.94	948	-3.66	**0**
Authorisation	49.98	59.02	1214	-1.59	0.111
Ease of Use	51.98	57.02	1322	-1.05	0.294
Flexibility	36.36	72.64	478.5	-6.26	**0**
Training	57.22	51.78	1311	-0.936	0.349
Accuracy	43.23	65.77	849.5	-4.08	**0**
Compatibility	46.78	62.22	1041	-2.64	**0.008**
Currency	41.87	67.13	776	-4.61	**0**
Right Data	46.56	62.44	1029.5	-2.83	**0.005**
Lack of Confusion	43.41	65.59	859	-3.82	**0**
Service Quality					
Tangible	48.96	60.04	1159	-1.94	0.052
Reliability	38.09	70.91	572	-5.78	**0**
Responsiveness	45.74	63.26	985	-3.24	**0.001**
Assurance	52.19	56.81	1333.5	-0.836	0.403

5.6.3 KSU and KFUPM

5.6.3.1 *Stakeholder performance variables*

The Mann-Whitney U test indicated no differences between KSU and KFUPM in the immediate recall of information ($p = 0.432$). Therefore, at the $p = 0.05$ level of significance, there is enough evidence to conclude that there was a difference in the median scores for the two universities with respect to all stakeholder performance variables except for immediate recall of information. The mean rank for KSU was also lower than that for KFUPM in relation to all stakeholder performance variables, indicating that KFUPM stakeholders perceived better performance than did those at KSU (Table 5.30).

Table 5.30: Mann-Whitney results (KSU and KFUPM)

Stakeholder performance	KSU (n=54)	KFU of P&M (n=54)	Mann Whit. U	Z	P Value
	Mean Rank	Mean Rank	U	Z	P Value
Improve stakeholders Productivity	44.17	64.83	900	-3.79	**0**
Time taken to Complete task	45.4	63.6	966.5	-3.12	**0.002**
Stakeholder confidence and performance	48.12	60.88	1113.5	-2.23	**0.026**
Computer awareness	48.05	60.95	1109.5	-2.31	**0.021**
Immediate recall of information	56.64	52.36	1342.5	-0.786	0.432
Ability to Identify Problem and Solution	46.86	62.14	1045.5	-2.56	**0.011**
ERP system Quality					
Content	45.96	63.04	997	-2.962	**0.003**
Format	49.09	59.91	1166	-2.039	**0.041**
Timeliness	54.62	54.38	1451.5	-0.045	0.964
Accessibility	54.76	54.24	1444	-0.096	0.923
Assistance	49.21	59.79	1172.5	-1.95	0.051
Authorisation	52.66	56.34	1358.5	-0.645	0.519
Ease of Use	52.47	56.53	1348.5	-0.761	0.447
Flexibility	44.08	64.92	895.5	-3.544	**0**
Training	55.69	53.31	1394	-0.416	0.677
Accuracy	48.58	60.42	1138.5	-2.185	**0.029**
Compatibility	47.35	61.65	1072	-2.457	**0.014**
Currency	52.05	56.95	1325.5	-0.9	0.368
Right Data	46.33	62.67	1017	-2.886	**0.004**
Lack of Confusion	47.42	61.58	1075.5	-2.424	**0.015**
Service Quality					
Tangible	49.32	59.68	1178.5	-1.85	0.064
Reliability	42.14	66.86	790.5	-4.47	**0**
Responsiveness	51.41	57.59	1291	-1.09	0.275
Assurance	51.71	57.29	1307.5	-1.04	0.3

5.6.3.2 *ERP system quality variables*

The Mann-Whitney U test (Table 5.30) also found no differences between KSU and KFUPM in timeliness, accessibility, assistance, authorization, ease of use, training or currency ($p>0.05$). In other words, at the $p = 0.05$ level of significance, there is enough evidence to conclude that there is a difference in the median scores for the two universities with respect to all ERP system quality variables except for timeliness, accessibility, assistance, authorization, ease of use, training and currency. The mean rank for KFUPM was also higher than that for KSU in relation to all fourteen ERP system quality variables, showing that KFUPM stakeholders perceived better system quality than did those at KSU.

5.6.3.3 *ERP service quality*

Finally, the Mann-Whitney U test results listed in Table 5.30 indicate a meaningful difference in terms of system reliability between KSU and KFUPM. In addition, as the mean rank for KFUPM was higher than for KSU in relation to all four ERP service quality variables, it can be concluded that KFUPM stakeholders perceived better service quality than those at KSU.

5.6.4 KFU and KFUPM

5.6.4. 1 *Stakeholder performance variables*

In the final comparison between pairs of universities, the Mann-Whitney U test results listed in Table 5.29 indicate no differences between KFU and KFUPM in the time taken to complete a task ($p = 0.152$). Therefore, at the $p = 0.05$ level of significance, we can conclude that there was a difference in the median scores for the two universities with respect to all stakeholder performance variables except for the time taken to complete a task. The additional fact that the mean rank for KFU was higher than for KFUPM in relation to all six stakeholder performance variables indicates that KFU stakeholders perceived better performance than those at KFUPM.

5.6.4.2 *ERP system quality variables*

The Mann-Whitney U test also found no difference between KFU and KFUPM in assistance, authorization, ease of use, training, compatibility, right data or lack of confusion ($p>0.05$). In other words, at the $p = 0.05$ level of significance, there is enough evidence to conclude that there was a difference in the median scores at the two universities with respect to all ERP system quality variables except for those seven. In addition, the mean rank for KFU was higher than for KFUPM in relation to most of the ERP system quality variables, indicating that KFU stakeholders perceived better system quality than did those at KFUPM (Table 5.29).

5.6.4. 3 *ERP service quality*

Finally, the Mann-Whitney U test results listed in Table 5.31 also indicate a meaningful difference in terms of system reliability and responsiveness between KFU and KFUPM. The table also shows that the mean rank for KFU was higher than that for KFUPM in relation to the ERP service quality variables, indicating that KFU stakeholders perceived better service quality than those at KFUPM.

Table 5.31: Mann-Whitney Results (KFU and KFUPM)

Stakeholder performance	KFU (n=54)	KFU of P&M (n=54)	Mann Whit. U	Z	P Value
	Mean Rank	Mean Rank	U	Z	P Value
Improve stakeholders Productivity	63.58	45.42	967.5	-3.68	**0**
Time taken to Complete task	58.58	50.42	1237.5	-1.43	0.152
Stakeholder confidence and performance	62.5	46.5	1026	-2.87	**0.004**
Computer awareness	62.7	46.3	1015	-3.07	**0.002**
Immediate recall of information	62.74	46.26	1013	-3.05	**0.002**
Ability to Identify Problem and Solution	69.76	39.24	634	-5.13	**0**
ERP system Quality					
Content	67.31	41.69	766	-4.495	**0**
Format	61.31	47.69	1090	-2.67	**0.008**
Timeliness	64.33	44.67	927	-3.71	**0**
Accessibility	64.56	44.44	914.5	-3.81	**0**
Assistance	58.49	50.51	1242.5	-1.62	0.106
Authorisation	57.08	51.92	1318.5	-0.919	0.358
Ease of Use	54.37	54.63	1451	-0.053	0.958
Flexibility	65.11	43.89	885	-3.67	**0**
Training	53.81	55.19	1421	-0.239	0.811
Accuracy	60.17	48.83	1152	-2.13	**0.033**
Compatibility	53.46	55.54	1402	-0.351	0.725
Currency	65.53	43.47	862.5	-4.06	**0**
Right Data	54.19	54.81	1441.5	-0.115	0.908
Lack of Confusion	56.78	52.22	1335	-0.797	0.425
Service Quality					
Tangible	54.69	54.31	1447.5	-0.07	0.944
Reliability	61.56	47.44	1076.5	-2.7	**0.007**
Responsiveness	61.28	47.72	1092	-2.59	**0.01**
Assurance	53.89	55.11	1425	-0.237	0.813

The results of the comparisons between the three universities show that the impact on performance was greatest at KFU and lowest at KSU. One possible reasons for these results is that KFU and KFUPM both implemented Oracle, an ERP system which is well known all over the world, while KSU chose to buy an in-house ERP system from a local company, which will certainly have had less experience and expertise than Oracle. Other possible reasons for the difference are preparation during the pre-implementation phase, customization and employees' resistance to change; all these reasons and more will be discussed in detail in the next chapter.

5.7 All universities

To more thoroughly test H1, standard multiple regressions was again used to assess the relative importance of the system quality variables in explaining differences in attitudes towards stakeholder performance, with the six stakeholder performance variables posited as the dependent variables and the fourteen ERP system quality variables as the independent variables.

The R^2 values show that the fourteen system quality variables, as a group, explained 48.0% of the variation in improved stakeholder productivity, 55.9% of the variation in time taken to complete a task, 50.0% in stakeholder confidence and performance, 51.6% in computer awareness, 38.4% in immediate recall of information and 64.0% in ability to identify problems and solutions.

The F values show that there were highly significant relationships ($p<.001$) between the fourteen ERP system quality variables and the six stakeholder performance variables. The model for ability to identify problems and solutions had the largest F value, $F(14, 168) = 19.554$, $p<.001$, indicating that it was the most significant model, followed by time taken to complete tasks, $F(14, 168) = 13.944$, $p<.001$, computer awareness $F(14, 168) = 11.714$, $p<.001$, stakeholder confidence and performance, $F(14, 168) = 11.010$, $p<0.001$, improved stakeholder productivity, $F(14, 168) = 10.146$, $p<.001$ and finally, immediate recall of information, $F(14, 168) = 6.857$, $p<.001$.

β statistics were again used to assess the unique contribution of each predictor and the effect on the outcome of a one standard deviation increase.

5.7.1 Reliability test

Reliability was once more measured in terms of internal consistency by clustering the items into their particular dimensional groups and calculating Cronbach's α. Table 5.32 shows that the total questionnaire, which consisted of 24 questions, had a coefficient score of 0.917, indicating impressive internal consistency. In addition, the performance, system quality and service quality constructs had respective reliability coefficient scores of 0.889, 0.841 and 0.776, which are strongly acceptable, clearly exceeding the 0.5 limit suggested by Nunnally (1978) for exploratory research.

Table 5.32: Reliability test - all universities

Constructs	Number of items	Cronbach's Alpha	Type
Total questions	24	0.917	High reliability
Performance	6	0.889	High reliability
System Quality	14	0.841	High reliability
Service Quality	4	0.776	High reliability

Hypothesis 1: ERP system quality variables have a significant impact on KSA stakeholders' performance variables (H1.1 - H1.14)

5.7.2 Multiple regression analysis

5.7.2.1 *System quality*

Improved stakeholder productivity: Table 5.33 shows that only four of the fourteen system quality variables had a positive significant impact on improved stakeholder productivity at $p<0.05$: timeliness, with a standardised coefficient of β = 0.230, ease of use (β = 0.202), flexibility (β = 0.275) and currency (β = 0.147). Thus, the regression equation to predict improved stakeholder productivity is:

$B_0 + B_1$ ***Timeliness*** $+ B_2$ ***Ease of use*** $+ B_3$ ***Flexibility*** $+ B_4$ ***Currency,***

where the values of B_0, B_1, B_2, B_3, and B_4 are 0.733, 0.244, 0.207, 0.222 and 0.131 respectively.

Time taken to complete task: Table 5.33 also shows that only four of the fourteen system quality variables had a significant impact on time taken to complete a task ($p<0.05$). These were content, with a standardised coefficient of $\beta = 0.323$, timeliness ($\beta = 0.173$), authorisation ($\beta = -0.189$) and flexibility ($\beta = 0.182$). Thus, the regression equation to predict time to complete task is:

B_1 Content + B_2 Timeliness + B_3 Authorisation + B_4 Flexibility,

where the values of B_1, B_2, B_3 and B_4 are 0.352, 0.178, -0.142 and 0.142 respectively, as listed in Table 5.33.

Table 5.33: Regression models for improved stakeholder productivity and time taken to complete task influenced by system quality at all universities

Model	USTD CO		STD CO	t	Sig.	Model	USTD CO		STD CO	t	Sig.
ISP	**B**	**Std. Error**	**Beta**			**TCT**	**B**	**Std. Error**	**Beta**		
(Constant)	0.733	0.363		2.016	0.046	**(Constant)**	0.367	0.324		1.133	0.259
Content	0.078	0.103	0.07	0.758	0.45	**Content**	0.352	0.092	0.323	3.825	0
Format	0.042	0.089	0.04	0.465	0.643	**Format**	0.048	0.08	0.048	0.604	0.547
Timeliness	0.244	0.097	0.23	2.529	0.012	**Timeliness**	0.178	0.086	0.173	2.067	0.04
Accessibility	-.127-	0.1	-.121-	-1.263-	0.209	**Accessibility**	0.009	0.089	0.009	0.103	0.918
Assistance	0.067	0.07	0.069	0.945	0.346	**Assistance**	-.020-	0.063	-.021-	-.319-	0.75
Authorisation	-.036-	0.051	-.046-	-.703-	0.483	**Authorisation**	-.142-	0.045	-.189-	-3.132-	0.002
Ease of Use	0.207	0.073	0.202	2.836	0.005	**Ease of Use**	0.107	0.065	0.108	1.65	0.101
Flexibility	0.222	0.06	0.275	3.718	0	**Flexibility**	0.142	0.053	0.182	2.678	0.008
Training	-.044-	0.054	-.056-	-.815-	0.417	**Training**	-.007-	0.048	-.009-	-.142-	0.887
Accuracy	0.118	0.071	0.128	1.666	0.098	**Accuracy**	0.006	0.063	0.007	0.103	0.918
Compatibility	-.020-	0.074	-.020-	-.265-	0.792	**Compatibility**	0.074	0.066	0.078	1.132	0.259
Currency	0.131	0.062	0.147	2.102	0.037	**Currency**	0.094	0.056	0.108	1.687	0.094
Right Data	0.05	0.064	0.062	0.781	0.436	**Right Data**	0.083	0.057	0.106	1.448	0.15
Lack of Confusion	0.007	0.062	0.009	0.109	0.914	**Lack of Confusion**	0.021	0.055	0.029	0.379	0.705

UNSTD CO-Unstandardized Coefficient STD CO-Standarized Coefficients
ISP=Improve stakeholders' Productivity, TCT= Time Taken to Complete Task

Stakeholder confidence and performance: Table 5.34 shows that among the variables of system quality, again only four had a significant impact on stakeholder confidence and performance at $p<0.05$: content, ($\beta = 0.178$), timeliness ($\beta = 0.181$), authorisation ($\beta = -0.299$) and flexibility ($\beta = 0.266$). Thus, the regression equation to predict stakeholder confidence and performance is:

B_0 + B_1 Content + B_2 Timeliness + B_3 Authorisation + B_4 Flexibility,

where the values of B_0, B_1, B_2, B_3 and B_4 are 0.969, 0.191, 0.183, -0.222 and 0.205 respectively.

Computer awareness: Table 5.34 also shows that five of the fourteen system quality variables had a significant impact on computer awareness at $p<0.05$: content

(β = 0.297), format (β = -0.172), assistance (β = 0.144), flexibility (β = 0.201) and currency (β = 0.229). Thus, the regression equation to predict computer awareness is:

$$B_1\,Content + B_2\,Format + B_3\,Assistance + B_4\,Flexibility + B_5\,Currency,$$

where the values of B_1, B_2, B_3, B_4 and B_5 are 0.383, -0.205, 0.160, 0.186 and 0.235 respectively.

Table 5.34: Regression models for stakeholder confidence and performance and for computer awareness influenced by system quality at all universities

Model	USTD CO		STD CO	t	Sig.	Model	USTD CO		STD CO	t	Sig.
CP	**B**	**Std. Error**	**Beta**			**CA**	**B**	**Std. Error**	**Beta**		
(Constant)	0.969	0.34		2.848	0.005	**(Constant)**	-.107-	0.402		-.267-	0.79
Content	0.191	0.097	0.178	1.98	0.05	**Content**	0.383	0.114	0.297	3.352	0.001
Format	0.016	0.084	0.016	0.19	0.85	**Format**	-.205-	0.099	-.172-	-2.072-	0.04
Timeliness	0.183	0.09	0.181	2.031	0.044	**Timeliness**	0.062	0.107	0.051	0.581	0.562
Accessibility	0.07	0.094	0.07	0.745	0.457	**Accessibility**	0.202	0.111	0.169	1.826	0.07
Assistance	0.001	0.066	0.002	0.022	0.982	**Assistance**	0.16	0.078	0.144	2.056	0.041
Authorisation	-.222-	0.048	-.299-	-4.646-	0	**Authorisation**	-.027-	0.056	-.030-	-.481-	0.631
Ease of Use	0.079	0.068	0.081	1.159	0.248	**Ease of Use**	0.137	0.081	0.117	1.696	0.092
Flexibility	0.205	0.056	0.266	3.675	0	**Flexibility**	0.186	0.066	0.201	2.817	0.005
Training	-.010-	0.051	-.013-	-.190-	0.85	**Training**	-.071-	0.06	-.079-	-1.187-	0.237
Accuracy	0.025	0.067	0.028	0.368	0.713	**Accuracy**	0.078	0.079	0.074	0.997	0.32
Compatibility	0.051	0.069	0.054	0.731	0.466	**Compatibility**	-.124-	0.082	-.111-	-1.524-	0.13
Currency	0.101	0.058	0.119	1.739	0.084	**Currency**	0.235	0.069	0.229	3.405	0.001
Right Data	0.114	0.06	0.148	1.894	0.06	**Right Data**	0.042	0.071	0.046	0.594	0.553
Lack of Confusion	-.033-	0.058	-.046-	-.561-	0.575	**Lack of Confusion**	-.098-	0.069	-.115-	-1.421-	0.157
UNSTD CO-Unstandardized Coefficie			**STD CO-Standarized Coefficients**								
CP=Confidence and Performance,CA = Computer Awareness											

Immediate recall of information: Table 5.35 shows that among the variables of system quality, only ease of use, compatibility and currency had a significant impact on immediate recall of information, with β coefficients of 0.246, -0.168 and 0.200 respectively at $p<0.01$. In other words, for every one standard deviation increase in ease of use and currency, immediate recall of data will increase on average by 0.246 and 0.200 points respectively, whereas for every one standard deviation increase in compatibility, immediate recall of information will decrease on average by 0.168 points. Thus, the regression equation to predict immediate recall of information is:

$$B_0 + B_1\,Ease\ of\ use + B_2\,Compatibility + B_3\,Currency,$$

where the respective values of B_0, B_1, B_2 and B_3 are 1.273, 0.252, -0.165 and 0.179.

***Ability to identify problems and solutions**:* Table 5.35 also shows that four of the system quality variables had a significant impact at $p<0.01$ on the ability to identify problems and solutions: content (β = 0.351), timeliness (β = 0.209), flexibility

(β = 0.209) and currency (β = 0.254). Thus, the regression equation to predict the ability to identify problems and solutions is:

$$B_0 + B_1\,\textit{Content} + B_2\,\textit{Timeliness} + B_3\,\textit{Flexibility} + B_4\,\textit{Currency},$$

where the values of B_0, B_1, B_2, B_3 and B_4 are -0.950, 0.439, 0.247, 0.188 and 0.253 respectively.

Table 5.35: Regression models for immediate recall of information and ability to identify problems and solutions influenced by system quality at all universities

Model	USTD CO		STD CO	t	Sig.	Model	USTD CO		STD CO	t	Sig.
IMI	B	Std. Error	Beta			AIP	B	Std. Error	Beta		
(Constant)	1.273	0.395		3.22	0.002	(Constant)	-.950-	0.336		-2.833-	0.005
Content	0.198	0.112	0.176	1.76	0.08	Content	0.439	0.095	0.351	4.603	0
Format	-.050-	0.097	-.048-	-.514-	0.608	Format	-.070-	0.083	-.061-	-.847-	0.398
Timeliness	0.057	0.105	0.053	0.54	0.59	Timeliness	0.247	0.089	0.209	2.77	0.006
Accessibility	0.194	0.109	0.186	1.78	0.077	Accessibility	-.033-	0.092	-.028-	-.353-	0.725
Assistance	0.098	0.077	0.101	1.281	0.202	Assistance	0.06	0.065	0.055	0.918	0.36
Authorisation	0.07	0.055	0.09	1.262	0.209	Authorisation	-.058-	0.047	-.067-	-1.232-	0.22
Ease of Use	0.252	0.079	0.246	3.173	0.002	Ease of Use	0.083	0.067	0.073	1.234	0.219
Flexibility	-.017-	0.065	-.021-	-.257-	0.797	Flexibility	0.188	0.055	0.209	3.404	0.001
Training	-.089-	0.059	-.114-	-1.510-	0.133	Training	-.015-	0.05	-.018-	-.305-	0.761
Accuracy	-.026-	0.077	-.028-	-.336-	0.737	Accuracy	0.027	0.066	0.027	0.417	0.677
Compatibility	-.165-	0.08	-.168-	-2.052-	0.042	Compatibility	0.063	0.068	0.058	0.931	0.353
Currency	0.179	0.068	0.2	2.633	0.009	Currency	0.253	0.058	0.254	4.388	0
Right Data	0.025	0.07	0.031	0.361	0.718	Right Data	-.075-	0.059	-.084-	-1.271-	0.206
Lack of Confusion	-.051-	0.068	-.069-	-.755-	0.451	Lack of Confusion	0.097	0.057	0.118	1.697	0.092

UNSTD CO-Unstandardized Coefficients STD CO-Standarized Coefficients

AIP= Ability to Identify Problem, IMI=Immediate Recall of Information

5.7.2.2 *Service quality*

To more thoroughly test H3, standard multiple regressions (Enter method) was again used to assess the relative importance of the service quality variables in explaining differences in attitudes towards stakeholder performance, with the six stakeholder performance variables posited as the dependent variables and the four ERP service quality variables as the independent variables.

The R^2 values show that the four service quality variables, as a group, explained 32.4% of the variation in improved stakeholder productivity, 33.2% of the variation in time taken to complete task, 31.6% in stakeholder confidence and performance, 33.0% in computer awareness, 10.6% in immediate recall of information and 31.3% in ability to identify problems and solutions.

The F values show that there were highly significant relationships ($p<.01$) between the four ERP service quality variables and all six of the stakeholder performance outcomes. The model for time taken to complete a task had the largest F value, at

$F(4, 168) = 20.398$, $p<.001$, indicating that it was the most significant model, followed by computer awareness $F(4, 168) = 20.192$, $p<.001$, then improved stakeholder productivity, $F(4, 168) = 19.644$, $p <.001$, stakeholder confidence and performance, $F(4, 168) = 18.977$, $p<.001$, ability to identify a problem and solution $F(4, 168) = 18.689$, $p<.001$ and finally, immediate recall of information $F(4, 168) = 4.86$, $p<.01$.

Again, β statistics were calculated to assess the unique contribution of each predictor on the outcome and the effect that a one standard deviation increase would have on the outcome.

Hypothesis 2: ERP service quality variables have a significant impact on KSA stakeholders' performance variables (H2.1 – H2.4)

Improved stakeholder productivity: Table 5.36 shows that among the four variables of service quality, only reliability had a positive significant impact on improving stakeholder productivity, with a standardised Beta coefficient β = 0.458 at p<0.001, so that for every one standard deviation increase in reliability, improved stakeholder productivity will increase on average by 0.458 points. Thus, the regression equation to predict improved stakeholder productivity is:

$\boldsymbol{B_0 + B_1\ Reliability = 2.238 + 0.420\ Reliability,}$

where the values of B_0 and B_1 are the unstandardized B coefficients shown in the regression analysis in Table 5.36.

Time taken to complete task: Table 5.36 also shows that all four variables of service quality except tangibility ($p = 0.391$) had a significant impact on time taken to complete a task. Thus, the regression equation to predict time taken to complete a task is: $\boldsymbol{B_0 + B_1\ Reliability + B_2\ Responsiveness + B_3\ Assurance,}$

where the values of B_0, B_1, B_2 and B_3 are 2.164, 0.358, 0.233 and -0.15 respectively.

Table 5.36: Regression models for improved stakeholder productivity and time taken to complete task influenced by service quality at all universities

Model	USTD CO		STD CO	t	Sig.	Model	USTD CO		STD CO	t	Sig.
ISP	B	Std. Error	Beta			TCT	B	Std. Error	Beta		
(Constant)	2.238	0.281		7.972	0	(Constant)	2.164	0.27		8.018	0
Tangible	0.139	0.073	0.152	1.913	0.058	Tangible	0.06	0.07	0.068	0.861	0.391
Reliability	0.42	0.077	0.458	5.491	0	Reliability	0.358	0.074	0.403	4.861	0
Responsiveness	0.058	0.069	0.076	0.848	0.398	Responsiveness	0.233	0.066	0.313	3.522	0.001
Assurance	-.068-	0.074	-.078-	-.920-	0.359	Assurance	-.150-	0.071	-.179-	-2.127-	0.035
UNSTD CO-Unstandardized Coefficie STD CO-Standarized Coefficients											
ISP=Improve stakeholders' Productivity, TCT= Time Taken to Complete Task											

Stakeholder confidence and performance: Table 5.37 shows that all four variables of service quality except tangibility (p = 0.082) also had a significant impact on stakeholder confidence and performance. Thus, the regression equation to predict stakeholder confidence and performance is:

B_0 + B_1 Reliability + B_2 Responsiveness + B_3 Assurance,

where the values of B_0, B_1, B_2 and B_3 are 2.294, 0.259, 0.275 and -0.174 respectively.

Computer awareness: Table 5.37 also shows that again, all four service quality variables except tangibility (p = 0.116) had a significant impact on computer awareness. Thus, the regression equation to predict computer awareness is:

B_0 + B_1 Reliability + B_2 Responsiveness + B_3 Assurance,

where the respective values of B_0, B_1, B_2 and B_3 are 1.62, 0.401, 0.258 and -0.191.

Table 5.37: Regression models for stakeholder confidence and performance and computer awareness influenced by service quality at all the universities

Model	USTD CO		STD CO	t	Sig.	Model	USTD CO		STD CO	t	Sig.
CP	B	Std. Error	Beta			CA	B	Std. Error	Beta		
(Constant)	2.294	0.27		8.508	0	(Constant)	1.62	0.32		5.055	0
Tangible	0.122	0.07	0.14	1.747	0.082	Tangible	0.131	0.083	0.125	1.578	0.116
Reliability	0.259	0.074	0.295	3.52	0.001	Reliability	0.401	0.087	0.381	4.59	0
Responsiveness	0.275	0.066	0.373	4.153	0	Responsiveness	0.258	0.079	0.292	3.285	0.001
Assurance	-.174-	0.071	-.209-	-2.460-	0.015	Assurance	-.191-	0.084	-.191-	-2.273-	0.024
UNSTD CO-Unstandardized Coeffici STD CO-Standarized Coefficients											
CP=Confidence and Performance,CA = Computer Awareness											

Immediate recall of information: Table 5.38 shows that the situation was different for immediate recall of information: among the service quality variables, only reliability had a positive significant impact at p<0.05 (β = 0.193). For every one standard deviation increase in reliability, immediate recall of information will therefore increase on average by 0.193 points and the regression equation to predict immediate recall of information is:

B_0 + B_1 Reliability = 2.951 + 0.177 Reliability,

where the values of B_0 and B_1 are the unstandardized B coefficients listed in Table 5.38.

Ability to identify problems and solutions: Table 5.38 also shows that the only service quality variables to have a significant impact ($p<0.05$) on the ability to identify problems and solutions were reliability ($\beta = 0.371$) and responsiveness ($\beta = 0.231$). Thus, for every one standard deviation increase in reliability and responsiveness, the ability to identify problems and solutions will increase on average by 0.371 and 0.231 points respectively and the regression equation to predict the ability to identify problems and solutions is: ***B_0 + B_1 Reliability + B_2 responsiveness,***

where the values of B_0, B_1 and B_2 are 1.305, 0.378 and 0.198 respectively.

Table 5.38: Regression models for ability to identify problems and solutions and immediate recall of information influenced by service quality at all universities

Model	USTD CO		STD CO	t	Sig.	Model	USTD CO		STD CO	t	Sig.
AIP	B	Std. Error	Beta			IMI	B	Std. Error	Beta		
(Constant)	1.305	0.314		4.155	0	(Constant)	2.951	0.323		9.145	0
Tangible	0.061	0.081	0.06	0.746	0.457	Tangible	0.105	0.083	0.115	1.262	0.209
Reliability	0.378	0.086	0.371	4.415	0	Reliability	0.177	0.088	0.193	2.014	0.046
Responsiveness	0.198	0.077	0.231	2.567	0.011	Responsiveness	0.091	0.079	0.118	1.146	0.254
Assurance	0	0.082	0	-.002-	0.998	Assurance	-.043-	0.084	-.050-	-.510-	0.611
UNSTD CO-Unstandardized Coeffic STD CO-Standarized Coefficients											
AIP= Ability to Identify Problem, IMI=Immediate Recall of Information											

5.7.3 Overall performance

5.7.3.1 *Multiple regression analysis*

Further regression analyses were employed to investigate whether ERP system quality and ERP service quality had any effect on overall stakeholder performance. In this case, system quality and service quality (both predictor variables) were included as independent variables, while overall stakeholder performance was the only dependent variable.

5.7.2.1.1 *System quality*

Table 5.39 shows that among the system quality variables, content had the highest β value (0.294), indicating that it had the largest relative effect on overall stakeholder performance. Of the other variables, format, accessibility, assistance, training, accuracy, compatibility, right data and lack of confusion were not significant predictors or determinants of overall stakeholder performance. Hence, the regression equation for overall stakeholder performance is:

B_1 Content + B_2 Timeliness + B_3 Authorisation + B_4 Ease of use + B_5 Flexibility + B_6 Currency,

Where the values of B_1, B_2, B_3, B_4, B_5 and B_6 are .274, 0.162, -0.069, 0.144, 0.154 and 0.165 respectively, as listed in Table 5.39

Table 5.39: Predicting overall stakeholder performance by ERP system quality

ERP system Quality	
Content (β)	.294***
Format (β)	-.043-
Timeliness (β)	.184**
Accessibility (β)	0.061
Assistance (β)	0.076
Authorisation (β)	-.108-*
Ease of Use (β)	.170**
Flexibility (β)	.231***
Training (β)	-.061-
Accuracy (β)	0.05
Compatibility (β)	-.025-
Currency (β)	.223***
Right Data (β)	0.06
Lack of Confusion (β)	-.015-
R^2	0.7
Adj. -R^2	0.672
F-ratio	25.612

The figures in the table are standardized regression weights (β), *p<.05, **p<.01, ***p<.001

Table 5.40: Regression results for predicting overall stakeholder performance by ERP system quality

Model	USTD CO		STD CO		Sig
	B	Std. Error	Beta	t	
(Constant)	0.381	0.229		1.665	0.098
Content	0.274	0.065	0.294	4.211	0
Format	-.037-	0.056	-.043-	-.650-	0.517
Timeliness	0.162	0.061	0.184	2.666	0.008
Accessibility	0.053	0.063	0.061	0.837	0.404
Assistance	0.061	0.044	0.076	1.377	0.17
Authorisation	-.069-	0.032	-.108-	-2.157-	0.033
Ease of Use	0.144	0.046	0.17	3.142	0.002
Flexibility	0.154	0.038	0.231	4.114	0
Training	-.039-	0.034	-.061-	-1.154-	0.25
Accuracy	0.038	0.045	0.05	0.855	0.394
Compatibility	-.020-	0.046	-.025-	-.432-	0.666
Currency	0.165	0.039	0.223	4.218	0
Right Data	0.04	0.04	0.06	0.986	0.326
Lack of Confusion	-.009-	0.039	-.015-	-.240-	0.811

5.7.2.1.2 ***Service quality***

As to the stepwise regression analysis of the relationship between service quality and overall stakeholder performance, Table 5.41 shows that both reliability and responsiveness had highly significant relationships with overall stakeholder performance: β = 0.437 and 0.291 respectively. Thus, the regression for overall stakeholder performance is described by the formula:

B_0 + B_1 Reliability + B_2 responsiveness,

Where the values of B_0, B_1, B_2 are 2.095, 0.332 and 0.186 respectively, as listed in Table 5.41.

Table 5.41: Predicting overall stakeholder performance by ERP service quality

Service Quality	
Tangible (β)	0.136
Reliability (β)	.437***
Responsiveness (β)	.291**
Assurance (β)	-.145-
R^2	0.421
Adj. -R^2	0.407
F**-ratio**	29.86

The figures in the table are standardized regression weights (β), *p<.05, **p<.01, ***p<.001

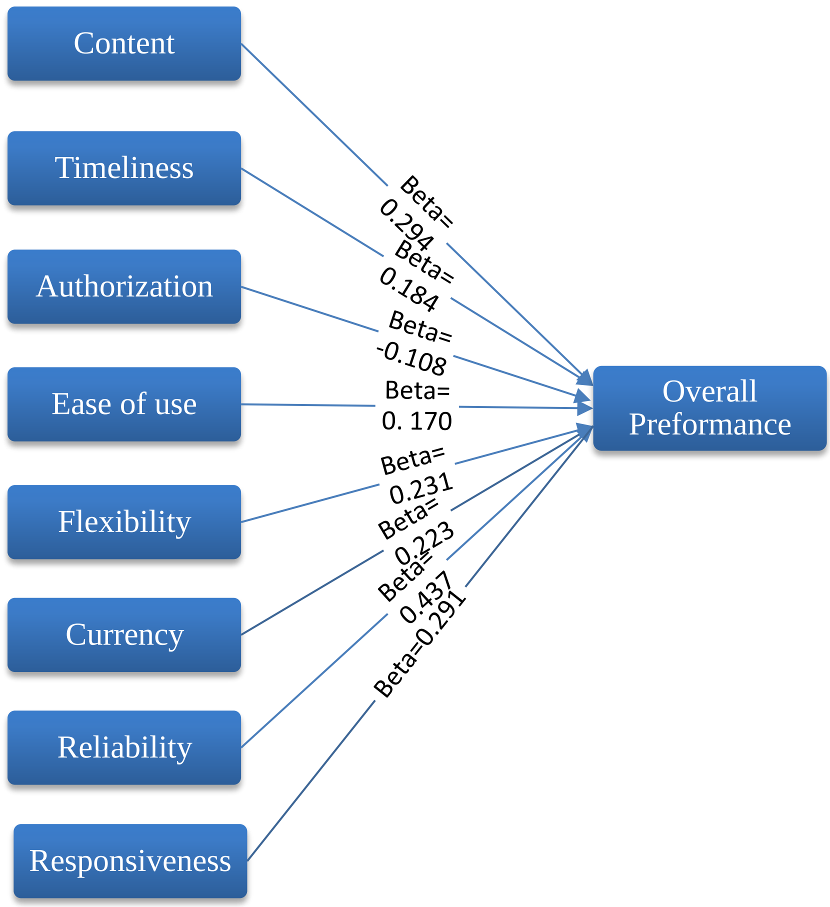
Table 5.42: Regression results for predicting overall stakeholder performance by ERP service quality

Model	**USTD CO**		**STD CO**		**Sig.**
	B	**Std. Error**	**Beta**	**t**	
(Constant)	2.095	0.215		9.75	0
Tangible	0.103	0.056	0.136	1.852	0.066
Reliability	0.332	0.059	0.437	5.669	0
Responsiveness	0.186	0.053	0.291	3.518	0.001
Assurance	-.104-	0.056	-.145-	-1.853-	0.066

The purpose of this research was to investigate whether ERP system quality and ERP service quality affected stakeholder performance. The analysis of the results shows that the following system quality factors had a significant impact on overall stakeholder performance: content, timeliness, and authorisation, ease of use, flexibility and currency. This is not surprising, because it matches reports in the literature of previous studies, although they had been used for different purposes.

As to service quality, the finding that responsiveness and reliability were the factors showing the highest significant impact on overall stakeholder performance was expected, whereas the insignificance of the assurance and tangibility factors was unexpected, since these factors were engaged and correlated with the others.

Based on the above analysis, Figure 5.5 shows a conceptual model representing the relationships among ERP system quality variables, ERP service quality variables and overall stakeholder performance.



System and Service Quality

Stakeholder Performance

Figure 5.7: Conceptual model of results

The outcome of the above model (Figure 5.5) is based on the quantitative part of this research; the researcher believes that there is still a need for additional qualitative data to complement the proposed model (Figure 5.5). According to Skok and Legge (2002), in complex ERP projects which involve multiple stakeholders and the interrelationship between them, a single data collection technique would be unlikely to provide a clear picture of the impact of the ERP system on stakeholders' performance. Therefore, there is a need for an in-depth analysis, for which situation an interpretive and qualitative approach is suitable, as it helps the researcher identify the key issues of concern among the stakeholders who have actually been involved in the ERP system in their daily work. This approach will be discussed in the following chapter.

5.8 Summary

This chapter has reported, analysed and discussed the results of the quantitative phase of this research in three steps: presenting the result of each case separately, making comparisons between the cases, then aggregating all of the data to assess the impact of the ERP systems on overall performance, shown in a conceptual model.

The next chapter will report and discusses the results of the qualitative phase (interview) of this research in the three case studies separately and make the comparison between the cases.

CHAPTER SIX

CASE STUDIES' QUALITATIVE ANALYSIS

PAGE

PAGE

6.1 Overview

This chapter continues the investigation begun in the previous chapter, aiming at a deep and profound understanding of the phenomenon under investigation, as well as testing the research hypotheses. Next, it examines the findings of the interviews, document review and study of the archival records. The raw data are then narrowed down by applying several techniques (as explained in detail in chapter 4). This chapter thus presents the findings and offers a secondary analysis of the empirical data to examine and validate the theoretical framework.

The interview findings are categorised according to the significant factors in the model. They are also coded in accordance with the sub-units and themes that are linked and found relevant to the key concepts. To offer a rigorous examination of the findings, a cross-cases comparative analysis is also made and the strongest patterns, key themes and concepts are identified.

Data analysis also suggests adding newly emerging constructs and factors; therefore, an iterative and flexible analysis of the data is adopted to embrace any suggested themes or patterns. The outcome of the initial preliminary analysis of the cases suggests some modifications to the framework, which are presented and discussed comprehensively in the next chapter.

6.2 Method

6.2.1 Sample

Interviews were conducted with 25 ERP system managers and employees (KSU n=9, KFU n=8, KFUPM n=8) who used the systems in their daily work; the participants all worked in the same departments (Management and administrative) and had sufficient experience. Although this sample cannot be taken as representative of the three universities overall, the participating managers were involved in the planning, pre-implementation and implementation phases; therefore, their feedback was essential to focus on any drawbacks and challenges faced by the universities. It was also important to interview employees in order to support the results of the questionnaire survey by eliciting further details from the participants.

6.2.2 Instrument design

The interview protocol comprised a total of ten open-ended questions posed to managers, seven of which were also asked of employees (see Appendix B). The aim of the interviews with managers was to open a conversation in order to identify the ideas behind the implementation and preparation for it, focusing on the barriers and challenges before and after implementation, and on future plans.

The interviews with employees were slightly different; the questions were based on the questionnaire results (chapter 5) and the aim was to elicit more detail from the interviewees about their opinions of the ERP system in terms of problems encountered and their suggestions for improved implementation.

6.2.3 Interview administration

The interviews were mainly conducted by phone during the months of August, September and October 2012. Two interviews were conducted by Skype due to the unavailability of managers at the time of the interview. All interviews were transcribed by the researcher, who conducted the interviews in English and Arabic: some English terms were used where necessary when the interview was in Arabic.

6.2.4 Data analysis

Interview answers were transcribed and examined analytically. As discussed in chapter 4, the analysis involved coding all the answers given by participants and classifying words under main headings. The frequency of the actual words and their synonyms used by participants in response to questions helped to identify patterns and relationships and to identify the most significant elements liable to be of value in improving post-implementation evaluation.

6.3 Case Study 1: King Saud University

MADAR is a local office project, created within KSU (2007-2008) for the purpose of managing the implementation of business systems (GRP/ ERP) at the university and the provision of advisory services to destinations outside it, under special agreements (MADAR systems' definition, 2012). The interviews with project managers of the MADAR system focused on the following specific points, which are considered essential from the managerial point of view and which had a direct effect on all phases or levels of implementation. Table 6.1 shows in detail the number of interviewees (Managers and employees) at KSU and the time spent during the interview.

Table 6.1: Profiles of the interviewees at KSU

Case	Interviewee	Role	System	Interview Time
KSU	Manager A	Project Manager	MADAR System	40-50 minutes
	Manager B	Project Manager		40-45 minutes
	Manager C	Project Manager		45 minutes
	Manager D	Project Manager		40 minutes
	Manager E	Project Manager		40 minutes
	Employee A	Employee affairs		30 minutes
	Employee B	Employee affairs		30 minutes
	Employee C	Financial department		35 minutes
	Employee D	Financial department		35 minutes

Source: Originated by the researcher

6.3.1 Contextual factors

- ***Employee resistance***

IS/ERP implementations often fail due to strong resistance from users. This problem should be addressed, especially in the case of the public sector. Managers A and E stated that although users were aware that the new system could help them with their performance in different ways, older users who had spent most of their careers in the same place preferred to work with the legacy system for the remainder of their careers rather than spend time learning how to work in the new system, which they considered complex compared to the old one. The majority of KSU project managers (four) stated that resistance to change was the major problem that they faced during the implementation phase:

> *It was really hard for us to convince the employees to use the new system, those employees who'd spent their careers working with the legacy system, especially when it came to the old users who didn't have many years left until their retirement* (Managers A).

Most Saudi universities operate in the public sector, receiving funding and support from the government, so the majority of personnel are government employees, which explains why KSU employees thought that their jobs were secure, according to manager D:

> *Dealing with government employees leads us as managers to another problem, which is job security. The employees thought that using the new system was not compulsory and by law nobody can fire them, therefore we have to take other action to solve this problem* (Manager D).

Manager B asserted that in response, the university management decided to encourage employees to attend training courses and to use the system efficiently, because their decisions to resist or accept would significantly affect the new ERP system:

> *To solve this problem as managers we agreed to link attending courses and using the new system effectively with promotion for all the employees in the same department. This decision was useful and helpful; by ending this problem we can now turn our efforts to evaluating the advantages and disadvantages of the system* (Manager B).

- ***Customization***

Organizations are diverse and have different needs. In all ERP installations, some degree of system customization is required. Although packaged applications are designed to work in different organizations, or even in different industries, they often do not provide all the functionality needed in a specific business. Albeit ERP as a software application is designed to work in different organizations or industries, or at different levels, some degree of system customization is required.

According to manager A, KSU configured its system to its needs by selecting appropriate components and by setting parameters that allowed the university to modify the system within the boundaries set by the developers of the application. MADAR was designed in house by a local firm. KSU management decided to choose a local company rather than a global one for many reasons, including cost effectiveness, ease of contact and the ability to address any changes or configurations based on the university's needs:

> *Choosing a local company wasn't a bad decision. Of course there is no comparison between a local and a global one, but the local one we can ask for any modification or changes we need on the system* (Manager A).

During the planning phase, KSU received many global and local implementation proposals for the ERP project. Manager C, believed that local companies were found to be a good choice because of their enhanced understanding of the university, in addition to the financial efficiency offered by using a local firm and applying its expertise in different departments:

> *Customisation wasn't a serious issue in KSU, since the MADAR system is provided by a local company, which makes it easier and flexible for the university to customise and modify any function to suit its needs* (Manager C).

MADAR managers B and E said that customisation of the system to meet the university's needs was not a barrier for them. This was attributable to the company's flexibility and its direct connection with the university, eliminating the need for an intermediary company.

- ***Weakness of project leadership***

Manager A believed that effective administration during and after implementation was one of the serious problems that KSU managers faced, because there was an assumption that the university administration was committed to supporting the project, especially the MADAR package, which had already been selected and implemented. As the ERP system was considered a new phenomenon and a major change for any university, it was essential to focus on preparatory courses for administrative and managerial personnel, rather than on the operational level of implementation activities:

> *Successful implementation depends on many factors. Effective project leadership is a critical issue for any implementation, by providing support and acceptance of the project* (Manager A).

Manager D added that the role of the management was to oversee pre-implementation preparation and facilitation during the implementation; they needed to be involved in every step of the project until full implementation of the ERP system. In any such project, the management should continually monitor the progress of the project and provide direction to the implementation teams:

> *Having an effective leadership is crucial, who are willing to allow for a huge attitude change by accepting that a lot of learning has to be done at all levels, including themselves, because their attitude will affect other*

> *employees as well, which will help the implementation go smoothly and easily* (Manager D).

MADAR project managers realized that the support of the university administration was essential at all levels and this was identified as one of the most important and crucial success factors in any ERP implementation, since management can deal with many aspects of the project, including planning, organisation, information system acquisition, employee selection and the management and monitoring of software implementation. Therefore, motivating managers and administrators to cooperate during all stages of the implementation was linked by KSU project managers to successful and effective decisions.

- ***Weakness of legacy system***

Manager A explained that ERP is intended to replace existing systems, usually known as legacy systems, each of which provides support for a specific functional area. These legacy systems comprise hardware, software, business processes and organisational structure. ERP implementation involves a complex transition from legacy information systems and business processes to an integrated ERP infrastructure and common business process throughout the organisation, dependent on sophisticated IT infrastructure. Transferring from one system to another is costly, because in a legacy system, information is spread across many different computers. This is not the only difficulty faced in transition:

> *There is no doubt that changing from the current legacy system to the ERP system is difficult, but when the current system has a bad data structure it makes it even more difficult* (Manager A).

Furthermore, manager E explained that the process of transition considered the university to be a unique organisation with a special environment, such as having different departments, administrations and cadres of employees, academics and students with different needs, in addition to the various companies linked with the university; these constitute a large number of stakeholders in a single organisation with voluminous data, each function or department operating with its own procedures and business requirements:

> *We suffered for long time from the bad data structures in the legacy system, but when it came to this stage it was another story. It takes a long time to do it* (Manager E).

MADAR system managers aware that KSU, one of the largest universities in the KSA, had hitherto functioned with an ill-structured system, making it very difficult to conduct data clean-up and transfer from the legacy system to the ERP system. Despite this weakness of the legacy system, the transition had to be efficient, because any mistake could cause many problems which would be difficult to rectify and which had to be solved before the implementation could proceed.

6.3.2 Improving stakeholders' productivity and performance

A fundamental economic purpose of the implementation of a new system is to achieve the highest productivity in stakeholders' work. The interviews examined this question from the stakeholders' point of view in order to clarify and supplement the questionnaire data. It was found that the results of the first (quantitative) phase of data collection concerning significant factors were similar to those of the second (qualitative) phase, with limited changes from a managerial point of view.

6.3.2.1 Systems Quality

- ***Training programme***

The majority of KSU employees were aware that training plays a major role in ERP implementation, which generally requires profound reengineering of any organization. Indeed, practical training is an important factor that affects its success or failure. Employee A believed that training offers a good opportunity for users to adjust to the changes introduced by the ERP system and helps to build positive attitudes towards the new system. It also provides experience for users, so that they can appreciate the attributes and potential benefits of the new system. It is hard to say whether the stakeholders were satisfied with the training programme provided by KSU. Employees believed that they did not have adequate training to enable them to understand the system in general and to operate it effectively.

Employees B, C and D explained that the majority of employees were unaware of the concept of ERP and how the system would help them to relate their work to other departments functionally; therefore it was important to build users' initial conceptual understanding of the new system, then to introduce other courses gradually. This may have helped employees to understand the system and make it more user-friendly.

> *There is a difference between a full, strong training course and a short session. I think what was provided for us was a session more than an appropriate training course. As employees we need intensive courses to build our confidence* (Employee B).

Employee A suggested that long-term training was better than short courses, especially for those with little or no knowledge of ERP systems:

> *A strong programme of training is really important, to give us as employees knowledge, strength and confidence in terms of using the system* (Employee A).

Employees thus appeared to be aware of how important training was, because it would help them to improve their work and increase their productivity. Therefore, there was a demand for adequate training courses before, during and after implementation. Early training would help the employees to accept the new system and reduce any discontent or resistance which they might feel towards it.

- ***Ease of use***

Employees A, C and D believed that preparation, pre-implementation, implementation and training were essential steps. Once the new system was implemented, stakeholders could focus on its advantages. A fully implemented ERP system can yield significant benefits. Although any ERP system is considered to be complex, participants found MADAR easy to use, which was a significant positive factor in its adoption by KSU employees, despite their need for more intensive training. The majority of the interviewees agreed that they found ERP easier to use than the legacy system:

> *The most important benefit of the MADAR system is that it is easy to use it compared to the legacy system, in terms of the ability to do the work easily and make faster information transactions (Employee B).*

Ease of use is considered a major benefit of any ERP system. Employees asserted that the ease of use of MADAR had a positive impact on both completing the task effectively and increasing their productivity:

> *Before I used the system I hesitated, I thought it would be difficult, but in fact it was the opposite. If I had known it was that easy I wouldn't have resisted in the beginning (Employee C).*

Furthermore, the presentation, format and content of the MADAR system were reported to make it even easier to use, so that users could access any information that they needed and improve the quality of their work; overall, employees believed that MADAR implementation had made their jobs much easier.

- ***Timeliness***

Both managers and employees listed timeliness as one of the benefits of using the ERP system. Employees A, B and D stated that timeliness was considered an important factor in two different ways: accessing the information that the user needed on time and helping users to do their work in a shorter time. Both of these helped users to fulfil the needs and requirements of their job.

> *As a financial employee, working with the MADAR system is affecting my work positively. For example it improves efficiency, reduces data errors and avoids duplication of information. In both functional and application domains it saves me many hours in my work* (Employee A).

According to employees B, C and D, the MADAR system allowed administrative and managerial personnel and faculty members to check their salaries and promotions. It also made it possible to transfer easily, accurately and quickly to other individual management functions within the system, such as procurement and distribution. Additionally, several interviewees stated that MADAR, as a packaged software system, had the advantages of reduced time, being easy to integrate and in general offering high system quality.

- ***Flexibility***

Interviewees gave differing answers regarding the flexibility of the MADAR system. Employees A, B and C, described as end-users, were more than pleased with its flexibility and portrayed it as flexible to use, offering an acceptable level of flexibility while making transactions faster. This degree of flexibility was provided at the time of implementation:

> *The level of flexibility in the MADAR system is really obvious, which has improved my ability to respond effectively, changing user interface,*

changing underlying data, and its effect is to change performance positively (Employee B).

In contrast, managers believed that flexibility could and should be improved by upgrading the system to meet their future needs:

I agree that MADAR has a high degree of flexibility when using the system daily, but as managers we look to have a higher degree of flexibility by updating the system in the future (Manager A).

Thus, project managers A, B, D and E demanded that the level of flexibility be increased in the future to match their planned expansion of the system, because ERP system infrastructure should anticipate expansion in its degree of flexibility.

To conclude, employees A, B, C and D agreed that flexibility, timeliness and ease of use were the most important factors and believed that they were having a significant impact by increasing their productivity and accuracy while reducing the time they spent on each job.

6.3.2.2 Service quality

Service quality was found to be a major area of concern for KSU project managers, (Managers A, B, C, D and E) due to its strong impact in facilitating the successful operation of the system and optimizing employee/user performance. Therefore, if the MADAR system were successfully implemented, the links between different departments of the university (Appendix) would not be adequate. Internal support from the service quality department would also be required. Interviewees felt that it was time to build a strong technical support/service to help the system flow smoothly and reduce the barriers which inhibited the effective use of the system.

Employees A, B, C and D agreed that the service quality department at KSU, which was linked with the MADAR system, was extremely important in facilitating their use of the system and solving problems. Therefore, it was important to implement a new system in parallel with the service:

It is important to start a new system with the latest hardware and software bought and programmed for this purpose (Employee D).

Service quality, in other words, was seen to lie in the communications between users and the technical department, in terms of how quickly and accurately it delivered answers to users’ enquiries. Interviewees perceived a strong link between speed of response and the accuracy of their own work:

> *The service quality team are showing a high level of understanding and experience dealing with the MADAR system’s difficulties, by quick responses to system enquiries* (Employee A).

According to employees C and D, the MADAR system had achieved a high degree of reliability and trust among users in a short time, because the service quality team was attempting to build strong relationships between the departments and users in terms of achieving a high level of successful implementation:

> *As employees, over time we can feel the effort from the service quality team to give the best they can to solve any problem we may face during the implementation and after* (Employee C).

It was widely perceived by the interviewees (managers and employees) that the implementation of the MADAR system at KSU was intended to enforce or reinforce changes in both financial and administrative aspects of the university’s operations. The majority of the employees asserted that they would not resist the change if they knew that changes were likely to have positive implications for themselves and the university, including non-financial benefits, since it was clear that the MADAR system had had a positive impact on their productivity at work and their performance in general.

6.4 Case Study 2: King Fahd University of Petroleum & Minerals

The Oracle system was created within KFUPM in 2006 for the purpose of managing the implementation of business systems (ERP) at the university and the provision of advisory services to destinations outside it, under special agreements. The interviews with project managers of the Oracle system focused on a number of specific points which were considered essential from the managerial point of view and which had a direct effect on all phases or levels of implementation.

Table 6.2 shows in detail the status of all interviewees at KFUPM and the time spent on each interview.

Table 6.2: Profiles of the interviewees at KFUPM

Case	Interviewee	Role	System	Interview Time
KFUPM	Manager A	Project Manager	Oracle system	40-45 minutes
	Manager B	Project Manager		40-45 minutes
	Manager C	Project Manager		35-40 minutes
	Manager D	Project Manager		35-40 minutes
	Manager E	Project Manager		35-40 minutes
	Employee A	Financial Department		30-35 minutes
	Employee B	Human Resource		30-35 minutes
	Employee C	Employees Affairs		30-35 minutes

Source: Originated by the researcher

6.4.1 Contextual factors

Participants in Case Study 2 were project managers of the Oracle system at KFUPM. This section examines the interview responses regarding specific contextual factors which were considered essential from the managerial point of view, and which were seen as having a direct effect on all phases or levels of implementation.

- ***Employee resistance***

Manager A stated that KFUPM, like other organisations, suffered from employees' resistance to the change brought about by the new system. Some employees showed an unwillingness to cooperate or engage with it. There may be many reasons for such resistance, but the chief one in the case of KFUPM was that employees refused to work hard and did not want their authority to be taken from them:

> *Ignorance and resistance to change from the users because they are not happy with the system. The authority they have may be taken away from them. Furthermore, they are worried about having to work more and work harder* (Manager A).

For managers B and C, such resistance on the part of employees was a consequence of a lack of preparation of the people who were likely to be affected by the change, which induced pressure upon them to use the system. Implementation of the Oracle system affected most important departments at KFUPM and impacted directly upon users. Therefore, a plan of preparation to shape users' understanding of the ERP system's importance and related concepts was required:

> *The management attempted to encourage stakeholders to accept the system, understanding the urgency of the business* (Manager B).

Manager D believed that resistance was manifested in both the attitude and the behaviour of some employees. They did not resist the change (i.e. the implementation of a new system) in itself, but instead resisted their own perceived loss of status, authority or comfort under the new system.

- ***Customisation***

Managers A and C asserted that ERP software applications are designed to fit any organisation, but a degree of customization is required according to the organization's needs. Manager E emphasised that the situation in HE differs from that in mainstream organisations in numerous respects. KFUPM project managers were aware of their needs; thus, the preparation for customization started as soon as they chose the Oracle system.

According to project manager A, ERP implementation at KFUPM was successful and smooth, without any serious problems, for two reasons: because the university had a dedicated open budget for the implementation, to allow for the solution of any problems faced, and because KFUPM followed the American university system, which made it easy to transfer data from the legacy system to the new one:

> *It wasn't difficult for KFUPM because the university solved the problem with the open budget it has. Also, the university did not change the system to Arabic, which would have made it difficult, but has kept it as it is in English, as it works in English, which is easier* (Manager A).

- ***Weakness of project leadership***

Project managers A, B and D believed that the strong project management at KFUPM was due to the successful experience of the project team, which comprised personnel from different departments. The project team was chosen to be involved in both the planning and implementation phases; therefore the key users were included in the implementation.

> *It was a wonderful and successful experience giving the project team nine months' worth of training and working closely with the system during the planning and implementation phase*s (Manager B).

Since ERP system implementation is complex and highly integrated, it is essential for a project team to plan, coordinate and control the complexity of the system. Furthermore, without complete cooperation in planning, implementation and design between all staff and departments, successful implementation will not be possible, according to Manager E.

- ***Weakness of the legacy system***

Project managers A, B and D were also aware that the demands on the new system required it to be well coordinated and integrated, to ensure the smooth flow of its functions. According to manager B, the poor structure of the legacy system was not the only problem faced by KFUPM; data being stored differently in different departments was another serious hurdle. Although KFUPM already followed the American university system, as noted above, transferring from the old separate components to a new integrated system was difficult:

> *The project team was a big support during the transfer of data, since they had been involved in the early stages of implementation* (Manager D) .

Although the process took a long time to complete, Manager E explained that a well-planned schedule for the transfer process, whereby data were transferred gradually, department by department, ensured that each item of data was entered once and accurately, which helped the whole process to be successful.

6.4.2 Improving stakeholders' productivity and performance

A positive impact on stakeholders' productivity and performance is perhaps the best return on investment that any public sector organisation can achieve. Therefore, interviewees were asked about their productivity and performance in order to address this issue from a stakeholder perspective and to clarify and supplement the quantitative data collected by means of the questionnaire in the first phase. The results show that the significant factors identified in the second (qualitative) phase were similar, with limited changes from a managerial point of view.

6.4.2.1 System Quality

- ***Training programme***

From an examination of the KFUPM training schedule, it was clear that an effort to organize a comprehensive programme of training in each department was already being implemented in the system (Appendix). From the managers' point of view, the training schedule met users' needs, especially as it provided courses for both end users and key users. However, many users felt that the training courses they had attended were not adequate to help them with the system and make it more user friendly:

> *We have a good schedule for the stakeholders' training which fits their needs. For example, there is manual training for 2 or 3 days, or 1 to 2 weeks for either the end users or the key users (Manager A).*

Although the training courses provided for the employees were not adequate, according to manager B, KFUPM attempted to prepare key users to train end users by providing a nine-month full-time training programme during the implementation phase. This step enabled key users to take a greater part in implementation:

> *At KFUPM we consider it important to involve key users in implementation. They spent more than nine months full-time during the implementation phase, which made it easy for them to understand the system in its early stages* (Manager B).

The decision by the strategic management of KFUPM to involve key users as early as possible in systems implementation was seen by interviewees as giving the university great advantages in terms of better understanding of the system, improved work quality and efficiency, easier facilitation and support for end users, while laying the foundations for more in-house training in future. From the users' point of view, however, the training programme was not adequate to their needs. According to employees A, B and C, a continuous or long-term training course was essential to increase their productivity and enhance their performance:

> *The training the university has provided is good but it is not enough. As users we are looking for a continuous programme. It is better to be up-to-date and more familiar with the system (Employee B).*

- ***Ease of use***

It was widely recognized by interviewees that since KFUPM had implemented the Oracle system, stakeholders had found it easy to use, accessing and linking to the information they wanted, whether via recent or historical data. Administrators and managers were able to access the full functionality of the system, and transactions were conducted on it between different departments in the university:

> *Easy access to the data history, or using corporate and divisional data, and sharing data with other departments are some of the important advantages of using the Oracle system* (Employee A).

In addition, Employee C explained that all employees were able to access data at the same time using the ERP system, whereas with the legacy system this task was much harder. For example, with the flexible integration of departments offered by ERP, employees from the finance department could obtain information about personnel from the human resources department. This made access to this information when required much easier than under the legacy system.

> *With the ERP system it's much easier to access any incorrect information and change it once, instead of going to each department separately and changing it many times (Employee C).*

- ***Timeliness***

According to employee A, KFUPM employees were aware that the principal purpose of implementing the Oracle system was to improve stakeholders' productivity, thus helping the university to achieve a better competitive position among Saudi universities. In this context, such improvement is another important benefit of ERP systems, saving time and reducing redundancy:

> *Implementing the ERP system has enhanced our stakeholders' performance for sure. For example, in the budget process they used to take six months or maybe more to finish the work, but with the new system it takes only two weeks* (Employee A).

- ***Flexibility***

Projects managers believed that insufficient flexibility can limit the success of an ERP system by preventing certain circumstances and making exceptional handling necessary. Therefore, in order to be effective, ERP systems need to be flexible.

Employees A, B and C reported noticing a difference in degree of flexibility between the legacy system and the newly implemented Oracle. In contrast, project managers felt that the degree of flexibility depended on the type of ERP infrastructure (flexible to change or pre-built functionality). Manager A concluded that in order to increase flexibility, the university would need to update the system to version 12 in six months' time.

A wide range of employees asserted that flexibility was one of the important elements of the ERP system, because they were able to change data, transfer it and allow variation over time. Moreover, employees B and C believed that system flexibility helped them to perform their tasks effectively and efficiently.

> *The ERP system has the ability to deal with both expected and unexpected changes easily, which improves their job performance* (Employee B).

6.4.2.2 Service quality

The majority of interviewees agreed that the absence of good service quality decidedly affected their productivity and performance. Based on the questionnaire results, none of the service quality factors (tangibility, reliability, responsiveness and assurance) was found to be significant at KFUPM. This may be explained by the lack of good service and technical support for system users in their work, which was seen to have affected their productivity and performance:

> *The absence of decent service quality from the technical team is affecting our productivity negatively. This poor service cause*s *delay and cripple*s *the work* (Employee A).

Advanced support from the service quality team would be required to facilitate the work of users, to solve any problems that they might have and to avoid any delay or postponement of stakeholders' tasks.

6.5 Case Study 3: King Faisal University

Oracle system, created within KFU (2008) for the purpose of managing the implementation of business systems (ERP) at the university and the provision of advisory services to destinations outside it, under special agreements. The interviews with project managers of the Oracle system focused on the following specific points, which are considered essential from the managerial point of view and which had a direct effect on all phases or levels of implementation.

Table 6.3 shows in detail the number of interviewees (Managers and employees) at KFU and the time spent during the interview.

Table 6.3: Profiles of the interviewees at KFU

Case	Name	Role	System	Interview Time
KFU	Manager A	Project manager	Oracle system	40-50 minutes
	Manager B	Project manager		40 minutes
	Manager C	Project manager		40-45 minutes
	Manager D	Project manager		40- 45 minutes
	Manager E	Project manager		30-35 minutes
	Employee A	Human Resource		30-40 minutes
	Employee B	Employee Affairs		30-40 minutes
	Employee C	Financial Department		30-40 minutes

Source: Originated by the researcher

6.5.1 Contextual factors

Project managers for the Oracle system at KFU focused in the interviews on the following specific points, which were considered essential from the managerial point of view and which had a direct effect on all phases and levels of implementation.

- ***Employee resistance***

In an IS environment, rapid change becomes an everyday part of organisational dynamics and any resistance by employees can cripple an organisation. Therefore, Managers A, C, and E, believed that management support played a crucial role in encouraging, facilitating and gaining a better understanding of the concept of ERP among the employees of KFU:

The management support of the university plays an important role for the decision makers among the employees, by explaining, training and supporting before and after implementation (Manager A).

Managers A, B and D felt that resistance to change might cause the university many problems, including delayed or slow start-up and obstructed or hindered implementation, which would have severe financial costs. Therefore, strong and effective leadership at the management level was essential to support decision makers and to persuade users to use the system effectively.

It is noticeable that employees' resistance to change affected the system implementation at KFU and caused many problems, such as delaying the implementation and financial problems (Manager C).

- ***Customisation***

While KFU chose to implement the same Oracle system as KFUPM, obtaining the customization of the system that it desired was one of its greatest challenges. The problem was not with Oracle itself, but with the vendor which supplied the system to the university, according to manager A:

Customization was the main barrier with the vendor of the Oracle system. They were not flexible regarding the customization, but wanted KFU to take the system as it is from the shelf (Manager A).

Manager B asserted that as with any organization, KFU required ERP packaged software that it was possible to configure or modify to meet the university's particular needs. There was a misunderstanding between the university and the system vendor, causing a delay in implementation in some departments:

Unfortunately, the vendor did not respect its contract with the university, so the university had to discuss all items in the agreement again. At the end the misunderstandings were resolved and the process continued (Manager B).

- ***Weakness of project leadership***

Understanding by top management of the scope of changes to the system was very important in the view of manager E. According to manager C, one way of managing change effectively adopted by KFU was the establishment of an Oracle planning and implementation team, including personnel from different departments of the university. This team was responsible for providing all the necessary information and determining and explaining the structure that each department and end user might need, as well as informing them about the system:

> *The project team has played an essential role during the planning and implementation phases of the Oracle project by explaining the idea of ERP, determining the departments' needs and facilitating implementation activities* (Manager C).

This was a critical factor in the implementation of the ERP system at KFU; without management support, the adoption of the Oracle system would have been unsuccessful.

- ***Weakness of the legacy system***

Managers A, B, D and E all understood that an ERP system has a sophisticated IS infrastructure; hence the transition from a legacy system to an integrated system is complex for any organisation, which means that when changing the system, the organisation should consider its own structure at the same time.

KFU had separate long-standing legacy systems which had been implemented and developed to meet the university's needs and decision making, but which offered no integration or communication between departments. Moreover, all data had to be entered separately by the different departments. Therefore, when the decision was made to change to an integrated system, there was a problem with the transferring of data to the ERP system, manager C stated. Although the data were extant and available, changing them to a different format was difficult:

> *As soon as KFU started implementing its ERP system, facing the problem of transferring data from the legacy system to the ERP system was one of the serious barriers, because it takes a long time to collect information and present it in a new format* (Manager C).

Manager E added that the Oracle system generally comes with standard applications centralizing the information of separate departments in an integrated system. Consequently, the transition process needed to be accurate, because data needed to be entered once, to fit the university's structure and match its needs.

> *Because of the misunderstanding between the university and the vendor, there was a delay in the transition process at KFU* (Manager E).

6.5.3 Improving stakeholders' productivity and performance

The success of any organisation today is largely dependent on stakeholders' ability and willingness to exploit and adopt new technology in their daily operations. Consequently, as for the other case studies, interviews were held with stakeholders to elicit their views and to clarify and supplement the quantitative questionnaire data. Once again, the results show that the same factors were found to be significant in this second (qualitative) phase, with limited changes from a managerial point of view.

6.5.3.1 System Quality

- ***Training programmes***

The KFU employees appeared to be sensible and aware of the importance of training to increase their understanding of the system and to build their confidence in it. Based on the questionnaire results, training was found to have had a significant impact on stakeholders' performance. Despite this encouraging result, employees A, B and C believed that more training was advisable:

> *It is important to organize and execute a continuous and effective training programme to help users acquire adequate knowledge, especially if new system functions are added* (Employee A).

Employees B and C believed that as with any organisation, the university experienced inconsistency between the Oracle and legacy systems and between Oracle and the university's structure, because change always has a positive or negative impact on the nature of work. Therefore, continuous training was essential to enable employees to learn about the new system in general and each specific job in particular. Moreover, employees wanted a comprehensive training programme to encompass their development of IS skills.

> *Training would be more useful if it covered both the system's features and related work processes. This would help employees to be comfortable and reduce mistakes* (Employee C).

The managers broadly agreed that it is worthwhile for any university undertaking ERP implementation to invest time and resources in adequate training; otherwise there is a strong possibility that the system will fail.

- ***Ease of use***

It was widely perceived by interviewees that the reaction of Oracle system users after attending initial training was that the system was easy to use and to understand. However, employee B believed that employees were used to working on the legacy system, which differed greatly from the new integrated one; when working with the new system they would need to be familiar with both its functions and its applications, necessitating that they acquire certain skills:

> *The most important benefit of the Oracle system is that it is an easy system to learn. Easy to link with different departments, easy to check and correct the work, easy to get a report. Overall, it changes the way we used to work for the better* (Employee B).

Employee C believed that implementing a new system at KFU was concerning for users, because they needed to familiarize themselves with different functions and applications; for example, the platform was new, data entry had changed and report formats were different. However, the new system was considered easy to understand from the users' point of view and they found that it had a logical flow.

- ***Timeliness***

Another significant finding of this set of interviews was related to the effect of time on employees' performance; the majority of interviewees (four managers, three employees) indicated that using the Oracle system reduced the time they would spend doing daily work:

> *In a short period of time it is easy to check and transfer from different departments. For example, checking financial issues and administrative records at the same time was a noticeable benefit* (Employee A).

Employees and managers indicated that the efficiency of the system in daily work was clearly noticeable compared to the legacy system; some estimated that a month's work could now be completed in less than a week. Therefore, employees of KFU believed that using the Oracle system saved time, which affected their performance positively and increased their productivity.

- ***Flexibility***

According to managers A, B and C, the need for an ERP system to have a degree of flexibility is paramount, because it facilitates the rapid development and implementation of applications that enhance stakeholders’ performance and productivity by responding effectively and quickly, to take advantage of emerging opportunities or to neutralize competitive threats. Thus, flexibility is absolutely required for any ERP system to function properly. As previously mentioned, when KFUPM implemented the Oracle system it had a level of flexibility built in with the system infrastructure. Employee C made the point that flexibility was an essential factor for KFU employees, having a significant impact on their performance:

> *Flexible… many advantages in our daily work, for example increased ability to access the system, reduced overall time it usually takes to do the work, and reduced complexity* (Employee C).

Employee B believed that system flexibility or ability to change and adapt was the most important of all factors, according to KFU employees. Flexibility from these users’ perspective included a flexible and friendly interface, systems integration, ability to connect with complete efficacy, and flexibility in transferring data to different departments.

Although flexibility was not identified as a significant factor in the quantitative phase of data collection at KFU, users of the Oracle system demanded a high level of flexibility to improve their productivity and performance. In other words, employees A, B and C asserted that if the system were any less flexible this would cause them difficulties in doing their tasks; the lack of structure and time criticality would lead to delays in doing their work.

6.5.3.2 Service quality

The service quality department at KFU was considered to play an essential role in building stakeholders’ trust and belief. The majority of interviewees (five managers and two employees) believed that service quality factors (reliability, responsiveness and assurance) had a significant impact on their performance:

> *I can rely on the Oracle system to do my work efficiently, since it is a well-known package. It is also provided with the latest hardware and software, which has helped me a lot in my work* (Employee B).

Employee A believed that quick responsiveness from service team to answer stakeholders' questions, explain facilities and solve problems was a very important issue for KFU employees:

> *As a new system user I am looking for quick responsiveness. It is important to feel secure and safe in my work in case anything happened to the system to find support and help as soon as I need it* (Employee A).

6.6 Universities Compared

6.6.1 Employee resistance

KSU dealt with resistance to change with considerable experience. This solution was proven to be a success with public sector employees. KFU and KFUPM were found to suffer from the same problem, but they did not seriously attempt to solve it.

6.6.2 Customization

Customization was one of the barriers at KSU, especially during attempts to tailor the system to the university's needs. KSU's choice to implement a local in-house system was not a bad decision; the local company offered flexibility and direct guidance to the university, enabling it to accept or order desired changes. Adopting an in-house ERP system is less expensive than using the services of better known global companies.

Although KFUPM project managers admitted that the Oracle user interfaces were not very friendly and that the system was not ideal for students, the customisation of the system was very advanced and was achieved without any serious problem. According to the project manager, as soon as the university chose the software, the vendors were contacted to initiate the preparation for implementation.

In contrast, customisation was the greatest difficulty that KFU faced with its Oracle system. In fact, the difficulty was with the Oracle vendor company, which did not fulfil the agreement it had with the university, causing a delay in implementation for some departments.

From this comparison between the universities it is clear that the system vendor plays a crucial role in enabling customisation before implementation; the important factors are clear requirements, contracts and strong commitment.

6.6.3 Weakness of project leadership

One of the reasons for ERP system failures is weak project management. The three universities had different experiences regarding project leadership or project management. KFUPM had considerable experience, which involved key users or managers in the planning and implementation phases and which gave them enough time to be involved and cooperate during sensitive phases of the implementation. The KFU project team comprised personnel from different departments and was involved in both planning and implementation phases, which helped the university to determine its needs and requirements. Both universities appear to have successfully involved managers in the implementation.

In contrast, KSU suffered from carelessness and apathy on the part of managers or key users, because of the late involvement resultant from employee resistance. As mentioned previously, KSU tried to solve this problem by linking positive cooperation with promotion, which was clearly successful.

6.6.4 Weak data structure of the legacy system

All three universities had difficulties involving their legacy systems, comprising their existing IT, organisational structures and work processes. In all cases, the difficulty lay in transferring data from the dispersed legacy systems to the new integrated ERP system; indeed, the inability to transfer and share data across non-integrated systems was one of the reasons for the change. KSU had a negative experience with badly structured data, which made it even more difficult to accommodate it to the ERP system, while KFU and KFUPM seem to have faced fewer challenges from the structure of their legacy systems.

6.6.5 Improving stakeholders' productivity and performance

6.6.5.1 Systems Quality

- ***Training***

Unsurprisingly, all interviewees at all three universities agreed that well programmed training courses were essential to them; in fact, this was considered the most important factor. Training empowered participants with more experience and confidence in the system, which they perceived as more user-friendly. Moreover, they asserted that they desired dedicated and thorough training, rather that short sessions of a few days.

- ***Flexibility***

KSU implemented an in-house ERP system; therefore, interviewees from this university demanded enhanced and updated flexibility, because what they had now was what came during the implementation, which promised flexibility of use.

In contrast, KFU and KFUPM had adopted Oracle, an ERP system provided by a well-known global company which provided the whole package of software with a regular upgrade plan as part of its contract with each university.

- ***Timeliness, ease of use***

Interviewees at all of the universities had the same opinion about the following factors: timeliness, ease of use, increased work productivity and a positive impact on their performance compared to the legacy system.

6.6.5.2 Service quality

There is no doubt that service quality affects stakeholders' performance in both positive and negative ways. Interviewees at all three universities agreed that the quality of service provided by the technical support team would play a major role in their performance and productivity at work.

KSU and KFU participants indicated that their service quality teams provided a high standard of service in terms of quick responsiveness and the provision of up-to-date hardware and software. Overall, interviewees believed that MADAR and Oracle service support offered assurance and reliability. In contrast, KFUPM interviewees did not feel that they had received the service support they should have had.

The provision of adequate service support is extremely important; the absence of expert service certainly affects stakeholders' performance negatively. For example, late response may reduce productivity and cause delays in work.

6.7 Summary

This chapter has presented the findings of the second, qualitative, phase of the data collection, i.e. interviews held with managers and system users at three KSA universities: KSU, KFU and KFUPM. The findings were presented according to the results of the quantitative phase, the final framework for the first phase and the interview themes. For each case, the results were divided into two categories: managers and users. A comparative analysis of the cases offers an explanation of the main patterns, themes and case-specific elements, enabling an understanding of the phenomenon from different angles.

The following chapter discusses the findings of both phases and links them with previous studies in order to draw final conclusions.

CHAPTER SEVEN

DISCUSSION

PAGE

PAGE

7.1 Overview

This chapter reviews the impact of ERP systems on stakeholders' performance in Saudi higher education. Factors were generated from three models to develop a framework which would help the researcher to gain a better understanding of how to evaluate the impact of such new systems. Therefore, there follows a discussion of the main quantitative and qualitative results and findings designed to elucidate the impact of ERP systems on their stakeholders in Saudi HE, through an in-depth interpretation of the data (from questionnaires, interviews and documentation) and its relation to the literature. Consideration is also given to the three case studies examined in chapters 5 and 6.

On the basis of this analysis, the researcher was able to identify six key success factors for high stakeholder performance, as presented in Figure 7.1: understanding resistance to change, appropriate customisation, effective management support, intensive training schedule, better system quality and better service quality.

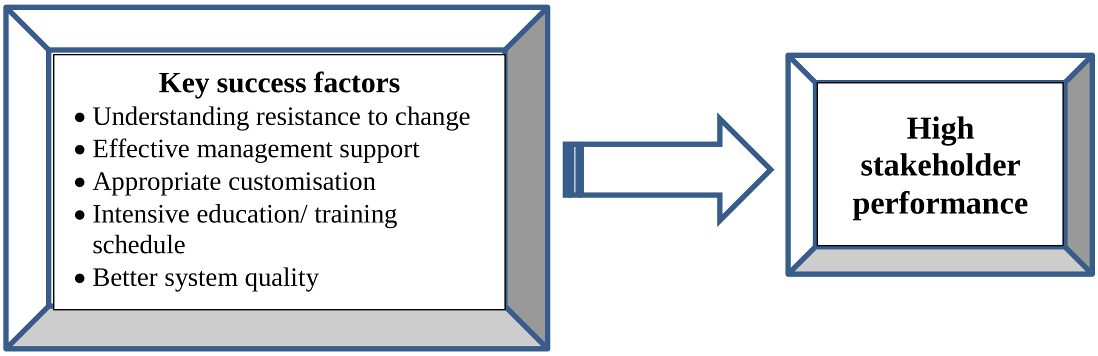


Figure 7.1: Key success factors for high stakeholder performance

The chapter is structured as follows. It begins with a brief introduction to the policies governing ERP implementation in Saudi HE, then examines the current situation of ERP evaluation, before discussing the key success factors identified from the analysis of quantitative and qualitative data, supported by reference to the literature.

7.2 Policies of the Saudi Higher Education Board

Saudi universities are subject to regulations issued by the Higher Education Board (2007), which govern aspects of academic practice including teaching, learning, student activities and management. The Higher Education Board is the supreme authority that is responsible for HE (above the level of secondary education), supervising and coordinating all HE institutions except those under military control. The aspects of the Board's responsibilities most relevant to the present research may be summarised as follows:

- Directing HE policy.
- Monitoring the development of university education in all sectors.
- Coordinating between universities, especially in the field of science and the award of degrees
- Issuing joint university regulations
- Regulating universities' financial affairs.

7.2.1 Key definitions and policies

Universities in the KSA are scientific and cultural institutions working under the guidance of Islamic law. Their duties include the implementation of educational policy, the provision of university education, the award of degrees, the advancement of scientific research, the conducting, reporting and publishing of research in their specialist areas and the provision of community services. Each university is financially independent from other HE institutions, in terms of ownership and disposal.

Under Saudi regulations, holders of the most senior positions are appointed and dismissed by royal decree. Accordingly, the rectors of all Saudi universities are appointed by royal decree on the recommendation of the minister of HE. Each rector is responsible for his university's financial, academic, administrative and student affairs.

7.2.2 Budget

Each university has its own independent budget determining revenues and expenditure, issued and approved by royal decree, whose implementation is subject to monitoring by the General Auditing Bureau. The fiscal year of each University is the state’s fiscal year.

University revenues consist of:

- Credits allocated by the government
- Donations, bequests, grants and endowments
- The proceeds of possessions and their resulting disposition
- Any revenue resulting from the conduct of research projects, scientific studies or services to others.

Each university prepares its own draft budget in coordination with its constituent colleges, institutes, centres, branches and departments, based on estimates of expenditure and associated justifications (Ministry of Saudi Arabian Higher education, 2012).

7.3 Implementing ERP Systems in Saudi HE

The government of the Kingdom of Saudi Arabia is responsible for the education sector in general and higher education in particular. The number of public universities has increased from 8 to 23, now covering all parts of the country. Given the growth of the HE sector, it is not surprising that the annual budget of the Ministry of Higher Education was at its largest ever for the year 2011-2012, at 150 billion SR (56 billion USD). With this money, universities are encouraged to achieve excellence in education, services and training to prepare the new generation to meet the market demand for qualified labour.

This large budget is divided between the 23 public universities according to their needs. The 2011-2012 budget figures for the three universities featuring in the present case studies are as follows: KSU, the largest and oldest university in the country, was awarded almost 8 billion SR, while KFUPM received a little over one billion SR and KFU had about 1.7 billion SR (Ministry of Saudi Arabian Higher education, 2012).

Obviously, within the limits of their budgets, all universities seek to implement the best technology possible, to match rapid technical developments, improve their productivity and help decision makers and users by providing accurate and timely data as needed.

7.3.1 ERP implementation in Saudi HE

Since 2006, Saudi Arabian universities have been encouraged to implement ERP systems. Beside the three case studies considered here, several universities have done so recently, while others are at the final stage of the evaluation phase, choosing between several companies who provide such systems, especially as the budget is not considered an obstacle. For instance, in April 2011, King Abdulaziz University signed a contract with the SAP Company to supply its software, starting with the financial module, followed by the personnel module and a logistics system, covering contracts, procurement, planning, budgeting, monitoring, warehousing and inventory control (KAU,2012).

Al Jouf University, one of the newest in Saudi Arabia, having been established in 2005, has deployed Cisco WebEx enterprise collaboration solutions for secure e-learning and a number of other Cisco WebEx products, including its Meeting Centre, Event Centre, Training Centre and Support Centre (Al Jouf University, 2012).

Shaqra University was established by royal decree even more recently, in 2009. In February 2011 it announced that it had signed a contract to install SAP software. It is noteworthy that Shaqra University then became the sixth Saudi academic institution to join the SAP University Alliance programme (section 7.3.2), following KSU, Jubail Industrial College, Yanbu Industrial College, KFUPM, Dammam Technical College and King Khaled University. Students of Shaqra University thus joined nearly 150,000 others in 1000 academic institutions around the world who, via this programme, gain practical experience in the field of large integrated SAP solutions (Shaqra University, 2012).

The King Abdullah University of Science and Technology (KAUST), also established in 2009, specialises in academic research in scientific and technological fields. To support this research effort, KAUST uses SAP IT systems and an on-line project development tool (KAUST, 2012).

The Prince Sultan University Girls' College has implemented the Oracle system, while some other universities have chosen local ERP systems; for example, Umm Al-Qura University decided to implement an in-house ERP system supplied by the Towteen Company. As for the remaining Saudi universities, they either still work with individual systems, or the researcher was unable to obtain information about the systems they have implemented.

7.3.2 SAP University Alliance

As noted above, several universities and colleges in the KSA have joined the global SAP University Alliance programme, boosting job prospects for students seeking employment in the increasingly knowledge-based Saudi economy. The University Alliance programme licenses member universities and fully equips their teaching staff to provide students with in-depth, hands-on experience of SAP software and solutions. The University Alliance community site, an online environment utilizing the latest social media tools and technologies, provides academic resources to teachers and students worldwide, facilitating professional opportunities. The programme also aims to build relationships with participating universities to recruit interns and graduates, enhancing the learning environment and project opportunities for students, while furthering the research and publication efforts of academic staff. It promotes the key academic and professional outcomes of higher-education degree programmes worldwide, combining business process knowledge with enterprise software expertise to develop one of the most valuable skills portfolios in the market. Finally, it offers students free workshops and organises conferences for thousands of teachers, supplying them with course materials and other instructional resources. Every year, hundreds of thousands of students at participating campuses experience first-hand how the fully integrated SAP enterprise information software systems operate (SAP , 2012).

Given the large number of Saudi universities which have implemented ERP systems to improve their productivity, or joined the SAP university alliance, it is obvious that awareness of the importance of ERP systems in general is increasing in the Saudi HE sector.

7.3.3 Current situation of ERP evaluation in Saudi HE

The majority of Saudi universities which have implemented ERP systems have done so quite recently; therefore, they have not yet reached the evaluation phase. While a few others have been running such systems for sufficiently long to be able to evaluate them, there is no evidence that they have conducted such an evaluation, either of the systems that they are using or of the performance of their employees. At the end of 2012, there was no evidence of any formal evaluation method having been used. The researcher found that no comprehensive attempt had been made to evaluate stakeholders' experience in any of the case studies (KSU, KFU and KFUPM), although at KSU a questionnaire survey on the MADAR system was conducted by Soliman Al-hadef, but no result has been published yet. The only other evaluation discovered during the case studies was an online survey on the KFUof P&M website, measuring overall satisfaction with all ICT systems including ERP (for a copy of the survey, see the Appendix F). Having failed to find any other evidence to the contrary, the researcher concludes that up to the end of 2012, there had been no extensive ERP evaluation studies at Saudi universities and in particular no performance evaluation (KFU of P&M feedback, 2012).

In the absence of any such in-house evaluation, the discussion which follows is based on the quantitative and qualitative data presented in chapters 5 and 6.

7.4 Key Best Practice

7.4.1 Understanding resistance to change

ERP systems are known to suffer high failure rates for many reasons, one of the most important being employees' resistance to change (Hong and Kim, 2002). Zafar et al. (2006) offer two different definitions of employee resistance to change, as "behaviour which is intended to protect an individual from the effects of real or imagined change" and as "employee behaviour that seeks to challenge, disrupt or invert prevailing assumptions, discourses and power relations". Chawla and Kelloway (2004) identify two types of reasons for resistance to change: attitudinal and behavioural. For example, users' attitude may refer to the degree to which users hold positive views about the need for organisational change, as well as the degree to which they expect such changes to have positive implications for themselves and the organisation (Kwahk and Ahn, 2010). In contrast, Aladwani (2001) offers two fundamental reasons for users' resistance to change: perceived risk, which is a managerial issue, and users' habits. Thus, the attitudes of users can determine whether they decide to support or resist such a change.

However, while the human aspect has been given fair attention throughout the IS literature, resistance to change has not received the same level of attention in regard to ERP systems. It is essential to investigate the causes of resistance to change, whether these lie in the organisations concerned, their employees, the new systems themselves or indeed in all of these at the same time. The present research is notable in focusing on the importance of social environmental factors in determining ERP stakeholders' performance in the post-implementation phase. It has examined the impact of ERP systems on stakeholders' performance and productivity, on the understanding that when a new system is introduced, the organisation and its members will welcome or resist the associated change, which will generate either a positive or negative impact on users' performance.

The findings of the current research reveal four main categories of reasons for employees to resist such change in their organisations: employees' characteristics, additional responsibility, loss of authority and lack of preparation. Each of these is discussed below.

7.4.1.1 Employees' characteristics

All three case studies were of public sector universities, where dealing with employee resistance can be said to be more difficult than in the private sector, because of the difference in security of employment. Since private employees do not enjoy the enhanced job security of their public-sector counterparts, they will tend to be relatively strongly motivated to accept change, such as the use of a new system. The majority of employees in the case study universities, being employed in the public sector, considered their jobs to be secure. Indeed, all public employees in Saudi Arabia come under the umbrella of the Ministry of the Civil Service and as such are protected by a specific and strong regulation which stipulates that no government employees may be dismissed or have their salary withheld. This meant that the universities faced a real challenge when adopting new technology, especially among older employees, who were less strongly motivated to use new systems than other younger employees (Saudi Arabia of Minister of civil service, 2012).

7.4.1.2 Additional responsibility

Despite not being happy with the existing systems and considering them inadequate for their needs, users were still reluctant to change because of the degree of comfort they felt with the old systems and because they worried about having to assume extra responsibility or to work harder under the new system (Huq et al., 2006). In addition, employees may resist a new system because they do not want to abandon the familiarity gained by working with the legacy system for a long time, or because they are worried about the extra payments they may receive (Dent and Goldberg, 1999).

7.4.1.3 Loss of authority

The researcher also found loss of authority to be an important element of resistance to change, which accords with the finding of Huq et al. (2006) that loss of status or authority among employees can constitute a barrier to change. This is especially true in Saudi culture, where giving people more authority in the workplace can make them develop a superior attitude towards their co-workers. Therefore, the potential loss of this power is an important factor in employees’ resistance to change.

An extraordinary example was set by KSU managers, who adopted the successful solution of linking employees’ effective use of the ERP system with their promotion. They also tracked the operations carried out by each employee to discover which of them were using the system effectively. This policy helped to encourage employees to attend training sessions and to operate the new system effectively.

7.4.1.4 Lack of preparation

According to Kwahka and Lee (2008), it is essential to ensure that users are prepared for any change in their organisations. Gargeya and Brady (2005) agree that if users are not ready or willing to change, change will not succeed or simply will not occur. Hence, any organisation planning to change from one system to another should be prepared for a long process, going beyond a technical transfer, so that the technical and social planning phases should run in parallel. For instance, managers must be charged with the responsibility of encouraging, controlling and training employees to be prepared for the new system (Aladwani, 2001). In order to facilitate successful ERP implementation, organisations should have a capable and effective change management team responsible for introducing the changes and resolving any problems, including employee resistance, which requires a clear plan of user preparation before and during implementation (Aladwani, 2001). This opinion is supported by a study of a successful ERP implementation, in which Kim et al. (2005) found a lack of organizational change management expertise to be a critical barrier to implementation.

The above discussion of four main reasons for resistance to change offers a clear picture of the environment in which ERP implementation could take place, especially in Saudi Universities. It is obvious that universities it would be better of focusing narrowly on the technical aspects of the preparation phase while ignoring the human aspects. The situation is made even more difficult by the fact that the majority of employees are unfamiliar with the ERP concept; consequently, universities could run a clear and well organized programme of preparation for their users, in parallel with the technical preparation phase. In the research case studies, there is evidence that the choice of the ERP system came for Senior management decisions without through review of alternative choices. In Saudi's universities there is a high need for stakeholders' preparation and involvement before the implementation of the ERP systems, the aim of this involvement is to understand and enhance stakeholders' values, avoid resistance and increase implementation success.

7.4.2 Effective management support

A successful ERP implementation is possible and achievable only when the organization gives due consideration too many important points, one of which is the support offered by top management. Almudimigh et al. (2001) define this support as the "willingness of top management to provide the necessary resources and authority or power for project success".

Somers and Nelson (2004) also consider top management to be a crucial element in determining the success or failure of ERP implementation, while the technological capability of the project management team is one of the most widely cited critical success factors, according to Finney and Corbett (2007). A successful implementation is achievable only when high level managers have a strong commitment to the project. Finney and Corbett (2007) identify three vital aspects of management support: committed leadership at the top management level, the need for management to anticipate any glitches that might be encountered and finally the involvement of technically oriented senior managers in the strategic planning phase.

For other authors (Soja, 2006; Yusuf, 2004), the success of any ERP project depends on two parties, the first of which is the project team, whose members are specialist internal managers and staff who have vital knowledge of cross-functional business relationships and experience of the old internal system. This team is responsible for introducing ERP into the organization, in collaboration with the second party, comprising experts from the external outsourcing company, representing the system suppliers on site. These two parties should have a clear plan of cooperation between them to help the project go smoothly and successfully. Kim et al. (2005) argue that this is necessary to keep abreast of progress and make adjustments to the system and to processes within the organization as necessary to shape the implementation. Somers and Nelson (2004) suggest that senior project management representatives and ERP end-user steering committee members should be involved in ERP selection, the monitoring of implementation and the management of outside consultants.

It was widely perceived by the managers interviewed for all three case studies that these essential elements of the implementation phase were missing. The executive managers demanded more support from middle managers and project teams, while middle managers required more knowledge and training, since the majority of them were not familiar with the details of the new ERP systems. In practice, the skills and knowledge of the project team are important in providing expertise in areas where team members lack knowledge (Somers and Nelson, 2004). Based on the interview data, it is obvious that Saudi universities have tended to neglect a very important part of the transformation phase. According to Kim et al. (2005), any IT transformation requires a comprehensive approach towards the large-scale process and system changes associated with ERP implementation. In other words, without appropriate change or top management support, the enterprise may not be able to adapt to the new system and to realise the desired performance gains.

It was noticeable that managers at the Saudi universities studied had paid little attention to these significant factors during pre-implementation and implementation, which explained the high degree of employee resistance to the new systems in all three case studies. The problem was a large gap in the preparation phase, concerning the role that top management should play during implementation. Almudimigh et al. (2001) argue that an active top management is important to provide adequate resources, fast decisions and support for the acceptance of the project throughout the organisation. Furthermore, they contend that the top management must be involved in every step of ERP implementation. Finney and Corbett (2007) state that project management refers to on-going management of the implementation plan. Therefore, it involves not only the planning stage, but also the allocation of responsibilities to various players. Top managers' involvement in the various phases of implementation is important in developing and promoting a vision for the enterprise's IT infrastructure and the role of the ERP system (Kim et al., 2005).

To enable successful ERP implementation, Beheshti and Beheshti (2010) state that top management involvement is critical; many managers may be involved but not completely realize the scope of the project, yet such managers should play important roles as leaders and facilitators of change. Hence, inadequate top management commitment is considered a major reason for the failure of implementation (Ligus, 2009).

Secondary results from the interviews with project managers indicate that this is the most problematic area for ERP implementation in Saudi public universities. The case studies found that the purchase of an ERP system would bring a Saudi university into a complex implementation relationship with ERP itself and a system integration partner. A possible explanation for the lack of management support is that there was a gap between decision makers and managers, who should be involved in all steps, from comparing potential suppliers and choosing between them to the preparation and implementation phases. By encouraging such involvement, universities would help to explain and facilitate their new systems and to avoid any possible resistance from their employees, the end users.

7.4.3 Appropriate customisation

While the decision to implement an ERP system is an important one for any organisation, it is most important to ensure that the implementation is successful. The system should match the organisation’s needs and fit its task. A degree of fit is required between the ERP system and the organisational processes it supports. Such a fit can be achieved through reciprocal adaptation of the ERP system and of the organisation’s processes, otherwise referred to as customisation (Holsapple et al., 2005). Rothenberger and Srite (2009) define customisations as “building custom features by using standard programming language, changing the ERP code and or including third party packages that require some degree of programming to implement”.

While the concept of customisation as applied to ERP systems is not clearly defined (Giff, 2009), practitioners and researchers have attempted to explain the difference between customisation and standardisation (Rothenberger and Srite, 2009; Holsapple, et al., 2005). Customisation requires ERP software to be configured or modified to meet organisations’ needs, by setting parameters that allow it to modify the system within the boundaries set by the developers. In addition, customisation can mould an ERP package to fit existing business processing, while business process modification involves changing the business process to match the ERP package. Customization can be used to enhance the value of off-the-shelf software, letting the purchasing enterprise add value for its core competences. By contrast, standardisation requires the adopting organisation to adapt its work to fit the functionality of the ERP software. In other words, organisations can implement third-party packages that are designed to work with the ERP software and supplement its functionality.

According to Rothenberger and Srite (2009), some degree of system customisation is required in all ERP installations. Although packaged applications are designed to work in different organizations, or even in different industries, they often do not provide all of the functionality needed in specific business. Each organisation must choose between customisation and standardisation, according to the nature of its activities and needs. In the case of universities, each of which is a unique organisation with its own characteristics (see chapter 2), customisation would be the more efficient option to undertake. Indeed, each of the universities studied for this research was different in terms of the customisation it required, while their various relationships with the ERP vendors were determined by the vendor companies themselves, which were responsible for the package and service provided to each university.

In the case of KFUPM, its experience of customisation was noticeably straightforward, since the university already followed the American system, facilitating the transformation from its legacy system to the Oracle ERP system. The customisation process was based on the university's needs and the implementation agreement for the required customisation went very well, with the university planning to upgrade the systems after six months. KSU, for its part, had chosen to adopt a local system (MADAR) and the customisation process itself was configured and modified to meet the university's needs. KSU was planning to implement the system in all departments, based on their needs and requirements. The choice of a local company to supply the ERP software meant that it was cheaper than global competitors. Consequently, any configuration or modification requested by the university would be done by the vendor company. In contrast, the third case study found evidence of a misunderstanding between KFU and the vendor of its Oracle system regarding customisation: the vendor wanted to deliver the package as is, while the university demanded a high degree of customisation to meet its needs. This caused a gap between the functionality offered by the software package and that required by the adopting university. These varying experiences show that ERP vendors play an essential role during adoption and adaptation.

Beatty and Williams (2006) state that during the initial implementation of an ERP system, many organisations choose to customize the standard software modules to meet implementation dates and to match their unique business requirements. Although most organisations that implement ERP undertake some customisation of the vendor's basic product offering, many make the mistake of over-customising their application modules in an attempt to appease all members of their ERP upgrade project teams.

Since this research focuses on the human aspect of implementation, i.e. the ERP stakeholders, it is useful here to return to the recommendations reported in section

7.4.2 concerning the involvement of managers in all stages of the implementation, as well as the importance of planning and preparation. This idea is supported by Giff (2009), who states that the main challenge to ERP customisation is understanding the system itself, since the managers will need to consult experts on specific modules if customisation becomes complex. Park et al. (2007) report that users often ask for customisation when their tasks and business needs are different from those envisaged by the design of the standardized package; indeed, this explains why so many ERP installations fail, as consultants' technical knowhow and users' business knowledge sometimes collide during implementation. Therefore, organisations in general and universities in particular find that ERP customisation and the upgrading of systems to match individual universities' needs represent the most severe technological headaches (Beatty and Williams, 2006).

A comparison between responses of managers interviewed in the case studies reveals differences among the strategies and policies of three universities, which makes no sense and which exacerbates the above difficulties. All three are public universities, supported by the government, with the same scope. Stronger relations and a more effective collaboration between all Saudi universities would help them to exchange expertise and to apply similar ERP systems to meet their common requirements.

To conclude, vendors should meanwhile play a significant role in supporting universities' continual investment in their new systems, by upgrading, adding functionality, achieving a better fit between each university and its adopted system, and being aware of the university's strategic values. Therefore, vendor support should include extended technical assistance, emergency maintenance and updating. All of these factors and the reasons for them, discussed above, can be seen to be linked to training, which is examined in the following section, where it will be argued that with packaged software, special user training is an important factor during the post-implementation phase.

7.4.4 Intensive education/ training schedule

Choosing the right system is important, but most important is choosing a system capable of integrating the existing work applications and data archives to make migration easy for users, to reduce the costs associated with transferring data and to avoid interruption due to training (Lassila and Buchner, 1999). Thus, training plays a major role in ERP implementation and use, which generally requires major reengineering of the organisation (Bradley and Lee, 2007). Similarly, Umble et al. (2003) assert that because user understanding is so important, education and training are among the most widely recognised critical success factors. ERP implementation requires a critical mass of knowledge to help users solve problems. It is important for employees to understand how the system works; otherwise they may discover their own suboptimal ways of using those parts of system that they are able to operate.

In general, the literature reveals the importance of ERP system training. For example, Chien and Hu (2009) state that education and training constitute the essential process of providing managers and employees with an understanding of the logic and overall concept of the ERP system, which involves teaching many groups of users how to operate the system efficiently in their daily work activities. According to Zhang (2005), intensive training can give users a better understanding of how their work is related to that of other functional areas within the same organisation. Hence, any user who produces results should be held responsible for making the system perform to expectations.

Significantly, most of our knowledge about IT learning focuses on the efficacy of training or support during implementation (i.e. before the application becomes operational). In this phase, training is typically considered “preparation for use” and previous studies have shown that implementation training has a significant impact on ERP success (Chien and Hu, 2009). It is therefore regrettable that ERP training is often compressed because implementation projects are running out of time and money. Indeed, organisations tend to cut training costs when adopting expensive systems, resulting in negative user attitudes and low integration equilibrium. In the case of Saudi universities, which enjoy the support of the government and correspondingly generous budgets, discussed earlier in this chapter, time and money are not major concerns. Notwithstanding this comfortable financial position, however, this research shows that training is still a critical issue in Saudi universities.

A clear picture of the full benefits of ERP adoption cannot be recognized until end users are using their new systems properly. Since these are complicated software packages, sufficient training programmes will be required to enhance employees’ confidence and intention to use them effectively (Hsu et al., 2008). To make end user training successful, it should start at an early stage, preferably before the implementation phase begins (Umble et al., 2003).

Surprisingly, the preliminary results of the quantitative phase of the present research found training not to be one of the final significant factors. This may be because the questions on training were worded negatively. In contrast, the majority of interviewees emphasised the importance of training and referred to the need for continuous training on the new system to help them to do their work effectively.

Over the past decades, the human element has been found to play an important role in user satisfaction with IS, including ERP (e.g. Wu and Wang, 2007; Calisira and Calisir, 2004; Aladwani, 2003; Kelly et al., 2001; Mahmood, 2000; Doll et al; 2004; Norman et al., 2002; Somers et al., 2003), while a good number of studies have examined the importance of training as part of this human focus. The significance of the current research is that it focuses on the human element from a somewhat different angle, which is the impact of ERP system training users' performance. There is no doubt that the human element is a "profitable card" for any organisation to play in order to avoid implementation failure and it is believed that appropriate training programmes can strengthen employees' confidence in using a new system (Hsu et al., 2008).

Chien and Hu (2009) agree that training provides a great opportunity for end-users to learn about work flow. For example, almost any organisation may face the challenge of conflict or inconsistency between the new ERP system, its current work processes and its structure. Therefore, Chien and Hu (2009) argue that the training environment differs continually as ERP implementation changes the work environment. This pattern represents a challenge to ERP training, because employees may feel frustrated and resist using the system if they do not have experience of what is happing in the transaction. Consequently, research has identified inadequate training as a major factor contributing to the failure of ERP systems.

Interviewees with employees in all three case studies indicated a widespread belief that they had not received appropriate training in terms of how to use the ERP system and that they would prefer continuous training, since a continuous and effective training plan must be organised and executed so as to help users to obtain sufficient knowledge of the new system and its added functions.

Chien and Hu (2009) argue that formal training and regular review sessions are both important to ensure that managers and employees stay up to date with the new system and process changes. Examining the training schedules of the three universities gave the researcher a clear picture of the training provided. It was apparent that the universities had planned short sessions of training for their employees, which would not be sufficient for to them to understand the operation of the new ERP systems. Indeed, the universities offered training sessions of 2-3 days for end users and a maximum of one or two weeks for key users, which is not considered adequate, especially as the majority of trainees were unfamiliar with the ERP concept.

Unfortunately, managers often heavily underestimate the degree of education and training necessary to implement an ERP system as well as the associated costs. Top management must be totally committed to spending enough money on end user training and incorporate it as part of the ERP budget (Umble et al., 2003). Chien and Hu (2009) asserted that such an integrated, complicated and costly undertaking as the adoption of an ERP system requires a well-organized intensive training schedule for employees in various relevant skills. In addition, ERP training cannot be viewed as an event that occurs once and for all, since one of the most common reasons for failure is inadequate on-going training.

Case study data indicate that KSU employees felt the need for more intensive and continuous training, but the university did appear to have achieved progress in its training policy. Large numbers of users were trained in order to implement the system in various departments, largely through a “train the trainer” approach (see Appendix: D). There was now among the university’s staff a greater awareness of the ERP system and how it affected their work. At KFUPM, many key users were first trained separately in each department so that they could then train other end users. Key users were also involved in the implementation and their experience enabled them to be more effective during other subsequent system implementation projects. More benefits are likely to surface as users adapt to the system and learn more about its functionality (see Appendix: F). In contrast, KFU was found to be providing the same short sessions of training for all its employees. These training sessions were conducted by the company which provided the system and implemented it at the university (see Appendix: E).

To conclude, the human element should to be handled on two levels: first, employees must be trained in the use of the new system in order to incorporate it into their daily operations. The second level is educational exposure (Gargeya and Brady, 2005). There is a heavy responsibility on managers, who should know and understand the implications of the system and must come to a consensus on the changes that will take place in each university. If managers agree that change is necessary and possible, they can be charged with distributing this information to their support managers, whereas if they are not in agreement or fail to collaborate, then there will be no enthusiasm to buy and implement the system; indeed, there may even be active resistance. There is a serious need for planned, intensive and continuous training to help employees build their understanding of the system and to keep them up to date with any upgrade of the ERP system, which will play a significant role in their performance as well. According to Marshall et al. (2000), education and training are major tools to improve human performance and encourage better decision making. Finally, while improving ERP stakeholders' performance remains a primary goal for modern Saudi universities to increase competitiveness, analysis of the quantitative data has revealed that not all constructs of the final research framework proved to be significant in achieving such improvement. Despite the fact that training was not a significant factor based on the initial results, nearly all the interviewees believed that well planned intensive training would have a significant impact on their performance.

7.4.5 Better system quality

A number of IS/ERP researchers have addressed the impact of adopting new systems from various perspectives, including user satisfaction, organisational performance and technical performance, while the literature has rarely focused on the impact of ERP implementation on stakeholders' performance. Therefore, whatever aspect is chosen for study IS/ERP system evaluation should consider two dimensions: impact, representing the net benefits, and quality, representing the best surrogate measure of probable future impact (Gable et al., 2008). Subsequently, it is essential to adopt the appropriate method of evaluating the quality of the system. Ifinedo and Nahar (2007) refer to the performance characteristics of the ERP system, stating that system quality is concerned with issues relating to the ease of using and learning the system.

Employing stakeholders' performance in the evaluation of ERP system effectiveness is certainly well established in the literature. However, several elements prompt concern. A major dimension used in the IS/ERP literature is system quality, which consists of several factors describing the quality of the system. This research was designed to investigate the impact of system quality and service quality on stakeholder performance. Based on the integration of the D&M, TTF and EUCS models, the researcher chose the most widely used factors under the dimension of system quality (see chapter 3).

A finding of the primary research was that six of the 14 system quality factors were significant: content, timeliness, and authorisation, ease of use, flexibility and currency. As to the secondary research findings, while the majority of participants agreed that these factors all had a significant impact on their performance, when asked in the interview to rank them by order of importance their responses identified three of them as having the most important impact on stakeholders' performance: flexibility, ease of use and timeliness (see Appendix:B2). The following subsections discuss the six significant factors in turn, beginning with the three most important ones.

7.4.5.1 Flexibility

The flexibility of an ERP system in dealing with change in its environment is important, so any change in the degree of flexibility is certain to affect users' performance in time. Hence, the flexibility of certain system processes can be used as a surrogate to measure the level of stakeholders' performance. However, the literature has largely concentrated on the three aspects of flexibility mentioned earlier: user satisfaction, organisational performance and technical performance.

Gebauer and Lee (2008) describe flexibility as the "capacity of an information system to adapt and to support and enable organisational change", noting that it "has been linked to operational efficiency and to organisational nimbleness". More simply, Gong and Janssen (2010) define flexibility as the "ability to respond effectively to changing circumstances".

Gebauer and Schober (2006) distinguish between two types of flexibility, in relation to use and to change. Flexibility-to-use refers to the range of process activities that are built into an enterprise system and supported without requiring a major change to the system, from a user perspective. Flexibility-to-use manifests itself primarily in system scope, including functionality, underlying databases, user interfaces and processing capacity. In contrast, flexibility-to-change is conceptually related to IT infrastructure and is measured by the effort that is required to change a given enterprise system after its initial implementation.

The case study data reveal that both types of flexibility were important to the universities' stakeholders, but the ways in which participants viewed flexibility varied slightly: end users were pleased about the degree of flexibility they had in their daily work compared to the legacy systems, whereas managers (key users) were concerned with both types of flexibility and looked forward to upgrading the systems in the hope of achieving a higher degree of flexibility.

A number of researchers (e.g. Gebauer and Lee, 2008; Gebauer and Schober, 2006; Gong and Janssen, 2010) believe that to be effective and efficient, an enterprise system needs to be flexible, covering a certain range of functions and feature while allowing for variation over time. Insufficient flexibility will limit the usage and success of an ERP system by preventing its use in certain circumstances and by making exceptional handling necessary. In addition, insufficient flexibility can reduce the overall lifetime of a system.

To conclude, the stakeholders at Saudi universities found that the ERP systems implemented at their workplaces were flexible and felt that they had a significant impact on their performance. Moreover, the flexibility of these systems contributed to the more efficient performance of given work tasks and processes.

7.4.5.2 Ease of use

According to Ifinedo and Nahar (2007), system quality refers to the performance characteristics of an ERP system and is concerned with the ease with which it can be used and its use learned. Indeed, the models most widely used to assess IS/ERP systems have been used to examine the effects of the ease of use factor on user satisfaction critical success factors, and users' culture (D&M and EUCS) (e.g.

Smitha and Mentzerb, 2010; Petter and McLean, 2009; Wu and Wang, 2006; Agourram and Ingham, 2007; Rai et al., 2002; McGill and Hobbs, 2003; Zhang et al., 2005; Nelason and Somers, 2001; Somers et al., 2003; Torkzadeh and Doll, 1991) and on system acceptance (TAM) (e.g. Bueno and Salmeron, 2008; Gyampah, 2007; Venkatesh, 2003; Dishaw and Strong, 1999).

The present research considered ease of use to be an important element of system quality, evaluating its impact on stakeholders' performance. Both primary and secondary findings show it to be one of the most significant factors affecting users' productivity and performance. There is no doubt that ERP systems are complex, yet large numbers of participants found them easy to use. Before ERP implementation, employees of all three universities had long suffered from conflict between departments, difficulties in performing their tasks and lack of integration, which caused difficulties in communicating with other platforms. The results of the case studies show that the ease of use of the ERP systems adopted by the universities meant that stakeholders were able to work effectively and efficiently; in other words, it improved their working environment and helped them to process their transactions efficiently, thus improving their productivity.

7.4.5.3 Timeliness

The principal purposes of any organisation in implementing an ERP system are to improve stakeholders' productivity and to increase their work efficiency. By achieving these two elements, the organisation will improve its competitive position in the work environment. In order to do so, timeliness is considered an important factor in two different ways: accessing the information that the users need on time and helping users to do their work in a shorter time.

As discussed in the literature review, among the important benefits of ERP systems are saving time, reducing redundancy and developing improvement. Similarly to flexibility and ease of use, the effect of timeliness has been examined on user satisfaction (D&M and EUCS), organisational performance and technical performance (e.g. Zhang et al., 2005; Nelason and Somers, 2001; Somers et al., 2003; Torkzadeh and Doll, 1991). The present researcher found it essential to include timeliness in the framework, because it was able to provide a clear indication of stakeholder performance and productivity.

The results relating to timeliness show that employees at Saudi universities are aware of the importance of ERP systems and their role in helping them to perform their work effectively, accurately and on time. Moreover, stakeholders compared the time they spent completing tasks before and after ERP implementation. In this context, employees found that they were able to save time which they could then use to complete other tasks. Considering timeliness as a factor to evaluate the impact of ERP systems on stakeholders' performance in such unique organisations is an essential issue, as discussed in chapters 2 and 3.

7.4.5.4 Content

A major challenge in IS design is to provide sufficient information without overloading system users. Therefore, it is important that an ERP system should contain exactly the information that its users need to complete their tasks efficiently and effectively. Content includes the provision of precise information and the production of final reports. Interestingly, different aspects of content have been widely discussed in the literature; i.e. user satisfaction and the evaluation of ERP system performance. It is also a feature of one of the important IS models, namely EUCS. The current research has considered the content factor by integrating EUCS with D&M and TTF in terms of focusing on stakeholder performance and productivity. Based on the primary and secondary results, a wide range of participants found their ERP systems to be providing employees with just sufficient information to do their work.

7.4.5.5 Authorisation

Another essential consideration in ERP evaluation is authorisation. In the ERP environment, this concept may take on a meaning different from that in other workplace environments, referring to users' ability to access data or to the availability of useful data.

Based on the interview results, loss of authority was one of the causes of employee resistance to ERP implementation. Some managers who believed in manual or semi-manual working were afraid of losing their authority with automation. Nonetheless, normal employees (end users) found in the new system an authority which they had not enjoyed in the past, because the adoption of an ERP system meant that work was no longer centralised.

Previous studies have considered various aspects of authorisation; for example, researchers have used the TTF model to study its effect on user satisfaction [REF]. However, the present researcher found it more appropriate to consider authorisation as a factor to measure the impact of the ERP system, in terms of the automation of all functions and transactions at the three universities.

It was widely perceived by the majority of participants that authorisation was satisfactory within the ERP systems. In other words, it was easy for them to access the data required to do their jobs, which had not been available before ERP implementation. Authorisation was found to be a significant factor, because easy access would reduce the time and effort needed to complete the work, compared with having to request permission to gain access to the necessary information. By saving time and effort in this way, ERP would certainly have a positive impact on stakeholder performance, while having the authority to access data would enhance employees' productivity.

7.4.5.6 Currency

The final significant factor in system quality is currency or recency (Bailey and Pearson, 1983), which refers to up-to-date information being provided by the ERP system; it is important that the system should provide the latest information relevant to the work process in question. The literature reports a large number of studies of currency in IS/ERP, ranging widely across aspects including user satisfaction and the evaluation of ERP system performance. It has also been used in two of the important IS model, namely TTF and D&M (e.g. Strong and Volkoff, 2010; Smitha and Mentzerb, 2010; Zigurs and Bukland1998; Goodhue and Thompson, 1995)

Considering ERP stakeholders' performance in universities is a new development in that its focus is the impact of the system on stakeholders in this particular environment. The results of this research reveal that employees believed that their ERP systems were providing data suitable for their purposes. Moreover, the degree of currency in ERP system environment met their needs and had a significant impact.

7.4.5.7 Section summary

University stakeholders were found to believe that the above six factors could help them to fulfil the needs and requirements of their work and that they certainly improved their performance. The findings of this research are consistent with those reported in the literature in terms of the importance of considering system quality in ERP evaluation, while it has also produced significant new insight that will be of benefit to practitioners and academics by its focus on stakeholder performance. It is easy to see and feel the benefits of ERP adoption by determining and evaluating such factors, related to process productivity and to the impact on stakeholder performance.

It is notable, however, that eight of the fourteen system quality factors originally considered were not found to be significant. Three facts may contribute to explaining their absence from the analysis: first, the universities studied were all pioneers, being among the first Saudi universities to implement ERP systems; secondly, the majority of stakeholders had relatively little knowledge of the concepts underlying ERP systems; finally, they lacked technical experience.

7.4.6 Better service quality

The final important dimension to be considered when evaluating an IS/ERP system is service quality, because it is a key dimension in determining the success or failure of such a system (Deshmukh and Vrat, 2004). Therefore, researchers have recognized the importance of service quality and the effects it may have on IS users. Indeed, some have called for more research to measure service quality (Chang and King, 2005). Petter et al. (2008) define service quality as “the quality of the support that system users receive from the IS department and IT support personnel”.

Deshmukh and Vrat (2004) conducted a review of 19 different service quality models, all of which focused on user satisfaction with service quality, the value of service quality, or the perceived value of IS. Many other researchers have emphasised the importance of service quality and its possible effects on various outcome measures. For instance, Ray et al. (2005) argue that a flexible IS infrastructure has a major role in facilitating rapid development and implementation of IS applications that enhance customer service processes by allowing the organisation to respond quickly to take advantage of merging opportunities or to neutralize competitive threats.

However, despite the importance of service quality and its effect on system users, there is limited reference to it in the research literature and it has been included in few frameworks. Indeed, none of the original models which the researcher has integrated into the current study considers service quality as one of its dimensions. The model of DeLone and McLean (1992), for example, which is the most widely cited in IS studies, does not take account of service quality. Several researchers have subsequently attempted to test and modify the D&M model and others have called for its further development and validation. The contribution of Pitt et al. (1995) was to modify the model to include service quality as a measure of IS success, arguing that it needed to be expanded to reflect the service role of IS department. In addition, Myers et al. (1997) highlight the importance of service quality at the organisational level, to provide customers with high quality.

While the few studies of IS service quality reported in the literature focus on a number of different aspects, including user satisfaction and measuring system performance, the present study makes a novel contribution by attempting to evaluate the impact of service quality on stakeholder performance in the ERP environment. It does so by treating service quality as a dimension which consists of four factors: reliability, assurance, tangibility and responsiveness. Two of these, responsiveness and reliability, were found to be significant. The primary results are consistent with the secondary results in terms of the importance of service quality and its effect on performance.

The majority of interviewees emphasised two aspects of their perceptions of service quality. First, stakeholders felt that it was important for the system they were using to be dependable and trustworthy, so that they could complete their tasks and improve their productivity. The second point was their willingness to provide a timely service, thus indicating that timeliness provides a significant connection between system quality and service quality.

The findings of this research are consistent with the literature in terms of the importance of service quality, while the novel contribution made by including service quality in the model is to demonstrate that it has a significant impact on stakeholder performance, in addition to the essential role played by effective and efficient service quality in increasing productivity.

The analysis presented in chapters 5 and 6, as well as in the above discussion, allows conclusions to be drawn as to the factors which have a significant impact on the performance of ERP stakeholders. Both the system quality and service quality dimensions have been identified in many studies reported in the literature, which focus on different aspects, perspectives and ERP implementation phases, although the role of management has only been identified in studies of the implementation phase. The results of the present research show that factors from the pre-implementation phase, the implementation phase (see Figure 7.2, Management Quality dimension) and the post-implementation phase (see Figure 7.2, System Quality and Service Quality dimensions) had a direct impact on stakeholders' performance. In ERP implementation, each phase has a direct impact on the following phase; in other words, all phases are linked and interconnected. Therefore, organisations in general and higher education institutions in particular should focus on all the early stages and the implementation phases if they wish to achieve high stakeholder performance.

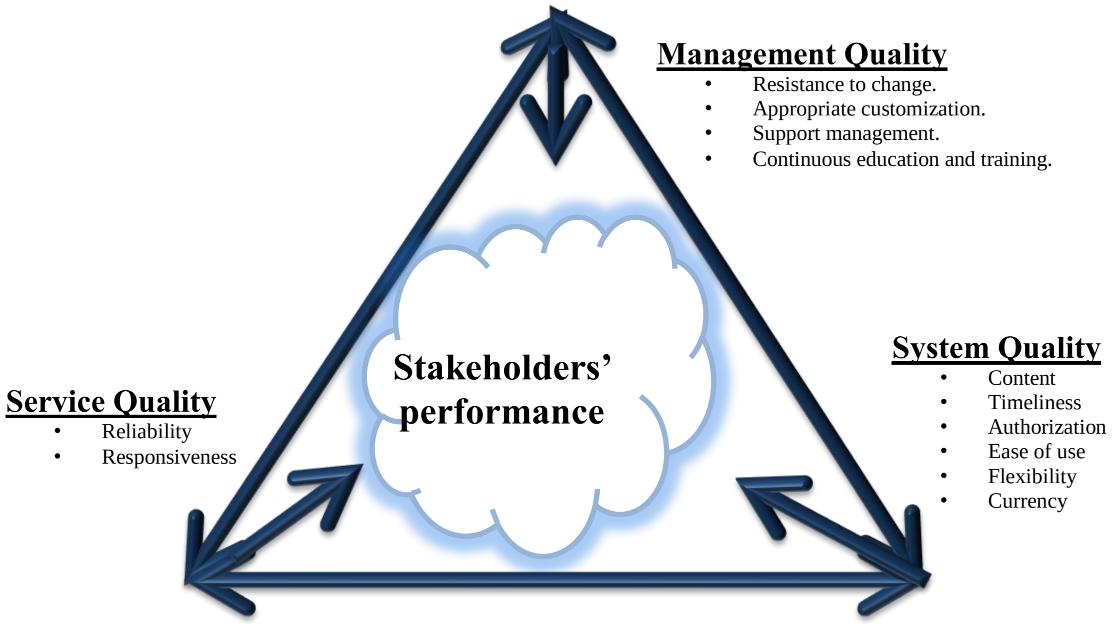


Figure 7.2: ERP system Impact on Stakeholders' Performance Model

7.5 Summary

The successful integration of three well known IS models (D&M, TTF and EUCS) and the selection of the most suitable factors to evaluate the impact of ERP systems on stakeholders performance in three Saudi universities has shown that adopting any one of the models separately would not have been sufficient for the purpose of this research.

In addition, the use of mixed methods of data collection and analysis helped the researcher to understand and present clearly the findings of the first phase of this research. There was an obvious consistency between the quantitative and qualitative data. However, each case has been analysed separately and the results have proven the significance of the quantitative findings in respect of most of the hypotheses tested.

The final chapter will compare the findings of the present research with those reported in the relevant IS literature. It will also identify the limitations of the research and highlight its main contributions, ending with suggestions for future studies.

CHAPTER EIGHT

CONCLUSIONS

PAGE

8.1 Overview

This chapter draws conclusions from the study findings, offering an understanding of the impact of ERP systems on stakeholders in Saudi universities in the context of past and future research. It begins by summarizing the research and its findings, outlining the main theme and rationale of each chapter of this thesis. Thereafter, the research contributions are discussed under three headings: contributions to methodology, to theory and to practice. The limitations of the research approach are then considered, followed by suggestions for significant future research avenues that might provide further developments in this important area of research.

8.2 Research Overview and Summary

The aim of this research was to develop the best possible framework to evaluate the impact of ERP systems on stakeholders' performance, in the specific context of Saudi Arabian higher education. To summarise the structure and conduct of the research, this section reviews the seven previous chapters of the thesis in turn under four main headings: setting the research aim and position; evaluating the current literature and designing the theoretical framework of the research; selecting the research philosophy and data gathering techniques to be adopted; and finally, conducting the empirical studies. Decisions about each of these steps in the research were taken on the basis of gaps identified in the literature, as well as the objectives and scope of the present study.

8.2.1 Research aim and position

Chapter 1 of this thesis introduced the field of interest and highlighted the aspects most closely related to the specific research area. It explained the importance of ERP systems in general and in higher education in particular. While a broad body of literature was identified as dealing with the implementation of such systems, indicating their importance, it was noted that few such studies had considered their adoption in the higher education sector (Rabaa'i, 2009). Since the government of Saudi Arabia has allocated a large part of its budget to investment in HE, most Saudi universities are tending to adopt the latest technology to improve their educational processes and productivity. Therefore, there is a serious need to investigate the impact of such new systems on stakeholders at these universities. Chapter 1 thus stated the aims of the research as being to highlight the impact of ERP systems on the performance of an academic institution and to provide researchers, practitioners and decision-makers with a framework to enhance their evaluation of the performance of ERP system stakeholders in higher education.

In order to position this research in relation to the existing literature, **chapter 2** provided a critical overview of the current literature in the five research areas on which this research touches: ERP systems, evaluation, stakeholders, performance and HE. This was found to link the performance of such systems with stakeholders' satisfaction as a central element of ERP literature. Saudi universities were identified as interesting cases relevant to this research, for a reason explained in chapter 3: that the impact of ERP systems on stakeholders' performance at Saudi universities had not been investigated by previous studies.

8.2.2 Literature review and theoretical framework

Chapter 3 further evaluated the literature reviewed in chapter 2, selecting three of the existing models discussed there, namely D&M, TTF and EUCS. It identified each of these models separately, and then reviewed the previous studies which had applied them in the context of ERP adoption. Based on the evaluation of these models and a consideration of factors counting for and against their use in the current research, the researcher decided to combine them, selecting the most suitable factors from each to evaluate the performance of ERP stakeholders. The choice of factors was supported by reference to the reports in the literature of their use to investigate different aspects of IS/ERP studies.

An initial theoretical framework was then developed, comprising three sets of factors corresponding to the dimensions of performance impact, system quality and service quality. From this were developed the research hypotheses and the dependent and independent variables. A shortcoming was also identified in considering stakeholders' performance evaluation, more specifically in the HE context; gaps in the field were highlighted in chapter 3, which helped to identify methodological and technical limitations in the research area under investigation.

8.2.3 Research philosophy and methods

Chapter 4 forms the methodological basis of this research, identifying the ontological, epistemological and theoretical foundations of the positivist paradigm. It justified the choice of this particular research philosophy as inspired by Yin's (2009; 2012) case study approach to understanding social phenomena. Chapter 4 also explained the sources used in this research, emphasising the reasons for using triangulation and mixed qualitative and quantitative data gathering techniques. It identified the sampling frame as three cases of ERP implementation in HE and the unit of analysis as the performance of the systems' stakeholders, explaining that this sampling frame was chosen because of the increasing implementation of ERP systems in Saudi universities.

8.2.4 Empirical work

Moving from the conceptual to the empirical, the hypotheses were tested in three case studies of Saudi universities (KSU, KFU and KFUPM), adopting the mixed-method approach, where a quantitative phase was followed by a qualitative one.

8.2.4.1 *Quantitative phase*

Chapter 5 reports the use of a questionnaire to gather quantitative data. The phase was divided into three steps: first analysing each case separately, then conducting a statistical comparison of the three sets of results and finally considering the data from all three together to assess the impact on performance in general.

8.2.4.2 *Qualitative phase*

The qualitative phase of data collection, where managers and employees were interviewed individually, was reported in **chapter 6** of this thesis, followed by an in-depth analysis, following the same three steps as in chapter 5.

Chapter 7 provided an in-depth discussion of the results of the two phases, taking account of how the mixed-method data collection and analysis related to the theoretical framework. The chapter ended with a proposed model for the evaluation of ERP stakeholders' performance.

8.3 Findings

The integrated research theoretical framework suggested by this research was found to be appropriate for evaluating the impact of ERP systems on stakeholders' performance in the context of Saudi universities. The stakeholders in question were identified as administrative employees and managers at KSU, KFU and KFUPM, using ERP systems in their daily work.

The mixed-method approach to data collection and analysis was found to be valuable, because it gave the researcher the opportunity to conduct the case studies in greater depth and to achieve a fuller understanding than would have been possible with any single method. The questionnaire proved to be a suitable technique to elicit initial general data about the quality of ERP systems in Saudi universities and the service provided during the post-implementation phase.

It was found that factors of system quality (flexibility, timeliness, ease of use, content, authorisation, currency) and service quality (responsiveness and reliability) had significant positive effects on stakeholders' performance and productivity. Consistent with published studies, these results prove that both system and service quality are important dimensions to be considered for the evaluation of ERP systems from the stakeholders' perspective.

Interestingly, the qualitative phase of the research can be seen to have added credibility to the findings. The interviews and documentary analysis were useful to supplement the questionnaire findings with more in-depth data. The factors identified during this qualitative phase (understanding resistance to change, effective management support, appropriate customisation, intensive education and training schedule) also had significant and positive effects on stakeholders' performance, from the management point of view. The interviews focused on managers rather than users, to deepen the understanding of these factors. The qualitative findings play a vital role in making the final model more comprehensive by adding the management dimension to those of system and service quality.

The research findings show the great importance of integrating all three dimensions throughout implementation, since all implementation phases are affected by each other, from planning to post-implementation.

8.4 Contributions

The contributions made by this research are various, in the theoretical, practical and methodological spheres. This thesis adds value to research and practice communities concerned with ERP systems, higher education, evaluation and public organisations.

Before the remainder of this section details the most important contributions of the study to theory, practice and methodology, Table 8.1 shows how it meets the objectives established in chapter 1 (section 1.3). The accomplishment of these objectives was made possible by the integration of three IS models and developing a framework for the evaluation of ERP stakeholders' performance.

Table 8.1: Accomplishment of research objectives

Research Objectives	Accomplishment
1: To review existing evaluation frameworks for ERP systems in order to assess the methods used to measure ERP systems.	Achieved in ***chapter 2*** through a thorough review of ERP evaluation methods.
2: To identify the most successful method applicable to evaluate the performance of ERP stakeholders.	Achieved in ***chapter 3*** with the identification of three IS models: D&M, TTF and EUCS.
3: To develop a suitable theoretical framework to evaluate the performance of ERP systems in HE in Saudi Arabia, from the perspective of their stakeholders.	Achieved in ***chapter 3*** by developing a theoretical framework based on the integration of the three IS models.
4: To collect and analyse case study data in order to test the theoretical framework.	Achieved by taking the mixed-method approach as reported in ***chapters 5 and 6***, using a questionnaire and interviews, supported with documentary and archival material, to evaluate the impact of ERP systems in three case studies in Saudi HE (KSU, KFU and KFUPM).
5: To identify the main factors having a significant impact on the performance of ERP stakeholders in higher education.	Achieved in ***chapter 7*** by finalising the framework based on the qualitative and quantitative data. The researcher also identified the specific needs and requirements for ERP implementation in Saudi HE.

Source: Originated by the researcher

8.4.1 Contribution to methodology

8.4.1.1 *An integrated IS framework to assess ERP systems in public higher education*

The main methodological contribution of this research has been the use of the case study strategy to explore the use of ERP systems in multiple organisations in the public HE sector. As explained in chapters 2 and 3, the majority of ERP studies have been set in manufacturing or service industries and in the private sector. Conducting case studies of the impact on stakeholders' performance of ERP systems in the public sector is challenging, as is the adoption of a mixed-method approach in such cases, due to the regulations restricting public sector organisations and the difficulty in accessing the data.

A further major contribution is to have conducted this research in a developing Middle Eastern country, namely Saudi Arabia, considering the general shortage of ERP studies set in public sector organisations and of all ERP studies set in this region, applying to both public and private sectors.

The following subsections evaluate the methodological approach taken here by considering in turn three factors recommended by Yin (2012: 171-176) for the evaluation of case studies, to prove the quality of the research approach.

8.4.1.2 *Defining the case*

The initial design of a case study evaluation must be based on a comprehensive understanding of the activity being evaluated, which may be considered the intended operation and outcomes of a 'case', giving explicit attention to contextual conditions. Here, each of the three case studies was reported separately in chapters 5 and 6, with an analysis of the data being followed by the findings. In each case there was a description of the university and of the ERP system it had adopted, a note of the date of implementation and a list of the departments which had implemented the system in question.

8.4.1.3 *Data collection procedures*

Case study evaluations tend to rely on a variety of sources, including some combination of fieldwork, participant observation, and questionnaire-based surveys of such groups as service personnel or neighbourhood residents, and social indicators. The mixed methods used in the present research were found to be valuable in exploring all aspects of the situations encountered in the case studies. The data were collected from the following sources: a questionnaire, interviews, documentation and archives.

8.4.1.4 *Data analysis procedures*

Data collection and analysis in case studies are likely to occur in an intermixed fashion. The successful case study researcher is likely to be a diligent investigator who understands the objective of the inquiry and can identify relevant evidence, even though specific sources may differ. He or she should thoroughly document the methodological steps taken to assure an unbiased data collection procedure, despite this variation. The present thesis details all stages of data collection and analysis in chapter 4.

8.4.2 Contribution to theory

The contribution of the current research to theory is manifold. The key contributions can be summarized as: (1) the integration of three widely used IS models to evaluate ERP systems from the stakeholders' perspective; (2) the development of a theoretical framework for evaluating stakeholder performance in the context of ERP systems; (3) interrelating the two phases of ERP implementation when evaluating the impact of systems. These contributions are dealt with in turn in the following subsections.

8.4.2.1 *Integration of three widely used IS models*

The main theoretical contribution of this thesis is to fulfil the need, identified in chapter 1, section 1.5, to develop a systematic method to evaluate stakeholders' performance. The first step was to investigate previous studies, which revealed the lack of a suitable existing model to evaluate the impact of ERP systems on stakeholders' performance. As the best of these models (D&M, TTF and EUCS) were found to be inadequate when used separately, the researcher chose to integrate them for the purpose of the present study. While the IS/ERP literature shows that researchers have sometimes combined one of these models with another, such as TTF with TAM, this research has shown that the integration of all three models improved significantly the ability to evaluate the performance of ERP stakeholders.

8.4.2.2 *Development of a framework for evaluating ERP stakeholder performance*

When integrating the three models, the researcher used the results of earlier studies to choose the most suitable factors for evaluating stakeholders' performance. This required the building of a theoretical framework to test the hypotheses that there are relationships between the quality of an ERP system, its service quality and stakeholders' performance.

8.4.2.3 *Interrelating two phases of ERP implementation*

This research contributes to the understanding of the drivers of ERP systems. It has succeeded in developing a model that enriches current research by offering specification and justification of a set of interrelationships between two important phases of ERP implementation (implementation itself and post-implementation), which have tended in the past to be the subject of separate research. By examining the association between these different phases, this research emphasises the role of management, in addition to ERP system quality and service quality.

There are three main aspects of the contribution related to the interrelation between the two phases of implementation, concerning linkage or integration, involvement and sustainability.

8.4.2.3.1 *Linkage or integration*

The model developed here covers three important dimensions (administration, technical and service/technical support) which must be considered together, not separately, if successful implementation is to be assured, and which will have a positive impact on employees' performance.

This research has proven that administrative work processes should be integrated. The integration between decision makers, executive managers, key users and end users, throughout the implementation phase, will have a positive impact on the success of the ERP system in the post-implementation phase. The current research model, by considering the pre-implementation phase to be a critical success factor, having a significant impact on stakeholder performance, has achieved the goal of integration. Hence, the developed model supports the rejection of solitary managerial decisions. Starting from this point, it supports a high level of involvement throughout implementation, as explained in the next subsection.

8.4.2.3.2 *Involvement*

Several studies reported in the literature emphasise the importance of involving key users in the implementation phase. The model developed here proves that the degree of user involvement during implementation plays an essential role in enhancing employees' understanding, acceptance and efficiency in respect of the new system. The researcher believes that the ERP stakeholders' performance model show users' involvement to be as important as system and service quality.

Furthermore, the value of the involvement of top managers, key users and users in implementation is enhanced by creating good understanding, support, experience and awareness using the new system, thus reducing the likelihood of employee resistance.

8.4.2.3.3 *Sustainability*

It is crucial for the developed model to be sustainable and to operate continuously, since the evaluation process is supposed to be based on the organisations' current policy. The findings of the present research relevant to sustainability concern two distinct areas: continuous education and training, and ongoing technical support.

Both quantitative and qualitative results show that education and training are crucial factors. In the studies reported in the literature, training has been considered under different dimensions, such as service quality, system quality and CSFs. While educational and training can be seen as separate elements, both should be continuous. Thus, the developed model considers education and training to cover both the implementation and post-implementation phases in a sustained way.

Education: Throughout the pre-implementation and implementation phases, educational courses for users are necessary and should be compulsory, since the majority of users are not even aware of the concepts behind ERP systems. Such educational courses should be considered the first step in users' involvement, helping them to understand these concepts, to make the systems more user-friendly, to reduce user resistance and prepare them for the next step.

Training: ERP systems are often described as complex, difficult and rapidly developing; therefore, continuous training is essential. In addition, it is normal for any organisation which has implemented such a system to consider upgrading it, making ongoing training very important to improve users' skills, to keep them up to date with the system and to enhance their ability and productivity. In short, continuous education and training will provide users with the knowledge they need.

Technical support: The relationships between the dimensions or constructs of management, system and service are highly important to show the interdependencies between ERP implementation and post-implementation performance. The dimension of service quality in the developed model is considered essential for the implementation of any system, because without continuous technical support, system success is not possible; the technical support team should provide the organisation with a high degree of continuous service. Therefore, the members of the technical support team themselves should have focused training courses in the early stages of implementation, in addition to their other two roles: helping users to solve any problems or difficulties they may face in their work and providing training courses for these users. Thus, by including the need to 'train the trainer', the developed model will provide users with continuous service and training at the same time.

8.4.3 Contributions to policy and practice

This research makes a unique contribution to practice through the rich knowledge and experience it supplies to HE rectors, decision-makers, executives, ERP practitioners, key users and end users. In addition, the current research has practical implications for the way in which ERP might enhance stakeholders' performance and thereby increase their productivity, as the developed model is comprehensive, covering all organisational levels: management, technical and service. It offers insight to organisations, clearly identifying steps which will ensure a high degree of success in ERP planning and implementation and yield significant stakeholder performance in the post-implementation phase. Therefore, for Saudi universities which plan to implement an ERP system or have already chosen a supplier and signed a contract (see chapter 7section73.1), the developed model adds value to the implementation phase and provides significant assistance in building and managing a well planned and strategic ERP implementation.

In addition, it helps vendors of ERP systems to cooperate with client organisations in terms of providing a clear offer of customisation matching their needs and continuous education and training for employees.

Universities, as discussed in chapter 2, are considered ‘unique’ organisations (Pollock and Cornford, 2004; Lockwood, 1985). Nonetheless, as well as differences, there are some similarities between universities and business organisations, which include complexity of purpose, limited measurability of output, autonomy from and dependency on wider society, diffuse structure of authority and internal fragmentation. Organisations in general may have one or more of these characteristics or components; it is the particular combination of the components within universities that make them unique.

In addition, universities in Saudi Arabia, as public organisations, may be seen as unique because universities in the public sector have different characteristics from those in the private sector (as discussed in chapter 7, sections 7.2.1 and 7.2.2). For instance, the rectors of all Saudi universities are appointed by royal decree on the recommendation of the minister of HE. Each rector is responsible for his university’s financial, academic, administrative and student affairs. However, the government, because it is the main source of income, must approve any long-term project and it constrains all strategic direction and major decisions .

To conclude, there is a need to identify carefully and clearly the needs of universities vis-à-vis ERP systems so that the vendors can provide the right components that will match their needs and satisfy the users by increasing their performance and productivity. Finally, the model developed here is intended to inspire ERP system developers to identify and meet the exact needs and intentions of client organisations according to their different roles, taking into consideration government policy and organisational context.

The following table 8.2: shows the contribution of this research to the literature of ERP systems evaluation from the stakeholders' perspective. This table is based on the summary of research limitations as they have been presented at the end of chapter (section 2.10).

Table 8.2: Theoretical contributions of this research

Research area	Existing research	Contribution of this research
ERP systems evaluation	Technology performance, financial, and satisfaction driven	Evaluating the stakeholders performance
ERP systems implementation	Focused on implementation phase and critical success factors	Evaluate the impact of ERP systems on stakeholders' performance in the post implementation phase.
Organisation / Sector	The existing research focus on the private and service sector	This research focus on the public sector in one of the developing countries (Saudi Arabia)
ERP systems in higher education	The existing literature focus on the ERP system in higher education from the technical and the implementation phase.	This research focus on the impact of ERP systems on stakeholders' performance and productivity.
ERP systems in higher education in Saudi Arabia	No literature available / found	To the day of conducting this research, research which considers evaluating the ERP system from stakeholders' perspective has not been focus on.
Integrated three models	The existing literature adopted the D&M, TTF, and EUCS models separately or integrated two models for different purpose.	This research integrated the D&M, TTF, and EUCS models for the purpose of evaluating stakeholders' performance in higher education context.

Source: Originated by the researcher

8.5 Limitations of the research

There are number of limitations in the current research that should be recognised. These can be summarised as follows:

- It focuses on the ERP post-implementation phase.
- Saudi universities which have implemented ERP systems need a sufficient period of time for them to be evaluated.

- All Saudi universities are in the public sector; therefore, the transferability of the findings and their implications will be limited by contextual idiosyncrasies related to developing counties, the Arab region and the Saudi public sector.
- No attempt was made to ensure gender balance; therefore, the research sample was more male than female, due to the policy of Saudi universities to have separate campuses for males and females. The empirical work was mainly conducted on male campuses.

8.6 Recommendations for practice

Based on the findings of this research, the following recommendations are made to help practitioners and managers avoid negative reactions to ERP implementation.

The Ministry of Higher Education should standardise ERP systems in all Saudi universities. It should customise one selected ERP system to match the government's higher education policy, thus saving money and time, ensuring better communication among Saudi universities and between them and the Ministry. If there were such an ERP system, customised to make it suitable for all Saudi universities, there would be no need to make serious changes unless these were fully justified. This would allow Saudi universities to have better communication amongst themselves and exchange experience to support the educational process in Saudi Arabia. Such a sharing of experience among universities would allow them to emphasise the positive aspects of ERP adoption and to reduce the likelihood of negative issues arising.

On the broader scale of the introduction of electronic government, the Ministry of Civil Service should consider the IT systems used by public bodies when making any changes to its central system. This would help to address the more general problem of poor linkage among organisations in the public sector.

8.7 Future Research

An important issue related to the contribution of this research is how the results may prove useful in other research contexts. In addition to the significant contributions outlined above, the current research also provides some important directions for future research in order to continue developing this vital research domain.

- It is important for future researchers to be able use the conclusions of this piece of research, but in different contexts, with different samples and methods of data collection and analysis.
- It would be useful for similar future research during the maturity phase to include all stakeholders in the universities.
- Future research should test the applicability of the model of ERP impact on stakeholders' performance in other public sector organisations.

Abreu, A. and Conrath, D. (1993) ‘The role of stakeholders’ expectations in predicting information systems implementation outcome’, *Proceeding SIGCPR '93 Proceedings of the 1993 conference on Computer personnel research*, pp. 408-415.

Abugabah, A., Sanzongni, L. and Poropat, A. (2009a) ‘The Impact of Information systems on user performance: A critical review and theoretical model’, *International Conference on Information Systems (ICIS), WASET*, pp. 809-819.

Abugabah, A., Sanzongni, L. and Poropat, A. (2009b) ‘Enterprise Resource Planning Systems (ERP) and User Performance: A literature Review’, *20th Australian Conference on information system*, 2-4- Dec 2009, Melbourne, pp. 820-829.

Abugabah, A., Sanzongni, L. and Poropat, A. (2010) ‘Information Systems Models: A Synthesized Validated Model for Measuring Information Systems Impacts on End User Performance’, *Information Society (I-Society)* 28-30 June 2010, pp. 230 - 237.

Adelakun, O. and Jennex, M. (2002) ‘Stakeholder Process Approach to Information System Evaluation’, *Eighth Americas Conference on Information Systems*, pp. 1186-1195**.**

Ahmed, Z., Zabib, I. and Arokiasamy, S. (2006) ‘Resistance to change and implementation success: the moderating role of change management initiatives’, *Asian Academy of Management Journal*, 11 (2), pp.1-17.

Agourram, H. and Ingham, J. (2007) ‘The impact of national culture on the meaning of information system success at the user level’, *Journal of Enterprise Information Management*, 20 (6), pp. 641-656.

Aladwani, A. M. (2001) ‘Change management strategies for successful ERP implementation’, *Business Process Management Journal*, 7 (3), pp.266 -275.

Aladwani, A. (2002) ‘An Empirical Examination of the Role of Social Integration in System Development Projects’, *Information Science Journal*, 12 (4), pp. 339-353.

Aladwani, A. (2003) ‘Key Internet characteristics and e-commerce issues in Arab countries’, *Information Technology & People*, 16 (1), pp. 9-20.

Al- Hossan, A. and Al- Mudimigh, A. (2011) ‘Practical Guidelines for Successful ERP Testing’, *Journal of Theoretical and Applied Information Technology*, 25, pp. 1-15.

Allen, D., Kern,T. and Havenhand, M. (2002) 'ERP critical success factors: an exploration of contextual factors in public sector institutions', *35th Hawaii International conference on systems sciences*, pp. 1-10.

Al-Mashari, M., Al-Mudimigh, A. and Zairi, M. (2003) 'Enterprise resource planning: A taxonomy of critical factors', *European Journal of Operational Research*, 146, pp. 352-364.

Al-Mashari, M. (2002) 'Enterprise resource planning (ERP) systems: a research agenda', *Industrial Management & Data Systems*, 102 (3), pp.165 - 170.

Al-Mashari, M. (2001) 'ERP software implementation: an integrative framework', *European Journal of Information Systems*, 10 (4), pp.216-226.

Al-Mashari, M., Zairi, M. and Okazawa, K. (2006) 'Enterprise resource planning (ERP) implementation: a useful road map', *International Journal of Management and Enterprise Development*, 3 (1/2) pp.169-180.

Al-Mudimigh, A., Zairi, M. and Al-Mashari, M. (2001) 'ERP software implementation: an integrative framework', *European Journal of Information Systems*, 10, pp. 216-226.

Al-Mudimigh, A. and Ullah, Z. (2011) 'Integration and communication to prevent dirty data: The role of MADAR projects', *Journal of Information*, (ISI Indexed).

Al-Mudimigh, A., Ullah, Z., Saleem, F. and Al-Aboud, F. (2009) 'Data mining for customer queries in ERP model – a case study', *Fifth International Joint Conference on INC, IMS and IDC*, pp.2000-2005.

Al-Mudimigh, A., Saleem, F. and Ullah, Z. (2009) 'Developing and integrated data mining environment in ERP-CRM model –a case study of MADAR', *International journal of education and information technologies*, 3 (2), pp.135-144.

Al-shamlan, H. and Al-Mudimigh, A. (2011) 'The change management strategies and processes for successful ERP implementation: A case study of MADAR' International *Journal of Computer Science*, 8, pp. 20-30.

Al-turki, U., Duffuaa, S. and Demiral, T. (2008) 'Stakeholders integration in higher education: supply chain approach', *European journal engineering education*, 33 (2), pp. 211-129.

Alyassen, H., Eldabi, T., Paul, R.J. and Haddadeh, R. (2008) 'Post implementation evaluation of IT systems: A close review of practice', in Irani, Z., and Love, P. *Evaluating Information Systems: Public and Private sector*. London: Elsevier Ltd, pp.134-152.

Amaratunga, M. and Baldry, D. (2002) 'Moving from performance measurement to performance management', *Facilities*, 20 (5/6), pp.217 – 223.

Amoli, J. E. and Farhoomand, A. (1996) 'A structural model of end user computing satisfaction and user performance' *Information &Management*, 30, pp. 65-73.

Argyropoulou, M., Ioannou, G., Soderquist, K. E. and J. Motwani, (2008) 'Managing ERP system evaluation and selection in SMEs using the six-imperatives methodology', *International Journal of Procurement Management*, 1 (4), pp. 430-452.

Avison, D. and Elliot, S. (2006) 'Scoping the discipline of information systems', in king, J., Lyytinen, K. *Information System the state of the field*. London: John Wiley & Sons Ltd.

Avison, D. and Pries, J. (2005) *Research in information systems: A handbook for research supervisor and their students*. Elsevier Butterworth-Heinemann.

Au, N. Ngai E. and Cheng, T.C. '(2002) 'A Critical review of end-user information system satisfaction research and a new framework', *Omega*, 30 (6), pp. 451-478.

Au, N. Ngai E. and Cheng, T.C. (2008) 'Extending the understanding of end user information systems satisfaction formation: An equitable needs fulfilment model approach', *MIS Quarterly*. 32 (1), pp. 43-66.

Bailey, J. and Pearson, S. (1983) 'Development of a tool for measuring and analysing computer user satisfaction', *Managements science*, 29 (5), pp. 530-545.

Bakry, A. and Bakry, S. (2005) 'Enterprise resource planning: a review and a stop view', *International journal of network management*, 15, pp. 363-370.

Ballantine, J., Bonner, M., Levy, M., Martin, A., Munro, I. and Powell, P.L. (1996) 'The 3-D model of information systems success: the search for the Dependent variable continues', *Information Resource Management Journal*, 9 (4), pp.5-14.

Ballejos, L. and Montagna, J.M. (2008) 'Method for stakeholder identification in inter organisational environments', *Requirements Engineering*, 13, pp. 281-297.

Beatty, R. and Willams, C. (2006) 'ERP II: Best practices for successfully implementation an ERP upgrade', *Communications of the ACM - Self managed systems CACM*, 49 (3), pp.105-109.

Beaudry, A. and Pinsonneault, A. (2005) 'Understanding user Responses to information technology: A coping Model of user adoption', *MIS Quarterly*, 29 (3), pp. 493-524.

Beheshti, H. (2006) ‘What mangers should know about ERP/ERPII’, *Management Research News,* 29 (4), pp. 184-193.

Beheshti, H.M. and Beheshti, C.M. (2010) ‘Improving productivity and firm performance with enterprise resource planning’, *Enterprise Information Systems,* 4, (4), pp. 445-472

Benbasat, I., Goldstein, D. and Mead, M. (1987) ‘The case research strategy in studies of information systems’, 11 (3), *MIS Quarterly*, pp.369-386.

Benbasat, I. and Weber, R. (1996) ‘Research commentary: rethinking “diversity” in information systems research’, *Information System Research,* 7 (4), pp.389-399.

Beretta, S. (2002) ‘Unleashing the integration potential of ERP systems. The role of process- based performance measurement systems’. *Business Process Management Journal,* 8 (3), pp. 254-277.

Bernstein, S. and Bernstein, R. (1999) *Elements of Statistics II: Inferential Statistics*. Schaum's Outline Series, New York: McGraw-Hill.

Bernrider, E., (2008) ‘IT governance for enterprise resource planning supported by the Delone- McLean model of information systems success’, *Information & Management*, 45, pp. 257-269.

Bititci, U. and Turner, T. (2000) ‘Dynamic of performance measurement systems’, *Information Journal of Operations& Production Management*, 20 (6), pp. 692-704.

Bititci, U. S., Carrie, A. S. and McDevitt, L. (1998) ‘Integrated performance measurement systems: a development guide’, *International Journal of Operations and Production Management*, 17, pp.522–534.

Bititci, U.S. (1997) Integrated performance measurement systems: a reference model. *In Proceeding of the IFIPWG 5.7 Conference on Organising, the Extended Enterprise*, Ascona, Switzerland, pp. 15–16.

Bititci, U.S. and Carrie, A.S. (1998), ‘Integrated performance measurement systems: structures and relationships’, *EPSRC Research Grant Final Report, Engineering and Physical Sciences Research Council*, Swindon, UK.

Bologa, A., Muntean, M., Sabau, G. and Scorta, I. (2009) ‘Higher education ERPs: Implementation factors and their interdependencies’, *WSEAS Transaction on Computers,* 8 (4), pp.651- 660.

Boonstra, A. (2006) ‘Interpreting an ERP- Implementation project from a stakeholder perspective’, *International journal of project management*, 24, pp.38-52.

Boonstra, A. (2009) ‘Identifying and managing stakeholders in enterprise information system project’, International Journal of Enterprise Information systems, 5 (4), pp.1-16.

Boudreau, M. and Robey, D. (1996) ‘Coping with contradictions in business process re-engineering’, *Information Technology & People*, 9 (4), pp.40- 57.

Blyth, A. (1999) ‘Using stakeholders, domain knowledge, and responsibility to specify information systems’ requirement’, *Journal of Organisational Computing and Electronic* , 9 (4), pp. 287-296.

Bradley, J. and Lee, C. (2007) ‘ERP training and user satisfaction: A case study’, *Journal of Enterprise Information Systems*, 3 (4), pp. 33-50.

Braun, V. and Clarke, V. (2006) ‘Using thematic analysis in psychology’, Qualitative Research in Psychology, 3, pp.77-101.

Bryman, A. (2011) *Business research methods*. 3rdedn. Oxford: Oxford University Press.

Bryman, A. and Bell, E. (2007) *Business research methods*. 2nd edn. Oxford: Oxford University Press.

Chae, B. and Poole, M. (2005) ‘Enterprise system development in higher Education’, *Journal of Cases on Information Technology*, 7 (2), pp. 82-101.

Calisir, F. and Calisir, F. (2004) ‘The relation of interface usability characteristics, perceived usefulness, and perceived ease of to end user satisfaction with enterprise resource planning (ERP) systems’, *Computer in Human Behaviour*, 20, pp.505-515.

Cameron, B. (2008) ‘Enterprise systems education: new direction &challenges for the future’, *SIGMIS CPR '08 Proceedings of the 2008 ACM SIGMIS CPR conference on Computer personnel doctoral consortium and research*, pp.119-126.

Chand, D., Hachey, G., Hunton, J., Owhoso, V. and Vasudevan, S. (2005) ‘A balanced scorecard based framework for assessing the strategic impact of ERP system’, *Computer industry*, 56, pp. 558-572.

Chang, H. H. (2008) ‘Intelligent agent’s technology characteristics applied to online auction’ task: A combined model of TTF and TAM’, *Technovation*, 28, pp. 564-577.

Chang, J. and King, W. (2005) ‘Measuring the performance of information systems: A functional scorecard’, *Journal of Management I information System,* 22 (1), pp. 85-115.

Chang, M., Cheung, W., Cheng, C. and Yeung, J. (2008) ‘Understanding ERP system adoption from the user’s perspective’, *international journal production economies*, 113, pp.928- 942.

Chawla, A. and Kelloway, E.K. (2004) ‘Predicating openness and commitment to change’, *The Leadership & Organizational Development Journal*, 25 (6), pp.485-498.

Checkland, P. (1981) *Systems Thinking, Systems Practice*, Chichester: John Wiley.

Chen, W. and Hirschheim, R. (2004) ‘A paradigmatic and methodological examination of information systems research from 1991 to 2001’, *Information systems journal*, 14, pp.197-235.

Chen, S-G. and Lin, Y-K., (2008) ‘An Evaluation method for enterprise resource planning systems’, *Journal of the Operations Research Society of Japan*, 51 (4), pp. 299-309.

Chien, S. and Hu, C. (2009) ‘The moderating effect of employee computer self-efficacy ERP competence constructs and ERP Effectiveness’, *Journal of Electronic commerce in organisation*, 7 (3), pp. 59-85.

Chien, S. and Tsaur, S. (2007) ‘Investigating the success of ERP systems: Case studies in three Taiwanese high-tech industries’, *Computers in Industry*, 58, pp.783-793.

Chin, W., Jonson, N. and Schwarz, A. (2008) ‘A fast form approach to measuring technology acceptance and other constructs’, *MIS Quarterly*, 32 (4), pp. 687- 703.

Conrath, D.W. and Mignen, O. P. (1990) ‘What is being done to measure user satisfaction with EDP/MIS’, *Information & Management*, 19 (1), pp. 7-19.

Church, A. H. and Bracken, D.W. (1997) ‘Advancing the State of the Art of 360-Degree Feedback’, *Journal of Applied Psychology*, 27 (11), pp. 983-1020.

Creswell, J., Clark, V., Gutmann, M. and Hanson, W. (2003*) Advanced Mixed Method Design*. London: SAGE Publication Ltd.

Creswell, J. (2009) *Research Design: Qualitative, Quantitative, and Mixed Methods Approach*. 3rd edn. London: SAGE Publication Ltd.

Cyert, R.M. and March, J.G. (1963) A *behavioural theory of the firm*. Englewood Cliffs, NJ: Prentice-Hall. A behavioural theory of the firm. Englewood Cliffs, NJ: Prentice-Hall.

Darmawan, I.G.N. (2001) ‘Adoption and implementation of information technology in Bali’s government : A comparison between single level path analyses using PLSPATH 3.01 and Amos4 and Multilevel Path Analyses using MPLUS2.01’, *International education journal*, 2 (4), pp.100-125.

Delone, W.H. and Mclean, E.R. (1992) ‘Information systems success: The quest for the dependent variable’, *Information systems research,* 3 (1), pp.60-95.

Delone, W. H. and Mclean, E.R. (2003) ‘The Delone and Mclean model of information systems success: A ten- year update’, *Journal of management information systems*, 19 (4), pp.9-30.

Dent, E. B. and Goldberg, S.G. (1999) ‘Challenging resistance to change’, *Journal of Applied Behavioural Science*, 35, pp.24-41.

Denzin, N. and Lincoln, Y. (1998) *Collecting and Interpreting Qualitative Materials*. London: SAG Publications Ltd.

Denzin, N. and Lincoln, Y. (2005) *The SAGE handbook of qualitative research*. 3rd edn. London: SAG Publications Ltd.

Devers, K. J. (1999) ‘How will we know "good" qualitative research when we see it? Beginning the dialogue in health services research’, *Health Service Research,* 34(5-2) pp. 1153–1188.

Dishaw, M.T., Strong D. M. and Bandy, D.B. (2002) ‘Extending the task technology fit model with Self-Efficacy Constructs’, *Eighth Americas Conference on Information Systems*, pp. 1021-1027.

Dishaw, M.T. and Strong, D. M. (1999) ‘Extending the technology acceptance model with task – technology fit constructs’, *Information &Management,* 36, pp.9-21.

Dishaw, M., Strong, D. and Bandy, D. (2004) ‘The impact of task technology fit in technology acceptance and utilization model’, *The tenth American conference on information systems*, pp.3306-3311.

Dixon, J.R., Nanni, A.J. and Vollmann, T.E. (1990) *The New Performance Challenge: Measuring Operations for World Class Competition*. Homewood, Ill, Dow Jones-Irwin.

Doll, W., Deng, X. and Raghunathan, T.S. (2004) ‘The meaning and Measuring of User Satisfaction: A multi group Invariance Analysis of the end user Computing Satisfaction Instrument’, *Journal of Management Information Systems*, 21 (1), pp. 227-262.

Doll, W. and Torkzadeh, G. (1988) ‘The measurement of end user computing satisfaction’, *MIS Quarterly*. 12 (2), pp. 250-273.

Doll, W. and Torkzadeh, J. (1991) ‘The measurement of end-user computing satisfaction: theoretical and methodological issues’, *MIS Quarterly*, 15 (1), pp. 5-10.

Dytham, C. (2003) *Choosing and Using Statistics - A Biologist's Guide*. 2nd edn. Blackwell Publishing.

Eerde, W. and Thierry, H. (1996) ‘Vroom’s expectancy model and work-related criteria: A meta-analysis’, *Journal of Applied Psychology*, 81, pp. 575-586.

Eden, C. and Heijden, K.V. D. (1993) ‘The relationship between stakeholder Analysis and Scenario Planning’, (Paper presented in the strategy seminar, at the London School of Economics), Strathclyde Business School.

Elmes, M., Strong, D. and Volkoff, O. (2005) ‘Panoptic empowerment and reflective conformity in enterprise systems- enabled organisations, *Information and organisations*, 15, pp.1-37.

Esteves, J. and Pastor, J. (2001) ‘Enterprise resource planning systems research: an annotated bibliography’, *Communication of the Association Information Systems*, 7 (8), pp.1-52.

Farbey, F., Land, L. and Targett, D. (1992) ‘Evaluating investments in IT’, *Journal of Information Technology*, 7, pp.109–122.

Farbey, B., Land, F. and Targett, D. (1993) *How to Assess Your IT Investment*. Oxford: Butterworth-Heinemann Ltd.

Farbey, B., Land, F. and Targett, D. (1999) ‘Moving IS evaluation forward: learning themes and research issues’, *Journal of Strategic Information System*, 8, pp.189-207.

Fink, A. and Kosecoff, J. (1985) *How to Conduct Surveys: A Step-by-Step Guide*. Beverly Hills, CA: SAGE Publications Ltd.

Finney, S. and Corbett, M. (2007) ‘ERP implementation a compilation and analysis of critical success factors’, *Business Process Management Journal*, 13 (3), pp. 329-347.

Freeman, W.R. (1984) *Strategic management: a stakeholders approach*. Poston: Pitman Marshfield.

Freeman, R. E. (2001) 'Stakeholder theory of the modern corporation', in Hoffman, W.M., Frederick, R.E., and Schwartz, M.S. (eds.) *Business Ethics: Readings and Cases in Corporate Morality Fourth Edition,* McGraw Hill, Boston.

Flick. (2009) *An Introduction to qualitative research*. 4th edn. London. SAGE Publication Ltd.

Fowler, A. and Gilfillan, M. (2003) 'A framework for stakeholders Integration in higher education information system projects', *Technology Analysis & Strategic Management*, 15 (4), pp. 467-489.

Fraser, C. and Fraser, A. (2003) 'Investigating the effectiveness of mangers through an analysis of stakeholder perceptions', *Journal of Management Development*, 22 (9), pp.762-783.

Gable, G., Sedera, D. and Chan, T. (2003) 'Enterprise systems success: a measurement model', *twenty forth international conference of information systems*, pp.576-591.

Gable, G. (1994) 'Integrated case study and survey research methods: An example in information systems', *European journal of information systems,* 3 (2), 112-126.

Gable, G., Scott, J.E. and Davenport, T.D. (1998) Cooperative ERP Life-cycle Knowledge Management. *9th Australasian Conference on Information Systems,* 29 September - 2 October, Sydney.

Gable, G., Sedera, D. and Chan, T. (2008) 'Re-conceptualizing information system success: The IS -impact measurement model', *Journal of the Association for Information Systems*. 9 (7), pp. 376-408.

Galliers, R. (1992) *Information Systems Research. Issues, Methods, and Practical Guidelines*. Oxford: Blackwell science Publication.

Gargeya, V. B. and Brady, C. (2005) 'Success and failure factors of adopting SAP in ERP system implementation', *Business Process Management Journal*, 11 (5) pp. 501-516.

Gattiker, T. and Goodhue, D. (2005) 'What happens after ERP implementation: understanding the impact of inter-dependence and differentiation on plant level outcome', *MIS Quarterly*, 29 (3), pp.559-585.

Gebauer, J. and Schober, F. (2006) 'Information system flexibility and the Cost Efficiency of Business Process', *Journal of the Association for information System*, 7 (3), pp. 122-147.

Gebauer, J. and Lee, F. (2008) ‘Enterprise system flexibility and implementation Strategies: aligning theory with evidence from a case study’, *Information System Management*, 25, pp. 71-82.

Gerring, J. (2004) ‘What is the Case study and what is it good for?’, *American political science review*, 98 (2), pp341-354.

Genoulaz, V. B., Millet, P-A. and Grabot, B. (2005) ‘A survey on the recent research literature on ERP system’, *Computer in Industry*, 56, pp. 510-522.

Giff, S. (2009) ‘ERP customization as software engineering: Knowledge Sharing and cooperation’, *IEEE software*, 26 (6), pp. 41- 47.

Globerson, S. (1985) ‘Issues in developing a performance criteria system for an organisation’, *International Journal of Production Research*, 23 (4) pp.639-646.

Gong, Y. and Janssen, M. (2010) ‘Measuring process flexibility and agility’, *ICEGOV '10 Proceedings of the 4th International Conference on Theory and Practice of Electronic Governance*, October, Beijing, China, pp. 173-182.

Googhue, D. (1998) ‘Development and measurement validity of a Task technology fit Instrument for user evaluations of Information systems’, *Decision Sciences*, 29 (1) pp.105- 138.

Googhue, D., Klein B. and March, T. (2000) ‘User evaluation of IS surrogates for objective performance’, *Information and Management*, 38, pp.87-101.

Googhue, D. (1995) ‘Understanding user evaluation of information systems’, *Management science*, 41(12) pp. 1827- 1995.

Googhue, D., Thompson, R. (1995) ‘Task – technology Fit and individual Performance’, *MIS Quarterly*, 19 (2), pp.213-236.

Goodpaster, K. (1993) ‘Business ethics and stakeholder analysis’, in Winkler, E. and Coombs, J. (Eds.) *Applied Ethics: A Reader,* Oxford: Blackwell. pp. 229-48.

Gros, C., Mueller, H. and Lovis, C. (2005) ‘Evaluating user interaction with clinical information systems: A model based on human computer interaction models’, *Journal of Biomedical informatics*, 38, pp.244-255.

Guba, E. and Lincoln,Y. (1994) ‘Competing paradigms in qualitative research’, research. In Denzin, N. K. and Lincoln, Y. S. (Eds.), *Handbook of qualitative research,* (pp. 105-117) Thousand Oaks. CA: SAGE Publication Ltd.

Haab, M. and Surry, D. (2009) *Implementation of ERP system in higher education*. Verlag: VDM Publishing House Ltd.

Hagood, W. and Friedman. L. (2002) ‘Using the balanced scorecard to measure the performance of your HR information Systems’, *Public Personnel Management*, 31 (4), pp. 543-557.

Hayes, R. and Utecht, K. (2009) ‘Enterprise resource planning implementation in an institution of higher education learning: A case study of Drummond University’, *Journal of cases on Information Technology*, 11 (2), pp. 42-55.

Helo, P. (2008) ‘Expectation and reality in ERP implementation: consultant and solution provider perspective’, *Industrial Management & Date systems*, 108 (8), pp.1045-1059.

Helo, P., Anussornnitisarn, P. and Phusavat, K. (2008) ‘Expectation and reality in ERP implementation: consultant and solution provider perspective’, *Industrial Management & Data Systems,* 108 (8), pp. 1045-1059.

Heo, J. and Han, I. (2003) ‘Performance measure of information systems (IS) in evolving computing environments: an empirical investigation’, *Information & Management*, 40, pp. 243- 256.

Hirschheim, R.A. (1991) ‘Information systems epistemology: An historical Perspective’, in Galliers, R. *Information Systems Research*. .Oxford: Blackwell Scientific Publications.

Hirschheim, R., and Klein, H. (1994) ‘Realizing emancipatory principles in information systems development: the case for ETHICS’, *MIS Quarterly*, 18, (1), pp.83-109.

Hirschheim, R. and Smithson, S. (1999) ‘Evaluation of information systems: a critical assessment’. In: Willcocks, Leslie P. and Lester, Stephanie, (eds.) *Beyond the IT productivity paradox, Wiley series in information systems*. John Wiley & Sons Ltd., West Sussex, UK, pp. 381-410. ISBN 9780471986928.

Holsapple, C., Wang, Y.-M. and Wu, J.-H. (2005) ‘Empirically testing user characteristics and fitness factors in enterprise resource planning success’, *international journal of human computer interaction*, 19 (3), pp. 323-342.

Hong, K-K. and Kim, Y-G. (2002) ‘The critical success factors for ERP implementation: an organizational fit perspective, *Information & Management*, 40 (1), pp.24- 40.

Howcroft, D., Newell, S. and Wagner, E. (2004) ‘Understanding the contextual influences on enterprise system design, implementation, use and evaluation’, *Journal of Strategic Information Systems*, 13 (4), pp. 271-7.

Hsu, L., Lai, R. and Weng, Y. (2008) 'Understanding the critical effect user satisfaction and impact of ERP through innovation of diffusion theory', *International journal technology management*, 43 (1-3), pp. 30- 47.

Huq, Z., Huq, F. and Cutright, K. (2006) 'BPR through ERP: Avoiding change management pitfalls', *Journal of Change Management*, 6 (1), pp.67-85.

Ifinedo, P., and., Nahar, N. (2006) 'Do top and mid- level managers view Enterprise Resource Planning (ERP) systems success measures differently', *International Journal Management and Enterprise Development*, 3 (6), pp. 618-635.

Ifinedo, P. and Nahar, N. (2007) 'ERP systems success: an empirical analysis of how two organisational stakeholder groups prioritize and evaluate relevant measures', *Enterprise information systems,* 1 (1), pp. 25-48.

Introna, L. (1997) *Management, Information and Power: A Narrative of the Involved Manager*. London: Macmillan.

Irani, Z., Sharif, A., Love, P. and Kahraman, C. (2002) 'Applying concepts of fuzzy cognintive mapping to model: The IT/IS investment evaluation process', *International Journal of Production Economics*, 75 (1/2) pp.199-211.

Irani, Z., Sharif1, A., and Love, P. (2005) 'Linking knowledge transformation to Information Systems evaluation', *European Journal of Information Systems*, 14, pp.213–228.

Irani, Z. and Love, P. (2008) *Evaluating Information System: Public and Private Sector*. Oxford: Butterworth-Heinemann.

Irani, Z. (1998) *Investment Justification of Information Systems: A focus on the evaluation of MRP11*, a thesis submitted for the degree of doctor of philosophy.

Islam, R. and Rasad, S. (2005) 'Employee performance evaluation by AHP: a case study', *Asia Pacific Management Review*, 11 (3), 163-176.

Ives, B. Olson, M., and Baroudi, J. (1983) 'The measuring of user information satisfaction', *Communications of the ACM*, 26 (10), pp. 785-793

Johnson. R.B., Onwuegbuzie, A.J. and Turner, L. (2007) 'Toward a definition of mixed methods research', *Journal of Mixed Methods Research*, 1 (2), pp. 112-133.

Jones, S. (2008) 'Social dimension of IT/IS evaluation: views from the public sector', In Irani, Z. and Love, P. (2008) *evaluating information systems, public and private sector*. Oxford: Butterworth-Heinemann is imprite of Elsevier, pp. 236-256.

Jones, T. M. (1995) ‘Instrumental stakeholder Theory A synthesis of Ethics and Economics’, *Academy of Management Review*, 20 (2), pp. 404-437.

Jorgenson, D.W., Ho, M. S. and Stiroh, K. J. (2004) ‘Growth of U.S. Industries and Investments in Information Technology and Higher Education’, Forthcoming in Corrado, C., Haltiwanger, J. and Sichel, D. *Measuring Capital in a New Economy*, Chicago, University of Chicago Press.

Kaplan, B. and Duchon, D. (1988) ‘Combining qualitative and quantitative Methods in Information Systems Research: A case study’, *MIS Quarterly*, 12 (4), pp. 571-586.

Kaplan, B. and Maxwell, J. (2005) ‘Qualitative research methods for evaluating computer information systems’, in *evaluating the organisation impact of the healthcare information system*, part 1, pp. 30-55.

Kaplan, B. and Cincinnati, U. (1988) ‘Combining qualitative and quantitative methods in information systems research: a case study’, *MIS Quarterly*, 12 (4), pp.571-586.

Kaplan, B. and Maxwell, J.A., (1994) ‘Qualitative research methods for evaluating computer information systems’, in Anderson, J.G., Aydin, C.E. and Jay S.J. *Evaluating Health Care Information Systems: Methods and Applications*, (eds), CA: SAGE Publication Ltd, pp.45-68.

Kaplan, R. and Norton, D.P. (1996), *The balanced scorecard: translating Strategy into Action*. Boston: Harvard Business School Press.

KAUST, 2012, available at:
http://www.kaust.edu.sa/research/management.html

Kelle, U. (2006) ‘Combining qualitative and quantitative methods in research practice: purposes and advantages’, *Qualitative Research in Psychology*, 3, pp. 293-311.

KFU of P&M feedback, 2012, available at:
http://feedback.kfupm.edu.sa/FS/nsurvey.aspx?surveyid=999ea5482ce42a293bd4243c744f5ce

Khalifa, G., Irani, Z., Balddwin, L. and Jones, S. (2001) ‘Evaluating information technology with you in mind’, *Journal of Information Systems Evaluation*, 4 (1), pp.1-26.

King Abdulaziz University, 2012, available at:
http://www.kau.edu.sa/content.aspx?site_id=0&lng=AR&cid=104133

King, P., Kvavik, R. B. and Voloudakis, J. (2002) Enterprise resource planning systems in higher education (ERB0222) Boulder, CO: EDUCAUSE Center for Applied Research (ECAR).

Kim, Y., Lee, Z. and Gosain, S. (2005) ‘Impediments to successful ERP implementation process’, *Business Process Management Journal*, 11 (2), pp.158-170.

Kittner, M. and Slyke, C. (2000) ‘Reorganizing information technology service in an academic environment’, *Annals of cases on information technology applications and management in organizations, IDEA group publishing*, 2, pp.124.

Kitto, S. and Higgins,V. (2010) ‘Working around ERP in Technological Universities’, Science, *Technology & Human Values,*35 (1), pp. 29-54.

Klein, K. K. and Myers, M. D. (1999) ‘A Set of Principles for Conducting and evaluating Interpretive Field Studies in Information Systems’, *MIS* Quarterly, 23 (1), pp. 67-94.

Klaus, H., Rosemann, M. and Gable, G. (2000) what is ERP? *Information Systems Frontiers*, 2 (2), pp. 141-162.

Kominis, G. and Emmanuel, C. (2007) ‘The expectancy-valence theory developing an extended Model of managerial motivation’, *Management Accounting Research*, 18, pp. 49-75.

Kompiera, M.A., Cooper, C.L. and Geurts, S.A. (2000) ‘A multiple case study approach to work stress prevention in Europe’, *European Journal of Work and Organizational Psychology*, 9 (3), pp. 371-400.

Kositanurit, B., Ngwenyama,O. and Bryson, K-M. (2006) ‘An exploration of factors that impact individual performance in an ERP environment: an analysis using multiple analytical techniques’, *European journal of Information Systems,* 15, pp. 556-568.

Kwahk, K-Y. and Ahn, H. (2010) ‘Moderating effects of localization difference on ERP use: A socio-technical systems perspective’, *Computers in Human Behaviour*, 26, pp.186-198.

Kwahk, K-Y. and Lee, J-N. (2008) ‘The role of readiness for change in ERP implementation:Theoretical bases and empirical validation’, *Information & Management,* 45 (7), pp.474- 481.

Kvavik, R., Katz, R., Beecher, K., Caruso, J., king, P., Voloudakis, J. and Williams, L. (2004) ‘The Promise and Performance of Enterprise Systems for

Higher Education', *research study from the EDUCUSE Canter for Applied Research*, 4, pp.5-85.

Kvavik, R.B., Katz, R.N., Beecher, K., Caruso, J., King, P., Voloudakis, J. and Williams, L.A. (2002) 'The promise performance of enterprise systems for higher education', *Educause Centre for Applied Research*, 4, pp. 10.

Land, F.F. (1992) 'The information systems domain', in R. Galliers. *Information Systems Research: Issues, Methods, and Practical Guidelines*. Oxford: Blackwell Scientific Publications.

Land, F.F. (2001) IS evaluation: Recent trends, Keynote speech, NUKAIS Information systems evaluation seminar, priestly Hall, Leeds Metropolitan university, 27th February, 2001.

Laframbosie, K. and Reyes, F. (2005) 'Gaining competitive advantage from integrating enterprise resource planning and total quality management', The *Journal of Supply Chain Management*, 41 (3), pp. 49-64.

Lansbury, R., (1988) 'Process management: A process Approach', *Human Resource Austria*, pp. 46-54.

Lassila, K.S. and Buchner, J.C. (1999) 'Adoption and utilization of commercial Software Packages: Exploring Utilization Equilibria, Transitions, Triggers, and Tracks', *journal of management information systems*, 12 (2), pp. 63-90.

Leech, N. L. and Onwuegbuzie, A.J. (2009) 'A typology of mixed methods research designs', *Quality & Quantity*, 43 (2), pp. 265-275.

Lim, E., Pan, S. and Tan, C. (2005) 'Measuring user acceptance towards enterprise resource planning (ERP) systems-understanding the dissonance between user expectations and managerial policies', *European of journal of information system*, 14, pp. 135-149.

Lockwood, G. (1985) 'Universities as organizations'. In G. Lockwood, and J. Davies (eds) *Universities: The Management Challenge*. Windsor: NFER-Nelson Publishing.

Lin, W.T., Chen, S.C., Lin, M.Y. and Wu, H.H. (2006) 'A study on performance of introducing ERP to semiconductor related industries in Taiwan', *International Journal Advantages Manufacturing Technology*, 29, pp. 89–98.

Longinidis, P. and Gotzamani, K. (2009) 'ERP user satisfaction issues: insights from a Greek industrial giant', *Industrial Management & Data Systems*, 109, (5) pp.628 – 645.

Low, C. and Ngai, E. (2007) 'ERP system adoption: An exploratory study of the organisational factors and impacts of ERP successes', *Information& Management*, 44, pp.418-432.

Lupu, A. R., Bologa, Sabau, Gh. and Muntean, M. (2008) 'The Romanian Universities in the process of data and information system integration', *Proceedings of the 7th WSEAS International Conference on Artificial Intelligence, Knowledge Engineering and Databases (AIKED '08)* Cambridge, pp.527-532.

Lyytinen K. and Hirscheim, R. A. (1987) 'Information systems failures: survey and classification of empirical literature,' *Oxford Surveys in Information Tech*, 4, pp. 257-309.

Mackenzie, K.D. and House, R. (1979) 'Paradigm development in the Social Sciences', in Mowday, R. T. and Steers, R. M. (eds.) *Research in Organizations: Issues and Controversies*. CA: Goodyear Publishing, Santa Monica. pp. 22-38.

MADAR system definition, KSU, 2012 available at: http://erp.ksu.edu.sa/default.aspx

Mahmood, M., Burn, J., Gemoets, L. and Jacquez, C. (2000) 'Variables affecting information technology end user satisfaction: a meta- analysis of the empirical literature', *International Journal Human Computer Studies*, 52, pp.751-771.

Marshall, T., Byrd, T., Gardiner, L. and Rainer, R. (2002) 'Technology acceptance and performance: An investigation into requisite knowledge', *Information Resource management*, 13 (3), pp. 33-45.

Markus, M.L. and Tanis, C. (2000) 'The enterprise systems experience-erom adoption to success', in Zmud. R.W. *Framing the Domains of IT Management: Projecting the Future Through the Past*. Cincinnati, OH: Pinnaflex, pp. 173-207.

Maskell, B. (1989) 'Performance measures for world class manufacturing', *Management Accounting*, 5, pp. 32-39.

Mason, R. O. (1978) 'Measuring information output: A communication system approach', *Information & Management*, 1 (5), pp. 219-234.

Mathiassen, L. (2002) 'Collaborative practice research', *Information Technology &People*, 15 (4), pp. 321-345.

Matin, G. (1979) 'What is the value of investments in information systems', *MIS Quarterly*, 3 (3), pp. 5-35.

MathWorks Inc. (2012) Introduction to analysis of variance: nonparametric methods.retrieved:22.05.2012from: http://www.mathworks.co.uk/help/toolbox/stats/bqttcvf.html#bq72grf-1

McGaughey, R. and Gunasekaran, A. (2007) 'Enterprise resource planning (ERP): past, present, and future', *International journal of enterprise information systems*, 3 (3), pp.23-35.

McGill, T. and Hobbs, V. (2003) 'User-developed application and Information systems Success: A Test of Delone and Mclean's Model', *Information Resource Management Journal*, 16 (1), pp. 24-45.

Mehlinger, L. (2006) *Indicators of successful enterprise technology implementation in higher education*. Morgan University.

Mingers, J. (2001) 'Combining IS research methods: towards a pluralist Methodology', *Information Systems Research*, 12 (3), pp. 240-259.

Ministry of Saudi Arabian Higher education, 2012, available at: http://www.mohe.gov.sa/ar/Pages/Budget.aspx .

Miles, M. and Huberman, A. (1994) *Qualitative data Analysis: an expanded Sourcebook*. 2nd edn. London: SAGE Publications Ltd.

Moon, Y. (2007) 'Enterprise resource planning (ERP): a review of the literature', *Mechanical and Aerospace Engineering*, 4 (3), pp. 235-264.

Moshe, Z. (2003) 'User satisfaction in ERP system: some empirical evidence', *Journal of Academic of Business and Economics*, 2 (1), pp.1-11.

Motwani, J., Subramanian, R. and Gopalakrishna, P. (2005) 'Critical factors for successful ERP implementation: Exploratory Finding from four case studies', *Computers in Industry*, 56, pp. 529-544.

Mumford, E. and Weir, M. (1979) *Computer systems in work design-the ETHICS method: Effective technical and human implementation of computer systems: a work design exercise book for individuals and groups*. London: Associated Business Press.

Myers, B., Kappelman, .L.A. and Prybutok, V.R. (1997) 'A comprehensive model for assessing the quality and productivity of the information systems function: Toward a theory for information systems assessment', *Information recourses management journal*. 10 (1), pp. 6-25.

Myers, B., Hollan, J. and Cruz, I. (1996) 'Strategic directions in human-computer interaction', *Journal ACM Computing Surveys (CSUR)*, 28 (4), pp. 794 – 809.

Myers, M. and Avison, D. (2002) *Qualitative research in information systems*. SAGE Publications Ltd.

Myers, M. (1997) 'Qualitative research in information systems', *MIS Quarterly*, (21:2), pp. 241–242. MISQ Discovery, archival version.

Nacher, N. (2008) 'The Mann Whitney U: A test for assessing whether two independent samples come from the same distribution', *Tutorials in Quantitative Methods for Psychology*, 4 (1), pp. 13-20.

Nah, F., Lau, J. and Kuang, J. (2001) 'Critical factors for successful implementation of enterprise systems', *Business Process Re-engineering & Management Journal*, 7 (3), pp.285 - 296.

Neely, A., Gregory, M. and Platts, K. (1995) 'Performance measurement system design: A literature review and research agenda', *International Journal of Operations & Production Management*, 15 (4), pp.80 - 116.

Norman, G. (2010) 'Likert scales, levels of measurement and the ''laws'' of statistics', *Advantage in Health Science Education*, DOI: DOI 10.1007/s10459-010-9222-y. Retrieved on 30.05.2012 from: http://xa.yimg.com/kq/groups/18751725/1039265037/name/Likert%2Bscales,%2Blevels%2Bof%2Bmeasurement%2Band%2Bthe%2B%25E2%2580%2598%25E2%2580%2598laws%25E2%2580%2599%25E2%2580%2599.pdf

Norris, D. M. (2003) 'Value on investment in higher education', *Boulder, COLO. Educause centre for applied research*, research Bulletin, 18.

Nunnally, J. C. (1978) *Psychometric theory*. New York: McGraw-Hill.

Oates, B. J. (2006) *Researching information systems and computing*. London: SAGE Ltd.

Okunoye, A. and Folick, M. (2006) ‘ERP Implementation in higher education: An Account of Pre- Implementation and implementation Phases’, *Journal of cases on information technology*, 8 (2), pp.110- 132.

Orlikowski, W. and Baroudi, J. (1991) ‘Studying information technology in organizations: research approaches and assumptions’, *Information Systems Research*, 2 (1), pp. 1-28.

Pallent, J. (2010) *SPSS Survival Manual*. 4th edn. Oxford: McGraw-Hill Education.

Pallant, J. (2005) *SPSS Survival Guide: A step by step guide to data analysis using SPSS for Windows*, Australia: Allen & Unwin.

Park, J., Suh, H. and Yang, H. (2007) ‘Perceived absorptive capacity of individual users in performance of Enterprise Resource Planning (ERP) usage: the case for Korean firms’, *information and management*, 44, pp. 300-312.

Paré, G. (2004)’ Investigating information systems with positivist case studies research’, *Communication of the Association for the Information Systems*, 13, pp.233-264.

Parr, A., and Shanks,G. (2000) ‘A model of ERP project implementation’, *journal of information technology* , 15, pp.289-303.

Pegah, k., Pegah, M. and Dillow, T. (2003) ‘Higher education ERP: framework to Reduce the Pain’, *Proceedings of the 31st annual ACM SIGUCCS fall conference,* pp. 86-89.

Peter, L. and Irani, Z. (2004) ‘An exploratory study of information technology evaluation and benefits management practices of SMEs in the construction industry’, *Information & Management*, 42, pp. 227-242.

Petter, S. (2008) ‘Measuring information systems success: models, dimensions, measures, and interrelationships’, *European journal of information systems*, 17, pp.236-263.

Petter, S., Delone W. and McLean, E. (2008) ‘Measuring information systems success: model, dimension, measures and interrelationships’, *European Journal of Information Systems*, 17, pp. 236-263.

Pitt, L., Watson, R. and Kavan, C. (1995) ‘Service quality: a measure of information systems effectiveness’, *MIS Quarterly*, 19 (2), pp. 173-187.

Pollock, N. and Cornford, J. (2001) ‘Customising industry standard Computer systems for universities: ERP systems and the university as a ‘UNIQUE’ Organisation’, *Standardization and Innovation in Information Technology, 2001 2nd IEEE Conference,* pp.320 – 331.

Pollock, N. and Cornford, J. (2004) ‘ERP System and the university as a ‘unique’ organisation’, *Information Technology & People,* 17 (1), pp. 31-52.

Pouloudi, A. and Serafeimidis, V. (1999) ‘Stakeholders in information systems evaluation: experience from a case study’, *Proceedings of the 6th European IT Evaluation Conference*, November 4-5th, London, UK, 90 - 98.

Pouloudi, A. and Whitley, E.A. (1997) ‘Stakeholder identification in inter-organizational systems: gaining insights for drug use management systems’, *European Journal of Information Systems*, 6 (1), pp. 1-14.

Pouloudi, A. (1999) ‘Aspects of the stakeholder concept and their implication for information systems development’, *Proceedings of the 32nd Hawaii International conference on systems science*, pp. 1-16.

Preston, L. E. and Sapienza, H. J. (1990) ‘Stakeholder management and corporate performance’, *Journal of Behavioural Economics*, 19, pp.361-375.

Rabaa`i, A., Bandara, W. and Gable, G. (2009a) ‘ERP system in the higher education sector: A descriptive case study’, *20 Australian conference on information systems*, Melbourne. pp. 456-470.

Rabaa`i, A. (2009b) ‘Identifying critical success factors of ERP systems at the higher education sector’, In ISIICT 2009 : *Third International Symposium on Innovation in Information & Communication Technology*, 15 - 17 December, 2009, Philadelphia.

Rabaa'i, A. and Gable, G. (2009c) ‘Extending the IS-Impact model into the higher education sector’, *In ICICS2009: 7th International Conference on Information and Communications Systems, 7-10 Dec.*, Macau.

Rai, A., Lng, S. and Welker, R. (2002) ‘Assessing the validity of IS Success Models: An Empirical Test and Theoretical Analysis’, *Information systems research*, 13 (1), pp. 50- 69.

Ray, G., Muhanna, W. and Barney, J. (2005) ‘Information technology and the performance of the customer service: a resource- based analysis’, *MIS Quarterly,* 29 (4), pp.625-652.

Robert, B. (2004) ‘The promise and performance of enterprise systems for higher education’, *Research Study from the EDUCUSE Center for Applied Research*.pp.1-7.

Robey, D. (1996) ‘Research commentary: diversity in information systems research: threat, promise, and responsibility’, *Information Systems Research,* 7 (4), pp. 400-408.

Rothenberger, M. and Srite, M. (2009) ‘An investigation of customisation in ERP system implementation’, *IEEE Transaction on Engineering Management,* 56, pp.663-676.

Rosemann, M. and Wiese, J. (1999) ‘Measuring the performance of ERP software: A balanced scorecard approach’, *10th Australasian Conference on Information Systems,* pp. 773- 784.

Rushinek, A. and Rushinek, S.F. (1986) ‘The influence of troubleshooting, education, and documentation on computer user satisfaction’, *Journals & Magazines*, 16 (1), pp.165-168.

Sabau, G., Munten, M. Bologa, A. and Bologa, R. (2009) ‘An evaluation framework for higher education ERP Systems’, *WSEAS Transaction on Computer,* 8 (11), pp. 1790-1799.

Sabherwal, R., Jeyaraj, A. and Chowa, C. (2006) ‘Information systems: individual and organizational determinants’, *Management science*, 52 (12), pp.1849-1882.

Sakris, J. and Sundarraj, R. P. (2000) ‘Factors for strategic evaluation of enterprise information technology’, *International Journal of Physical Distribution &Logistics Management,* 30 (3/4), pp. 196-220.

Sane, V. (2005) ‘Enterprise resource planning overview,’ Ezine articles. Retrieved Jan 2, 2011, available at: http://ezinearticles.com/?Enterprise-Resource-Planning-Overview&id=37656.

SAP news, 2012, available at:
http://sap-news.tmcnet.com/news/2011/05/17/5514769.htm

SAP news, 2012, available at:

http://www.sap.com/mena/services/universityalliances/index.epx

Sarantakos, S. (2005) *Social Research*. 3rd edn. Plgrave :Macmillan.

Saudi Arabia of Minister of civil service, 2012, available at:
http://www.mcs.gov.sa/_layouts/mocs/intro/intro.htmI

Saudi Arabian Higher Education Board, 2007, 2012, available at:

http://www.imamu.edu.sa/mangment_of_univirsity/University_Council/Pages/the_system_of_higher%20education.aspx

Saunders, C. and Jones, J. (1992) 'Measuring performance of the information systems function', *Journal of Management Information System*, 8 (4), pp. 63-82.

Seddon, P. (1997) 'A specification and extension of the Delone and Mclean of IS success', *Information systems research*, 8 (3), pp.240-253.

Seddon, B., Graeser, V. and Willcocks, L. (2002) 'Measuring organizational effectiveness: IS an overview and update of senior management perspectives', *Data base for advances in information systems*, 33 (2), pp. 11-28.

Sedera, D., Gable, G. and Chan, T. (2003) 'Measuring enterprise system success: A preliminary model', *Ninth Americas Conference on Information Systems (AMCIS)*, pp.476-485.

Seddon, P. (1999) 'Dimension of information systems success", *Communication of the Association for Information Systems*, 2 (20), pp. 2-60.

Seddon, P. and Kiew, M. (1994) 'A partial test and development of Delone and Mclean's model of IS success', *Australian Journal of Information Systems*, 4 (1), pp. 90-109.

Sedera, D. Gable, G. (2004) 'A factor and structural equation analysis of the enterprise system success measurement model', *Twenty- fifth international conference on information systems*, pp.449-464.

Seng, D. and Leonid, C. (2003) 'Business Process-Oriented Information Support for a Higher Education Enterprise', *7th Pacific Asia Conference on Information Systems*, 10-13 July 2003, Adelaide, South Australia, pp.1055-1047.

Serafeimidis, V. and Smithson, S. (2000) ‘Information systems evaluation in practice: a case study of organizational change’, *Journal of Information Technology*, 15 (2), pp. 93–106.

Serafeimidis, V. and Smithson, S. (2003) ‘Information systems evaluation as an organisational institution-experience from a case study’, *Information systems journal*, 13, pp. 251-274.

Seth, N. and Deshmukh,S.G. (2005) ‘Service quality modedls: a review’, *international Journal of Quality & Reliability Management*, 22 (9), pp.913-949.

Shang, S. and Seddon, P. (2000) ‘A comprehensive framework for classifying benefits of ERP Systems’, *American Conference on Information systems, (AMCIS)*, pp. 1005-1014.

Shannon. E. and Weaver, W. (1949) *The mathematical theory of communication*. Urbana, IL: University of Illinois Press.

Shaqra University, 2012, available at: http://su.edu.sa/English/Pages/default.aspx

Shehab, E.M., Sharp, M.W., Suprmaniam, L. and Spedding, T.A. (2004) ‘Enterprise resource planning. An integrative review’, *Business Process Management*, 10 (4), pp. 359-386.

Skok, K. and Legge, M. (2002) ‘Evaluating enterprise resource planning (ERP) systems using an Interpretive Approach’, *Knowledge and Process Management*, 9 (2), pp. 72–82

Smitha, C.D. and John T. Mentzer, J.T. (2010) ‘Forecasting task-technology fit: The influence of individuals, systems and procedures on forecast performance’, *International Journal of Forecasting*, 26, pp.144–161

Soja, P. (2006) ‘Success factors in ERP systems Implementations: lessons from practice’, *Journal of Enterprise Information Management*, 19 (6), pp. 646-661.

Somers, T., Nelson, K. and Karimi, J. (2003) ‘Confirmatory factors analysis of the end user computing satisfaction instrument: replication within an ERP domain’, *Decision Sciences*, 34 (3), pp. 595-621.

Somers, T., Nelson, K. and Ragowsky, A. (2000) ‘Enterprise resource planning (ERP) for the next Millennium: development of an integrative framework and implications for research’, *American Conferences on Information Systems (AMCIS)*, pp. 998-1004.

Somers, T. and Nelson, K. (2004) ‘A taxonomy of players and activities across the ERP project life cycle’, *Information &Management*, 41, pp. 257- 278.

Son Yu, C. (2005) ‘Causes influencing the effectiveness of the post-implementation ERP system’, *Industrial Management & Data Systems*, 105 (1), pp.115 - 132.

Spathis, C. and Ananiadis, J. (2005) ‘Assessing the benefits of using an enterprise system in accounting information and management’, *The Journal of Enterprise Information Management*, 18 (2), pp.195-210.

Spathis, C. and Ananiadis, J. (2005) ‘Assessing the benefits of using an enterprise system in accounting information and management’, *Journal of Enterprise Information Management*, 18 (2), pp.195 - 210.

Stensrud, E. and Myrtveit, I. (2003) ‘Identifying high performance ERP projects’, *Journals & Magazines*, 29 (5), pp. 398 - 416.

Stoak, S. and William, J. (1992) ‘Measuring performance of the information systems function’, *Journal of management information systems*, 8 (4), pp. 63- 82.

Stockdale, R. and Standing, C. (2006) ‘An interpretive approach to evaluating information systems: A content, context, process framework’, *European Journal of Operation Research*, 173, pp.1090-1102.

Stockdale, R., Standing, C., Love, P. and Irani, Z. (2008) ‘Revisiting the content and process of IS evaluation’, in Irani, Z. and Love, P. *Evaluating Information Systems: Public and Private sector*. London: Elsevier Ltd, pp. 35-48.

Strong, D. and Volkoff, O. (2010) ‘Understanding organisation- enterprise system Fit: A Path to Technology Artifact’, *MIS Quarterly*, 34 (4), 731- 755, pp.731-756.

Swartz, D. and Orgill, K. (2000) ‘Higher education ERP: lessons learned’, *EDUCAUSE 2000 in Nashville*, pp. 1-12.

Tabachnick, B. G. and Fidell, L. S. (2001) *Using multivariate statistics*. 4th edn. Needham Heights, MA: Allyn & Bacon.

Tashakkori, A. and Teddlie, C. (2003) 'The past and future of mixed methods research: From data triangulation to mixed model designs'. In Tashakkori, A. and Teddlie, C. *Handbook of mixed methods in social and behavioural research.* Thousand Oaks, CA: SAGE Publication Ltd. pp. 671-702.

Teddlie, C. and Yu, F. (2007) 'Mixed methods sampling a typology with examples', *Journal of Mixed Methods Research*, 1 (1), pp. 77-100.

Teddlie, C. and Tashakkori, A. (2006) 'A general typology of research designs featuring mixed', *Research in the School*, (1), pp. 12-28.

Teijlingen, E. and Hundley, V. (2001) 'The importance of pilot studies', department of sociology, *social research update*, *University of Surrey*, 35, pp.1-5.

Thomas, G. (2011) *How to do your case study: a guide for students and researchers*. SAGE Publications Ltd.

Torkzadeh, G., Koufterosb, X. and Doll, W. (2005) 'Confirmatory factor analysis and factorial invariance of the impact of information technology instrument', *OMEGA.* 33, pp. 107-118.

Torkzadeh, G. and Doll, W.J. (1999) 'The development of a tool for measuring the perceived Impact of information technology on work', *OMEGA*, 27, pp.327-339.

Tsai, W., Fan, Y., Chou, J. and Yang, C. (2007) 'The relationship between implementation variables and performance improvement of ERP systems', *International journal Managements*, 38 (4), pp. 350- 373.

Umble, E., Haft, R. and Umble, M. (2003) 'Enterprise resource planning: implementation procedures and critical factors', *European Journal of Operational Research*, 146, pp. 241-257.

Vessey, I., Ramesh, V. and Glass, R. (2002) 'Research in information systems: An Empirical study of Diversity in Discipline and its Journal', *Journal of Management information systems*, 19 (2), pp. 129-174.

Wagner, E. and Newell, S. (2004) ‘Best’ for whom? The tension between ‘best practice’ ERP packages and diverse epistemic cultures in a university context’, *The Journal of Strategic Information Systems*, 13 (4), pp. 305-328.

Wagner, E. and Newell, S. (2006) ‘Repairing ERP producing social order to create a working information system’, *Journal of Applied Behavioural Science*, 42 (1), pp. 40-57.

Wang, X. and Huang, J. (2006) ‘The relationships between key stakeholders’ project performance and project success: perception of Chines construction supervising engineers’, *International Journal of Project Management*, 24, pp.253-260.

Walsham, G. (1993) *Interpreting Information Systems in Organizations*. Chichester: Wiley.

Walsham, G. (1995) ‘The emergence of interpretivism in IS Research’, *Information Systems Research*, 6 (4), pp.376-394.

Waston, E. and Schneider, H. (1999) ‘Using ERP systems in education’, *Communication of the Association for Information Systems*, 1 (9), pp. 1-47.

Wei C.- C. (2008) ‘Evaluating the performance of the ERP systems based on the knowledge of ERP implementation objectives’, *The International Journal of Advanced Manufacturing*, 39, pp. 168-181.

Wieder, B., Booth, P., Matolcsy, Z. and Ossimitz, M.L. (2006) ‘The impact of ERP systems on firm and business process performance’, *journal of Enterprise Information Managements’*, 19 (1), pp.13-29.

Wilkes, R. B. and Dickson, G. W., (1987) ‘Assessment of the information systems organization: An empirical investigation of assessor perspectives’, Proceedings of8th ICIS Pittsburgh: Pennsylvania, pp.428-441.

Woodroof, J. and Kasper, G. (1998) ‘A conceptual development of process and outcome user satisfaction’, *Information Resources management journal*, 11 (2), pp. 37-43.

Wood, J., Vidgen, R., Wood-Harper, A. and Rose, J. (1995) Business process redesign: radical change or reactionary tinkering? In Burke, G. and Peppard, J. (eds), Examining Business Process Re-Engineering: Current Perspectives and Research Directions. London: Kogan, pp. 245-261.

Wu, J. and Wang, Y. (2006) ‘Measuring ERP Success: The ultimate users’ view’, *International Journal of Operation and Production Management*, 26 (8), pp.882-903.

Wu, J. and Wang, Y. (2007) ‘Measuring ERP Success: The key –users ‘viewpoint of the ERP to produce a viable IS in the organisation’, *Computer in Human Behaviour*, 23, pp.1582-1596.

Yin, R. (2009) *Case study research: design and methods*, 5th edn. London: SAGE Publications Ltd.

Yin, R. (2012) *Application case study research*.6th edn. London: SAGE Publications Ltd.

Yusuf, Y., Gunasekaran A. and Abthorpe, M. (2004) ‘Enterprise information systems project implementation A case study of ERP in Rolls-Royce’, *International journal Production Economies*, 87, pp. 251-266.

Zhang, Z., Lee, M., Hung, P., Zhang, L. and Huang, X. (2005) ‘A framework of ERP systems implementation success in China: An empirical study’, *International journal production economies*, 98, pp. 56-80.

Zhu, Y., Li, Y., Wang W. and Chen, J. (2010) ‘What leads to Post-Implementation success of ERP? An empirical study of the chinese retail industry’, *International Journal of Information Management,* 30, pp. 265-276.

Zigurs, I., & Buckland, B. K. (1998). A theory of task/technology fit and group support systems effectiveness. *MIS Quarterly*, 22(3), 313–334.

Zornada, L. and Velkavrh, T.B. (2005) ‘Implementing ERP systems in higher education institutions’, *proceeding from the 27th International Conference on Information Technology ICTI, Cavtat, Croatia*. pp. 1-7

APPENDIX: A

ETHICAL APPROVAL

School of Information Systems, Computing and Mathematics
David Gilbert, Head of School, Professor of Computing
Jasna Kuljis, Head of Information Systems and Computing, Professor of Computing
Tony Rawlins, Head of Mathematical Science, Professor of Mathematics

Brunel
UNIVERSITY
WEST LONDON

Brunel University, Uxbridge,
Middlesex UB8 3PH, UK
Telephone: +44(0) 1895 274000
Fax: +44(0) 1895 251686
Emails:
Yongmin.Li@brunel.ac.uk
Annette.Payne@brunel.ac.uk
Lampros.Stergioulas@brunel.ac.uk
Zidong.Wang@brunel.ac.uk

Date: 05 December 2011

STATEMENT OF ETHICS APPROVAL

Proposer: Mona Althonayan

Title: Evaluating the performance of ERP system in Saudi Arabia higher education: a stakeholders' perspective

The school's research ethics committee has considered the proposal recently submitted by you. Acting under delegated authority, the committee is satisfied that there is no objection on ethical grounds to the proposed study. Approval is given on the understanding that you will adhere to the terms agreed with participants and to inform the committee of any change of plans in relations to the information provided in the application form.

Yours sincerely,

Zidong Wang

Professor Zidong Wang
Chair of the Research Ethics Committee
SISCM

Royal Embassy of Saudi Arabia
Cultural Bureau in the
United Kingdom & Ireland

سفارة المملكة العربية السعودية
الملحقية الثقافية
بالمملكة المتحدة وايرلندا

الشئون الأكاديمية:S10059

إلى من يهمه الأمر

تفيد الملحقية الثقافية السعودية في بريطانيا بأن الطالبة / **منى علي ثويني الثنيان** سجل مدني رقم 1011837125 أحد المبتعثات من وزارة التعليم العالي بموجب القرار رقم 89531 تاريخ 1429 /12/19 هـ لدراسة الدكتوراة في تخصص نظم معلومات بجامعة برونيل في بريطانيا إلى 2012/05/01 م. و نأمل مساعدتها في جمع المعلومات المطلوبة بخصوص بحثها.

والله الموفق،،،

الملحق الثقافي في بريطانيا

أ. د. غازي بن عبد الواحد المكي

NO........ DATE: .... ENC. ....

630 Chiswick High Road, London W4 5RY, E-mail: sacbuk@uksacb.org Website: www.uksacb.org
Tel: +44 (20) 3249 7000 Faxes: +44 (20) 3249 7004 / +44 (20) 3249 7005 / +44 (20) 3249 7006

APPENDIX: B

B1: QUESTIONNAIRE

B2: INTERVIEW FORM

Brunel UNIVERSITY WEST LONDON

Evaluating the Performance on ERP systems in Saudi Arabia Higher Education: A stakeholders' perspective

- This study is intends to investigate the impact of ERP systems on the performance of the stakeholders, in the environment of higher education.
- This questionnaire is divided to four sections:
    - ♦ The first section is general information.
    - ♦ The second section is stakeholders' impact; interviewees are requiring choosing one answer and giving opinion if required.
    - ♦ The third section is the ERP systems quality; interviewees are requiring choosing one answer
    - ♦ The fourth section is the technical support; interviewees are requiring choosing one answer. (Please do not give more than one answer).
- The questionnaire is to be filled by the administrative, staff and faculty, who are work on the systems daily.
- Please provide as detail information as possible.
- The information provided will be held strictly and confidential.
- If you interested in the results of this research, we will be happy to send you a result copy of this research.
- If you have any concerns or complaints regarding the ethical elements of this project please contact siscm-srec@brunel.ac.uk or Dr Laurence Brooks, Tel. No. 01895 266010
- Your cooperation is highly appreciated.
- Please if you have any questions do not hesitate to contact the researcher at mona.althonayan@brunel.ac.uk or KSA-mobile,0554620396-UK 0044-7729119102

I have read the information sheet. I agree to participate in the study and give my consent freely. I understand that the study will be carried out as describe in the information statement, a copy of which I have retained. I realise that whether or not I decided to participate is my decision. I have all questions answered to my satisfaction.

Participant name ....

Signatures ……………….

Date ....

SECTION 1 General Information	
I. Name of the university	
II. Which ERP system are your university using?	
III. What is your Job title?	

SECTION 2 Stakeholders' impact:

1-The ERP system have positive impact on the productivity of your job.

○ Strongly agree ○ Agree ○ Don't know ○ Disagree ◉ Strongly disagree

2- The ERP system is an important aid to me in the performance of my job.

○ Strongly agree ○ Agree ○ Don't know ○ Disagree ○ Strongly disagree

3- The ERP systems enhance your performance.

○ Strongly agree ○ Agree ○ Don't know ○ Disagree ○ Strongly disagree

4-The ERP system enhances my effectiveness in my job.

○ Strongly agree ○ Agree ○ Don't know ○ Disagree ○ Strongly disagree

5- The Oracle system allows me to accomplish more work than would otherwise be possible.

○ Strongly agree ○ Agree ○ Don't know ○ Disagree ○ Strongly disagree

6- The ERP system enhances my awareness about the system.

○ Strongly agree ○ Agree ○ Don't know ○ Disagree ○ Strongly disagree

7- The ERP system facilities quick information retrieval.

○ Strongly agree ○ Agree ○ Don't know ○ Disagree ○ Strongly disagree

8- It is easy to detect possible errors in the ERP system.

○ Strongly agree ○ Agree ○ Don't know ○ Disagree ○ Strongly disagree

9- The ERP system helps me to identify problems.

○ Strongly agree ○ Agree ○ Don't know ○ Disagree ○ Strongly disagree

10- It is easy with the Oracle system to find solutions to problems.

○ Strongly agree ○ Agree ○ Don't know ○ Disagree ○ strongly disagree

Please explain in two points how the ERP systems enhance your job performance.

1..

2..

SECTION 3 system quality:

11- The ERP system provides me with information that I need.

○ Strongly agree ○ Agree ○ Don't know ○ Disagree ○ Strongly disagree

12-The ERP system provides reports that seem to be just about exactly what I need.

○ Strongly agree ○ Agree ○ Don't know ○ Disagree ○ Strongly disagree

13-The output is presented in a usual format.

○ Strongly agree ○ Agree ○ Don't know ○ Disagree ○ Strongly disagree

14-I can get the information I need in time.

○ Strongly agree ○ Agree ○ Don't know ○ Disagree ○ Strongly disagree

15-I can get data quickly and easily when I need to.

○ Strongly agree ○ Agree ○ Don't know ○ Disagree ○ Strongly disagree

16-I can get the help that I need in accessing and understanding the data.

○ Strongly agree ○ Agree ○ Don't agree ○ Disagree ○ Strongly disagree

17- The data would be useful to me is unavailable because I don't have the right authorization.

○ Strongly agree ○ Agree ○ Don't know ○ Disagree ○ Strongly disagree

18- It is easy to learn how to use the ERP system that gives me access to data.

○ Strongly agree ○ Agree ○ Don't know ○ Disagree ○ Strongly disagree

19- The ERP system is too inflexible to be able to respond to my need for changing data.

○ Strongly agree ○ Agree ○ Don't know ○ Disagree ○ Strongly disagree

20- I am not getting as quick a turnaround as I need on requests for new reports or data.

○ Strongly agree ○ Agree ○ Don't know ○ Disagree ○ Strongly disagree

21- There is not enough training on how to find, understand, access or use corporate divisional data.

○ Strongly agree ○ Agree ○ Don't know ○ Disagree ○ Strongly disagree

22-The data that I use is accurate enough for my purposes.

○ Strongly agree ○ Agree ○ Don't know ○ Disagree ○ Strongly disagree

23 -When it's necessary to compare or aggregate data from two or more different sources there are may be unexpected or difficult inconsistencies.

○ Strongly agree ○ Agree ○ Don't know ○ Disagree ○ Strongly disagree

24- It is difficult or impossible to compare or aggregate data from two different sources because the data defined differently.

○ Strongly agree ○ Agree ○ Don't know ○ Disagree ○ Strongly disagree

25- I can get data that is current (up to date) enough to meet my needs.

○ Strongly agree ○ Agree ○ Don't know ○ Disagree ○ Strongly disagree

26- It is more difficult to do my job effectively because some of the data I need is not available.

○ Strongly agree ○ Agree ○ Don't know ○ Disagree ○ Strongly disagree

27- The data is stored in so many different places and in so many forms; it is hard to know how to use it effectively.

○ Strongly agree ○ Agree ○ Don't know ○ Disagree ○ Strongly disagree

Which of the above system characteristics you consider significantly enhance your performance (please state 3 in order of importance)

1...

2...

3...

SECTION 4 Technical support:

28- The ERP system has up –to date hardware and software.

◯ Strongly agree ◯ Agree ◯ Don't know ◯ Disagree ◯ Strongly disagree

29- The ERP system is dependable.

◯ Strongly agree ◯ Agree ◯ Don't know ◯ Disagree ◯ Strongly disagree

30- The ERP system user support team give prompt service to users.

◯ Strongly agree ◯ Agree ◯ Don't know ◯ Disagree ◯ Strongly disagree

31- The ERP system user support team have the knowledge to do their job well.

◯ Strongly agree ◯ Agree ◯ Don't know ◯ Disagree ◯ Strongly disagree

Do you expect any other technical support from the ERP system support team? (Two point please)

1...

2...

This is the end of the questionnaire, thank you very much your cooperation is highly appreciated

Mona Althonayan

Brunel UNIVERSITY WEST LONDON

Evaluating the Performance on ERP systems in Saudi Arabia Higher Education: A stakeholders' perspective

- This study is intends to investigate the impact of ERP systems on the performance of the stakeholders, in the environment of higher education.
- This interview is divided to 7 questions.
- You are free to answer or refuse to answer any questions.
- The interview is to be answered by the administrative, staff and faculty, who are work on the systems daily.
- Please provide as detail information as possible.
- The information provided will be held strictly and confidential.
- If you interested in the results of this research, we will be happy to send you a result copy of this research.
- If you have any concerns or complaints regarding the ethical elements of this project please contact siscm-srec@brunel.ac.uk or Dr Laurence Brooks, Tel. No. 01895 266010
- Your cooperation is highly appreciated.
- Please if you have any questions do not hesitate to contact the researcher at mona.althonayan@brunel.ac.uk or KSA-mobile,0554620396-UK 0044-7729119102

I have read the information sheet. I agree to participate in the study and give my consent freely. I understand that the study will be carried out as describe in the information statement, a copy of which I have retained. I realise that whether or not I decided to participate is my decision. I have all questions answered to my satisfaction.

....	....	....
Participant	Signatures	Date

•Can you can explain in detail what are the main barriers or challenges facing KSU during the implementation, or pre implementation.

……………………………………………………………………………………………
……………………………………………………………………………………………
……………………………………………………………………………………………
……………………………………………………………………………………………

•Did KSU face any problems, barriers during the implementation regarding the customization?

……………………………………………………………………………………………
……………………………………………………………………………………………
……………………………………………………………………………………………

•What is the plan for the future?

……………………………………………………………………………………………
……………………………………………………………………………………………
……………………………………………………………………………………………

1-Based on your answer in the questionnaire please explain how the ERP system has (or has not) positive impact on the productivity of your job.

……………………………………………………………………………………………
……………………………………………………………………………………………
……………………………………………………………………………………………

2-In which way The ERP system is an important aid to you in the performance of your job.

……………………………………………………………………………………………
……………………………………………………………………………………………
……………………………………………………………………………………………

3-Which of the ERP system characteristics you consider significantly enhance your performance (please state 3 in order of importance)

……………………………………………………………………………………………
……………………………………………………………………………………………
……………………………………………………………………………………………

4-Please explain how the quality of the ERP systems enhances your job performance

……………………………………………………………………………………………
…………………………………………………………………………………………
…………………………………………………………………………………………

5-Do you think that you need continuous training on how to find, understands, access or use corporate divisional data.

…………………………………………………………………………………………
…………………………………………………………………………………………
…………………………………………………………………………………………

6- Do you expect any other technical support from the ERP system support team?

…………………………………………………………………………………………
…………………………………………………………………………………………
…………………………………………………………………………………………

7-As ERP system user what do you think the major barriers in implementing the ERP systems?

…………………………………………………………………………………………
…………………………………………………………………………………………
…………………………………………………………………………………………

8-As a project manager I appreciate if you can add further comments for future ERP system implementation in Saudi Arabian Universities.

…………………………………………………………………………………………
…………………………………………………………………………………………
…………………………………………………………………………………………
…………………………………………………………………………………………

APPENDIX: C

LITERTURE EVALUATION

	Factors	Title of the study	Authors	Year	Type of the study	Sample	ERPs environment	Focus of the study	Evaluate the S or P
1	Improve stakeholders' productivity, ease of use, reliability, authorization,	An exploration of factors that impact individual performance: an analysis multiple analytical techniques	Boontaree Kositanurit, Ojelanki Ngwenyama and Kweku-Muata Osei-Bryson	2006	On line survey	(255) ERP users and (95) non ERP users	Yes	TTF – User satisfaction	
2	Compatibility, Training, assistance, accuracy, timeliness, ease of use, accessibility.	Enterprise Resource Planning Systems (ERP) and user performance: A literature Review.	Ahed Abugabah, Louise Sanzogni.	2009	Comprehensive literature Review (proposed model)	---------	Yes	TAM, TTF and D&M	
3	Compatibility, Training, assistance, accuracy, ease of use, error recovery, currency, format, experience, flexibility, timeliness, accessibility	The impact of information Systems on user Performance: A critical review and theoretical model	Ahed Abugabah, Louise Sanzogni, and Arthur Poropat	2009	Comprehensive literature Review (proposed model)	---------	No	TAM, TTF and D&M	
4	Service quality, training, accuracy, reliable, timeliness, time taken to complete task, immediate recall, easy to use, improve productivity.	ERP user satisfaction issues insights from a Greek industrial giant	Pantelis Longinidis and Katerina Gotzamani	2009	Questionnaire and interview	68 users and personal interview	Yes	Measure ERP users' satisfaction using 19 items, examined the existence of deviation in satisfaction levels among ERP users with five different characteristics, department of employment, gender, age, education, and IT experience.	

5	Information quality, systems quality, service quality	Investigating the success of ERP systems case studies in three Taiwanese high tech industries	Shin-Wen Chien and Shu-Ming Tsaur	2007	Survey	Multiple case study	Yes	Propose a success model for ERP systems and empirically investigate the multi-dimensional relationships among the success measures	S
6	Content, accuracy, format, timeliness, ease of use	ERP systems adoption An expiratory study of the organisational factors and impacts of ERP success	Chuck C. H. Low and Erick W. T. Ngai	2007	Interview and Survey	Multiple case study	Yes	Examine the relationship of success factors ERP and BPI	S
7	System quality, training, accuracy	A framework of ERP systems implementation success in China: empirical study	Zhe Zhang, Matthew K.O.Lee, Pei Huang, Liang Zhang, Xiaoyuan Huang	2005	Interview	Multiple case study	Yes	Improve critical factors that affect ERP implementation success.	S
8	Time, flexibility, reliability, service	Evaluating the performance of an ERP system based on the knowledge of ERP implementation objectives	Chun- Chin Wei	2008	Survey	Case study	Yes	Evaluating the performance of an ERP	S
9	Task relevance, compatibility.	Empirically Testing User Characteristics and Fitness Factors in Enterprise Resource Planning.	Clyde W. Holsapple, Yu-Min Wang and Jen-Her Wu.	2005	Questionnaire	617 candidate	Yes	User characteristics and faintness factors.	
10	Ease of use, user performance, and support.	A structural model of end user computing satisfaction and user performance	Jamshid Etezadi- Amoli and Ali Farhoomand	1996	Questionnaire	341EUC end user	No	EUCS and user performance	

11	Technical IT skills, flexible IT	Information Technology and the Performance of the Customer Service Process: A resource based analysis	Gautam Ray, Waleed Muhanna and Jay B. Barney.	2005	Survey	100 employee in the health insurance	No	The performance of the customer service.	
12	Time, quality, flexibility, service.	A neutral network evaluation model for ERP performance from SCM perspective to enhance competitive advantage	Chiu Chang, Hein- Ginn Hwang, Hsueh Liaw, Ming-Chien Hung, Sing-Liang Chen and David C Yen	2008	Questionnaire	60	Yes	SCM	
13	Training, ease of use.	ERP Training and user satisfaction	Joseph Bradley and C. Christopher Lee	2004	Questionnaire	113 employees	Yes	ERP in midsized university	
14	User productivity, task performance, task accomplishment, system quality.	Understanding the critical factors effect user satisfaction and impact of ERP through innovation of diffusion theory	Li-Ling Hsu, Robert S.Q.Lai and Yu-Te Weng	2008	Questionnaire	504	Yes	Incorporate the innovation theory with IS success model to evaluate the success factors for ERP implementation.	
15	Accuracy, reliability, timeliness, format, accessibility, response time, flexibility, responsiveness, service support, accurate	A critical review of end user information system satisfaction research and research framework	Norman Au, Eric W.T.Ngai and T.C.Edwin Cheng	2002	Comprehensive literature Review (proposed model)	------------	No	EUISS	

16	Accurate, flexible, easy to use, reliable, allows data integration, recall for individual work, improves individual productivity, beneficial for individual's tasks, saves individual tasks,	ERP systems success: an empirical analysis of how organizational stakeholder groups prioritize and evaluate relevant measure	P. Ifindo and N. Nahar	2007	Survey in Finland and Estonia	66 respondents in 44 diverse, privet, industrial organizations	Yes	ERP systems success	
17	Accurate, flexible, easy to use, reliable, allows data integration, recall for individual work, improves individual productivity, beneficial for individual's tasks, saves individual tasks,	Do top and midlevel managers view ERP success measures differently?	Princely Ifindo and Nazmun Nahar	2006	Survey in tow small Northern Europe countries	350 firms in Finland and 120 in Estonia	Yes	ERP systems success	
18	Training, accuracy, timeliness, reliability, response time, ease of use, flexibility, output requirement	Measuring ERP success: the ultimate user's view	Jen-Her Wu and Yu-Min Wang	2006	Survey and interview	264 ERP ultimate users	Yes	ERP systems success	
19	Technology functionalities, task requirement, individual abilities.	Stakeholders process approach to information systems evaluation	Olayele Adelakun and Murray E. Jennex	2002	Interview, archives and survey.	Stakeholders of two companies, McBee and Powerco	No	Stakeholders evaluation	

20	Flexibility, accuracy, timeliness, reliability, confidence in systems, currency, error recovery, response/ turnaround time, training, job effects, format,	Development of a tool for measuring and analyzing computer user satisfaction	James E. Bailey and Sammy W. Pearson	1983	Questionnaire and Interview.	32 middle managers	No	CUS	
21	Service quality	Measuring Organizational IS effectiveness: an overview and update of senior management perspectives	Peter B. Saddon, Valerie Graeser and Leslie P. Willcocks	2002	Survey.	80 senior IT mangers	No	IT mangers evaluations	
22	Quality of work/ complete task	Employee performance evaluation by AHP: A case study	Rafikul Islam and Shuib bin Mohd Rasad	2005	Absolute measurement procedure of AHP	294 employee of inter system maintenance service	No	Evaluate the performance of the operational level employee	
23	Training, ease of use	ERP training and user satisfaction: a case study	Joseph Bradley and C. Christopher Lee	2007	Survey.	143 employee	Yes	ERP systems training and user satisfaction	
21	Compatibility, ease of use, flexibility,	The relation of interface usability characteristics, perceived usefulness, and perceived ease of use to end-user satisfaction with ERP system	Fethi Calisir and Ferah Calisir	2004	Survey.	51 end user in 24 companies	Yes	Examines various usability factors affecting end user satisfaction	

24	Improve productivity, improve performance	Managing user acceptance towards ERP understanding the dissonance between user expectations and managerial policies	Eric T.K. Lim , Shan Ling Pan and Chee Wee Tan	2005	Action research	Case study 20 consultants	Yes	Dissonance between user expectancy performance and managerial policies	
25	Accuracy, reliability, timeliness, accessibility, response, flexibility, work performance, service quality, training, responsiveness	Extending the understanding of end user information systems satisfaction formation: an equitable needs fulfilment model approach	N. Au, E. W. T. Ngai and T.C.E. Cheng	2008	Survey.	922 employee from the airline and hotel sector	No	EUS	
26	Authority, time, system quality	The relationships between key stakeholders' project performance and project success: perception of Chinese construction supervising engineers	Xiaojin Wang, Jing Huang	2006	Survey	245	No	Stakeholders evaluate project success	
25	Training, accuracy, timeliness, reliability, flexibility, ease of use, response time	Measuring ERP success: The key –users' viewpoint of the ERP to produce a viable IS in the organization	Jen-Her- Wu and Yu Min Wang	2007	Survey	Top 1000 enterprise in Taiwan	yes	Key user satisfaction as means of determining system success	
26	Ease of use, user skills	Variables affecting information technology end user satisfaction: a meta-analysis of the empirical literature	Mo Adam Mahmood, Janice M. Burn, Leopoldo A. Gemoets and Carmen Jacquez	2000	Comprehensive literature Review	-----------	No	EUS	

27	Content, format, ease of use, accuracy, timeliness, computer experience	User satisfaction in ERP system: some empirical evidence	Moshe Zviran	2003	Survey	172 user of ERP system	Yes	EUS	
28	Content, format, ease of use, accuracy, timeliness,	The meaning and measurement of user satisfaction: A multigroup invariance analysis of the end user computing satisfaction instrument	William J. Doll, Xiaodong Deng, T.S. Raghunathan, Gholamreza Torkzadeh and Weidong Xia	2004	Gholamreza Torkzadeh	1386 user from over 60 firms	No	EUS	
29	Content, format, ease of use, accuracy, timeliness,	A discrepancy model of end user computing involvement	William J. Doll and Gholamreza Torkzadeh	1989	Survey data and field experiment	618 from 44 firms	No	End user computing involvement	
30	Task productivity/ time, increase productivity, accomplish more work. Customer service.	Confirmatory factors analysis and factorial invariance of the impact of information technology instrument	William J. Doll,, Xenophon Koufteros and Gholamreza Torkzadeh	2005	Survey	332	No	Measuring information technology impact	
31	Task productivity/ time, increase productivity, accomplish more work. Customer service.	The development of tool for measuring the perceived impact of information technology on work	Gholamreza Torkzadeh and William J. Doll,	1999	Interview , questionnaire	409 end user from18 organization and 8 manufacturing firms	No	Measuring information technology impact	

32	Content, format, ease of use, accuracy, timeliness.	Confirmatory factor analysis of the end user computing satisfaction instrument: replication within an ERP domain	Toni M. Somers, Klara Nelson and Jahangir Karimi	2003	Nationwide mail survey	407	Yes	Measuring end user satisfaction with ERP software application	
33	Systems quality/ currency, content, accuracy, format, timeliness, ease of use, reliability, authorization.	An exploration of factors that impact individual performance in an ERP environment: analysis using multiple analytical techniques	Boontaree Kositanurit, Ojelanki Ngwenyama and Kweku- Muata Osei- Bryson	2006	Survey	349 respondents of these, 255resondents are ERP users	Yes	Evaluate individual performance in an ERP environment	
34	TAM and TTF	Extending the technology acceptance model with Task Technology Fit	Mark T. Dishaw and Diane M. Strong	1999	questionnaire	50 firms	No	Evaluate the integration between TAM and TTF is useful to understand the software utilization	
35	TTF	Task technology fit and effectiveness of group support systems: evidence in the context of task requiring domain specific knowledge	Uday Murthy and Dived Kerr	2000	Experiment	76	No	Effectiveness of group support systems technology by explore TTF hypothesis	
36	TTF	User evaluation of IS as surrogates for objective performance	Dale Goodhue, Barbra Klein and Salvatore March	2000	Experiment	155	No	User evaluation	

37	TTF	Development and measurement validity of a task technology fit instrument for user evaluation of information systems	Dale Goodhue	1989	Questionnaire and interview	360 questionnaire and 100 interview	No	User evaluation	
38	Awareness, recall, individual productivity, format, ease of use accuracy, flexibility	A factor and structural equation analysis of the enterprise systems success measurement model	Darshana Sedera and Guy Gble	2004	Survey	Identification survey 137 Exploratory phase :310 Confirmatory phase :153 oracle users	Yes	Measuring ERP systems success	
39	Information quality/ accuracy, Ease of use,	Assessing the validity of IS success models: an empirical test and theoretical analysis	Arun Rai, Sandra Lang and Robert Welker	2002	Questionnaire	274	No	Assessing the validity of IS success models	
40	Awareness, recall, individual productivity, format, ease of use accuracy, flexibility, currency, access, timeliness, content	Measuring enterprise systems success: a preliminary model	Darshana Sedera, Guy Gable and Taizan Chan	2003	Survey	317	Yes	Measuring the ERP systems success	
41	Awareness, recall, individual productivity, format, ease of use accuracy, flexibility, currency, access, timeliness, content	Re- conceptualizing information systems success: the IS impact measurement model	Guy Gable, Darshana Sedera and Taizan Chan	2008	Survey	153	No	Information systems success	

42	System quality/ reliability ease of use, response time. Training, user experience	Information systems success: individual and organizational determinants	Rajiv Sabherwal, Anand Jeyaraj and Charles Chowa	2006	Meta- analysis	612 finding from 121 study, from 1980 to 2004	No	Information systems success	
43	System quality, system importance	A partial test and development of Delone and McLean's model of IS success	Peter Seddon and Min-Yen Kiew	1994	Questionnaire	94	No	Information systems success	
44	Awareness, recall, individual productivity, format, ease of use accuracy, flexibility, currency, access, timeliness, content	Enterprise systems success: a measurement model	Guy Gable, Darshana Sedera and Taizan Chan	2003	Survey	27 public sector	Yes	Measuring the ERP systems success	
45	Awareness, recall, individual productivity, format, ease of use accuracy, flexibility, currency, access, timeliness, content	Measuring enterprise systems success: the importance of multiple stakeholder perspective	Guy Gable, Darshana Sedera and Taizan Chan	2004	Survey	310	Yes	Measuring the ERP systems success	
46	Timeliness, accuracy, content Individual impact, reliability,	User developed application and information systems success: A test of Delone and McLean's model	Tanya McGill and Valerie Hobbs	2003	Experiment	79	No	Information systems success(UDA)	

47	Service quality/ tangibles, reliability, responsiveness, assurance, empathy	Service quality: A measure of information systems effectiveness	Leyland Pitt, Richard Watson and C. Bruce Kavan	1995	Questionnaire	237	No	Information systems	
48	tangibles, reliability, responsiveness, assurance, empathy	Perceived service quality and user satisfaction with the information services function	William Kettinger and Choong Lee	1994	Questionnaire	400 computer users	No	Service quality in information systems	
49	Flexibility, reliability, productivity, timeliness, service level.	IT governance for enterprise planning supported by the Delone-McLean model of information systems success	Edward Bernroider	2008	Questionnaire	209	Yes	Measuring the ERP systems success	
50	Improving job performance, enhancing productivity of job, enhancing speed of performance tasks, easier to perform tasks	Perceived absorptive capacity of individual users in performance of enterprise resource planning (ERP) usage: the case for Korean firms	Jong –Hun Park, Hyun-Jn Suh and Hee-Dee-Dong Yang	2007	Questionnaire	245	Yes	Measuring the users performance of ERP systems	
51	Training, employee self -efficacy, IT awareness	The moderating effect of employee computer self-efficacy on the relationship between ERP competence constructs and ERP effectiveness	Shin-Wen Chien and Changya Hu	2009	Survey and questionnaire	657	Yes	The role of employee self –efficacy fulfils in ERP effectiveness	

52	Task interdependence, training, ease of use, ease of access	Subcultures and use of communication information technology in higher education institution	Canchu Lin and Louisa Ha	2009	Survey	1022	No	The role of information technology communication in higher education	
53	Training, awareness, compatibility, accuracy	Critical success factors of enterprise resource planning systems implementation success in China	Liang Zhang, Matthew Lee, Zhe Zhang and Probire Banerjee	2002	Survey	138	Yes	Measuring the ERP systems success	
54	Accuracy, timeliness, user's job performance, completeness of information, systems availability.	Performance measure of information systems(IS) in evolving computing environments: an empirical investigation	Jaeho Heo, Ingoo Han	2003	Survey	137	No	Evaluate the impact of information systems on business performance	
55	Training and education, suitability of hardware and software, data accuracy and integrity, timeliness.	A framework of ERP systems implementation success in China: An empirical study	Zhe Zhang, Matthew K. O. Lee, Pei Huang, Liang Zhang, Xiaoyuan Huang	2005	Interview	4- Case studies	Yes	ERP systems implementation success	
56	Content, format, timeliness, accuracy, ease of use	Measuring user satisfaction and perceived usefulness in the ERP context	Moshe Zviran, Nava Pliskin, Ron Levin	2005	Questionnaire	200 ERP systems users	Yes	Measuring user satisfaction in ERP context	
57	D&M (individual impact)	The relationship between implementation variables and performance improvement of ERP systems	Wen- Hsien Tsai, Yi-Wen Fan, Jun-Der Leu and Li – Wen Chou, Ching-Chien Yang	2007	Questionnaire	5000 largest corporation in Taiwan	Yes	Measuring ERP performance	S

58	Task efficiency, overall benefits,	The implementation factors that influence the ERP (enterprise resource planning) benefits	Shih-Wei, Yu-Chieh Chang	2008	Survey	166	Yes	The implementation factors that influence the ERP (post implementation phase)	p
59	Time, quality, flexibility, service	A neural network evaluation model for ERP performance from SCM perspective to enhance enterprise competitive and advantage	Chiu Chang, Hsin-Ginn Hwang, Hsueh- Chih Liaw, Ming- Chien Hung, Sing- Liang Chen, David C. Yen	2008	Questionnaire and Interview	60 questionnaire	Yes	Evaluation ERP performance from SCM perspective	p
60	System quality, information quality	The consequence of information technology acceptance on subsequent individual performance	M. Igbaria, M. Tan	1997	Survey	Case study	No	Examine the relationships between IT acceptance and individual performance	P
61	Ease of use, content, accuracy, format timeliness.	The meaning and measurement of user satisfaction: a multi group invariance analysis of the end user computing satisfaction	William J. Doll., Xiadoing Deng., T.S.Raghunathan., Gholamreza Torkzadeh., Wwidoing Xia.	2004	Survey	1,166 Responses	No	Test the equivalent of the factor loading and the structural weights of the first order factors across subgroups	S

APPENDIX: D

KSU

Aspirations of MADAR Project

• Shifting to a reference in the implementation of the enterprise resource planning (ERP) systems in government entities and private in the Kingdom of Saudi Arabia.

• recruit the necessary expertise to ensure the successful implementation of the resource planning systems.

• Change Management at the facility to ensure the implementation of the new systems properly and unhindered

Achievements throughout the project at King Saud University

1. Activation of the financial systems and the new management of all key agencies and departments.

2. Documentation of work procedures in the financial and administrative systems.

3. Creating a new generation of staff carries experiences of the older generation through the transfer of knowledge and experience that has been documented financial and administrative systems.

4. Reduce dependence on individuals to manage the work and activate of teamwork and Specialist.

5. Auditing and purification and reviewing old data and the new transfer regulations.

6. Provide integrated information infrastructure and interconnected within the university.

7. Process re-engineering some work to reduce reliance on paperwork and raise the efficiency of the implementation of these measures.

8. Train a large number of users and provide easy access training materials to raise the efficiency of users (Appendix).

9. Transition to a consultant in the field of reference providing consultancy in the implementation of the financial and administrative systems.

10. Benefit from the experience throughout the MADAR project at King Saud University in the group of some research master's and doctoral students in local universities, European and American.

11. Published a collection of scientific research, which holds experience throughout the project as a case study.

12. Benefit from the experience over the project in some studies and statistics that carried out some of the colleges, through questionnaires were distributed to the users of the system and project management.

Beneficiary departments

• Financial Management

• The purchase department administration and pursue, and follow up

• General Administration of planning, budget and follow-up

• Management control warehouses

• Administrative Communications Centre.

• Deanship of faculty members and staff.

A comprehensive Report about MADAR systems until

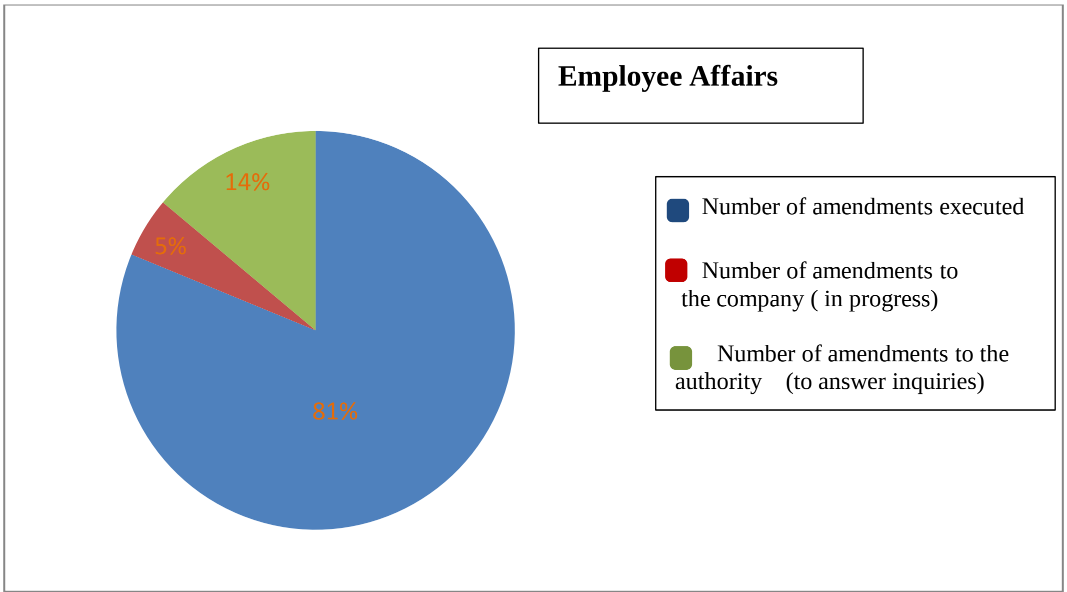
March 2012

1-System of employees' affair, Training, Scholarship and Salaries

Date starting system:	2008-2009
Number of users:	927
Departments activated by the system:	Deanship of faculty members and staff, training and scholarship and Salaries
The rest of the university departments:	Implement processes leave, start the work, resolve absence, evaluation of job performance and some other operations.

Current status of the system

Number of modifications reported	Number of amendments executed	Number of amendments to the company (in progress)	Number of amendments to the authority (to answer inquiries)
410	**333**	**20**	**57**

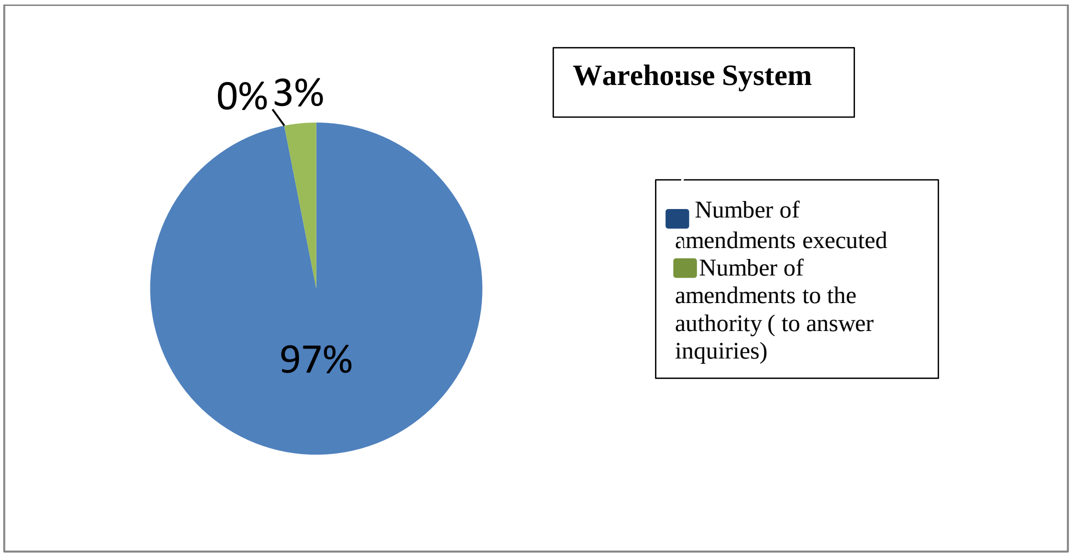


2-Warehouse system

Date starting system:	2007- 2008
Number of users:	341
Departments activated by the system:	Purchasing and warehouse management
The rest of the university departments:	Implement requisitions automatically from their positions.

Current status of the system

Number of modifications reported	Number of amendments executed	Number of amendments to the company (in progress)	Number of amendments to the authority (to answer inquiries)
97	**94**	**0**	**3**

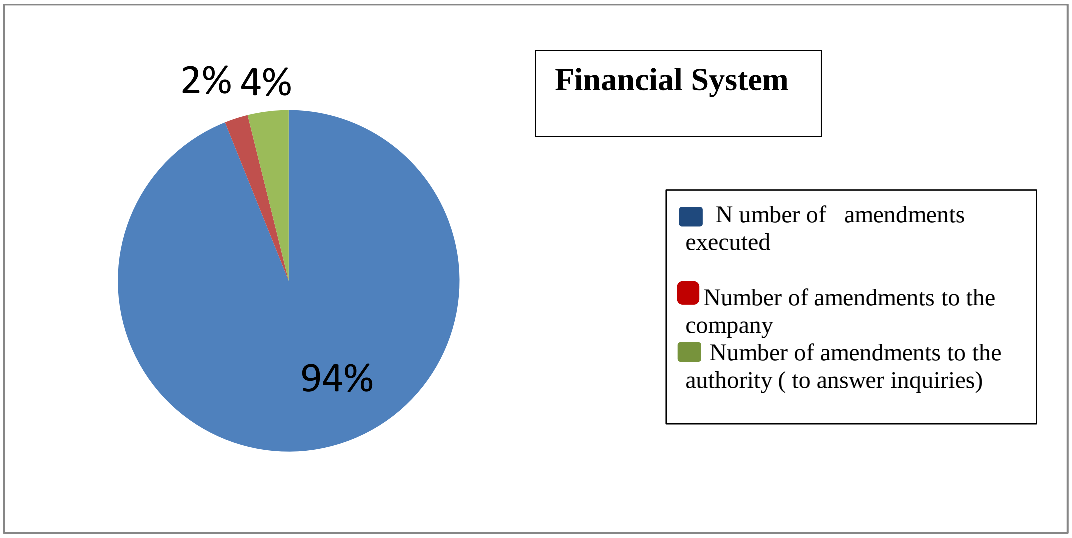


3-Financial system

Date starting system:	2008-2009
Number of users:	94
Departments activated by the system:	Central financial management
The rest of the university departments:	--

Current status of the system

Number of modifications reported	Number of amendments executed	Number of amendments to the company (in progress)	Number of amendments to the authority (to answer inquiries)
181	**170**	**4**	**7**

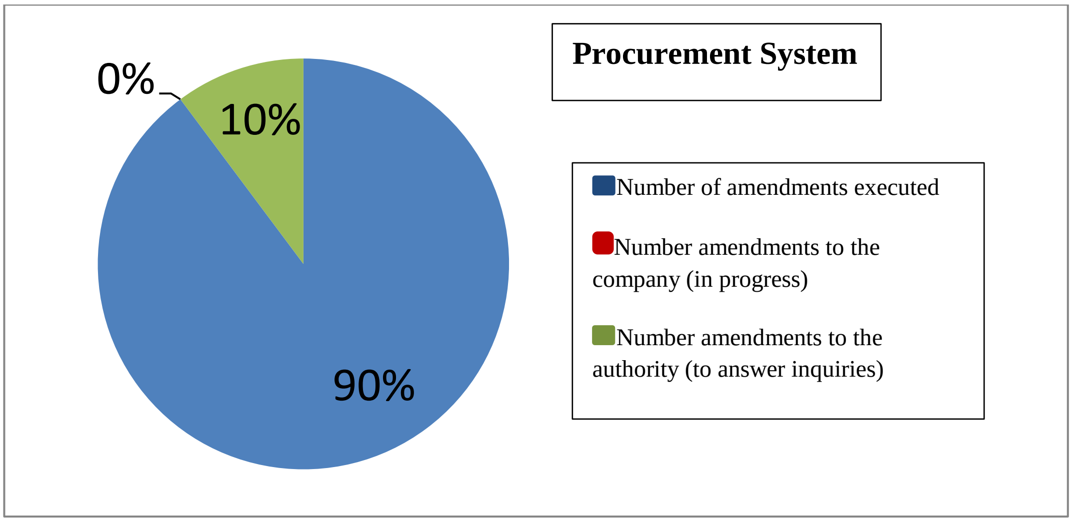


4- Procurement system

Date starting system:	2008- 2009
Number of users:	252
Departments activated by the system:	Purchasing and warehouse management
The rest of the university departments:	The university administration incorporate requests from their insurance and electronic

Current status of the system

Number of modifications reported	Number of amendments executed	Number of amendments to the company (in progress)	Number of amendments to the authority (to answer inquiries)
49	**44**	**0**	**5**

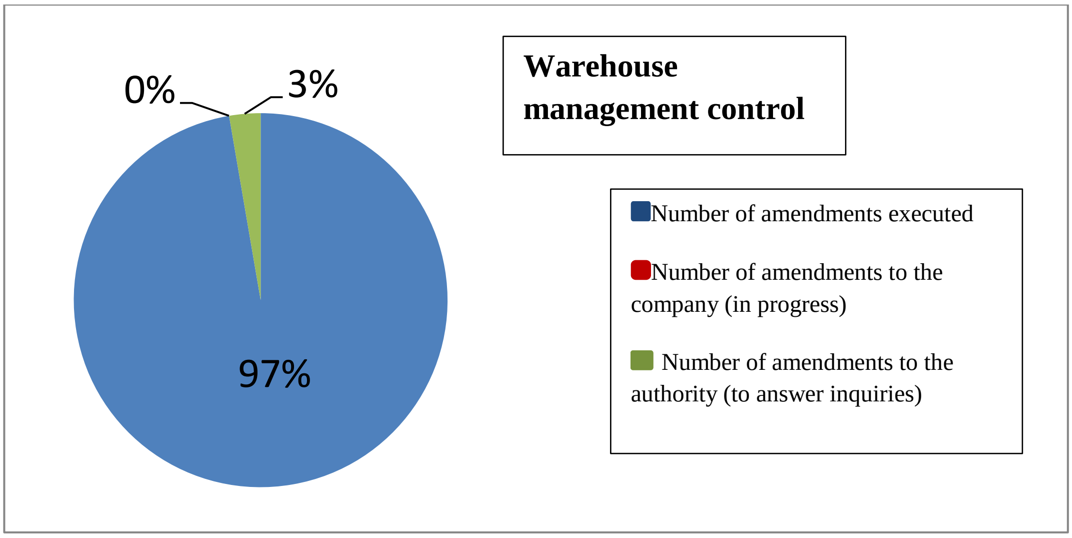


5- Warehouse control system and the Covenant

Date starting system:	2007-2008
Number of users:	74
Departments activated by the system:	Warehouse management control
The rest of the university departments:	Some departments are allowed to carry out the transfer of the Covenant

Current status of the system

Number of modifications reported	Number of amendments executed	Number of amendments to the company (in progress)	Number of amendments to the authority (to answer inquiries)
37	**36**	**0**	**1**

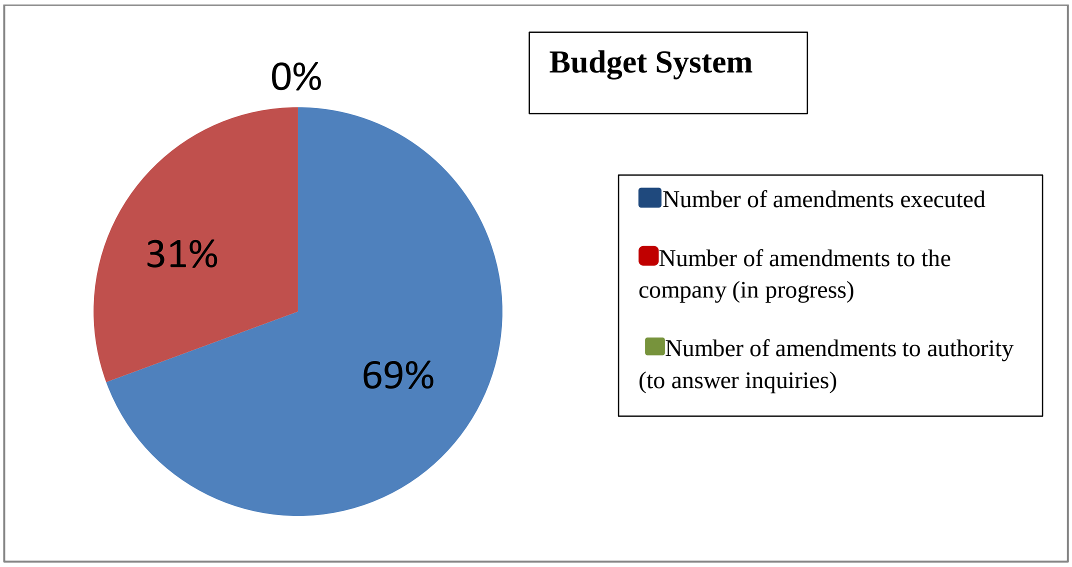


6- Budget system

Date starting system:	Did not begin the actual application
Number of users:	15 pilot on the environment
Departments activated by the system:	General Department of Planning and Budget and follow-up
The rest of the university departments:	---

Current status of the system

Number of modifications reported	Number of amendments executed	Number of amendments to the company (in progress)	Number of amendments to the authority (to answer inquiries)
49	**34**	**15**	**0**

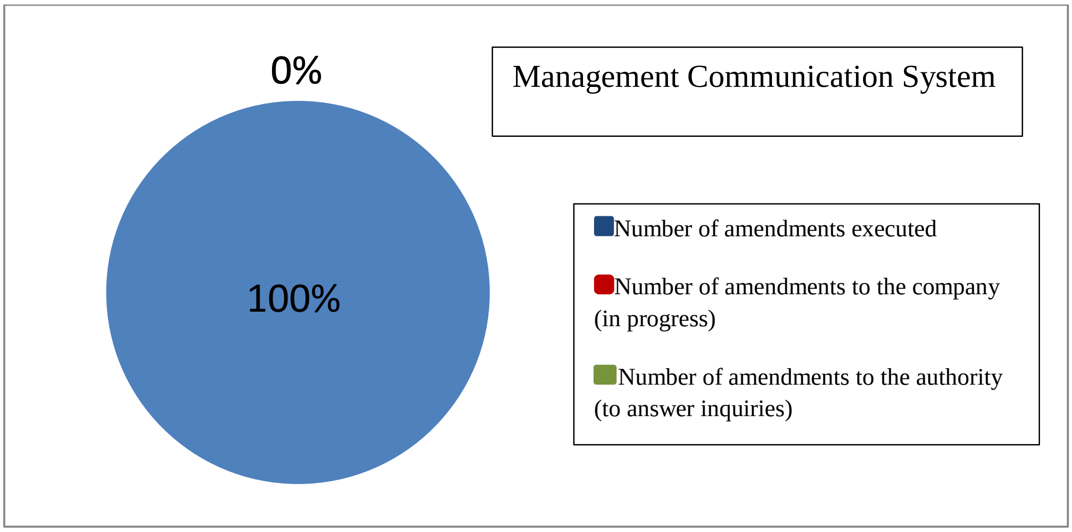


7- Management Communication System

Date starting system:	Did not begin the actual application
Number of users:	2648
Departments activated by the system:	All units of the University
The rest of the university departments:	--

Current status of the system

Number of modifications reported	Number of amendments executed	Number of amendments to the company (in progress)	Number of amendments to the authority (to answer inquiries)
141	**141**	**0**	**0**



Departments and the number of employees who have been trained to draft rules Systems financial and administrative

No	Name of the System	Trainers	Male	Female	Male DEB	Female DEB	Total of DEB &ADM	Training by Company Staff	Training by MADAR Staff
1	**Financial System**	72	70	2	1	0	1	48	24
2	**Management Communication System**	1,895	1,375	520	343	124	467	288	1,607
3	**Warehouse system**	73	63	10	38	2	40	20	53
4	**Inventory control system**	22	22	0	1	0	1	22	0
5	**Testament System**	16	16	0	1	0	1	16	0
6	**Procurement System**	102	79	23	43	9	52	20	82
7	**Competitions System**	35	26	9	7	4	11	20	15
8	**Employee System**	513	390	123	136	32	168	100	413
9	**Salary System**	165	127	38	3	3	6	40	125
10	**System Training and Scholarship**	28	22	6	1	1	2	28	0
11	**Budget system**	15	15	0	2	0	2	15	0
12	**Total**	2,936	2,205	731	575	175	750	617	2,319

APPENDIX: E

KFU

KFU Oracle ERP Application Project Deployment

The scope of this deployment framework is to deploy the Oracle ERP application in King Faisal University (Single Entity) with the below listed ERP application components:

	PHASE1
	Financial Management
1	Oracle General Ledger
2	Oracle Accounts Payables
4	Oracle Assets
5	Oracle Cash Management
	Supply Chain Management
6	Oracle Inventory
7	Oracle Purchasing
8	Oracle I Procurement
	Human Resources Management
9	Oracle Core HRMS
10	Oracle Payroll
	Customizations
11	Refer to the Appendix A for the Customizations which are in scope for this deployment framework
	Production Support
12	Two Months Support

	PHASE2
	Financial Management
1	Budgeting
	Supply Chain Management
2	Oracle Sourcing
3	Oracle I Supplier
4	Oracle Procurement Contract
	Human Resources Management
5	Oracle Self Service <SSHR>
	Production Support
6	One Month Support
	Customizations
7	None

Phase2 - High Level Implementation Scope

Planning & Budgeting

1. Manage budget planning & reporting centrally for KFU.
2. Integrate with the budgets & Actuals in General Ledger for data extract/write back.
3. Online access for Budget definition and balance inquiries.
4. Apply business rules to calculate next year budget based on current year actuals or previous year budget.
5. Budget at different department levels
6. Control budgeting cycle using budget targets and budget approval workflow
7. Develop budgets using increase and aggregate functions
8. Budget validation and approval mechanism to enforce budget constraints
9. Budget Reporting and Analysis – This must fall within the total number of customized reports of the scope.
10. Grant users different responsibilities based on their functional role within the budget definition process

I Procurement

1. Setup & Enable I Procurement for online requisitions process as per the standard feature with built-in integration with Oracle Purchasing
2. Setup & Enable online approval for purchase requisitions in I Procurement
3. Upload Item Catalogues (if provided by KFU for their item master & Item Categories)

Procurement Contract

1. Setup Contract Terms & Condition Clause Types and fixed content (KFU to provide the clause types as per the needed format)
2. Enable contract for Oracle purchasing as per the standard feature
3. Configure the purchasing contract layouts in the system for automatic generation of purchasing contracts (KFU to provide their layouts) – This must fall within the total number of customized reports of the scope.

Sourcing & I Supplier Portal

1. Setup Sourcing Process for quotation & Bids negotiation as per the standard feature
2. Supplier Access and security functions for enabling external suppliers to access the KFU application for suppliers as per the standard feature to automate the supplier communication with regards to purchase orders, shipments and invoicing.

Self Service HR

Setup and enable Self Service HR for the below standard functions within Self Service HR Application

1-Employee Self Service for below listed standard processes

-Personnel Information (Employee Self-Service)

-Pay slips (Employee Self Service)

-My Information – Assignment Info (Employee Self Service)

-Events and Bookings (Employee Self Service)

-Education and Qualification (Employee Self Service)

-Other Professional Awards (Employee Self Service)

-Resume (Employee Self Service)

-Leave of Absence (Employee Self-Service)

-Documents of Record (Employee Self-Service)

-Manage Payroll Payments (Employee Self-Service).

2-Manager Self Service for below listed standard processes

-Change Manager (Manager Self-Service)

-Change of Regular Salary (Manager Self Service)

-Termination (Manager Self Service).

-Personnel Information (Manager Self-Service)

-My Employee Professional Information (Manager Self Service)

-Events and Bookings (Manager Self Service)

-Education and Qualification (Manager Self Service)

-Other Professional Awards (Manager Self Service)

-Resume (Manager Self Service)

-Leave of Absence (Manager Self-Service)

-Transfer and Promotion (Manager Self-Service)

-Change cost center (Manager Self-Service)

-Documents of Record (Manager Self-Service)

APPENDIX: F

KFU of P&M

Functional Scope of Work at

Academics Modules

1. Admission & registration

2. Student affairs 2.1 Student Housing 2.2 Student Services 2.3 Coop & Summer Training 2.5 Counselling & Advising 2.6 Student Fund 2.7 Alumni Services

3. Applied Research

4. Scientific Research

5. Graduate Studies

IT Modules

1. Document management system

2. University portal

3. Business intelligence

Administrative Modules

1. General ledger

2. Accounts payables

3. Accounts receivables

4. Cash management

5. Fixed assets

6. Costing & budgeting

7. Inventory management

8. Warehouse management

9. Purchasing

10. Project accounting

11. Maintenance management

12. Faculty Affairs

13. Staff Affairs

14. Payroll

15. F&P Services

16. Support services

- Office and Housing Services
- Medical Services
- Food Services
- Safety and Security Services
- Transportation Services
- Book Stores

Change Management: Training Programs

- ➢ Business Process Training (3 programs)
- ➢ Oracle Applications Training (4 programs)
- ➢ Oracle Technology Training (6 programs)
- ➢ Accounting Concepts Training (Planned)

Business Intelligence Strategy

Establish a Business Intelligence Competency Centre

-Select specialized tools and systems for the following:

-Data Extraction, Profiling, Cleansing, Quality, Transformation and Loading, Warehousing and Marting

-Ad-hoc reporting and analysis

-Enterprise Performance Reporting

-Data and Text Mining

-Statistical and Advanced Analyses

Develop a strong ownership for the BI program through awareness, training and incentives

-Implement the Systems in phases:

Phase I: Research, HR, and Finance, Selected Services

Phase II: Student and Faculty, Others.

ITC Customer Satisfaction Survey

Thank you for your interest in helping ITC evaluate our services and determine your current and future IT needs. This survey should take you around 5 minutes. We appreciate your cooperation.

1. How satisfied are you with the following services provided by ITC?

	Very Satisfied	Satisfied	Dissatisfied	Very Dissatisfied	No basis to rate
Email Services					
Internet Services					
KFUPM Website					
ITC Website					
ITC Customer Support					
IT Equipment Supply					
PC Labs					
Banner					
Blackboard					
ERP					
Business Intelligence(BI)					
Residential Management System (RMS)					
MedCare					
Library Information System (Symphony)					

2. Which aspect of these services are you 'Most-Satisfied' with?

	Performance	**Availability**	**Usability**
Email Services			
Internet Services			
KFUPM Website			
ITC Website			
ITC Customer Support			
IT Equipment Supply			
PC Labs			
Banner			
Blackboard			
ERP			
Business Intelligence (BI)			
Residential Management System (RMS)			
Med Care			
Library Information System (Symphony)			

3. Which aspect of these services are you 'Least-Satisfied' with?

	Performance	**Availability**	**Usability**
Email Services			
Internet Services			
KFUPM Website			
ITC Website			
ITC Customer Support			
IT Equipment Supply			
PC Labs			
Banner			
Blackboard			
ERP			
Business Intelligence (BI)			
Residential Management System (RMS)			
Med Care			
Library Information System (Symphony)			

4. For the Service Aspect you are 'Least-Satisfied' with, please give details?

----

5. How can we improve the services which you are 'Least-Satisfied' with?

----

6. Please Check:

o Student

o Faculty

o Staff

o Visitor

Thank you for your time

APPENDIX: G

STATISTICS

CROSSTABULATIONS

- Crosstab Analysis: Job Title by University (N=169)

			Name of University			Total
			KFU	**KFU of P&M**	**KSU**	
JOB TITLE	Administrative	Count	27	28	30	85
		% within name of university	50.00%	50.90%	50.00%	50.30%
	Management	Count	27	27	30	84
		% within name of university	50.00%	49.10%	50.00%	49.70%
Total		Count	54	55	60	169
		% within name of university	100%	100%	100%	100%

Pearson Chi-Square = .012 *p* = .994; *N*=169. 0 cells have expected count less than 5.

- Crosstab Analysis: Name of ERP System by University (N=169)
- Crosstab Analysis: Name of ERP System by University (N=169)

			Name of University			Total
			KFU	KFU of P&M	KSU	
NAME OF ERP SYSTEM	Madar system	Count	0	0	60	60
		% within name of university	0.00%	0.00%	100%	35.50%
	Oracle System	Count	54	55	0	109
		% within name of university	100%	100%	0.00%	64.50%
Total		Count	54	55	60	169
		% within name of university	100%	100%	100%	100%

Pearson Chi-Square = 169.000, *p* = .001; *N*=169. 0 cells have expected count less than 5

POST HOC POWER ANALYSIS

Post hoc power analysis using GPower 3.1 software to determine the appropriate sample size for conducting the statistical tests, test based on type of test, effect size, and power.

Statistical test	Effect size	Power	Recommended Sample size	Achieved Sample size	Sufficient sample size
Correlation (2-tailed)	Medium	0.95 0.8	138 84	54-60[1] per university group	No
Multiple Regression Systems Quality 14 Predictors	Medium	0.95 0.8	194 135	54-60[1] per university group	No
Multiple Regression Service Quality 4 Predictors	Medium	0.95 0.8	129 85	54-60[1] per university group	No
Kruskal Wallis (3 Groups)	Medium	0.95	252		
		0.8	159	169 (3 groups)	Yes
Mann Whitney (2-tailed)	Medium	0.95	210		
		0.8	128	169 (3 groups)	Yes

Note: **[1] KFU sample (n=54), KFU of P&M sample (n=55), KSU sample (n=60)**