Measuring the Benefits of Information Systems for Small- and Medium-Sized Enterprises in Saudi Arabia

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DEDICATION

To the spirit of my dear husband Misfer … we started this journey together, hoping to achieve our wish of obtaining the highest certification, but you have gone from our world, leaving me with the remains of your memory. This has helped me to complete the journey. Darling, you would not believe how lonely and thorny the road has been after you left.

To my dear parents Misfer and Nora … your love, care and sacrifice, with your tears and your words are the secret of my continuing steadfastness.

To my beloved brother Ibrahim, who has sacrificed much so I could go beyond all the difficulties.

To my three lovely kids, Layan, Abdulmalik and Sattam, who see in me their only hope after God.

To my dear brothers and sisters who, at all times, have never spared any effort to help me.

To you all, I dedicate this effort—my PhD thesis.

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LIST OF ABBREVIATIONS

ACSPRI	Australian Consortium for Social and Political Research Incorporated
ADF	Asymptotically Distribution-Free (Interval Estimation)
AGFI	Adjusted Goodness-of-Fit Index
AMOS	Analysis of Moment Structures (Software)
AMS	Academy of Marketing Science
ANOVA	Analysis of Variance
APEC	Asia-Pacific Economic Cooperation (Forum)
ASME	Association of Small and Medium Enterprises (Singapore)
ASV	Average Shared Variance
AVE	Average Variance Extracted
CBA	Cost–Benefit Analysis
CDSI	Central Department of Statistics and Information (Saudi Arabia)
CEO	Chief Executive Officer
CFA	Confirmatory Factor Analysis
CFI	Comparative Fit Index
CITC	Communications and Information Technology Commission (Saudi Arabia)
CMS	Content Management System
CR	Composite or Construct Reliability
CRM	Customer Relationship Management
CSF	Critical Success Factor/s
D&M model	DeLone and McLean Model
df	Degree of Freedom
DSS	Decision Support System
EDI	Electronic Data Interchange

EFA	Exploratory Factor Analysis
ERP	Enterprise Resource Planning
ES	Enterprise Systems
FIML	Full Information Maximum Likelihood (Estimation)
GDP	Gross Domestic Product
GFI	Goodness-of-Fit Index
HSD	Tukey's Honestly Significant Difference (Test)
ICT	Information and Communications Technology
IFI	Incremental Fit Index
IRS	Information Reporting System
IS	Information System/S
IT	Information Technology
ITPOSMO	Information, Technology, Processes, Objectives and Values, Staffing and Skills, Management System and Structure and Other Resources
KSA	Kingdom of Saudi Arabia
LV	Latent Variable
MCI	Ministry of Commerce and Industry (Saudi Arabia)
MENA (region)	Middle East and North Africa
MIS	Management Information System
ML	Maximum Likelihood
MOMC	Multi-Objective, Multi-Criteria
MS	Microsoft
MSV	Maximum Shared Variance
NFI	Normed Fit Index
NNFI	Non-Normed Fit Index (also known as TLI: see below)
NPV	Net Present Value

PLM	Product Life Cycle Management
PNFI	Parsimony Normed Fit Index
R&D	Research and Development
RBT	Resource-Based Theory
RBV	Resource-Based View
RCC	Riyadh Chamber of Commerce
RFI	Relative Fit Index
RMR	Root Mean Square Residual
RMSEA	Root Mean Square Error of Approximation
ROI	Return on Investment
SaaS	Software as a Service
SAGIA	Saudi Arabian General Investment Authority
SBA	Small Business Administration (Us)
SBC	Small Business Coalition (Australia)
SCIT	Saudi Committee for International Trade
SCM	Supply Chain Management
SEM	Structural Equation Modelling
SIDF	Saudi Industrial Development Fund
SMC	Squared Multiple Correlation
SMEs	Small- and Medium-Sized Enterprises
SPSS	Statistical Package for the Social Sciences
SR	Saudi Riyal (Currency)
SRMR	Standardised Root Mean Square Residual
SSI	Small-Scale Industry
SWOT	Strengths, Weaknesses, Opportunities and Threats
TCT	Transaction Cost Theory
TLI	Tucker–Lewis Index (also known as NNFI: see above)

TOE	Technology–Organisation–Environment (Framework)
TPS	Transaction Processing System
TRA	Theory of Reasoned Action
UAE	United Arab Emirates
UoA	Unit of Analysis
VA	Value Analysis
VE	Variance Extracted
VQ	Vendor/Consultant Quality

ABSTRACT

The role of information systems (IS) in relation to economic growth and competitiveness in developing countries has become more vital. In particular, the impact of IS on small- and medium-sized enterprises (SMEs) has been the target of much debate: these enterprises are seen as the vital engines of economic growth and innovation. Despite substantial investment by developing countries in IS and the benefits promised, very little research exists on measuring the benefits of IS for SMEs in these countries. By moving beyond the current literature's predominant focus on IS success in developed countries and large organisations, this research will contribute towards a model for measuring IS success for SMEs in developing countries.

The study uses both qualitative and quantitative methods. Based on qualitative evidence from a content analysis of 30 case studies published on the websites of IS vendors for developing countries, and then comparing these results with academic studies undertaken in similar contexts, the analyses yielded 566 pertinent benefits of IS to SMEs. The benefits have been synthesised and mapped to the IS impact measurement model, which has provided the conceptual foundation for this research. The model comprises 44 measures across five dimensions: 'individual impact', 'organisational impact', 'system quality', 'information quality' and 'vendor quality'. The model was validated in the Saudi Arabian context using survey methodology. Using Statistical Package for the Social Sciences (SPSS) and Analysis of Moment Structures (AMOS) software, data from 365 valid responses were analysed using structural equation modelling (SEM) and confirmatory factor analysis (CFA) techniques. The results demonstrate the validity of this model in the new context.

The study makes important theoretical contributions to the body of knowledge around IS research on SMEs and the measurement of IS success. First, this research introduces a theoretical model to measure the success of IS in SMEs in Saudi Arabia as a case study of a developing country. In addition, this study contributes to theory by extending the IS impact model (developed by Gable et al. [2008]) in several ways. Not only has the model been validated in a different setting than that of previous studies, but the study also—while confirming the other four existing dimensions—addresses the prior IS impact model's deficiency regarding the 'vendor (service)

quality' dimension in the context of developing country SMEs. The study thus incorporates the 'vendor quality' dimension into the existing dimensions of the IS impact model; this is relevant to the discourse on IS systems' success. Moreover, the operationalised set of measures offers comprehensive items that can be used as a basis for research in other contexts to establish standardised scales.

In addition to its important theoretical contributions, the model provides critical insights to policy makers and managers on assessing the benefits of IS for SMEs in developing countries. This research contributes to the literature in the Saudi Arabian SME context, on which there is a paucity of research in general, and in particular on IS. Although this research has been conducted in the Saudi Arabian context, the findings could be applicable to similar business contexts in developing countries, particularly in other countries of the Gulf Cooperation Council (GCC) (i.e., Kuwait, United Arab Emirates [UAE], Qatar, Bahrain and Oman). The study identifies vital factors pertaining to both vendors and SMEs that could form the basis of future studies in these contexts. Indeed, the study paves the way for future research on the assessment of IS's benefits in developing country SMEs in in general and GCC countries in particular.

DECLARATION

I certify that this thesis does not incorporate without acknowledgment any material previously submitted for a degree or diploma in any university; and that, to the best of my knowledge and belief, it does not contain any material previously published or written by another person except where due reference is made in the text.

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Amal Alshardan

22/07/2015

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PUBLICATIONS

The researcher has four publications as listed below:

Alshardan, A., Goodwin, R., & Rampersad, G. (2013). Measuring the benefits of IS in small organizations in developing countries. *International Journal of Conceptions on Computing and Information Technology, 1*(2), 12–17.

Alshardan, A., Goodwin, R., & Rampersad, G. (2014). Evaluating the Success of ICT in SMEs in Developing Countries. *Technology Innovation Leadership in Development: A 'Middle East' (West Asia) Perspective* (pp. 165–178): Nova Publishers New York, Editors: Giselle Rampersad & Fay Patel.

Alshardan, A., Goodwin, R., & Rampersad, G. (2015). *Towards a More Relevant Definition of SMEs in Information Systems Research.* Paper presented at the International Research Conference on Science, Management and Engineering 2015 (IRCSME 2015), Dubai, 28–29 January.

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Chapter 1. INTRODUCTION

1.1 Chapter Introduction

This chapter aims to provide an overview of the research. The research motivation is presented in the next section, followed by the research aim and objectives. The research questions are detailed within the context of this study. The chapter also includes an outline of the thesis and concludes with a chapter summary.

1.2 Research Background and Motivation

Economic growth and innovation are prominent issues that are particularly important in the context of global economic uncertainty. Small- and medium-sized enterprises (SMEs) are universally acknowledged as having a significant role in contributing to innovation and growth (Lin, 1998; Snider, da Silveira, & Balakrishnan, 2009). There is widespread agreement that the SME sector generates significant earnings for national economies in both developed and developing countries (Edvardsson, 2006; Lin, 1998; Snider et al., 2009), constituting the majority of firms and also providing the main source of employment (Edvardsson, 2009).

The use of IS in SMEs is vital, as it can lead to efficiency, effectiveness and innovation benefits (Plewa, Troshani, Francis, & Rampersad, 2012; Plewa, Troshani, & Rampersad, 2011; Rampersad, Plewa, & Troshani, 2012). However, SMEs confront many barriers to implementing IS successfully, including the lack of skilled labour and additional funding, and the cost of development and implementation (Freel, 2000). Measuring and assessing IS investment success in SMEs is necessary to confirm the continued success of these systems (Mirani & Lederer, 1998).

Although many significant measurement techniques and models can measure the benefits of IS (e.g., DeLone & McLean, 1992; DeLone & McLean, 2003; Gable et al., 2008; Shang & Seddon, 2002), in most cases, these models are based on a large organisational context. Studies have shown that SMEs are not miniature replicas of larger firms; they are fundamentally different from larger firms due to their special characteristics and requirements (Martin-Tapia, Aragon-Correa, & Senise-Barrio, 2008). SMEs face a digital divide from their larger counterparts, evidenced by significant differences in IS-related activities such as e-commerce and e-procurement (Lefebvre & Lefebvre, 1992; Levy & Powell, 1998). Moreover, these

differences are perpetuated by the lack of agreement on how to define an SME (O'Reagan & Ghobadian., 2004), as well as by the mythical concepts around SMEs (Gibb, 2000).

This gap between SMEs and their larger counterparts regarding IS is magnified further in developing countries, mirroring the digital divide between developing and developed countries (Patel, Sooknanan, Rampersad, & Mundkur, 2012). Questions arise over how IS in SMEs can instigate economic growth in developing countries (Avgerou, 1998). Despite promises and rhetoric around the positive effects of IS on the social and economic wellbeing of citizens of developing countries, in-depth investigation challenges these assumptions (Baliamoune-Lutz, 2003; Laguerre, 2012; Patel et al., 2012). Debates arise over the meaning of 'digital divide', with moves away from a mere focus on technology access towards the use and realised benefits for technology users (Qureshi, 2012). Developing countries have substantially different business environments compared to those of developed countries in relation to laws and regulations, governmental control, workforce characteristics, management style and customer income characteristics (Al-Mabrouk & Soar, 2006; Alghamdi, Goodwin, & Rampersad, 2011b; Alwahaishi & Snasel, 2012; Baliamoune-Lutz, 2003; Bhuasiri, Xaymoungkhoun, Zo, Rho, & Ciganek, 2012; Fathian, Akhavan, & Hoorali, 2008; Grazzi & Vergara, 2012; Indjikian & Siegel, 2005). Roztocki and Weistroffer (2011) highlight the high failure rate of IS implementation in developing countries and note that IS applications in developed countries have a 'different focus as mature infrastructure is already in place, and project success is often determined by very different criteria' (p. 164). In addition, Soja (2008) emphasises the difficulties in of implementing IS in developing countries, particularly regarding human resource constraints and high costs.

Much research on IS success in SMEs or large organisations has been conducted in a developed nation context. Research in developing country contexts is lacking in general. Specifically, little literature on IS success in Saudi Arabian SMEs exists (Adaileh, 2012; Ahmad, 2011; Al-Gahtani, Hubona, & Wang, 2007; Aldraehim, Edwards, Watson, & Chan, 2012; AlGhamdi, Nguyen, Nguyen, & Drew, 2012; Avgerou, 1998; Azyabi, Fisher, Tanner, & Gao, 2014; Manochehri, Al-Esmail, & Ashrafi, 2012; Skoko & Ceric, 2010; Waverman, Coyle, & Souter, 2011; Wei, Loong, Leong, & Ooi, 2009). This makes it difficult for Saudi SMEs to learn from the existing research, given the differences in economic, cultural and political factors between

Saudi Arabia and developed countries in this context. Therefore, research focus on this area is critical to ensure the success of IS implementation in the SMEs of developing countries (Consoli, 2012; Manochehri et al., 2012).

This study develops and evaluates a benefits measurement model for IS in developing country SMEs, based on qualitative and quantitative methods. The study's focus is on Saudi Arabian SMEs (justified in Section 1.6). The model offers valuable insights to managers and policy makers with the responsibility for IS implementation in Saudi Arabia and other developing countries to ensure that effective IS investment is realised.

1.3 Research Problem

Despite ongoing research on measuring IS success, no satisfactory and comprehensive solution is apparent (Joosten, Basten, & Mellis, 2014). Further, research on IS evaluation in the context of developing country SMEs is still very limited (Avgerou, 1998; Manochehri et al., 2012; Wei et al., 2009).

Due to the paucity of research on SMEs and developing countries compared to that of large organisations and developed countries, concerns exist regarding the impact of differences in these two contexts. Prior research suggests that organisational context is a determinant of IS success. Therefore, developing a model for evaluating IS in developing country SMEs is vital to justify the value and contribution of these systems to an organisation and to ensure the systems' ongoing success (Mirani & Lederer, 1998).

1.4 Research Aim and Objectives

The main aim of this research is to develop a benefits measurement model for IS in SMEs, using Saudi Arabia as a developing country case study.

In pursuing this primary aim, the following objectives have been identified:

1. To understand the characteristics and needs of developing country SMEs and how these differ from those of large organisations from an IS perspective: Understanding these characteristics and differences is crucial to adapt, adjust or validate current IS measurement models. This objective can be achieved by conducting a comprehensive review of the IS literature, which is

extended to the literature of other disciplines, including management, business and marketing.

2. To understand the existing models used to measure IS success in different contexts than SMEs. Accordingly, this study reviews a broad range of the literature on current IS success measurement models. This builds awareness of the different dimensions and measures applied to IS in general and can be used to discuss their validity for measuring IS success in the SME context.
3. To summarise the benefits of IS in SMEs in developing countries. To do this, the study collects all the benefits of IS in SMEs from both the academic literature and practical examples to develop a benefits measurement model that can be applied to IS in developing country SMEs.
4. To identify the different dimensions of IS success in the context of developing country SMEs.
5. To identify the different measures in each dimension of IS success in the context of developing country SMEs.
6. To generate a benefits measurement model for IS in developing country SMEs, based on a qualitative method and guided by Gable et al.'s (2008) existing IS impact model.
7. To further validate the new model in the context of Saudi Arabian SMEs, as a case study of a developing country context.

1.5 Research Questions

Defining the research questions is a critical step in any study. According to Leedy and Ormrod (2001), 'the problem or questions, is/are the axis around which the whole research effort revolves' (p. 49). Moreover, it is important to express the research questions precisely and divide them into manageable sub-questions. According to Cooper and Schindler (2006), research questions can be divided into sub-levels following a top-down approach, with the question's hierarchical structure comprising four levels: (1) management, (2) research, (3) investigative, and (4) measurement.

The management level re-expresses the main research question in this study into more manageable sub-questions. Hence, the principal research question:

> What are the benefits of IS in SMEs in developing countries?

became the following management-level question:

How can the impact of IS in SMEs in developing countries be systemically and effectively measured?

This question is further divided into sub-questions (also called research questions). In turn, each of these is sub-divided into investigative questions as shown below:

1. What are SMEs?

    a. What size criteria are used to define SME size?
    b. Do the definitions differ according to countries, sectors and industries?
    c. Which characteristics differentiate SMEs and large organisations from an IS perspective?

2. How can the success of IS in developing country SMEs be measured?

    a. What are the benefits of IS in the context of developing country SMEs?
    b. What are the main dimensions of a benefits measurement model for IS in developing country SMEs contexts?

3. Is the IS impact model suitable for measuring the effects of IS in developing country SME contexts?

    a. Are all existing dimensions and measures applicable in the new context?
    b. Are any additional dimensions or measures required for the new context?

4. Is the new measurement model valid for measuring IS benefits in Saudi Arabian SMEs?

    a. Are all dimensions in the new model significant?
    b. Are all measures in the new model significant?

The measurement level is the detailed level. Some questions can be measured qualitatively; thus, the investigative level is sufficient for answering these questions. Other questions, especially those that are measured using quantitative measures, are better if sub-divided into measurement-level questions (Cooper & Schindler, 2006).

It is worth noting that defining the research questions of any study is a dynamic process, in which the questions can be altered, replaced or further refined while the research is in progress (Cooper & Schindler, 2006; Kaplan & Maxwell, 2005).

Table 1-1: Research questions

Research Question 1: What are SMEs?	
Investigative Question 1	What criteria are used to define the size of SMEs?
Investigative Question 2	Does the definition differ according to country, sector and industry?
Investigative Question 3	What characteristics differentiate SMEs and large organisations from an IS perspective?
Research Question 2: How can the success of IS in SMEs in developing countries be measured?	
Investigative Question 1	What are the benefits of IS in the context of SMEs in developing countries?
Investigative Question 2	What are the main dimensions for a benefits measurement model for IS in SMEs in a developing country context?
Research Question 3: Is the IS impact model suitable for measuring the impact of IS in SMEs in the developing countries' context?	
Investigative Question 1	Are all existing dimensions and measures applicable in the new context?
Investigative Question 2	Are any additional dimensions or measures required for the new context?
Research Question 4: Is the new measurement model valid for measuring the benefits of IS in SMEs in Saudi Arabia?	
Investigative Question 1	Are all dimensions in the new model significant?
Investigative Question 2	Are all measures in the new model significant?

1.6 Establishing the Context

1.6.1 SMEs

Many IS-related studies identify organisational size as a major factor that must be considered carefully. Mabert, Soni and Venkataramanan (2003b) have stated that an enterprise's size plays an important role in IS implementation and affects several key organisational dimensions. Eikebrokk and Olsen (2007) confirm that firm size can affect several crucial organisational processes and, consequently, research. They further state that dealing only with large corporations may create a bias in

conclusions about information technology (IT) (Eikebrokk & Olsen, 2007). Some reasons for the effect of organisational size include: (1) SMEs are different from large organisations and have their own characteristics and needs regarding IS; (2) lately, SMEs have begun to focus on IS and hence face many challenges due to their lack of experience and resource limitations; (3) the market for IS has recently realised the differences between large organisations and SMEs and has therefore begun providing SMEs with new, less complex, versions of packaged software that better suits their needs. However, in IS research, the differences between large organisations and SMEs have only been considered by a few studies.

As scholars note, no universal definition of SMEs exists (Gooding & Iii, 1985; Kimberly, 1976; Lee, Kim, & Kim, 2007). Some definitions are based on quantitative criteria such as the number of employees, turnover and assets, while other definitions use qualitative criteria (Blau, 1970; Fathian et al., 2008). The latter typically employ classifications based on development stages and organisation strategies (Lee et al., 2007). Moreover, SME definitions vary from country to country and within different industries in the same country.

The Chapter 2 literature review provides more details regarding SME definitions and characteristics.

1.6.2 SMEs in Developing Countries

Academic researchers differentiate between developed and developing countries in relation to differences in government regulations, economic laws and other social factors that might affect research findings concerning SMEs undertaken in the different countries' contexts.

This research has been undertaken in the context of a developing country, whereas most theories and models are based on the context of developed countries (Alghamdi, Goodwin, & Rampersad, 2011a; Alshardan, Goodwin, & Rampersad, 2013; Grazzi & Vergara, 2012; Roztocki & Weistroffer, 2011; Vrgovic, Glassman, Walton, & Vidicki, 2012). Applying these theories and models to developing countries validates them further and extends them into the new context. According to their characteristics, SMEs in developing countries should be particularly desperate to evaluate their IS, to avoid failure, which would have greater financial impact.

Problems arise due to the many barriers towards IT in developing countries, including for example: a lack of appropriate IT and qualified IT professionals, an absence of economic incentives and infrastructure, a lack of explicit IT policy, and poor IT infrastructure and communication with suppliers (Vrgovic et al., 2012).

Therefore, this study focuses on creating a model that can help SMEs in developing countries to tackle their limitations towards IS, and to face and overcome the challenges involved in achieving successful IS.

More details about the context of developing countries are found in the literature review in Chapter 2.

1.6.3 SMEs in Saudi Arabia

The research context of SMEs in the Kingdom of Saudi Arabia (KSA) has been chosen for this study for a number of reasons:

1. The research's main context provides an example of a developing country. This study develops a benefit measurement model for IS in developing country SMEs based on qualitative methods. These methods are represented by a content analysis of customer success stories published on IS vendors' websites. The study has selected cases from a number of different developing countries. A validation of the developed model (using a survey) has then been applied to the Saudi Arabian context as an example of a developing country. Saudi Arabia represents a developing country, given the shared characteristics of economics and business regulations (Alghamdi et al., 2011a; Alshardan et al., 2013; Grazzi & Vergara, 2012; Roztocki & Weistroffer, 2011; Vrgovic et al., 2012). In addition, Gulf Corporation Council (GCC) nations have other characteristics in common, including cultural and social matters (Skoko, 2012).
2. To date, few studies onf IS in Saudi SMEs exist (Alfaadhel, 2010). To the best of the researcher's knowledge, none of these studies have examined the evaluation of IS success in Saudi SMEs.
3. Although some studies on SMEs have been completed in Saudi Arabia, official studies have not focused on the success of IS in SMEs. In addition, supporting statistical data from the government are either lacking or conflicting (Ahmad, 2011).

4. In terms of the high rate of SME failure in Saudi Arabia, IS failure is also expected to be a major contributing factor (Alsaleh, 2012; Looney, 2004; Sharma & Bhagwat, 2006).
5. Due to the increasing number of SMEs that use IS in Saudi Arabia (Business Monitor International, 2012b), collecting enough data for validation and generalisation is now possible.
6. Saudi Arabia was selected as an example of a developing country. As with many developing countries, it has become a target for major IS/enterprise resource planning (ERP) vendors looking for locations for new sales growth (Adaileh, 2012; Huang & Palvia, 2001).

The KSA is located in the south-west corner of Asia, and is at the crossroads of Europe, Asia and Africa. It is surrounded by the Red Sea to the west; Yemen and Oman to the south; the Arabian Gulf, UAE and Qatar to the east; and Jordan, Iraq and Kuwait to the north. Saudi Arabia's Red Sea coastline stretches about 1,760 km (1,100 miles) while its Arabian Gulf coastline is roughly 560 km (350 miles) (Central Department of Statistics and Information, 2010).

No official definition of SMEs is used in Saudi Arabia; however, a number of organisations use a variety of definitions. For instance, the Saudi Arabian General Investment Authority (SAGIA) defines small enterprises as those with between 25 and 59 employees and medium-sized companies as those with between 60 and 99 employees (Ahmad, 2012). Another definition set by the Saudi Industrial Development Fund (SIDF) defines SMEs as those firms whose annual sales do not exceed 20 million Saudi Riyals (SR) (equivalent to US$5.3 million).

It is difficult to establish a common SME definition that would be acceptable to all authorities in Saudi Arabia. Therefore, for the purpose of this study, the SME definition is based on that adopted by SAGIA for two primary reasons. First, SAGIA's definition employs a standard quantitative criterion, which is the number of employees. Second, the scarcity of financial company data in the Saudi Arabian SME sector (Ahmad, 2012). It is also worth noting that SAGIA is among the primary institutions responsible for managing Saudi Arabia's investment environment (Ahmad, 2012).

SMEs in Saudi Arabia face many challenges. Among these, the lack of an authority responsible for SMEs is a major problem. Other challenges include the lack of several aspects: funds, skilled human resources; management and marketing skills; modern technology (Eikebrokk & Olsen, 2007). Further, SMEs face with issues relating to innovation and business planning (Levy & Powell, 2000; McCartan-Quinn & Carson, 2003).

Conversely, several opportunities are encouraging SMEs in Saudi Arabia to proceed with their businesses and to work effectively. The Saudi government and the private sector have recognised the capability of SMEs and their needs for support including capital, training and business services. Accordingly, the Kafalah Program was established to support SMEs financially with this being administrated by the SIDF, the Ministry of Finance and Saudi banks (Alsaleh, 2012).

1.7 Thesis Organisation

This thesis presents the phenomenon to be investigated, the techniques and methods employed in this investigation, and the analysis of results and conclusions around its theoretical and practical contributions. This section summarises the contents of each chapter.

Chapter 1: Introduction

The introductory chapter presents evidence that supports the importance of and motivation for researching the chosen topic. The chapter briefly introduces the related research background, which identifies the study's relationship to previous work. In this chapter, the research objectives, research questions and clarification of the research problem are presented. The chapter establishes the context of the study and concludes by presenting the thesis organisation.

Chapter 2: Literature Review

The literature review summarises state-of-the-art IS success research and identifies the theoretical foundation and research gaps pertinent to the study. The literature review examines two areas. The first deals with SMEs and includes their definitions and characteristics. The second includes IS in SMEs and existing IS success measurement models. The literature review also discusses important IS

measurement models. In addition, it presents issues related to IS success models and SMEs, such as the importance of involving multiple stakeholders in IS evaluation, and the timing of measuring IS impact. Finally, the chapter concludes by identifying research gaps in the current literature.

Chapter 3: Research Design

The research design chapter begins by discussing the research strategy. Next, the methodology is outlined, and details are provided of the main research methods employed: literature reviews, content analyses and surveys. Following this, an exploratory research plan is presented, which covers a series of activities including the three research phases.

Chapter 4: Research Methodology

This chapter discusses the research methodology undertaken in two phases: quantitative and qualitative. The first phase details the content analysis methods used to derive the a priori model for IS success in SMEs. It consists of the procedure used to develop a pool of benefits for IS in SMEs and the mapping procedure used in developing the a priori model for IS impact on SMEs.

In the second phase, the research model is validated using a quantitative research methodology with a validation survey. Details of the survey phase, including the instrument design and data collection process, are presented. In addition, the frequencies of the demographic variables and the descriptive data analysis are revealed here.

Chapter 5: Quantitative Results

This chapter is dedicated to analysing the survey data that employed SPSS and Analysis of Moment Structures (AMOS) software along with structural equation modelling (SEM) and confirmatory factor analysis (CFA). The chapter discusses the data analysis methods and includes the data screening methods and the model testing results.

Chapter 6: Discussion of Research Findings

This chapter discusses and interprets the study's findings. It justifies the data analysis results based on the literature review of SME and developing country characteristics. Thus, the chapter presents a critical discussion of the anticipated and obtained results and the dimensions and measures of the final measurement model.

Chapter 7: Conclusions

The final chapter reviews the thesis in terms of revisiting the research aim, objectives and research questions. It also lists the study's contributions to academic research and practice, research limitations and future research opportunities. Finally, the chapter lists other outcomes of this research, which include publications and learning activities.

1.8 Chapter Summary

The introductory chapter has presented the fundamentals of this research, including the research motivation, background, aim and objectives, and the research questions.

The next chapter will present a review of the related academic literature and relevant theories.

Chapter 2. LITERATURE REVIEW

2.1 Chapter Introduction

This chapter provides an overview of the topic being investigated; namely, IS success in Saudi Arabian SMEs, as a case study of a developing country. The literature review presented in this chapter is structured into four sections (Figure 2-1): the first section concerns IS. It begins by providing an overview of IS, including definitions and major characteristics. This is followed by theories regarding IS success and relevant measurement models. The third section of the literature review focuses on SMEs and significant relevant issues, such as definitions and characteristics, and the ways in which SMEs differ from large organisations. The fourth section reviews the context in which this study is applied. This is the context of developing countries in general and Saudi Arabia in particular. This discussion includes the current situation in Saudi Arabia with regard to IS and academic studies conducted in similar contexts.

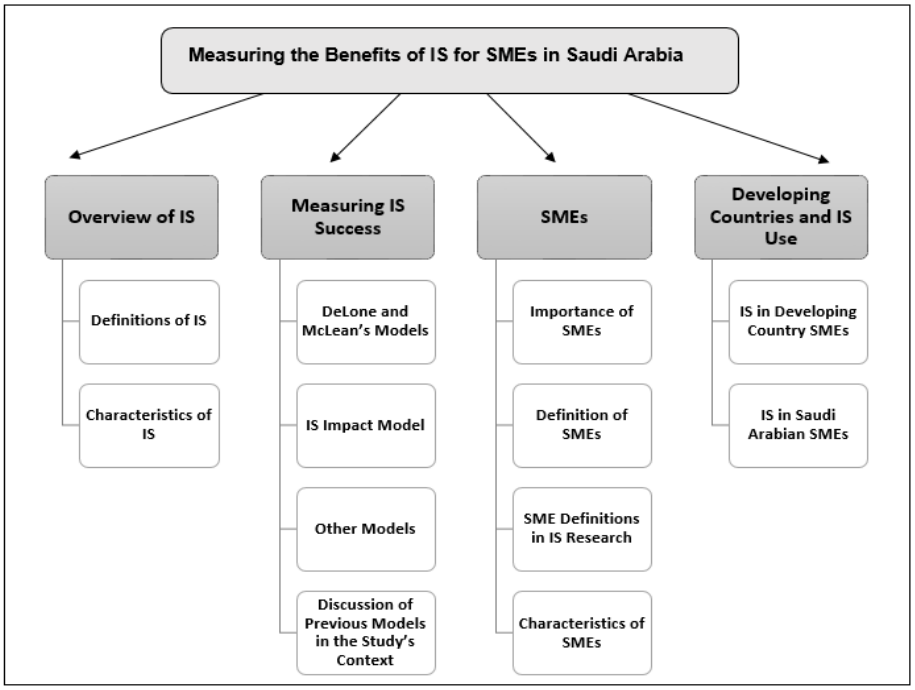


Figure 2-1: Structure of Literature Review in this study

2.2 Overview of IS

IS have varied uses, ranging from advanced mobile phones and text messaging (Alqahtani & Goodwin, 2012; Susanto & Goodwin, 2011) through to computers and the internet; this also extends enterprise systems (ES). This research is concerned with IS as it relates to the software used by organisations to maintain business processes. Other concepts in this study used as synonyms for IS are ES or ERP. The following sections discuss the meaning of each concept.

2.2.1 Definitions of IS

IS have become vital software applications, with significant influence on the business world. As Davenport (1998) has stated, 'the business world's embrace of ESs may in fact be the most important development in the corporate use of information technology in the 1990s' (p. 122). Various definitions of IS exist. Klaus, Rosemann and Gable (2000) have defined ERP as customisable, standard software solutions with the potential to link and automate all aspects of the business, incorporating core processes and major administrative functions into a single IT architecture. Mabert, Soni and Venkataramanan (2003a) have stated that ERP systems are enterprise-wide, supporting cross-functional processes using a common database. Another definition introduced by Stratman and Roth (2002) states that an IS integrates two or more functional areas, one of which must be production operations, through using common databases and transaction processing. The option of decision support also addresses the enterprise's integrated elements. These definitions of IS assist understanding and identification of this research's core; they also help to understand the characteristics of IS, as shown in the next section.

2.2.2 Characteristics of IS

Many researchers prefer to describe IS, rather than state an exact definition. Al-Mashari, Al-Mudimigh and Zairi (2003) have suggested that the basic architecture of an ERP system builds upon one database, one application and a unified interface across the entire enterprise. Mabert et al. (2003b) have stated that ERP software should include integrated modules for accounting, finance, sales and distribution, human resources, materials management and other business functions based on a common architecture that links the enterprise to both customers and suppliers. Juell-

Skielse (2006) has added that ‘ERP packages, such as SAP R/3 and Oracle Applications, have developed from a core of functionality, usually finance and control or human resources, to cover more or less most areas of a business’ (p. 5).

Klaus et al. (2000) have summarised the nine key characteristics embedded in this type of software package as follows: (1) rich configuration and customising potential; (2) high level of functionality that aims to provide a whole solution to enterprises or other organisations; (3) highly process-oriented, across many management function modules; (4) full documentation; (5) multiple industries targeted; (6) support acts across countries; (7) high frequency and repetition of usage; (8) consistent graphical user interface throughout the whole application software; and (9) very complicated administration.

Thus, software for use in simple office functions such as Microsoft Office or customised, yet still simple, applications without high-level functionality and rich configuration are not considered to be ISs as defined by this study. Nevertheless, IS for SMEs are simpler than IS for large organisations. Despite this, the need for the abovementioned IS characteristics in a system should be considered as IS (ES or ERP). IS vendors have acknowledged differences in the needs of large and small organisations and have developed specific ISs for SMEs that fulfil the simple needs of smaller enterprises (this is discussed in more detail in Section 2.3.4).

2.3 Measuring IS Success

Organisations of different sizes invest heavily in IS (Petter, DeLone, & McLean, 2008). Naturally, they expect positive effects on the organisation and its functions. Thus, it is important to measure and examine the success and effects of such a significant investment.

Nevertheless, the academic literature debates the effects of ISs on organisations. Some researchers have reported positive effects, while others have discovered insubstantial or detrimental effects (Sedera, 2006). Gable, Sedera and Chan (2008) have suggested four possible reasons for these conflicting results: (1) incomplete or inappropriate measures of success; (2) the lack of theoretical grounding for the causal and process models of IS success; (3) a myopic focus on financial performance indicators; and (4) weaknesses in the survey instruments employed or in data collection approaches.

Further, the definition and measures of IS success continue to challenge businesses (Irani, 2008). The lack of consensus regarding IS success is due to a number of factors. First, the effects of IT are indirect and are influenced by many factors: human-related, organisational and environmental. The mixture of IS's technical and social aspects ensure such measurements are complex and confusing (Petter et al., 2008). Second, IT and work practices are entangled; it is difficult to identify the discrete influence of each on IS success (Agourram, 2009). Third, the methodological perspectives used to measure IS success have difficulty in identifying the dependent variables (Agourram, 2009).

Another important reason for these divergent evaluations is differences in the terms used that relate to the meaning of IS. The term 'IS' is broad and can refer to many types of IS used in organisations, such as decision support systems (DSSs), computer-mediated communications, e-commerce and knowledge management systems (Petter et al., 2008). Depending on the type of system, the ways of measuring IS success may be different (see also Section 2.3.2). This study examines the software used by an organisation to specify its internal organisational business processes. This type of software is usually referred to as an ES or ERP. Although these two terms are used interchangeably by many scholars, Shang and Seddon (2002) have distinguished between them, noting that ES includes ERP, customer relationship management (CRM), supply chain management (SCM), product life cycle management (PLM) and e-procurement software. However, ERP is the most important class of ES (Shang & Seddon, 2002). Hence in this study, the terms (with their acronyms IS, ES or ERP) refer to IS projects used by an organisation, whichdo not include CRM, SCM or PLM.

As this study examines IS in relation to SMEs, the systems chosen are different to those originally used by many studies, such as Gable et al. (2008) and Shang and Seddon (2002), which examined large organisations. Consequently, this may affect the measures and dimensions of the model, as many existing IS/ES measures are related to the features of IS for large organisations.

During the past few decades, much effort has been made to identify the factors that contribute to IS success, and several models have been proposed for measuring IS success (DeLone & McLean, 1992, 2003; Gable et al., 2008; Shang & Seddon, 2002).To the best of the researcher's knowledge, no comprehensive benefits

measurement model exists for IS success for Saudi Arabian SMEs as a developing country case study. Existing studies on IS success in SMEs, and its evaluation remain under-developed. Many prior studies on IS in SMEs have focused on adoption (e.g., Fink, 1998; Juell-Skielse, 2006) and implementation success (Koh, Gunasekaran, & Cooper, 2009; Loh & Koh, 2004; Mabert et al., 2003a, 2003b; Snider et al., 2009; Sun, Yazdani, & Overend, 2005), while few studies have attempted to measure benefits. Therefore, developing a benefits measurement model is essential for evaluating IS in SMEs in the context of Saudi Arabia and developing countries to justify IS's value and contribution in relation to productivity. The following section first reviews some important IS success models and then discusses issues regarding these models in the context of SMEs and developing countries.

2.3.1 DeLone and McLean's Models

DeLone and McLean's (1992, 2003) models are probably the most-cited models in the IS community. DeLone and McLean (1992) conducted a review of the research published during the period 1981 to 1987. Based on this review, they created an IS success taxonomy. A full set of 119 success measures was condensed into six categories (or components) of IS success: 'system quality', 'information quality', 'use', 'user satisfaction', 'individual impact' and 'organisational impact'. Figure 2-1 shows this original IS success model (DeLone & McLean, 1992).

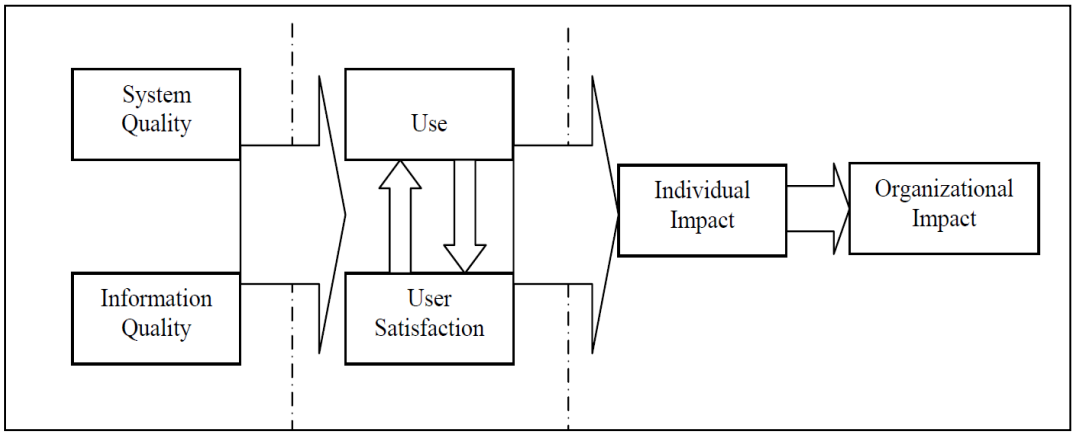


Figure 2-2: DeLone and McLean's (1992) IS success model

This model suggests that when an IS is first created, its features can be observed in terms of the degree of system and information quality. Users then employ the systems and are either satisfied or not satisfied with them. Use of the systems will

affect the individual's work performance and consequently the organisation (either positively or negatively) (DeLone & McLean, 1992).

DeLone and McLean's 1992 model (the 'D&M' model) has been tested successfully in many empirical studies (Agourram, 2009). In addition, many researchers have suggested modifications or improvements to their model. Petter et al. (2008) reviewed 180 papers from the academic literature for the period 1992 to 2007 that dealt with some aspect of IS success in general and with DeLone and McLean's models in particular. Pitt, Watson and Kavan (1995) have evaluated the instrument from an IS perspective and suggested that the construct of 'service quality' be added to the D&M model. Seddon and Kiew (1996) studied a portion of the IS success model and modified the construct 'use' by changing it to 'usefulness'.

Seddon (1997) has proposed another adjustment to the D&M model. He has argued that the D&M model's original form was confusing as process and variance models were combined within the same framework. Seddon suggested that the concept 'use' was very unclear and needed further clarification. He introduced a new model in which three different potential meanings were derived for the 'use' construct. He also analysed the process and variance of the model separately. According to Petter et al. (2008), these changes presented by Seddon complicated the model, reducing its effectiveness.

Many researchers have suggested revising or extending the model to other contexts. Some have adapted it to measure the success of particular applications, such as knowledge management (e.g., Jennex & Olfman, 2004; Kulkarni, Ravindran, & Freeze, 2007; Wu & Wang, 2006) and e-commerce (e.g., DeLone & McLean, 2004; Molla & Licker, 2001; Zhu & Kraemer, 2005).

Based on these improvements and other alternative frameworks for measuring IS effectiveness, DeLone and McLean conducted an in-depth analysis and reflection, and then updated their model, proposing the new DeLone and McLean (2003) IS success model (see Figure 2-2).

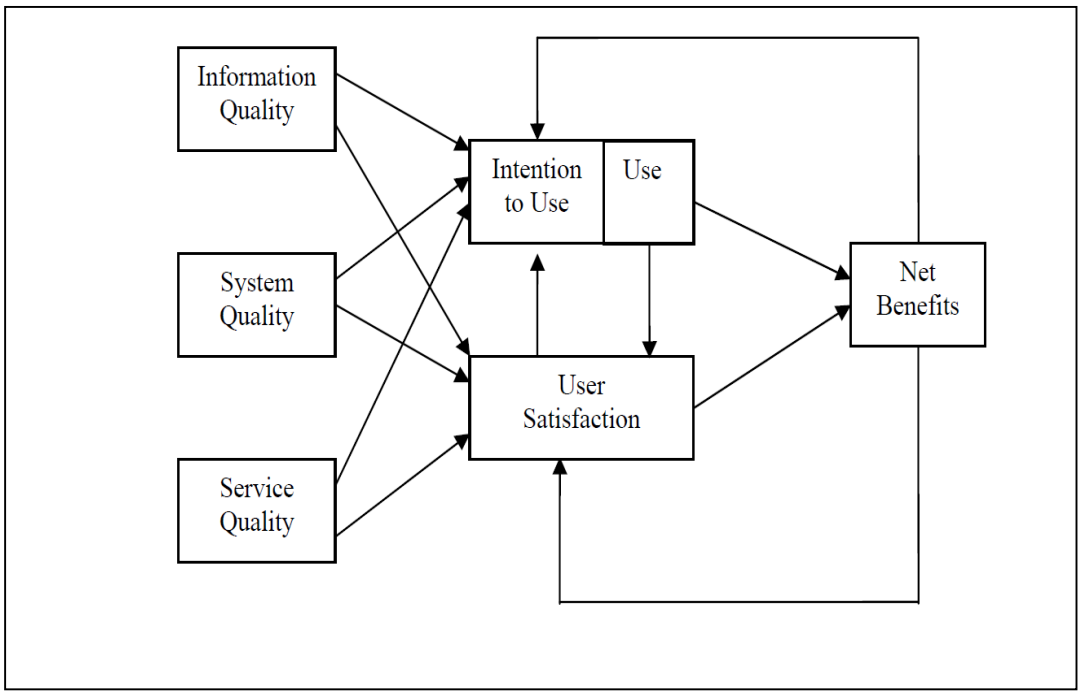


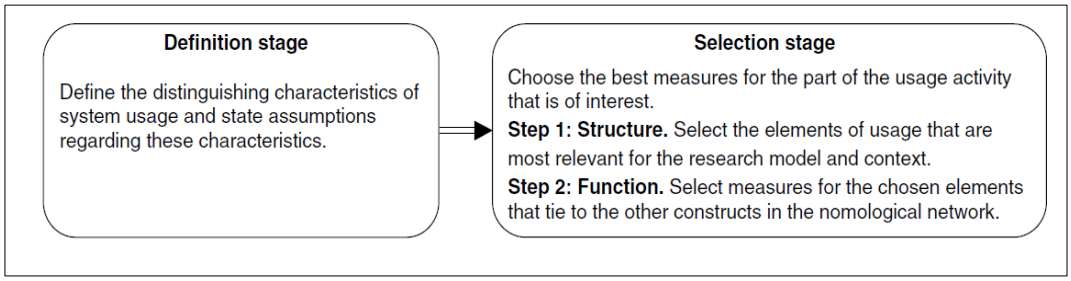
Figure 2-3: DeLone and McLean's (2003) IS success model

The updated D&M IS success model contains three main enhancements. First, the model accepted Pitt et al.'s (1995) recommendation to include 'service quality' as a construct. 'Service quality' became a dimension of IS success and not, as previously, just a sub-set of 'system quality'. The new model also addressed the criticism that IS could affect levels other than the individual and organisational, such as work groups, industries and societies (Myers, Kappelman, & Prybutok, 1998; Seddon, Staples, Patnayakuni, & Bowtell, 1999). Accordingly, DeLone and McLean replaced the 'individual impact' and 'organisational impact' constructs with 'net benefits', breaking it down to include multiple levels of benefits (Petter et al., 2008). A third improvement made to the new D&M model was further clarification of the 'use' construct (Petter et al., 2008). The authors explained the construct as follows: '"[u]se" must precede "user satisfaction" in a process sense, but positive experience with "use" will lead to greater "user satisfaction" in a causal sense' (DeLone & McLean, 2003).

The D&M model opened the gate for many researchers: they either tested the model empirically in different contexts or criticised and enhanced some of its aspects. One criticism of the D&M model is its lack of a theoretical basis. In relation to this, Sabherwal, Jeyaraj, and Chowa (2006) performed a comprehensive meta-analysis examination of the D&M model. According to Petter et al. (2008), Sabherwal et al.'s

(2006) examination validated a part of the D&M model by synthesising the quantitative research related to IS success. Sabherwal et al.'s (2006) work provided insights into IS success and its determinants by integrating previous research in this field. Their study developed a comprehensive model that included constructs related to the context, users and IS success. Their theoretical model was tested using a combination of meta-analysis and SEM. The results underlined the importance of user-related and contextual attributes in IS success.

In the D&M (2003) model, the importance of 'use' as a dimension for measuring IS success was emphasised. However, DeLone and McLean (2003) mentioned the ambiguity of improper or simple definitions of system use. Burton-Jones and Straub (2006) responded to DeLone and McLean's (2003) call and examined the 'system usage' construct in more detail. Burton-Jones and Straub's (2006) systematic approach to reconceptualising the 'system usage' construct has assisted researchers in developing reliable and valid measures of system usage for any given context. In their paper, rather than identifying a single conceptualisation of system usage, which is quite impossible, they present a method for systematically developing usage conceptualisations for specific contexts and for identifying measures theoretically. They defined system usage as 'an activity that involves three elements: (1) a user, i.e., the subject using the IS, (2) a system, i.e., the object being used, and (3) a task, i.e., the function being performed'. Their approach consists of two stages: defining system usage and selecting valid content. The latter consists of a two-step approach, including structure and function (see Figure 2-3).

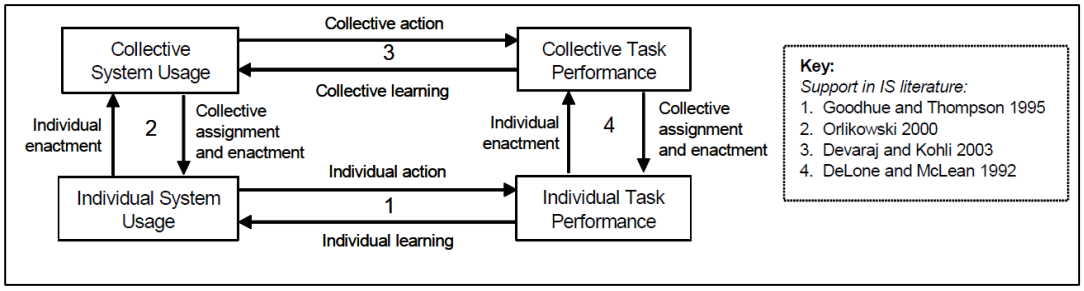


Note: Sourced from Burton-Jones & Straub (2006)

Figure 2-4: Staged approach for defining system usage and selecting usage measures

In another study, Burton-Jones and Gallivan (2007) provided a multi-level theory of system usage. Their study focused on the multi-level nature of system usage. The

authors believed that studying system usage at each level separately would lead to an inaccurate and disjointed assessment of the organisations' functions. Accordingly, they provided detailed steps for building multi-level theories of system usage, devised guidelines for supporting each step and provided a concrete illustration (see Figure 2-4).



Note: Sourced from Burton-Jones & Gallivan (2007)

Figure 2-5: Theoretical model of system usage

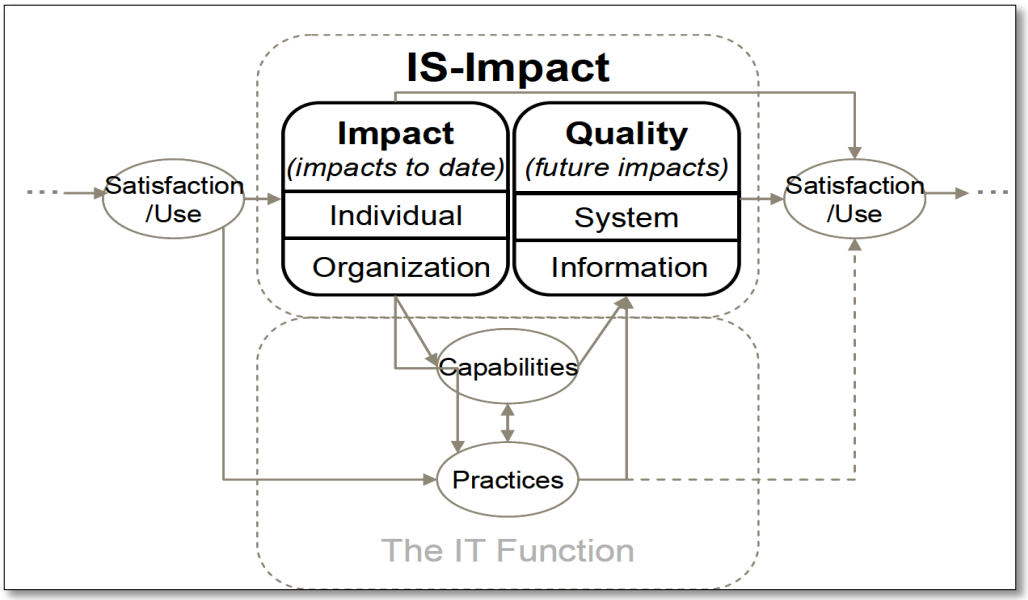
A wide range of studies have made enhancements to the D&M model; clearly, the model has been criticised for its inapplicability to all contexts. This has also been acknowledged by the authors themselves (DeLone & McLean, 2003). A major issue related to the D&M model regarding the SME context is its oversight of organisational factors as potential determinants of IS success (Sabherwal et al., 2006). Such factors are important in the context of SMEs as they have their own characteristics that differ from those of large organisations. However, the leading role of the D&M success model as a valuable framework for understanding the key success dimensions of IS cannot be ignored.

2.3.2 IS Impact Model

Based on DeLone and McLean's (1992) IS success model and tests of other researchers' work (Myers et al., 1998; Shang & Seddon, 2002), Gable et al. (2008) developed a more advanced IS impact model (see Figure 2-5). To obtain and validate this model, the authors employed three surveys (an identification, a specification and a confirmatory survey) with data collected from 600 respondents. The identification survey aimed to specify the salient success dimensions and measures; the specification survey was then used to identify the a priori model; while the confirmatory survey validated the a priori model and instrument (Gable et al., 2008). Using a multi-method research design, Gable et al. (2008) extended the

research cycle proposed by MacKenzie and House (1978) and McGrath (1964) to develop and validate a measurement model. Their research entailed two main phases: an exploratory phase to develop the hypothesised model and a confirmatory phase to test the model against the collected data.

Gable et al. (2008) defined the IS impact of an IS as 'a measure at a point in time of the stream of net benefits from the IS, to date and anticipated, as perceived by all key user groups' (p. 10). Thus, the IS impact model is represented by two halves: the 'impact' half measures the net benefits to date and the 'quality' half measures the possible future effects (Gable et al., 2008). Three important issues addressed in this paper reconceptualise IS success: the completeness, mutual exclusivity and necessity of the dimensions and measures.



Note: Adapted from Gable et al. (2008)

Figure 2-6: The IS Impact measurement model

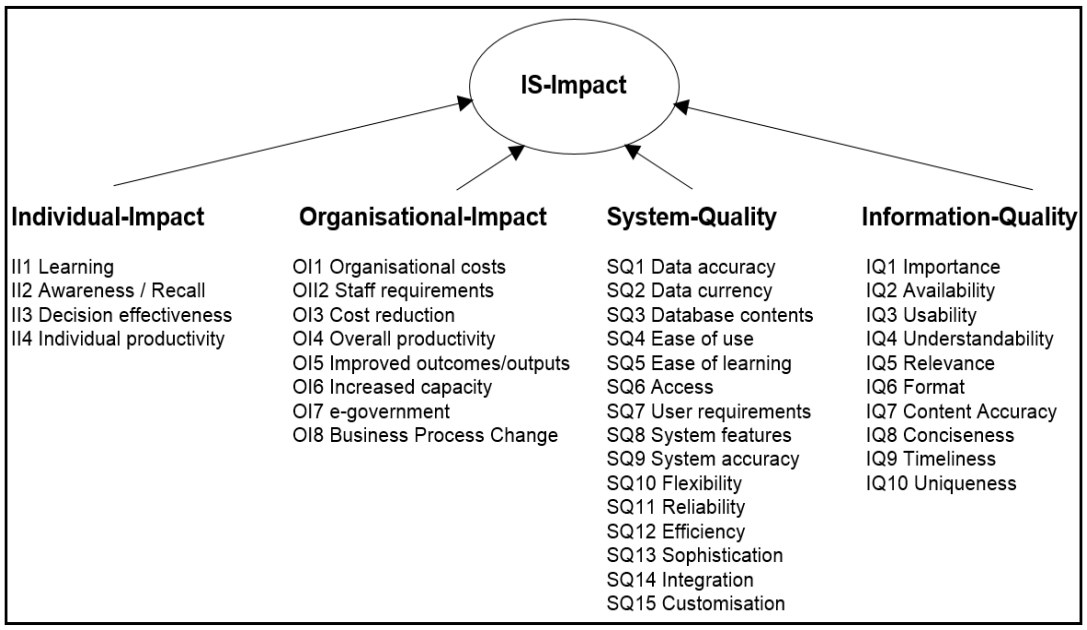
The IS impact model focuses on one causal flow of IS net benefits, associating four dimensions with IT function. It consists of four constructs: 'individual impact', 'organisational impact', 'system quality' and 'information quality'. These represent four distinct yet related dimensions of the multi-dimensional phenomenon; namely, IS success, divided into two halves. Further, debated continues on whether the constructs of 'use' and 'satisfaction' are dimensions of IS success. Through a comprehensive exploratory study, Gable et al. (2008) drew the following conclusion:

both ‘use’ and ‘satisfaction’ are antecedents or consequences of IS impact, rather than being two dimensions. When evaluating an IS, measures of these dimensions represent variables that are highly comparable across time, stakeholders, various types of system and different contexts. The impact dimensions represent the benefits achieved from the system. The quality dimensions reflect future potential; hence, these four dimensions reflect a complete view of the measure of IS success (Gable et al., 2008) (see Figure 2-5).

The IS impact model is differentiated from DeLone and McLean’s IS success model in the following ways: (1) it illustrates a measurement model, while the D&M model depicts a causal/process model of success; (2) the addition of new measures reflects a more holistic view of the context of ERP systems and organisational characteristics; (3) it includes additional measures to probe the ‘organisational impact’ construct; (4) it eliminates and consolidates measures; and (5) it revisits the relevance of the ‘use’ and ‘satisfaction’ constructs (Gable et al., 2008).

In addition, Gable et al. (2008) treated the model rigorously, and its dimensions as formative. They focused on the completeness, mutual exclusivity and necessity of dimensions and measures. Moreover, the original 37 measures were reduced to 27 measures in this IS impact model, for parsimony. The 37 measures of IS impact are shown in Figure 2-6.

The major differences between the D&M and IS impact models, and the belief that IS impact is a trustworthy and reliable model, suggest that research is enhanced if it is grounded in different models instead of only one. This broadens understanding and exploits the advantages of others’ work, providing new results that can make comparison more useful. Thus this study, unlike other research, has taken IS impact as a major theoretical base.



Note: Sourced from Gable et al. (2008)

Figure 2-7: IS Impact model's 37 measures

2.3.3 Other Models

The literature review has examined other acknowledged models to extend the understanding of different factors, measures and methods used in this area of research. Some issues raised from the overall review of the models are discussed in Section 2.3.4.

2.3.3.1 Saunders and Jones' Model

Saunders and Jones (1992) developed the IS function performance evaluation model. Their model identifies how measures should be selected from the multiple dimensions of the IS function. Employing a Delphi-based method, they examined how IS function performance dimensions were ranked in importance by IS executives. Through several interviews with chief executive officers (CEOs) and chief information officers, they found that the effect of strategic direction was the highest-ranked dimension of IS function, followed by integration of the IS function's planning with corporate planning. In addition, they concluded that the quality of information outputs and IS functions contributes to organisational financial performance.

2.3.3.2 3-D Model

Ballantine et al. (1996) evaluated DeLone and McLean's (1992) model on a number of dimensions and proposed a new 3-D model that fundamentally extended DeLone and McLean's work. In this model, the concept of IS success was separated into three fundamental dimensions: technical development, deployment to the user and delivery of business benefits. As a further extension of DeLone and McLean's work, Ballantine et al.'s (1996) work exhibits four developments. First, the 3-D model supports more complex contingencies. Second, some progress has been made regarding the confusion between dependent and independent variables: influencing factors are the closest equivalent to independent variables, and the outcomes of each level are the closest equivalent to dependent variables. Third, the 3-D model recognises stakeholder needs at different levels. Fourth, Ballantine et al. (1996) advocated that different methods and measures should be considered to evaluate success at these different levels.

2.3.3.3 Myers' Model

Figure 2-7 shows the comprehensive IS assessment model proposed by Myers et al. (1998). This IS assessment model added two dimensions not present in DeLone and McLean's (1992) model: 'service quality' and 'work group impact'.

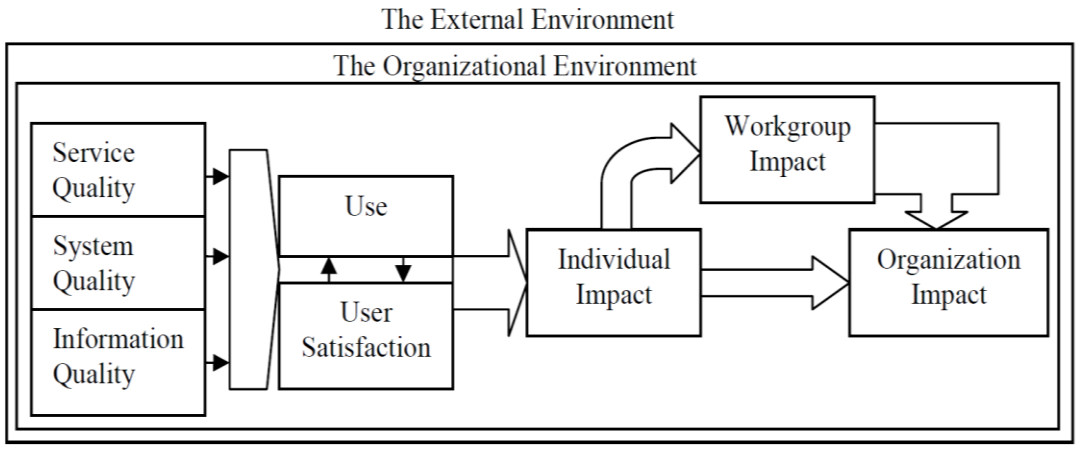


Figure 2-8: Myers's model

2.3.3.4 Cameron and Whetten's Seven Questions for Measuring Organisational Effectiveness

Seddon et al. (1999) recommended that, before evaluating an IT investment, clear answers would be required to each of Cameron and Whetten (1983) seven questions for measuring organisational effectiveness. These questions are shown in Table 2-1 below.

Table 2-1: Seven questions measuring organisational effectiveness

1. From whose perspective is effectiveness being judged?
2. What is the domain of activity? (depends on tasks emphasised in the organisation, competencies of the organisation and demands from external forces)
3. What is the level of analysis? (individual, sub-unit, organisation, population, societal)
4. What is the purpose of evaluation?
5. What time frame is employed? (short, long)
6. What types of data are to be used? (objective or perceptual)
7. Against which referent is effectiveness to be judged? (effectiveness of this organisation)

Note: Adapted from Cameron and Whetten (1983), as cited in Seddon et al. (1999)

2.3.3.5 ES Benefits Framework

Shang and Seddon (2002) proposed an ES benefits framework by summarising ES benefits after system implementation. Their study was based on secondary data from 233 ES vendor-reported stories published on the vendors' websites. Another data source was interviews with managers of 34 organisations that had used ES. Shang and Seddon's (2002) framework classifies potential ES benefits into 21 lower-level measures, organised into five main categories: operational, managerial, strategic, IT infrastructure and organisational benefits. The first three categories relate to the operational, management and strategic levels respectively. IT infrastructure benefits represent an important contribution of Shang and Seddon's ES benefits framework, highlighting the IT benefits that ES generate in an organisation. In addition, their paper provided a detailed example of how the framework had been applied to identify benefits in a longitudinal case study of four organisations.

2.3.3.6 IT Business Value Models

IS evaluation approaches are classified into two categories. Whether objective or subjective measures are applied depends on the category (Ifinedo, 2006). Objective measures use financial parameters, such as profit and productivity, while subjective measures focus on attitudinal, perceptual parameters, such as user satisfaction and acceptance of a system (Ifinedo, 2006).

Objective measures are dominant in the IT business value literature within an identifiable stream of research (e.g., Barua, Konana, Whinston, & Yin, 2004; Brynjolfsson, 1993; Chan, 2000; Martinsons, Davison, & Tse, 1999; Melville, Kraemer, & Gurbaxani, 2004; Tallon, Kraemer, & Gurbaxani, 2000). These models are associated with the degree of IT investment success in relation to organisational performance. The measures focus predominantly on the tangible financial parameters of the organisation, such as return on investment (ROI), cost–benefit analysis (CBA) and net present value (NPV) (Chan, 2000; Martinsons et al., 1999; Saloojee, Groenewald, & Du Toit, 2007).

Enhancements, extensions and integration have been developed to add intangible benefits using evaluation methods such as multi-objective, multi-criteria (MOMC), value analysis (VA) and critical success factors (CSF) (Saloojee et al., 2007). In addition, to incorporate the role of organisations through these models, researchers propose that further dimensions, such as system and supplier quality, be added to IT business value models (e.g., Barua et al., 2004; Melville et al., 2004). However, financial parameters remain the primary aspect of these models; this is difficult to quantify and relevant information is not easily obtained from organisations (Ifinedo, 2006). Accordingly, and to comply with the current research objectives, the approaches used in this study comprise subjective and perceptual measures only.

2.3.4 Discussion of Previous Models in the Study's Context

Many issues have arisen in the work undertaken to review previous models of IS success. These issues are based on this study's context, which is centred on the characteristics and needs of SMEs and developing countries. The following section discusses these issues in relation to a previous model. This will clarify the gap in previous research in relation to the new context.

2.3.4.1 Degrees of Importance or Weights of Measures

The weight and priority of measures differs according to many factors, including the context, the stakeholder viewpoint, and the level and unit of analysis (UoA) (DeLone & McLean, 2003). As stated by Petter et al. (2008):

> The context, purpose, unit of analysis (individual vs organisational), and importance of systems should dictate the relative weights to place on each of these success dimensions and measures. (p. 258)

In addition, Heo and Han (2003) have claimed that the constructs of the IS success model have different degrees of importance, based on the firm's characteristics.

2.3.4.2 Multiple Stakeholder Perspectives

According to Seddon et al. (1999), a stakeholder is a person or group in whose interests the evaluation of IS success is being measured. Gable et al. (2008) have defined stakeholders as the main groups of direct IS users—those users who access the system directly or those who use its direct outputs. They also note that these key user groups can vary with the type of system. Seeking the appropriate perspective(s) of relevant stakeholders is important in the different phases of research. This begins with framing the research questions and deriving and executing the research design, through to the empirical phases in which the sample frame and data collection are established. Prior research has shown the importance of properly identifying stakeholder(s). Seddon et al. (1999) have argued that when evaluating IS, it is imperative to clarify from whose perspective the success is being judged. As such, this section discusses the reviewed literature to assist in approaching relevant SME stakeholders.

Stakeholder classification varies across areas of study. In management science, Anthony (1965) has provided the basis for the employment cohort classification, with three levels of employment in an organisation: (1) strategic, (2) management and (3) operational. The IS in any organisation entails many 'users', including the top executives, data entry operators and external customers. Grover, Jeong and Segars (1996) have identified four different classes of IS evaluation perspectives: (1) users, (2) top management, (3) personnel and (4) external entities. Others have classified stakeholders more broadly into internal and external stakeholders. For example, Wu, Wang, Chang-Chien and Tai (2002) have identified the two main classes of

stakeholders in IS implementation as the internal project team and the external contractor. Their research was conducted within internal implementation teams, focusing on top managers, key users, end users and management information system (MIS) staff. Shang and Seddon (2002) similarly identified technical staff as a distinct and vital employment cohort in IS evaluations. Sedera, Tan and Dey (2006) identified four employment cohorts in IS evaluations: (1) strategic, (2) management, (3) operational and (4) technical. Singletary, Pawlowski and Watson (2003) analysed qualitative data to illustrate the importance of including different views on IS success at different organisational levels. They established that the three IS employment cohorts were (1) managers, (2) IT professionals and (3) end users. Gable et al.'s (2008) study of the IS impact model identified three key user groups: strategic users, operational users and technical users. The question in this part of the current study is therefore: are the stakeholders in SMEs different to those identified for large organisations?

McMahon (2007) has mentioned that stakeholder relationships receiving the most attention in SME literature are those between managers and owners, owner-managers and other owners, and insiders (primarily owner-managers, other owners and managers) and outsiders (mainly creditors and lenders). Daily and Dollinger (1993) have noted that small firms, particularly family-owned and family-managed businesses, are more likely to have a single individual—the owner-operator—who can assess the firm's processes accurately. Goldberg, Cohen and Fiegenbaum (2003) distinguished between three crucial stakeholders in SME software companies: investors, customers and employees.

However, multiple stakeholders' perspectives can be measured in this study only when the internal stakeholder is considered: stakeholder analysis here is a multi-stakeholder analysis. Apart from external users of the system who might have access to or influence on the system (e.g., customers and suppliers), ERP systems are used in SMEs by short hierarchy employment cohorts inside the organisation. The main SME stakeholders are owner-management users and operational users.

According to the SME literature (see Section 2.4), all SMEs have a very traditional and similar organisational set up. At the highest level, there is the owner, followed by (in some cases) managers and then the employees (McMahon, 2007). In O'Reagan and Ghobadian's (2004) study, SMEs are classified as being owner-

managed or as being professionally managed. In addition, the major characteristics of SMEs are centralised when the owner (in many cases) is the manager and the only person who can make decisions regarding the organisation. Moreover, the IT professional is not common fin SMEs: many do not employ IT professionals or technical staff. Therefore, for the purpose of the current study, the focus groups are: (1) owner-management users, (2) the manager if different from the owner and (3) the operational employee (system end-user).

2.3.4.3 Who Benefits from IS?

A variety of entities could be affected by IS activity, ranging from individuals to national economic accounts (DeLone & McLean, 2003). Apparently, not only organisations or individuals benefit from IS. The impact of IS has moved beyond immediate users and work groups, across organisations and industries, to consumers and society, and also includes the environment, society, the economy and the country (DeLone & McLean, 2003). Moreover, different stakeholders might have different opinions regarding what represents a benefit to them. DeLone and McLean (2003) have stated that:

> It is impossible to define these 'net benefits' without first defining the context or frame of reference. The fact that the D&M Model does not define this context is a matter of detail, not of oversight. The focus of any proposed study must be defined. Our model may be useful to both Microsoft and the user community, but each may have a very different definition of what constitutes net benefits and thus IS success. (p. 22)

In the SME context, Deros, Yusof and Salleh (2006) note that SMEs very often rely on a one-person management. The owner controls everything in an SME; ineffective management is attributed to the owner's lack of business and management experience. It is clear that the SME owner-manager's role might replace the functions (if any) of other managers or people in strategic positions. Reframing the IS success construct is important for SMEs; hence, a reconstruction of the IS impact model to reflect this issue might be required.

2.3.4.4 Role of Context

The context's role is particularly important to evaluating IS success. Many researchers have remarked that measure selection is highly dependent on the system's type and context. DeLone and McLean (1992) have indicated that '[t]his

success model clearly needed further development and validation before it could serve as a basis for the selection of appropriate IS measures' (p. 88). They have repeated this point in their updated model: '[f]or each research endeavour, the selection of IS success dimensions and measures should be subject to the objectives and context of the empirical investigation' (DeLone & McLean, 2003, p. 27). They highlighted that 'context should dictate the appropriate specification and application of the D&M IS Success Model' (DeLone & McLean, 2003, p. 18). To select success measures based on context, Seddon et al. (1999) have provided a context matrix as a valuable reference.

Contextual differences can include the organisation's size or the type of system (Gable et al., 2008). Different contexts can comprise different industries or any contextual boundaries such as country or culture (Petter et al., 2008). Whyte, Bytheway and Edwards (1997) have found that 'there are important differences deriving from the organisational, user, and systems variations which can modify the view as to which attributes (success measures) are important' (p. 65).

As mentioned in the previous review of D&M model literature, some researchers have developed approaches to measure success in different contexts, including specific industries, or depending on the type of system, by incorporating the various dimensions of the D&M model. Several researchers have commented on the difficulty of applying DeLone and McLean's IS success model when defining and operationalising IS success in specific research contexts. Accordingly, many have made changes to the model (e.g., DeLone & McLean, 2004; Jennex & Olfman, 2004; Kulkarni et al., 2007; Molla & Licker, 2001; Wu & Wang, 2006; Zhu & Kraemer, 2005).

It is clear that most models are based on a large organisation context. It is also clear that large organisations and SMEs have different characteristics. Therefore, this research focuses on measuring the benefits of IS in the context of SMEs. Extending the IS success model into this new context is critical.

2.3.4.5 System Type

Organisations use many types of IS, such as DSSs, computer-mediated communications, e-commerce and knowledge management systems (Petter et al., 2008).McAfee (2006) has classified IT projects into three categories: function IT,

network IT and enterprise IT. These three varieties of IT projects are shown on Table 2-2.

Methods of measuring IS success might differ depending on the system type. As reported by DeLone and McLean (2003), a study conducted by Jiang and Klein (1999) used a 24-item impact measurement instrument to survey 113 managers regarding system impacts across three different types of system: transaction processing systems (TPSs), information reporting systems (IRSs) and DSSs. Their study suggests that different impact measures are appropriate for different types of systems. Moreover, Doll and Torkzadeh (1998) have developed a multi-dimensional measure of systems usage based on the nature and purpose of a system.

When SMEs use ERP (originally designed for large organisations), they normally use only up to 20 per cent of the product's features. SME requirements are limited, while the offered products exceed their specifications in every way, including cost (Goldmine Technologies, 2010). Leading vendors have realised this and are now producing special solutions for SMEs. For example, SAP has introduced SAP Business One, SAP Business ByDesign and SAP Business-All-In-One. Microsoft has introduced Dynamics NAV. These ISs are produced especially for SMEs and differ from those used by large organisations. Accordingly, SMEs should select the IS that suits their organisational size.

Table 2-2: The three varieties of IT projects

IT category	Definition	Characteristics	Examples
Function IT	IT that assists with the execution of discrete tasks	• Can be adopted without complementary simulators • Impact increases when complements are in place	Spreadsheets, computer-aided design and statistical software
Network IT	IT that facilitates interactions without specifying their parameters	• Does not impose complements but lets them emerge over time • Does not specify tasks or sequences • Accepts data in many formats • Use is optional	Email, instant messaging, wikis, blogs and mashups

IT category	Definition	Characteristics	Examples
Enterprise IT	IT that specifies business processes	• Imposes complements throughout the organisation • Defines tasks and sequences • Mandates data formats • Use is mandatory	Software for ERP, CRM and SCM

Note: Sourced from McAfee (2006)

This study examines the use of IS by SMEs. Accordingly, the system chosen for this study differs from that used by IS impact models for large organisations (SAP Finance). Consequently, this may affect the model's measures and dimensions. Several of these measures are related to the features of IS for large organisations, which might not exist in SMEs. Therefore, these measures may no longer be valid in the SME context. Other ERP features unique to SMEs have not been addressed by the IS impact model for large organisations; hence, there is a need for new measures to be created for that purpose.

2.3.4.6 Framework or Model

Academics mention two terms in studies in this area: framework and model. Although these terms are sometimes used interchangeably, each has a specific meaning. 'Framework' describes the conceptual background; it is a general description. A conceptual framework is used in research to give an overall representation of the research actions or to apply a preferred approach to a thought or idea. A conceptual framework focuses on presenting the connectivity among all aspects of research. A 'model' can be considered as a theoretical construct that represents something, by using a set of variables and the relationships among them. Because this research refers to and adopts a previous model (Gable et al., 2008), the term 'model' will be used consistently throughout the thesis, rather than 'framework'.

2.3.4.7 Overlapping Measures

As observed in many studies, overlaps exist between measures and dimensions. However, consistency in research is critical (DeLone & McLean, 2003) and

researchers are encouraged to use current models without minor modifications, facilitating across-study comparisons. As DeLone and McLean (2003) state: '[w]here possible, we advocate the application of existing, validated measures rather than the development of new measures' (p. 27). Nevertheless, validating existing models in different contexts and/or using different methods based on contemporary variables and context is vital.

An example of measurement overlap in the SME context might be seen when considering organisational and individual impacts. This can occur in the SME context; often, the owner is the only user in the organisation. Therefore, he or she might have an organisational perspective as an owner and a simultaneous individual perspective as an ordinary user. There are many reasons for overlap and inconsistency between studies, including mixing independent success measures and dependent variables (Petter et al., 2008) or treating variables as reflective rather than formative.

In the current study, special attention is given to choosing the dimensions and measures in these relationships. The measures in this study are designed to provide parsimonious solutions, as well as complete ones.

2.3.4.8 Timing

Timing is an important issue for many researchers. Agarwal and Prasad's (1997) study dealt with both initial system usage and intentions of future use. The authors found that different factors affected initial versus future use of the world wide web. Karahanna, Straub and Chervany's (1999) study also supported that result, finding that different factors were associated with intention-to-use windows between potential adopters and continuing users. Chin-Yueh's (2007) results suggest that the effect of perceived ease of use in a system's early adoption became non-significant after extended experience, especially in an SME environment. In Shang and Seddon's (2002) study, a common pattern of benefit development indicated an increase in benefits over time in each of the five IS benefit dimensions: operational, managerial, strategic, IT infrastructure and organisational benefits. The period of benefit development could be up to three years. These examples from empirical studies demonstrate that the results from early evaluation can differ from those of continued evaluation (DeLone & McLean, 2003). In other words, the timing of evaluation can make a difference when evaluating results. This is critical in IS, as

these systems require a deployment process that includes training. In general, the benefits of IS increase over time. Benefits are lowest in IS life cycle level during deployment, increasing rapidly until a stable position is reached (Chin-Yueh, 2007) (see Figure 2-8). For SMEs, the situation might be made worse due to their limited budget; they may not be able to afford a long deployment process. Here, choosing the correct time for evaluating IS is critical.

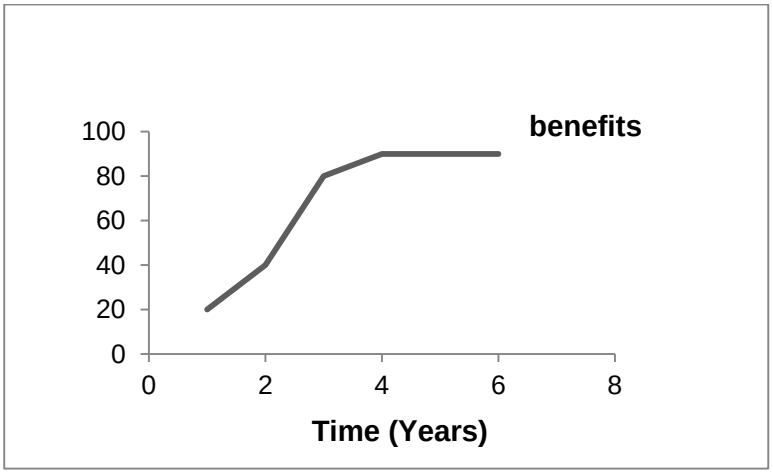


Figure 2-9: Illustration of IS benefits against time

2.3.4.9 Multi-dimensional Measures

A significant problem with previous IS success measurement models is the sole use of the 'user satisfaction' dimension as a replacement measure of success. Moreover, most previous research has focused on a single dimension of success such as 'system quality', 'benefits' or 'user satisfaction'. Few studies have measured and considered the multiple dimensions of success and their interrelationships. However, as Petter et al. (2008) state: '[u]ntil IS empirical studies consistently apply a validated, multi-dimensional success measure, the IS field will be plagued with inconsistent results and an inability to generalize its findings' (p. 256). In the current study, the IS impact model, which is a comprehensive multi-dimensional measurement model, is used as a base from which to produce a model for measuring the impact of IS in SMEs. These dimensions and measures are then tested in the context of SMEs.

2.3.4.10 Theoretical Basis

As suggested earlier in this literature review, many models of IS success, such as DeLone and McLean's (1992, 2003) models, are criticised for insufficient explanation

of their underlying theoretical basis. A theoretical basis is essential in any study, as it enhances research validity. According to Burton-Jones and Straub (2006), few (if any) in-depth theoretical assessments exist regarding the components and relationships of units used to construct many IS success models. Burton-Jones and Straub (2006) have further stated that with the absence of theoretical grounding, past studies have arrived at mixed conclusions regarding the links and relationships between the different constructs of IS success models. This deficiency in theoretical foundation, combined with the diverse results of empirical studies, has raised concerns about the validity of the measures and constructs in prior IS success models and the proposed relationships between constructs.

Theory-related issues exist for both causal and measurement models. Seddon (1997) has tested part of the causal structure empirically. His study provides evidence that supports some model paths. However, most researchers have received mixed results in testing causal relationships between IS success constructs (Hunton & Flowers, 1997). Burton-Jones and Gallivan (2007) have provided a multi-level theory of system usage. Sabherwal et al.'s (2006) study developed a comprehensive theoretical model, including constructs related to the context, users and IS success. Their model explains the interrelationships between the four constructs that represent the success of a specific IS: 'user satisfaction', 'system use', 'perceived usefulness' and 'system quality', as well as their relationships with the context and user-related constructs.

The current study focuses on the underlying theories that can explain the new phenomenon of evaluating IS use by developing country SMEs. In doing so, the study enables development of a benefits measurement model for IS in SMEs. Unlike other studies based on the D&M model, the current study is based on the IS impact model. Justification for any update to the model is provided in accordance with the rationale and reasoning derived from existing theories and models. The D&M model has been tested and used in many contexts and has proven validity for use in other contexts (Urbach, Smolnik, & Riempp, 2009). The IS impact model has been chosen for its ability to measure the up-to-date impact of the system undergoing evaluation. In addition, it can forecast the potential impact of a future system by evaluating the quality of information and the system itself. This model is concise and parsimonious, which ensures it is practical and easy to use. Moreover, the model measures the level of impact across multiple staff perspectives in an organisation. The advantages

of the IS impact model form a sound underlying base that can be validated in the context of SMEs.

2.4 SMEs

2.4.1 Importance of SMEs

SMEs have a significant influence on the economic growth of all countries. They play an important role in employment and innovation (Lin, 1998; Snider et al., 2009). Studies have shown that SMEs are not smaller replicas of large firms (Martin-Tapia et al., 2008). They differ fundamentally in several ways, such as having limited resources, the inadequacy of employees' skills, uncertainty regarding IS and a lack of vision for their prospective competitive advantages (Salmeron & Bueno, 2006).

Traditionally, IS investment has been dominated by large organisations. This is no longer the case: SMEs are increasingly implementing IS and in addition, many software package vendors are now considering SMEs as a focal market.

Further, organisational size is a major factor that must be carefully considered in many IS-related studies. Enterprise size plays an important role in IS implementation and influences several key organisational dimensions (Mabert et al., 2003b). Eikebrokk and Olsen (2007) have confirmed that firm size can affect critical research findings for the following reasons: (1) SMEs are different from large organisations and in terms of IS, have their own characteristics and needs; (2) SMEs have begun recently to focus on IS and hence are facing many challenges due to their lack of experience and resource limitations; and (3) vendors supplying the market for IS have begun to understand the differences between large organisations and SMEs and are providing SMEs with a new, less complex, version of packaged software that better suits their needs. However, very few studies in IS research have considered these differences between large organisations and SMEs. Dealing only with large organisations in the academic IS research can result in biased conclusions about IS (Eikebrokk & Olsen, 2007).

With this limited focus in the research on organisational size as a mediating factor, even less emphasis is placed on the 'criteria' for organisational size, with studies in IS and other disciplines employing inconsistent measures to determine organisational size. Some studies use the number of employees, while others use financial criteria such as turnover, assets or average revenue over a number of

years. Despite the relevance of such criteria to other disciplines such as marketing and management, they are less relevant to IS studies (Love & Irani, 2004).

The current study attempts to consolidate the views of a number of disciplines and reach a consensus regarding organisational size for IS studies. The next section reviews the findings from the literature on what may constitute an SME. This is followed by archival analysis of prior academic research and company profiles. The identified size criteria for IS research are then discussed, followed by the conclusion of this discussion on the definition of SMEs.

2.4.2 Definition of SMEs

As scholars have stated widely, no universal definition of SMEs exists (Gooding & Iii, 1985; Kimberly, 1976; Lee et al., 2007). Some definitions are based on quantitative criteria such as the number of employees, turnover and assets, while other definitions use qualitative criteria (Blau, 1970; Fathian et al., 2008). The latter typically employ classifications based on development stages and organisational strategies (Lee et al., 2007). Moreover, the definition of SMEs differs from country to country. This section outlines the debate on the criteria for size definition and other issues related to size. It also identifies the various definitions used by different countries and regions.

Size definition has received a significant amount of attention from IS scholars since the 1970s. The operational definition of size was previously the number of employees and/or qualitative and quantitative criteria, such as the number of local branches, the number of hierarchy levels, the number of functional divisions and the number of sections per division (Blau, 1970; Kimberly, 1976). Many of the size measures described in the literature may reflect different dimensions. For instance, the number of employees could reflect a dimension related to the availability of, or constraints on, human resources. Other dimensions such as material resources might be reflected by physical capacity measures such as the number of beds in a hospital or financial assets measures (Gooding & Iii, 1985). Alternative perspectives of size definition are based on the structural characteristics of organisations and the resources used by an organisation (Gupta, 1980), and on a financial perspective, including annual sales, workforce, assets and market share (Ein-Dor & Segev, 1978). Raymond (1985) has presumed the importance of organisational context, implying that research findings achieved in a large business environment could not

necessarily be generalised to small businesses. This is because the characterisation of a small firm's organisational context is fundamentally different to that of a large firm. The lack of consistency about firm size definition in the literature over the past three decades suggests the need for a systematic approach to determine SME size.

At present, the SME definition is influenced by regional and national differences (Fink & Ploder, 2009). The number of employees in SMEs is a main factor used by governments to define SMEs. However, this differs between regions and countries. Unlike the European Union, which includes organisations with less than 250 employees, China includes companies employing up to 3,000 persons. In the United States of America (USA), the American Small Business Administration (SBA) considers firms employing up to 1,500 employees as small (Saini & Budhwar, 2008).

These variations are illustrated further by focusing on how an SME is defined in different countries and regions. For example, The USA definition of an SME is set by a government department, the SBA Size Standards Office. The SBA definition of a small business is determined by a combination of factors: industry type, number of employees, three-year average of gross revenues and the type of SBA service requested.

The European Commission analyses SMEs according to the following three characteristics: (1) number of employees, (2) annual revenue and (3) balance sheet total (total assets). The European Community suggests three categories for SMEs: medium, small and micro (European Commission, 2005). Micro-SMEs have up to 250 employees and either an annual turnover below 50 million euros, or an annual balance sheet total not exceeding 43 million euros (European Commission, 2005).

Within Asian economic systems, the SME definitions also vary across countries. For example, China's definition of SMEs is relatively complex and involves large firms (Xiangfeng, 2008). The number of employees ranges between 100 and 600 in small companies, and between 200 and 3,000 in medium-sized companies. In addition, detailed size criteria are applied to specific sectors such as construction, transportation, trade and restaurants (Xiangfeng, 2008). The high upper limits of the number of employees in China might result from China's economic background, which includes the availability of human resources from its large population. Even in

countries that are geographically close to China, such as Taiwan, Korea and Japan, the definitions of SMEs vary.

Malaysia is another example of a country with no consistent SMEs definition, having adopted an SME definition in each sector based on the annual turnover and number of employees (Small and Medium Enterprise Basic Law, 1999). In Australia, Holmes and Gibson (2001) conducted a study for the Small Business Coalition (SBC) to develop a definition of 'small business'. They identified 15 different small business definitions in the Australian legal system used for different purposes; these relied heavily on quantitative measures of assets and/or employee numbers. They proposed a universal definition for small business as follows: '[a] business which is independently owned and operated, with close control over operations and decisions held by the owners. The business entity is not publicly traded and business financing is personally guaranteed by the owners. The business will have less than 20 employees' (Holmes & Gibson, 2001).

Further, the definition of SMEs varies widely across Asia-Pacific Economic Cooperation (APEC) forum countries (Hall, 1995). A summary of these definitions is given in Table 2-3. While other measures such as turnover, capital size and assets statistics are in many cases part of the criteria, the overriding consideration appears to be based on employee numbers. Studies that use the number of employees to define organisation size justify this as the number of employees can affect the organisation's structure and behaviour (Edvardsson, 2009). However, when using employee numbers as a measure of organisation size, other issues arise. These include whether employees are full- or part-time, labour regulations for hiring employees, working hour limits for full- and part-time employees, and employee and social security taxes. Using the number of employees as a sole factor can be misleading in gauging an organisation's actual size (Gibson & Van Der Vaart, 2008).

A study's purpose and specific context are both vital factors that influence the definition of size (Harrison, Mykytyn, & Riemenschneider, 1997). O'Reagan and Ghobadian (2004) argue that the definition of SMEs not only depends on who is doing the defining, but most likely depends more on why the definition is made. From an IS perspective, not all employees in an organisation are direct or indirect users of the implemented IS.A limited numbers of employees actually use IS, while many other employees may have little to do with it. Thus, the number of employees may

not reflect the actual use of IS in an organisation. A related argument suggests that SME definitions fail to consider contemporary IS attributes (O'Reagan & Ghobadian., 2004). IS use in current day SMEs can be measured by applying new tangible criteria such as the number of people who use IS, the number of computers, the number of computers per server, and the type of network or IS (O'Reagan & Ghobadian., 2004).

In the absence of a universal definition of SMEs, classifications using mixed criteria have been developed (O'Reagan & Ghobadian., 2004). Some researchers, such as Gibson and Van Der Vaart (2008), have proposed a formula for defining SMEs that blends more than one SME criterion. However, the complexity of this formula has led to difficulties in practical applications. Moreover, there is agreement that no existing formula would be suitable for all studies (Gibson & Van Der Vaart, 2008).

Another issue with SME definitions is the wide application of the term. Numerous studies have preferred separating the definition into micro-, small- and medium-sized, rather than combining them in one definition. Bohórquez and Esteves's (2008) study analysed the size of SMEs as a moderator of ERP's effect on SME productivity. Their study suggested that SME size moderates the ERP influence on productivity. Moreover, an accurate SME definition based on employee numbers or financial measures (such as assets, turnover or profits) is subject to the erosion of inflation, as well as being riddled with statistical and accounting holes (Holmes & Gibson, 2001). Consequently, it is important to note that these definitions change over time. For example, since 1996, the European Commission definition has changed three times. The SME definition therefore needs to be adjusted over time due to changing variables such as inflation, population change and overall market valuation. Thus, based on a lack of consensus in the literature, a key question remains: what definition can be used for SMEs in relation to IS research? To answer this question, the current study has conducted archival analysis, as discussed in the next section.

Table 2-3: Summary of main SME definitions in selected APEC economies

Country	Definition of SME	Measure
Australia	Manufacturing: less than 100 employees Services: less than 20 employees	employment

Country	Definition of SME	Measure
Canada	Manufacturing: less than 500 employees Services: less than 50 employees	employment
China	Varies with industry: usually less than 100 employees	employment
Indonesia	Less than 100 employees	employment
Japan	Less than 300 employees, or ¥10 million assets Wholesaling: less than 50 employees, or ¥30 million assets Retailing: less than 50 employees, or ¥10 million assets	employment assets
Korea	Manufacturing: less than 300 employees Services: less than 20 employees	employment
Malaysia	Varies: less than RM 2.5 million and less than 75 employees	shareholders' funds employees
Philippines	Less than 200 employees, or PHP 40 million	assets employment
Singapore	Manufacturing: less than S$12 million Services: less than 100 employees	fixed assets employment
Chinese Taipei	Manufacturing: less than NT$40m paid-up capital, and less than total assets of NT$120m In business, transport, and other services: sales of less than NT$40m	paid-up capital, assets and sales
Thailand	Labour intensive: less than 200 employees Capital intensive: less than 100m Baht	employment capital
USA	Less than 500 employees	employment

Note: Adapted from Hall (1995)

2.4.3 SME Definitions in IS Research

A review of the IS journals found varied SME definitions: these top-tier journals included *MIS Quarterly*, *Information Systems Research (ISR), Communications of the ACM*, *Management Science (MS)* and *Journal of Management Information Systems (JMIS)*. Most studies referred to their samples as SMEs (47 out of 53). Of these, four studies excluded micro-organisations from their sample (Fink, 1998; Levy, Powell, & Galliers, 1999; Snider et al., 2009; Wiesner, McDonald, & Banham, 2007). Seven studies distinguished between micro-, small- and medium-sized firms and defined each classification exactly. Six studies (out of the 53) chose only small firms and referred to their sample as small businesses rather than SMEs (Courseault Trumbach, Payne, & Kongthon, 2006; De Sousa-Brown, 2008; Lee et al., 2007; McCartan-Quinn & Carson, 2003; Street & Meister, 2004; Thong, 1999). Moreover, an Indian study referred to SMEs as small-scale industry (SSI) (Saini & Budhwar, 2008). Appendix F includes a full list of the academic studies in this archival analysis of SME definitions.

The studies varied in the characteristics used to define SMEs, with 48 using employee numbers. Some studies (15 out of the 48) used employee numbers with additional quantitative criteria measures, such as turnover, revenue and assets. The limit stated for the maximum number of employees varied between 500, 300, 250, 200 or 100. However, in one study, this number reached 2,000 employees (Chen, Wang, & Wu, 2010). In China, where this study was conducted, the definition of SMEs can include firms with 2,000 or even 3,000 employees in some sectors. Further, some studies excluded micro-firms, which they identified as organisations with less than 6, 10 or 20 employees.

Another characteristic used to define SMEs is monetary measures, such as turnover, revenue or total assets. The values of turnover in the examined studies ranged between 12 and 175 million euros. Revenue values ranged from a very low 0.32 million euros in a US study (Desouza & Awazu, 2006) and as high as 10 billion euro in a Taiwanese study (Huang & Chou, 2004). The justification of extremely low values was not required. In empirical studies, this limit would ensure inclusion of an organisation as an SME when the sample might not represent exactly what the authors deemed the highest limit. What needs to be justified is whether companies

with high turnovers or revenue should be classified as large organisations rather than SMEs. Two studies had turnovers or revenue above 100 million euros (Huang & Chou, 2004; Love & Irani, 2004). These high values are more likely to be found in the large organisation category. However, their inclusion could be justified by using the number of employees as another size criterion. The two studies were conducted in Taiwan and Australia, where the general government classification did not specify turnover or revenue in the SME classification. In considering turnover and revenue as synonymous and excluding extreme values, most studies have turnovers or revenue limited to 50 million euros.

Total assets can be used as a size criterion by organisations. Total assets are also referred to as the annual balance sheet total, which details the value of the company's main assets (European Commission, 2005). In its SME definition, the European Commission (2005) uses total assets along with the number of employees and turnover. The value of total assets was set to not exceed 43 million euros in 2005 and 27 million euros in 2004. Two studies in the sample used the European Commission 2004 and 2005 definitions to classify their data (Eikebrokk & Olsen, 2007; Karjalainen & Kemppainen, 2008). Similarly, two studies in Singapore used samples defined by the Association of SME (ASME) of Singapore (Kendall, Tung, Chua, Ng, & Tan, 2001; Thong, 1999). ASME has a similar role to that of the European Commission, and uses turnover or total assets with the number of employees to define SMEs, but with different values. Total assets are set by ASME to not exceed 6.5 million euros (Kendall et al., 2001). Further, another study in Canada adopted a qualitative definition from the US SBA in which a 'small business' was defined as being independently owned and operated and not dominant in its field (Street & Meister, 2004).

In general, among the studies that use total assets, the limit values varied from as little as 1.5 million euros in an Indian study (Saini & Budhwar, 2008) to the very large scale of 59.7 million euros in a Chinese study (Chen et al., 2010). Most studies had turnovers or revenue limited to 50 million euros. However, one study conducted in China used a turnover or revenue of more than 50 million euros (59.7 million euro = 500 million Chinese Yuan (CNY). For the current study, this slight difference appears justified by China's economic context.

Some studies use measures suited to their industry. For example, one study in the building construction industry used production value rather than employee numbers (Acar, Koak, Sey, & Arditi, 2005). A study in the IS industry used the number of licensed users, the organisational level and industry, in addition to the number of employees: their study was concerned with ERP implementation (Snider et al., 2009).

From the above archival analysis, it is clear that a variety of size measures for SMEs have been used by scholars in different disciplines, countries and sectors. The aim of this analysis was to explore the current status of academic literature regarding SME definition. No consistency was found between studies in their definition of SMEs or in the organisational characteristics that determined the size of SMEs, even within the same country and sector. This analysis has identified an important gap in the literature due to the lack of a universal definition that enables meaningful comparison across studies.

It is important to understand there is no one definition of SMEs that suits the needs of all governments and research purposes (Holmes & Gibson, 2001). However, the current study seeks a clear definition regarding the IS discipline. This definition should include the combination of organisation and IS criteria that meet the characteristics of SMEs from an IS perspective.

As shown in the analysis, definitions of SMEs differ significantly across countries and regions in both the academic literature and in practice. There is no agreement on the different academic and government definitions across regions, countries and industries. In addition, the SME definition in practice is influenced by many factors including the sector and the vendor's approach.

The majority of SME definitions are based on the number of employees. The inclusion of monetary values in the SME definition, such as the values of turnover, revenue and fixed assets, vary widely from one country to another. A few definitions have operationalised other quantitative criteria such as the number of branches or production values. A limited number of definitions use qualitative criteria such as the involvement of ownership or the organisational structure.

Thus, based on the lack of consensus, the current study suggests that researchers of SMEs should indicate the region, country and sector in which their studies have

taken place, clearly stating their SME size criteria in a manner that allows correct cross-study comparisons to be made. The analysis also suggests that IS studies can consider new size measures that are more related to IS and that reflect the actual use of IS in the organisation. New measures for IS such as IT budgets, the number of user licences and the type of IS could also be included. From a theoretical perspective, Wade and Hulland (2004) have stated that using a resource-based view (RBV) introduces new considerations that must be dealt with by IS researchers. In fact, the set of IS resources introduced in their study indicates what could be considered as a size measure of SMEs from the IS perspective. Both technology-based IS assets and IS capabilities (Bharadwaj, 2000) are included as IS resources. Examples of IS assets include IS infrastructure, which covers the tangible IS technology used by the firm, such as hard and soft infrastructure (Lopes & Galletta, 1997), while IS capabilities include intangible IS resources such as IS technical skills and IT management skills (Bharadwaj, 2000).

Despite the prominence of SME research, the definition and classification of SMEs are still under development. This section has identified important size criteria when considering organisational size from an IS perspective. Archival analysis of both related academic papers on SMEs and practical use of the definition has raised three key issues. First, many studies lack clarity on what constitutes an SME, which leads to ambiguity and reduces the usefulness of such papers to similar research. Second, inconsistency exists in the definition of and measures used for SMEs in the literature, even within the same region, country or industry. Third, the measures in these studies may not be suitable in IS-related research. In contrast, organisation size measured by the number of employees, turnover or assets will not influence IS investment levels. While the current study acknowledges the difficulty in agreeing on one definition due to differences between countries, economies, legislation and industries, it urges that researchers clearly state the size criteria upon which they have relied when defining SMEs. In addition, this study suggests that IS studies consider new measures for organisation size that are more related to IS and that reflect the actual use of IS in an organisation, such as the number of user licences, the size of the IT budget and other selected size criteria.

2.4.4 Characteristics of SMEs

Whatever the problems of defining SMEs, it is important to understand the characteristics of SMEs and how these differ from those of large organisations. These differences have a significant influence on IS in SMEs. Many researchers indicate that selecting IS success measures depends on the type and context of the system. As Petter et al. (2008) state:

> The practical application of the D&M model is naturally dependent on the organisational context. The researcher wanting to apply the D&M model must have an understanding of the information system and organisation under study. This will determine the types of measures used for each success dimension. The selection of success dimensions and specific metrics depend on the nature and purpose of the system(s) being evaluated. (p. 239)

Snider et al. (2009) have argued that, if the differences between small and large firms are not fully understood, managing ERP projects in SMEs will continue to be time-consuming, painful and unprofitable. Chen and Williams (1998) have noted that in SME studies, organisational culture—especially the characteristics of owner-managers—appears to affect the perception, adoption and development of electronic data interchange (EDI).

This section critically reviews the literature on the characteristics of SMEs to isolate the features unique to SMEs and identify the effect of those characteristics on IS and more specifically their effects on IS success.

2.4.4.1 Classifications of SME Characteristics

The unique characteristics of SMEs appear clearly in the structure, management and decision-making aspects of an organisation. They also emerge in risk taking and in product and service procedures. Based on an extensive literature review, these characteristics have been classified into five categories. This categorisation is inspired mainly by MacGregor and Vrazalic (2006), Kartiwi and MacGregor (2007) and Blili and Raymond (1993). The classification includes characteristics related to: (1) organisational structure; (2) financial resources; (3) management, decision making and risk; and (4) products, services and markets. From the perspective of IS research, another category has been identified: (5) characteristics related to IS. These features are described below in more detail.

Notably, these characteristics overlap. The first four categories can be referred to as general characteristics of SMEs, while the fifth is a specific characteristic of IT/IS. These characteristics are correlated and affect IS both directly and indirectly. It is important to mention that the overlap between classifications occurs due to the nature of the related characteristics. These classifications and characteristics are summarised in Table 2-4.

Table 2-4: SME characteristics

Characteristics	Example studies reported
Characteristics related to organisational structure	
Centralised	Seibert (2004); Levy & Powell (2000); McCartan-Quinn & Carson (2003); Lin (998); Kartiwi & MacGregor (2007); Ein-Dor & Segev (1978)
Informal	Seibert (2004); Levy & Powell (2000); Lin (1998); McCartan-Quinn & Carson (2003); Snider et al. (2009); Blili & Raymond (1993); Kartiwi & MacGregor (2007)
Flexibility	McCartan-Quinn & Carson (2003)
Fragile	Snider et al. (2009); Ein-Dor & Segev (1978); Kartiwi & MacGregor (2007)
Segregation between functions	Gable & Highland (1993); Blili & Raymond (1993)
Characteristics related to financial resources	
Lack of financial resources	McCartan-Quinn & Carson (2003); Snider et al. (2009); Bohórquez & Esteves (2008); Snider et al. (2009); Cragg & Zinatelli (1995); DeLone (1981); Ein-Dor & Segev (1978); Harris & Katz (1991); Kartiwi & MacGregor (2007); Yap, Soh, & Raman (1992); Levy & Powell (2000); Blili & Raymond (1993)
Difficulty in obtaining credit	Snider et al. (2009); Kartiwi & MacGregor (2007)
Characteristics related to management and decision making	
Uncertainty	Blili & Raymond (1993); Kartiwi & MacGregor (2007); Levy & Powell (2000)
No senior management involved in IS decisions	Levy & Powell (2000); Snider et al. (2009); Blili & Raymond (1993); Kartiwi & MacGregor (2007); Yap et al. (1992)

Characteristics	Example studies reported
Short-term, reactive decision-making cycle	Blili & Raymond (1993)
Intuitive decision process	Blili & Raymond (1993); Kartiwi & MacGregor (2007)
SMEs face more risks than large businesses	Kartiwi & MacGregor (2007)
SMEs are more reluctant to take risks	Kartiwi & MacGregor (2007)
Characteristics related to products/services and markets	
Narrow product/service range	Kartiwi & MacGregor (2007)
Limited share of the market	Kartiwi & MacGregor (2007)
Product-oriented not customer-oriented	Kartiwi & MacGregor (2007)
Unable to compete with larger counterparts	Kartiwi & MacGregor (2007)
Characteristics related to IS	
Lack of IT staff	Gable & Highland (1993); Levy & Powell (2000); Snider et al. (2009); Cragg & Zinatelli (1995); DeLone (1981); Yap et al. (1992); Levy & Powell (2000); Kartiwi & MacGregor (2007)
Lack of IT department	Levy & Powell (2000); Snider et al. (2009)
Less management support for IS	Snider et al. (2009); Cragg & Zinatelli (1995); Blili & Raymond (1993); Kartiwi & MacGregor (2007); Levy & Powell (2000)
Less experience with IS	DeLone (1981); Blili & Raymond (1993)

2.4.4.2 Characteristics Related to Organisational Structure

The organisational structure of SMEs differs from that of large organisations. It is often a centralised, informal structure (Seibert, 2004). Ein-Dor and Segev (1978) have stated that firm size is inversely related to the level of centralisation of the MIS function and to the hierarchical level of the MIS director. Kartiwi and MacGregor (2007) have noted that SMEs have a small and centralised management with a short-

term perspective. Moreover, this informal structure includes both informal strategies and operations (Snider et al., 2009).

Flexibility is perceived by many researchers as a positive characteristic of SME structure (McCartan-Quinn & Carson, 2003). Fathian et al. (2008) have observed that SMEs experience behavioural advantages due to their greater flexibility and ability to adapt to market changes. Raymond's (1985) study showed that small firms are capable of developing, implementing and administering their own applications in-house, due to their structure's characteristics.

Alternatively, the SME structures are criticised for being fragile (Snider et al., 2009). Ein-Dor and Segev (1978) have stated that larger firms tend to be more organisationally mature. Moreover, the fragile structure of SMEs can be attributed to poor management skills (Kartiwi & MacGregor, 2007).

Gable and Highland (1993) have identified the difficulty of function segregation as an important differentiating characteristic of SME structure. They described this as 'the segregation of function that is possible in many large system environments, but frequently not possible in the smaller system context' (Gable & Highland, 1993). Their study supports the results of Blili and Raymond (1993), whose study indicates the informal structure of SMEs, with minimal differentiation among units.

2.4.4.3 Characteristics Related to Financial Resources

SME research exhibits a general agreement regarding another important characteristic—the lack of human and financial resources (Kartiwi & MacGregor, 2007; McCartan-Quinn & Carson, 2003; Yap et al., 1992). This feature—as detailed in the next section—affects many aspects of IS directly, such as training and consultancy support. The lack of financial resources also correlates to the difficulty in obtaining credit (Snider et al., 2009).

Cragg and Zinatelli (1995) have concluded that SMEs lack adequate hardware and software. DeLone (1981) has reported that a major difference between computer use in large and small organisations relates to the cost of hardware and software, finding that smaller firms spent relatively more on hardware. Blili and Raymond (1993) have described SMEs' 'poverty' in terms of human and financial resources. According to their findings, SMEs spend a larger proportion of their operating expenses on IT than

large organisations (Harris & Katz, 1991). In addition, SMEs are more reluctant to spend on IT; therefore, their use of technology is limited (Kartiwi & MacGregor, 2007). Levy and Powell (2000) also found that SMEs may be unable to accommodate the introduction of IS, including implementation and training costs, due to their limited resources.

All of these financial difficulties faced by SMEs negatively affect training and consultancy support. In addition, financial issues may lead to IS project delays or even abandonment. Moreover, the cost of an ERP implementation may be proportionally higher for SMEs than for large organisations (Bohórquez & Esteves, 2008; Snider et al., 2009).

2.4.4.4 Characteristics Related to Management, Decision Making and Risk

Many SME characteristics are related to management, decision making and risk. Kartiwi and MacGregor (2007) report that SMEs have less control over their external environment than larger businesses and therefore face more uncertainty. Some studies, such as those by Blili and Raymond (1993) and Levy and Powell (2000), specify that SMEs experience uncertainty in the IT environment. SMEs' lack of knowledge and experience often means they are faced with a high level of uncertainty regarding the new technological environment and the use of IT for strategic or competitive purposes (Blili & Raymond, 1993).

Owner management is a common characteristic of SMEs (Yap et al., 1992). Blili and Raymond (1993) have indicated the dominant role of the owner in limited information sharing and limited decision-making delegation. Accordingly, SMEs seldom have senior management involvement in IS decisions (Levy & Powell, 2000; Snider et al., 2009). Kartiwi and MacGregor (2007) indicate that SME owners often withhold information from their colleagues.

Decision making has a specific format in SMEs. The strategic decision-making cycle is short term, as it focuses on reaction rather than anticipation (Blili & Raymond, 1993). Decision making is also characterised in SMEs as intuitive, rather than being based on detailed planning and exhaustive study (Kartiwi & MacGregor, 2007). It tends to be based on experience rather than formal managerial techniques, and is focused on physical flows (Blili & Raymond, 1993). As SME owners have such a

strong influence in the decision-making process, many SMEs are characterised by the intrusion of family values and concerns in their decision-making processes (Kartiwi & MacGregor, 2007).

In terms of risk, SMEs face more risks than large businesses as their failure rates are higher (Kartiwi & MacGregor, 2007). Hence, SMEs are more reluctant to take risks or invest in IT and therefore make limited use of technology. Evidence of this has been shown by many researchers, who have demonstrated that most SMEs avoid sophisticated software and applications (e.g., Chen, 1993; Cragg & King, 1993; DelVecchio, 1994; Holzinger & Hotch, 1993; Khan & Khan, 1992). Thus, the propensity exists for SMEs to invest in IS at much lower rates (Levy & Powell, 2000).

These management characteristics clarify that this type of IS model is more important to SMEs than to their larger counterparts, as SMEs are subject to rapidly made and intuitive decisions. Moreover, they have a very high failure rate, so the risk of maintaining an unsuccessful IS is very high. The aim of developing a benefits measurement model is to help SMEs justify their IS investment.

2.4.4.5 Characteristics Related to Products, Services and Markets

Kartiwi and MacGregor (2007) report that from a product, service and market perspective, many SMEs are characterised by a narrow product/service range and limited market share. As they are often confined to a niche market, SMEs largely rely on just a few customers. Moreover, SMEs are product-oriented, unlike large businesses, which are more customer-oriented. As a result, SMEs are not interested in large shares of the market and they are unable to compete with their larger counterparts (Kartiwi & MacGregor, 2007). Other significant characteristics of SMEs include: they have an operational focus (Levy & Powell, 2000); they exhibit a strong desire for independence; and they avoid business ventures that impinge on their independence (Kartiwi & MacGregor, 2007).

2.4.4.6 SME Characteristics Specific to IS and IT

Some studies in IT and IS have examined SME characteristics related to IT/IS (DeLone, 1988; Gable & Highland, 1993). These characteristics include the IT aspects of SMEs, such as staffing, departments and managerial behaviour in relation to IS. The lack of IT staff and departments seems to be a characteristic feature of SMEs. Gable and Highland (1993) have identified these characteristics of small

system environments as a difficulty to attract, develop and retain specialised technical expertise. SMEs seldom have specifically designated IT employees or an independent, formal IT department (Levy & Powell, 2000; Snider et al., 2009). DeLone (1981) noted that not only do smaller firms depend more on external programming services and external expertise, they also lack internal expertise (Cragg & Zinatelli, 1995; Yap et al., 1992). Moreover, SMEs lack technical knowledge and specialist staff and provide little IT training for staff (Kartiwi & MacGregor, 2007).

A feature of most SMEs is the minimal management support (Levy & Powell, 2000; Snider et al., 2009), with managers in SMEs tending to give insufficient attention to IS (Cragg & Zinatelli, 1995). SMEs are also characterised by less experience with IS compared with large organisations: many have only become computerised relatively recently and have little experience and training in IS management (Blili & Raymond, 1993; DeLone, 1981).

With regard to the type of IS used in SMEs, IS within SMEs are not very advanced and are subordinate to accounting functions (Blili & Raymond, 1993). Moreover, most SMEs expect their IT to have a longer life than that expected by larger firms. What this means is that many SMEs are locked into systems developed using advanced tools that are unsupported or incompatible with current industry standards (Levy & Powell, 2000). The SME characteristics that might affect several aspects of IS and change the measures of IS success models are described in the following paragraphs.

2.4.2 Possible Effects of SME Characteristics on IS

Despite the obvious effects of specific IT/IS SME characteristics, it is evident that the general characteristics of SMEs also affect many aspects of IT and IS. Many academics have examined some of these aspects, either empirically or conceptually. This section reviews and discusses the possible effects of SME characteristics on IS. As previously stated, these characteristics are correlated and overlap, so it is difficult to isolate specific characteristics in terms of their particular effect on certain IS aspects. For example, some IS studies have found that the centralised SME structure affects creativity, innovation, response times and the decision-making orientation of problem-solving actions (Levy & Powell, 2000; McCartan-Quinn & Carson, 2003). Each of these is an aspect related to IT/IS adoption and implementation. Similarly, the effects of many SME characteristics on IT/IS have

been studied by researchers. However, gap remains in the field of IS success measurement. As a result, to specify suitable measures for IS success in SMEs, a closer examination of their characteristics in relation to IT is needed. The discussion of the characteristics of SMEs is vital to validate IS impact in the SME context, as measurement models are highly related to the context.

The characteristics of SMEs affect IS both positively and negatively. Examples of positive effects are visible in the simple, flexible structure of SMEs, which leads to immediate feedback and fast communication lines, better understanding and quicker responses to customer needs (Deros et al., 2006). Accordingly, SMEs are more advantageously positioned in terms of IS adoption, as they respond quickly to new technology and are able to implement IS rapidly. This is further enhanced by the short decision-making chain, provided that the owner or management is committed to IS implementation and has leadership of all decision-making processes (Deros et al., 2006; Levy & Powell, 2000; McCartan-Quinn & Carson, 2003). In addition, SME's structures are conducive to new initiatives for change, innovation and creativity, which are related to many aspects of IS adoption and the IS implementation process. Researchers have found that small firms are more capable of developing, implementing and administering their own applications (Fathian et al., 2008; Raymond, 1985).

Another positive effect of SME characteristics is the difficulty created by segregating functions in larger organisations. The employees of SMEs are generally given authority and responsibility in their own work areas. This authority can create cohesion and enhance a common purpose among the workforce to ensure that a task is done well. Given other factors, such as good relationships between employees and employees' job satisfaction, these features can lead to an innovative environment, thus supporting a culture of improvement (Deros et al., 2006).

Conversely, SMEs have many weaknesses. The majority of SMEs do not have adequate financial resources and lack access to commercial lending or the ability to obtain credit. In addition, SMEs face frequent raw material shortages, fluctuations in raw material prices, and inadequate inventory management and stock control (Deros et al., 2006). Consequently, in relation to IT, SMEs have neither adequate budgets for training staff and consultancy support, nor for adequate hardware and software. This can stifle improvement efforts and lead to difficulty in implementing IS projects.

Therefore, SMEs may be affected more severely by unsuccessful implementation, with these weaknesses leading to project delays or even abandonment (Snider et al., 2009).

In terms of human resources, SMEs usually face a lack of both expertise and skilled employees, because they cannot offer workers better wages and working conditions (Deros et al., 2006). This can be related directly to another SME characteristic: the lack of IT expertise. In turn, this affects all phases of IS from planning and operation through to maintenance and updates. It also increases the need for external support and expertise. Snider et al. (2009) have found that internal training teams often suffer from lack of time and skills to prepare and deliver effective training sessions. Moreover, the majority of SME entrepreneurs have low levels of formal education and limited training in new management principles and practices (Deros et al., 2006), which leads to minimal managerial and technical expertise. Very often, SMEs rely on one-person management; thus, insufficient time and attention are given to the various managerial functions. In SMEs, the owner controls everything and ineffective management is attributed to the owner's lack of business and management experience (Deros et al., 2006). Similarly in relation to IT, SMEs rarely have senior management involvement in IS decisions (Levy & Powell, 2000; Snider et al., 2009) and are more reluctant to spend money on IT (Kartiwi & MacGregor, 2007). Therefore, most SMEs avoid sophisticated software and applications.

In addition, SMEs have problems in relation to their strategies. Deros et al. (2006) have mentioned that SMEs are negatively affected by poor management strategies such as the lack of proper time management, cash flow management systems and marketing techniques. In fact, very few SME owners prepare adequate feasibility studies and sound marketing investigations for new enterprises. Most decisions are based on general opinions rather than expert advice. Accordingly, SMEs might face greater challenges in adopting technology (Snider et al., 2009).

General resistance to change or to adopting new ideas is another SME characteristic (Seibert, 2004). Accordingly, SMEs may not identify IT's potential because of their operational focus (Levy & Powell, 2000). As indicated by many researchers, such as Deros et al. (2006) and Kartiwi and MacGregor (2007), the majority of SMEs rely on out-of-date technology. The reason for this is that some SMEs do not trust new

technology, while others are unable to afford it. In many cases, this leads to inefficiency, misinformation and inadequate in-house expertise (Deros et al., 2006)

SMEs have special characteristics that differentiate them from larger organisations. These characteristics play an important role in IS adoption, use and management. In other words, they affect all IS phases: pre-implementation, implementation and post-implementation. Understanding SME issues and characteristics is crucial before making any attempt to measure IS success.

The effect of some SME characteristics on IT/IS has been studied by IT/IS researchers. However, a gap remains in the field regarding measuring IS success. More studies are needed to examine other effects of SME characteristics in the IT/IS field.

As mentioned previously, SME characteristics affect the selection and construction of IS success measures. To specify suitable measures for IS in SMEs, a closer examination of the specificity of SMEs in relation to IT is required. The SME characteristics discussed in the previous section are referred to when developing the benefits measurement model of IS in SMEs.

2.5 Developing Countries and IS Use

Academic researchers have differentiated between developed and developing countries as two different contexts, using factors such as government regulations, economic laws and other social factors that could affect research findings.

This research has been undertaken in a developing country context. The main reason for this is that inadequate research has been undertaken in a developing country context, with most theories and models based on developed country contexts (Alghamdi et al., 2011a; Alshardan et al., 2013; Grazzi & Vergara, 2012; Roztocki & Weistroffer, 2011; Vrgovic et al., 2012). Applying these theories and models in developing countries will validate and/or extend them into this new context.

This following section reviews the context of developing countries, outlining their characteristics and the current state of their IS use. It then focuses on Saudi Arabian SMEs as an empirical case study of the developing country context.

2.5.1 IS in Developing Country SMEs

The use of IS in developing countries continues to be challenging because of several factors (Alghamdi et al., 2011a; Alghamdi et al., 2011b). IS products are not often tailored to the unique needs of developing countries, as they were initially designed for developed country markets (Berisha-Namani, 2009). Further, limited financial resources (Berisha-Namani, 2009) and the inadequate expertise and human resources in developing country SMEs (Berisha-Namani, 2009), along with the lack of robust regulatory frameworks pose major problems. In non-English speaking contexts, the language barrier is also a consideration for developing countries. Some citizens may not necessarily know other languages beyond the local language, whereas IS products may for example, be dominated by English-language content (Grazzi & Vergara, 2012). Those challenges increase the need for research that investigates and evaluates the status of IS in developing countries. Further, more concerns are raised for the SMEs context whereas usually unfocused in academics' literature.

Thus, with the growing importance of IS in developing country SMEs, researchers have begun to investigate the adoption and use of IS in contexts such as Malaysia (Alam & Noor, 2009), Nigeria (Irefin, Abdul-Azeez, & Tijani, 2012) and the KSA (Skoko, 2012; Skoko & Ceric, 2010). Generally, the focus of existing studies is on pre-implementation considerations surrounding IS in developing country SMEs, rather than on post-implementation issues. For example, these include barriers to adopting IS in developing country SMEs such as Oman (Ashrafi & Murtaza, 2008), Qatar (Manochehri et al., 2012), Kosovo (Berisha-Namani, 2009), Nigeria (Apulu & Latham, 2010) and South Africa (Modimogale & Kroeze, 2011). These barriers concern the lack of internal capabilities, the high cost of IS and the lack of information about suitable IS solutions and implementation (Ashrafi & Murtaza, 2008; Berisha-Namani, 2009). Academics in this context have also identified the need for more training facilities and government support (Apulu & Latham, 2010; Manochehri et al., 2012).

Different strategies are recommended to assist SMEs in overcoming barriers and improving IS implementation in their businesses, such as educating staff and management about IS, investing in recruitment or outsourcing to knowledgeable IS

specialists, and building a culture that is innovative and favourable to technology (Modimogale & Kroeze, 2011).

The pre-implementation challenges of IS in developing country SMEs can affect post-implementation; they sometimes continue to affect the post-implantation stage, threatening the system's success and the business's possible consequent failure. Thus, understanding IS pre-implementation challenges helps to identify IS's post-implementation benefits.

Nonetheless, a limited number of studies have attempted to measure the post-implementation benefits of IS in developing country SMEs (Ndiege, Wayi, & Herselman, 2012). Such studies provide valuable information to identify and evaluate the benefits of IS for these SMEs. For instance, Kale, Banwait and Laroiya (2010) surveyed 130 SMEs in India to determine whether and how Indian SMEs were benefitting from IS implementation for ERP. Their study revealed that most SMEs implemented a new IS to integrate with the existing one. They also determined that IS implementation was mainly beneficial in reducing inventory, and improving customer services and communications. In addition, the study found that top management support and user involvement and participation were the major contributors to IS success (Kale et al., 2010). Ndiege et al. (2012) focused on assessing the quality of IS used by SMEs in Kenya. They concluded that the low usage of IS within SMEs was attributable to the low-level IS skills of both SME management and IS users, and to poorly designed IS that did not adequately address the SME's needs. In Jordan, Hawari and Heeks (2010) developed a 'design–reality gap' model and applied it to a case study of IS failure in a Jordanian manufacturing firm. Analysing the situation both before and during IS implementation through a combination of interviews, observations and document analyses, Hawari and Heeks (2010) found sizeable gaps between the assumptions and requirements built into the IS design and the actual realities of the client organisation. Their model derives from different IS success measurement models comprising the seven dimensions included in the ITPOSMO acronym (**i**nformation, **t**echnology, **p**rocesses, **o**bjectives and values, **s**taffing and skills, **m**anagement system and structure and **o**ther resources) (Hawari & Heeks, 2010).

Many studies have used the D&M model as their theoretical base. Ndiege et al. (2012) evaluated the quality of IS in developing country SMEs by applying the D&M

model. This determined the quality to be barely sufficient (Ndiege et al., 2012). Similarly in Malaysia, Wei, Loong, Leong and Ooi (2009) presented a re-specification of the D&M model. They proposed a conceptual model that resulted from a comprehensive review of the IS success literature. Their results provide an expanded understanding of the factors that measure IS success and suggest ways to improve IS usage (Wei et al., 2009). Ghobakhloo and Tang (2015) have developed an integrated IS success model based on the D&M model and a firm's technology–organisation–environment (TOE) framework. Their model was tested using data based on 316 Iranian and Malaysian manufacturing SME participants. Their model reveals that the determinants of IS success for SMEs incorporate both organisational and environmental determinants, in addition to the technological factors identified in the D&M model (Ghobakhloo & Tang, 2015).

Despite the value of previous studies in their examination of IS benefits in specific countries, a more comprehensive model is required. The current study has proposed a conceptual model that stems from an extensive review of SME characteristics and IS success models, validated with data from various countries. This study has also employed the highly relevant IS impact model as the theoretical base, extending analysis beyond the typical D&M model's scope.

2.5.2 IS in Saudi Arabian SMEs

As is the case globally, in Saudi Arabia SMEs are considered one of the driving forces for economic growth. According to the Central Department of Statistics and Information (2010), SMEs in Saudi Arabia account for 95 per cent of all private enterprises, with an annual growth of 16% per cent, and provide over 24.7 per cent of all employment in the country. Moreover, more than 700,000 active SMEs exist in Saudi Arabia: approximately 47 per cent of these undertake commercial and hotel businesses; 27 per cent are in construction; 12 per cent in industry; 6 per cent in social services; and 8 per cent in sundry other sectors (Central Department of Statistics and Information, 2010).

There is no official definition of SMEs in Saudi Arabia; however, a number of organisations use different definitions. For instance, SAGIA has defined small enterprises as those with between 25 and 59 employees and medium-sized companies as those with between 60 and 99 employees (Ahmad, 2012). Another definition set by the SIDF defines SMEs as those firms whose annual sales do not

exceed 20 million SR (equivalent to US$5.3 million) (SIDF, 2010). Table 2-5 lists different definitions of SMEs used by different Saudi Arabian organisations.

It is considered difficult to establish a common SME definition that would be acceptable to all Saudi Arabian authorities. Therefore, for the purpose of this study, the definition of SMEs is based on that adopted by SAGIA for two primary reasons: first, SAGIA's definition employs a standard quantitative criterion, which is the number of employees. The second reason is the scarcity of financial company data in the Saudi Arabian SME sector (Ahmad, 2012). It is also worth noting that SAGIA is among the primary institutions responsible for managing the investment environment in Saudi Arabia (Ahmad, 2012).

In Saudi Arabia, SMEs face many challenges: of these, the lack of an authority responsible for SMEs is among their major problems (Alfaadhel, 2010). Other challenges, similar to those faced by many other SMEs worldwide, include: lack of funds, lack of skilled human resources, lack of management and marketing skills and lack of modern technology. Furthermore, Saudi Arabian SMEs are faced with issues in innovation and business planning (Ahmad, 2012).

Table 2-5: Different definitions of SMEs from different Saudi Arabian organisations

Saudi organisations	Definition of SMEs	Reference
SAGIA	Small: 25–59 employees Medium: 60–99 employees	Ahmad (2012)
SIDF	SMEs: annual sales do not exceed 20 million SR	SIDF (2010)
Riyadh Chamber of Commerce (RCC)	Small: 10–19 employees Medium: 20–99 employees	RCC (2015)
Saudi Chamber of Commerce (SCC)	Fewer than 100 workers	Ministry of Commerce and Industry (2015); Alfaadhel (2010)

Some specific challenges of Saudi Arabian SMEs, (as reported by Alenaizan), include: the volume of loans by Saudi banks to the SME sector accounting for less than 4 per cent of the GDP and representing only 2 per cent of total loans; the absence of a regulatory environment that would allow registration of guarantees; the

absence of financial statements; the lack of skilled labour; and the lack of data on markets. Finally, SMEs are not considered suitable for overseeing very large projects, and contractors do not source their resources locally.

In contrast, the many opportunities available in Saudi Arabia encourage SMEs to continue operating and developing their businesses. For instance, the Kafalah Program was established to support SMEs financially and to overcome these obstacles, making the financing of SMEs economically feasible. For example, it provided facilities that enabled SMEs to access loans by providing a bank guarantee covering up to 80 per cent of the funding amount (SIDF, 2010) and also provided training activities to assist SME managers (Alsaleh, 2012; SIDF, 2010). Additionally, in Saudi Arabia, the Communications and Information Technology Commission (CITC) has a major role in information and communications technology (ICT) regulation. The Act that established the role of the Commission comprises a number of objectives:

> including: provision of advanced, sufficient and affordable communications services; creating the proper climate to encourage fair competition; utilizing frequencies efficiently; transferring telecommunications technology and keeping [a]breast with its developments, and realizing clarity and transparency in processes [and] procedures, in addition to achieving the principles of equality and non-discrimination and protecting the public interest as well as the interests of users and investors. (CITC, 2015)

The Saudi government has had positive results from its attempts to build a strong ICT infrastructure in the KSA. According to statistics published by the Central Department of Statistics and Information (2010), the Ninth Development Plan (2010–2014), in addressing private sector growth (including growth in SMEs), has assisted organisations in keeping up with changes in ICT and the economic, social and cultural effects of globalisation. The ICT sector in Saudi Arabia has become the largest and fastest growing ICT marketplace in the Arab region (AlGhamdi, 2012). Strong growth rates are set to expand at a compound annual growth rate of 11.4 per cent through 2015. This rapid growth is fuelled mostly by increased spending on hardware and IT services (AlGhamdi, 2012). Further, the focus on software spending has improved, with over 75 per cent of manufacturing, services and trading companies in Saudi Arabia considering new deployments or upgrades of ERP solutions (Business Monitor International, 2012a).

In addition, the Saudi government's 2010–2014 plan for economic development focuses on smaller employers, with firms encouraged through motivation and loans to increase their spending on research and development (R&D), reduce dependence on expatriate labour, invest in the new economic cities and increase women's participation in the labour market (Alenaizan, 2014).

To summarise the current situation of SMEs in Saudi Arabia, Alfaadhel (2010) has undertaken an analysis of the strengths, weaknesses, opportunities and threats (SWOT) for Saudi Arabian SMEs: Table 2.6 presents a summary of these results. A remarkable point that relates to the IS area includes the promised future support for SMEs by the Saudi government. However, weaknesses and threats are still present for SMEs in Saudi Arabia, as with other SMEs globally. This includes a lack of financial support, inadequate human skills and a lack of expertise. Other points are added in the environment of a developing country such as a lack of online services, difficulties in regulation that support SMEs and insufficient knowledge and information provided to SMEs.

Table 2-6: Summary of SWOT analysis for Saudi Arabian SMEs

Strengths
Continuous development of SMEs' economical potential.
Financial ability of the government to support the SME sector.
Stability of the economic situation.
Good education system.
Tax-free environment.
Weaknesses
Weak market information data.
Lack of educational awareness regarding entrepreneurship in both high school and university education.
Absence of a well-developed entrepreneurial culture and weak management skills.
Long process for securing a licence to start a business.
Difficulties in accessing financial resources for start-ups and micro-enterprises.
In general, banks ask for guarantees, which are often difficult for new SMEs to meet, as they usually do not possess enough assets to guarantee bank loans.
Banks charge high interest rates as they see SMEs as being a higher risk investment.

Consulting, training and information sources are inadequate.
Improper development of support services (industrial parks and business incubators).
Lack of support for innovative activities.
Lack of online services for SMEs to access business information and accordingly facilitate interaction with public administration.
Insufficient knowledge and information to enable SMEs to access external markets.
Difficulties in obtaining Islamic loans.
Difficulties in finding suitable workers.
Difficulties in securing foreign worker visas.
Difficulties in finding trained workers.
Opportunities
Continuing the process of simplifying the regulatory framework.
IT development imposed by competition at an international level and the necessity to elaborate vertical strategies for SMEs with activity in the IT field.
SMEs can potentially address the unemployment problem.
Help local economies to rely more on SMEs and not only on the petrochemical industry for exports.
Threats
High competition from the local market.
Competition from the international market, such as China and Southeast Asia, in terms of products and services.
Financing of the SME sector is through banking credits with no attractive interest rates.
Inefficient investment in the professional training of employees or qualified personnel.
Mismatches between labour skills and market requirements.

Note: Sourced from Alfaadhel (2010)

The characteristics of Saudi Arabian SMEs highlight the critical need for support, including ensuring efficiency through practices that include evaluating IS, to ensure ongoing success (Skoko, 2012). Despite their specific characteristics, no academic or government studies have been published that have evaluated IS used by SMEs in Saudi Arabia. The current study is the first to tackle this research gap.

2.6 Research Gaps

In the review of the literature, several gaps were found that crossed the entire relevant research area. This study is expected to make contributions that address these research gaps in the ways described below.

The existing IS evaluation models and frameworks are designed to measure the benefits in large organisations and not in SMEs. Many existing important IS/ES evaluation models and frameworks have been tested empirically in large organisations. However, none of these models or frameworks has been developed for evaluating IS in Saudi Arabian SMEs.

The existing IS success measurement studies have many problems. These include emphases on some measures over others, such as on financial measures and traditional IS measures such as user satisfaction, or an emphasis on a single key user group. These problems have led to poor construct selection and model incompleteness. Moreover, not many studies have been conducted on the IS used as a software or business process across the organisation, which differs in many ways from other basic IS software such as spreadsheets, computer-aided design and email. These studies have focused on the adoption or implementation phases of the IS life cycle. Developing countries face many changes and have many characteristics with potential effects on the current models, which have only been evaluated in the context of developed nations.

With regard to the IS impact model used in this study as a theoretical base, it has only been validated in the Australian public sector and in a major university, where it evaluated a single system (the financial system). Gable et al. (2008) encouraged researchers to validate the model further in different contexts so it could be generalised and standardised. In addition, the 37 (or 27) measures in the IS impact model still need further testing: following the identification survey, the formative construct validation suggested the exclusion of ten of the 37 items in this model. Gable et al. (2008) mentioned that although 27 measures would provide a more parsimonious solution, efforts in the ongoing validation of the 37 measures in the IS impact model with other applications continue to be encouraging.

2.7 Chapter Summary

This literature review has examined different dimensions of IS, SMEs, developing countries and Saudi Arabia's current situation regarding IS. Focus has been placed on two major aspects. The first aspect concerns the existing models and framework for measuring IS success in organisations. The second aspect concerns the characteristics and situation in the context in which the model is to be applied (SMEs, developing countries and Saudi Arabia).

As established at the outset, the aims of this literature review were to provide directions for the research. In the course of reviewing the literature, a clear research direction was identified. Besides the possible research objectives, four additional objectives for this literature review were identified. First, the literature review helped to identify and summarise prior research relevant to the field of study. In the process of this extensive literature review, much relevant literature was identified, with only the most relevant literature, selected through a careful pruning process, presented in this chapter. Second, the literature review sought to provide a definition of SMEs from the IS perspective as a basis of understanding in this research. Due to the diversity and inconsistency in definitions of SMEs, it was necessary to introduce a suitable definition of SMEs. This study attempted to find a universal definition for SMEs that was suitable for IS. However, this objective ended with only suggestions and recommendations. The actual definition of SMEs in this study had to be applied empirically before selecting the sample for the study. No further investigation was done in relation to the definition, to avoid disturbing the research direction. Despite this result, the work undertaken with regard to the definition was valuable and assisted in the understanding of SMEs: this also helped with the process of selecting and validating the data sampling frame.

The third objective achieved by this literature review was to provide a comprehensive view of the context of this study; that is, SMEs in Saudi Arabia. This included the characteristics of SMEs and developing countries in addition to the Saudi Arabian context and how these characteristics affect IS and IS success models, such as the IS impact model. In achieving this objective, the unique context of this study was revealed and the possibility of a new model suitable for the needs of SMEs in Saudi Arabia was suggested. The last objective of the literature review was to identify relevant theories and models related to the research project. Several scholars have

suggested the importance of evaluating IS, starting with tested theories and models that provide a solid foundation for any further application, extension or modification. By reviewing extensions of the D&M models in different contexts, the study concluded that a research opportunity existed for the IS impact model, as it had never before been tested in the context of SMEs. Therefore, this study has been guided by the IS impact model, which represents the conceptual basis. Moreover, all identified benefits have been studied and compared to gain a comprehensive understanding of the prior research on IS success.

Chapter 3. RESEARCH DESIGN

3.1 Chapter Introduction

This chapter provides an overview of the research design used in this thesis. Yin (2003) has argued that each type of empirical research has an implicit, if not explicit, design. The research design is the logical sequence that connects the empirical data to the initial research questions and, ultimately, to the conclusion. The research design helps researchers to plan efficiently and control different phases of the research to achieve its objectives.

The main objective of the proposed study is to develop a benefits measurement model for IS in SMEs.

This chapter starts with the research strategy and then details the research plan, including all the research phases and activities. The research methodology is then defined and selected.

3.2 Research Strategy

A research strategy is vital in establishing a general perspective within which to understand the research. It identifies the research paradigm and type of research that will be conducted throughout the study (Patton, 1990). One way to improve comprehension of the research is through the research space framework offered by Berthon, Pitt, Ewing and Carr (2002). Their framework states that research is an epistemological process that occupies a conceptual space defined by four primary parameters or dimensions: problem or phenomenon, theory, method and context. The problem parameter specifies the focus of the research: in other words, it specifies what is being investigated by the researcher. In this study, the problem is how to measure the benefits of IS in developing country SMEs. The theory parameter explains how and why a certain phenomenon may occur before, during and after the research. In terms of theory, the study relies on different theories that explain the phenomenon of IS in SMEs. Despite the large volume of literature on measuring IS success, no established theories exist in this area (Rai, Lang, & Welker, 2002). This study has referred to well-known models that measure IS in general (as discussed in Chapter 2). The IS impact model was chosen as the theoretical base of this study because of its ability to measure the evaluated system's up-to-date impact and to

forecast the system's potential impact in the future by evaluating information and system quality (Elias, 2011; Gable et al., 2008; Tate, Sedera, McLean, & Burton-Jones, 2014). (Further justifications for choosing the IS impact model can be found in Chapters 2 and 4.)

The next parameter from the research space framework is the method: this is concerned with generating knowledge about the problem. It addresses how one may initiate knowledge about the phenomenon and includes the methods of both data collection and analysis. Finally, the context addresses who, what and where—the phenomenological context and content of the problem. Table 3-1 shows the study parameters as described by (Berthon et al., 2002).

Table 3-1: Research space parameters for the study

Parameters	Descriptions
Problem	Develop a benefits measurement model for IS in SMEs
Theory	IS impact model by Gable et al. (2008)
Method	Data collection: analysis and survey Data type: qualitative and quantitative Data analysis: content analysis for qualitative data and the SPSS software for quantitative data
Context	SMEs in Saudi Arabia

Berthon et al. (2002) have classified research strategies into three groups: replication, extension and generation. They further sub-divided them into different degrees of freedom (*df*). For example, a zero-degree-of-freedom research strategy holds all three research dimensions (theory, method and context) as close as possible to the original study. In contrast, the three-degrees-of-freedom research strategy changes all three research dimensions from the original study. In other words, these types of studies generate new theories, new methodologies and use new contexts in achieving their outcomes. In between these two strategies are the one- and two-degrees-of-freedom research strategies, which imitate, generate and

vary the three dimensions. Even though these strategies alter one or more parameters, the other parameters (one or two) are still constantly held to variations; these include context-only, method-only, theory-only, theory/context, method/context and theory/method extensions.

This study generates a new model based on quantitative methods. It also uses the IS impact measurement model proposed by Gable et al. (2008) as the conceptual basis. Hence, this research study follows generation strategy. It has a new context in that the context of SMEs is different from that of large organisations. In terms of methodology, the study implements different methods than those used in the original study. In terms of theory, this study relies on different theories that explain the phenomenon of IS in SMEs. In addition, Gable et al. (2008) expressed the view that one of the limitations of the IS impact model is that it has only been conducted in the Australian public sector.

Model development was conducted in three phases: The first phase consisted of identifying the problem: in this phase, the literature review was conducted and SME characteristics identified.The second phase was the generation of the a priori model using content analysis. The third phase consisted of validating the model using a survey.

3.3 UoA

A critical point in research design is determining the unit(s) of analysis (UoA). The UoA is defined as the major entity being analysed in a study. It is the ‘what’ or ‘who’ that is being studied (Kyrgidis & Triaridis, 2010).

UoA can be chosen from anything related to the questions and hypotheses in the research (Pinsonneault & Kraemer, 1993). It is important to know the UoA, as well as the type of IS being measured, along with the system’s objectives, when measuring IS success (McCabe M, 2010). Pinsonneault and Kraemer (1993) have classified the UoA into categories comprising an individual, group, department, organisation, application, system or application portfolio; it also might be a development project or any phase of a development project.

The UoA can be the system; however, the system can be defined at many levels. At a very low level, the system is the application per se. At the next level, the system

can be defined as the application and infrastructure attached to it, including the required hardware. The highest level of system definition is the application plus infrastructure plus services attached to it. The UoA for this study is the system of IS in SMEs. This study adopts the highest level of definition, as SMEs conceive applications, infrastructure and services as a single unit. The reason for this is that SMEs are relatively new to the adoption of IS. They lack IT expertise; therefore, SMEs rely more on the services and infrastructure support provided by vendors. Moreover, IS are unlike other software applications that are bought independently and used immediately without adoption procedures or support from vendors. This study measures the success of IS as a whole. It does not measure the application in isolation without its vital surrounding elements, such as support from the vendor, user and organisation.

Choosing stakeholders is a vital aspect of the research, as they need to represent fully the UoA. Moreover, having only one type of stakeholder in the sample may limit the findings' validity (Pinsonneault & Kraemer, 1993). Accordingly, the analysis of IS application in this study was undertaken as a multi-stakeholder analysis. An IS system is used by employment cohorts from different levels of the hierarchy in any given organisation and also has some level of open access for external users (e.g., customers and suppliers). The study focuses on an organisation's internal stakeholders. The main stakeholders in this study include: owners, management users (if different than the owners) and operational users. In the SME context, the owner-manager can represent the organisation, reflecting its influence. According to Daily and Dollinger (1993), with SMEs in particular a family-owned and -managed business is more likely to have a single individual—the owner-operator—who can assess the firm's processes accurately. Operational users can be selected to reflect the individual impact.

3.4 Research Plan

In general, this research consists of three main phases. The first phase was conducted to understand the problem and the context via a literature review. This included understanding previous models of IS success, defining SMEs and their characteristics, and identifying the context in which this study will take place. The second phase specified the research problem through content analysis of customer stories from the commercial press to create an a priori model for the SME context.

The third phase verified the results with a quantitative survey method to test and improve the measurement mode. The overall plan for this research is provided in Figure 3-1. The figure shows the detailed stages of each phase, explained below.

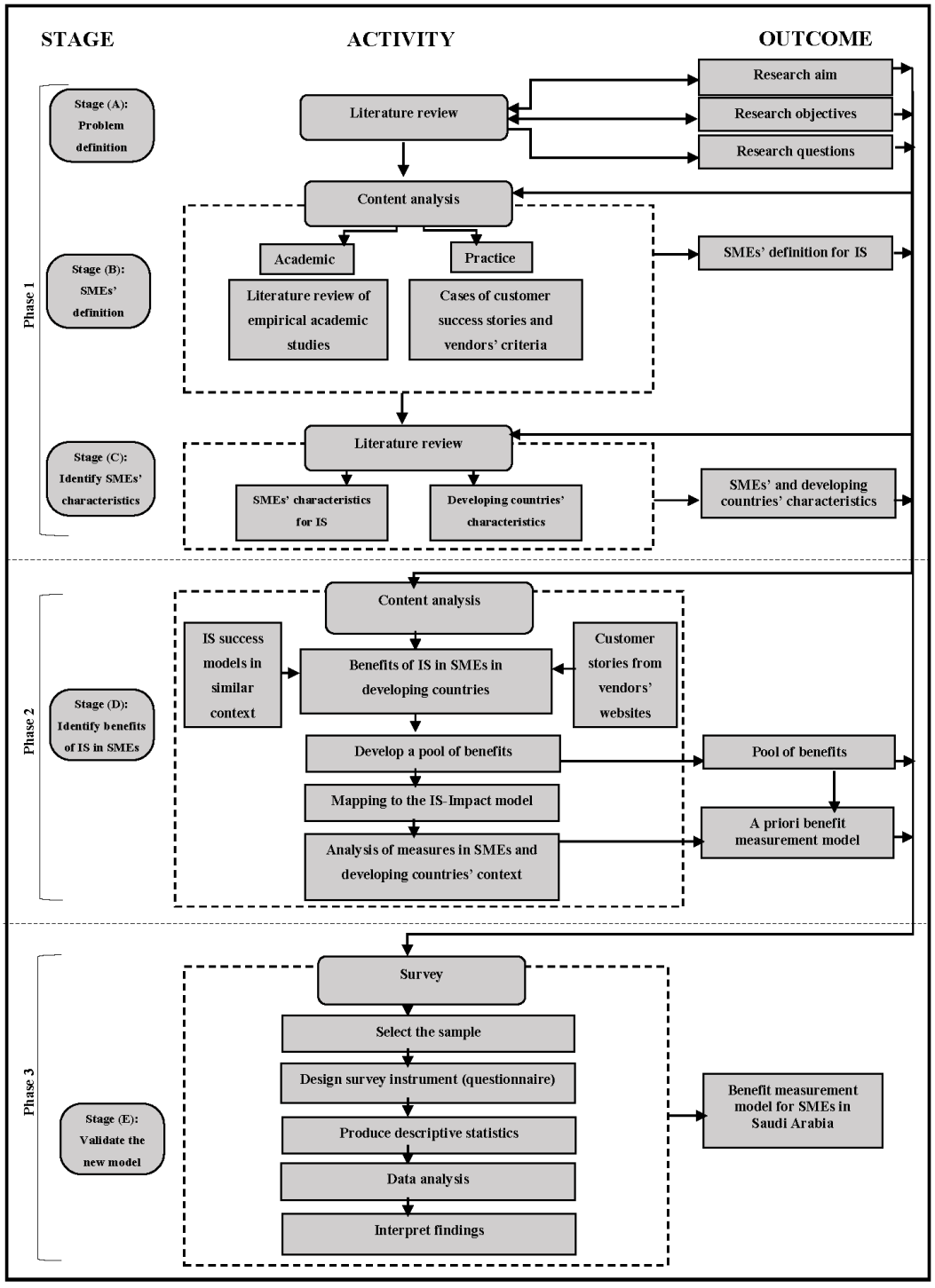


Figure 3-1: Research plan

The first phase is a combination of three stages to enable a comprehensive understanding of the research problem and context. The outcome from this phase will provide the input for all the phases that follow.

Phase 1, Stage (A): Define research problem. For any research to occur, the first step is to explore the research area and state the problem/s clearly. Questions need to be determined, as this is essential in all research. Researchers should review the literature related to the topic (Cooper, 1982) to be precise when formulating research questions The aim of the literature review in this study was to understand the research problem, to determine what is known on the topic and to gain deeper insights into the unknown aspects of the topic (Yin, 2003). The literature review also identified the research context, the knowledge gaps and the relevant sub-questions. The review was based on the knowledge gaps and the issues identified in academic literature, the research scope and the research objectives. The implications of this included that the review's findings needed to be further identified in the study by researching the practice. The research motivation, as well as the research objectives and questions were the outcomes of this stage. These outcomes have provided significant input for the following stages.

Phase 1, Stage (B): SME definition. Taking into account the research motivation for investigating the problem, the research questions and the primary literature review, the next challenge was to determine which of the many accepted definitions of SMEs to accept. Thus, this stage defined what constitutes SMEs. This stage was conducted across the latest academic and practitioner-oriented information sources. The academic section included a literature review that examined how organisational size has been defined and how SMEs operate. This stage also reviewed government documents and reports in many countries as part of the search for SME definitions. The research sub-question 'what are SMEs?' was also answered. Hence, the outcome of this stage was to achieve consensus about a definition of SMEs that would be suitable for use in relation to IS, as well as to indicate the sampling frame for the different data collection processes in this research (see Chapter 5 for details about SME definitions).

Phase 1, Stage (C): SME characteristics: The literature review results suggested the context: this plays a major role in IS success and the related measurement model. It was also necessary to understand the context of SMEs via their unique

characteristics. In this stage, an extensive literature review was conducted with regard to the general and specific characteristics of SMEs regarding IS. This stage also discussed in detail the possible effects of these characteristics on the IS benefits measurement model (see Chapter 2: 'Literature Review'). The research question, 'what characteristics differentiate SMEs and large organisations?', was also answered at this stage. The outcome, a list of SME characteristics that may affect the instrument model, provided important input for the following phases, where it was used in the content analysis and survey procedures.

Phase 2, Stage (D): Develop the a priori model. This stage consisted of the content analysis methods used to derive the a priori model for IS success in SMEs. The procedure started by collating the benefits of IS and SMEs from two leading IS vendors, SAP and Microsoft Dynamics NAV, which both have specialists in relation to IS for SMEs. The outcome of this stage was a pool of IS benefits for SMEs. These benefits were used in a systematic procedure to develop a priori benefits measurement model (included in Chapter 6, where further details are discussed). The pool of benefits was then mapped to the IS impact model. In addition, analysis for every measure of the IS impact model was conducted to ensure that the addition, removal or retention of any measure had a conceptual justification in terms of SME characteristics. The final outcome of this stage was an a priori model for IS impact in SMEs. The research question, 'what is the impact of IS in SMEs?', was partially answered at this stage.

Phase 3, Stage (E): Validation survey. In this stage, the a priori model of IS success in SMEs in developing countries was empirically tested for further improvements and enhancement. A verified version of the model was introduced. The survey procedure started by selecting the sample with the help of the frame that was the outcome of Phase 1, Stage (B). The instrument design was the next step, based on the a priori model from the previous phase. Next came the distribution and collection procedures. The items considered included the form of the survey (a written document, an online questionnaire, a face-to-face interview or a telephone interview) and the best distribution procedure for the survey in accordance with the selected sample and budget. After collecting feedback, the data were then analysed using quantitative software (SPSS). Based on these results, descriptive statistics were produced and finally, interpretation of the findings occurred and the validated IS impact model for IS in SMEs was produced.

3.5 Research Method

The selection of appropriate research methods is critical to any research project and is determined by the research questions and the state of knowledge in the area under study (Pinsonneault & Kraemer, 1993). This section reviews relevant studies in the literature that identify and justify the selection of research methods.

Different research methods can be found in the literature, such as experiments, case studies, surveys, archival analyses and histories. Many researchers claim that the reason for conflicting results in IS success research studies is due to the methodology used and their validity (Alshardan et al., 2013; Bohórquez & Esteves, 2008; Petter et al., 2008). The choice of one research method over others is influenced by many factors. According to Yin (2003), three main conditions differentiate methods and determine which is suitable for any given study: the type of research questions posed (who, what, where, how and why); the extent of control over behavioural events; and the degree of focus on contemporary events. Table 3-2 illustrates the research methods and their relevance in different situations.

Table 3-2: Relevant research methodologies for different situations

Methodology	Research question	Control over behavioural events	Focus on contemporary events
Experiment	How, why?	Yes	Yes
Survey	Who, what, where, how many, how much?	No	Yes
Content analysis	Who, what, where, how many, how much?	No	Yes/No
History	How, why?	No	No
Case study	How, why?	No	Yes

Note: Adapted from Yin (2003)

In addition, selecting the different methods generally depends on the research classification. Researchers classify their research papers according to the purpose of the study. Research papers can be classified in three ways: 1) exploratory—to

explore new topics; 2) descriptive—to describe existing phenomenon; and 3) explanatory—to explain why something happened (Pinsonneault & Kraemer, 1993). In addition, the previously mentioned approaches, such as case studies, surveys, archival analyses, experiments and histories, can be used in all three classifications (Yin, 2003).

In line with Yin's (2003) classification, the experiment and history methodologies were not applicable in this study because of the contemporary nature of IS in SMEs and the lack of control over behavioural events. This limited the focus to the remaining methods: survey, content analysis or case study. In comparing these three methods to the objectives and capabilities of this research, content analysis and survey were chosen for this study, together with a literature review.

The use of multiple sources and methods in one study is called triangulation. Triangulation increases result robustness and allows findings to be strengthened by cross-validation (Gable, 1994; Kaplan & Maxwell, 2005; Lee, 1991). To achieve the research objectives effectively, this research identified multiple stages, each of which used different research methods. According to Yin (2003), when an observable fact is not well understood, qualitative methods such as case study and content analysis may be used to build a theory or model. This theory or model may then be tested using quantitative methods, such as surveys and experiments. As this research was concerned with developing a measurement model in a new context, the research methodology incorporated both qualitative and quantitative methods.

The use of IS in developing country SMEs is a contemporary issue (Avgerou, 2008). This contemporaneity necessitated using a qualitative methodology, either content analysis or case study (Yin, 2003). As this research was focused on investigating the impact of IS on SMEs, it needed many sources from which to identify and document the possible benefits experienced by organisations. Given that IS in SMEs is a new phenomenon, the benefits of a few case studies in the same country (due to the research's time frame and budget) might not be fully recognised. Hence, this research applied a content analysis approach for the development phase, which generated the measurement model. For the validation phase, a survey was employed. Table 3-3 describes the research methods used in the three main phases, which are briefly introduced in the following sections.

Table 3-3: Research phases employed in this research

Phase	Stage	Methods
Phase 1: Definition phase	Stage (A): Define the research problem	Literature review
	Stage (B): Identify what SMEs are	Literature review Content analysis
	Stage (C): Identify the characteristics of SMEs	Literature review
Phase 2: Model generation phase	Stage (D): Identify the benefits of IS in SMEs	Literature review Content analysis
Phase 3: Model validation phase	Stage (E): Verify the a priori model	Literature review Survey

The three methods selected for use in the three phases of this study were the literature review, the content analysis and a survey.

3.5.1 Literature Review

Any research project should start with an assessment of the literature, to locate studies related to the research questions being addressed (Jenkins, 1985). Thus, a comprehensive literature review is critical for establishing and maintaining cumulative knowledge and also presents a good opportunity to justify current research in the related area (Keen, 1980).

In Stage (A), the comprehensive literature review aimed to identify, assess and critically examine existing IS evaluation models and frameworks. The literature review provided the background for this study; its theoretical foundation, an IS impact model, was illustrated. Even though these terms and concepts were reviewed at this stage, it was vital to gain an understanding of both the research context (SMEs) and the definition and characteristics of SMEs. Knowledge gaps were also identified, enabling the formulation of research objectives. In addition, the literature review justified the most appropriate research methods for this study, and demonstrated the links between current and previous studies and their contributions to knowledge on IS success.

In Stage (B), the literature review assisted the study by broadening the awareness of SME-related issues, not only in IS, but also in other disciplines. In addition, the literature review, with its focus on the IS discipline, identified the gaps in SME

research. In the content analysis used to define SMEs for IS, the literature review again played a valuable role.

The literature review in Stage (C), continued to identify and observe critical research methods and also justified the most appropriate research methods for the study. In addition, it identified the benefits of IS in SMEs through the characteristics of SMEs, together with the content analysis from vendors' success stories, to form and justify the a priori model.

In Stage (D), the literature review presented the means by which to conduct successful content analysis and mapping procedures.

Finally, in Stage (E) the literature review demonstrated how to conduct a successful survey, including the process for sample selection and the sampling frame. It also provided further details on the construction of the survey questions, the conduct of the survey, the distribution and collection of the survey form responses, analysis of the data and reporting of the findings.

3.5.2 Content Analysis

Krippendorff (2013) has defined content analysis as 'a research technique for making replicable and valid references from data to their context' (p. 24). It is a systematic technique for compressing many words of text into fewer content categories based on explicit rules of coding (Stemler, 2001; Weber, 1990). Through this method, the researcher searches for structures and patterned regularities in the data and, based on these structures and patterns, makes inferences.

Content analysis is a widely used qualitative research technique. Hsieh and Shannon (2005) classified the content analysis method into three different approaches: conventional, directed or summative. Conventional content analysis, also termed 'inductive category development', is associated with study design that aims to describe current issues when existing theory and research on the subject are limited. Directed content analysis is a deductive category application that is used when existing theory and prior research are inadequate. The objective of directed content analysis is typically to validate or extend an existing framework, model or theory. Summative content analysis is a cumulative analysis that starts by identifying certain words or content in text. The major differences between the three approaches are

the coding schemes, the code's origins and threats to trustworthiness (Hsieh & Shannon, 2005). According to Krippendorff (2013), six questions must be addressed in every content analysis conducted:

1. What data are analysed?
2. How are they defined?
3. What is the population from which they are drawn?
4. What is the context relative to which data are analysed?
5. What are the boundaries of the analysis?
6. What is the target of the inferences?

3.5.2.1 Using Content Analysis in This Study

Three stages in this study employed the content analysis approach. Stages (B), (D) and (E) all employed qualitative content analysis, but different approaches were used. In Stage (B), different definitions of SMEs were examined by content analysis, which was also used to justify the validity of these definitions in the IS discipline.

In Stage (D), content analysis was applied to data from two different data sources: vendors' success stories about IS software (SAP [enterprise software]) published by the commercial press; and customers' success stories from Microsoft Dynamics NAV ERP software. Summative content analysis extracted the stated benefits (positive impacts) of IS in SMEs. This produced a pool of IS benefits in SMEs. The unique characteristics of SMEs, as determined in previous stages, were then applied to both the benefits measurement model and the IS impact model to justify their validity in measuring SME IS success. The identified benefits of IS in SMEs were then mapped into the IS impact model. Several modifications were made to extend and refine the IS impact model so it would be appropriate for measuring the impact of IS in SMEs, thus constituting the a priori model.

As mentioned by Shang and Seddon (2002), the limitation of using vendor-published success stories as evidence is that vendors may overstate the success and benefits of their products. However, this phase's objective was to identify possible benefits and not to gauge the magnitude of vendors' success or existing specific cases. This meant that the focus was to collect all the benefits of IS in SMEs, with this information then undergoing content analysis against the characteristics of SMEs and the IS

impact model to build the a priori model. The a priori impact model was later tested using survey methodology.

In Stage (E), qualitative data analysis was conducted using content analysis. This was done by mapping the impact items that emerged from the question responses to the a priori model and making further modifications. This then led to the development of the final version of the IS impact model in SMEs.

3.5.2.2 Addressing Reliability

Reliability is an important issue with any qualitative methodology. Weber (1990) states that: '[t]o make valid inferences from the text, it is important that the classification procedure be reliable in the sense of being consistent: Different people should code the same text in the same way' (p. 12). Moreover, reliability problems increase if the word meanings or category definitions are ambiguous or the coding rules are uncertain. Therefore, to avoid problems of reliability, it is vital to develop a set of explicit recording instructions (Stemler, 2001; Weber, 1990).

Hence, the content analysis stage reliability in this study (mainly Stage D) was addressed using different techniques. First, different data sources were used in the process of content analysis, involving data from both academic and practice sources. Second, the coding of the content analysis process was developed using a set of explicit instructions. Third, the tentative results of the content analysis applied were checked against the characteristics of the SME and developing countries' context. Finally, the results were mapped to a sound theoretical model (IS impact model) that has been verified by many studies. Moreover, the developed model in this stage was further validated using a quantitative method (survey). More details of this method are discussed in Chapter 4, Section 4.2.

3.5.3 Survey

The survey approach is a quantitative analysis method that collects and analyses data from large numbers of respondents (Gable, 1994). It can also be defined as an empirical investigation for collecting quantitative information about items within the population. The data are then analysed using statistical techniques (Pinsonneault & Kraemer, 1993).

The survey instrument can take many forms: a paper-based questionnaire, an online questionnaire, or an in-person administered questionnaire in the form of a face-to-face or telephone interview, all of which are completed by collecting data from the person being surveyed (Pinsonneault & Kraemer, 1993). Moreover, the survey is considered the most widely used method in IS research (Newsted, Huff, & Munro, 1998).

The survey method is appropriate for answering research questions that start with ‘what’, ‘who’, ‘where’, ‘how many’ and ‘how much’ (Yin, 2003). In addition, the survey method is recommended when investigating large populations and is generally used in verification and validation purposes (Gable, 1994). Further, Gable (1994) has identified other purposes of the survey approach, such as identifying common patterns and relationships in organisations, detecting outliers and providing generalisation of the results. Pinsonneault and Kraemer (1993) have identified three distinct characteristics of the survey method. These characteristics are: (1) surveys are a type of quantitative method and require standardised information; (2) surveys use structured and predefined questions to collect information (i.e., a questionnaire); and (3) information is generally collected via a sample of the population with the aim of generalising the findings to the population.

As with any research method, the survey approach has its strengths and weaknesses. According to Gable (1994), the major advantages of surveys include greater confidence in the overview of the results; the ability to document precisely the data norm; identification of extreme results; and associations between variables in a sample. This is in addition to the fact that surveys are inexpensive, reliable and easy to conduct.

Conversely, the survey approach tends to provide only an overall understanding of a situation at a certain point in time. It provides little information on the underlying meaning of the data and some variables are unable to be measured by this method. Moreover for a survey to succeed, it requires rigid design in elucidating causal relationships or providing descriptive statistics, and it must contain all relevant questions asked correctly (Gable, 1994). Therefore, surveys in an initial study design (tool and administration) can be quite inflexible and remain unchanged throughout the data collection process. This rigidity can also extend towards discoveries made during data collection. In the survey approach, participants may find it challenging to

recall information accurately in response to any controversial questions. The researchers may also discover at a later stage that a question was ambiguous or misunderstood; it would then be too late to rephrase that question. Further, traditional survey research usually serves as a methodology of verification rather than of discovery (Gable, 1994).

As mentioned previously, surveys are used mainly to collect data from a large population from whom it is difficult to gather data directly, and are also used in new research areas where minimal theory has been developed (Newsted et al., 1998). The survey method has three distinct characteristics that assisted the research purposes of this study (Pinsonneault & Kraemer, 1993, pp 77-78). First, the purpose of a survey is to produce quantitative descriptions of some aspects of a studied population. In this study, the rationale of the survey was to confirm the a priori model developed in a previous phase, based on the IS impact model. This required standardised information about the subject being studied; in this case, the a priori benefits measurement model for SMEs in developing countries. Second, the principal method of collecting information in a survey asks participants structured and predefined questions. In this study, the a priori model was developed prior to the survey phase, so the predefined structured questions were already available. This is different to the case study method in which the predefined questions may not exist (Pinsonneault & Kraemer, 1993). Third, normally survey information is collected from a fraction of the study population; however, it is collected in such a way that it is generalisable to the wider population. In this study, the data collected from a selection of Saudi Arabian SMEs provided examples from a developing country context. The results could be generalised to SMEs in other developing countries.

This study has used the survey method as part of the data collection process. The reasons for choosing the survey method included: surveys permit theoretical propositions to be tested in an objective fashion; they provide high generalisation of the findings; and they are efficient and cost effective to conduct. In this study, the survey formed the validation phase of the IS benefits measurement model's improvements regarding developing country SMEs.

Generally, survey design can be categorised as being either cross-sectional or longitudinal, depending on whether the time dimension is excluded or included by receiving explicit attention (Pinsonneault & Kraemer, 1993).

The main purpose of applying the survey in this study was to test, validate and confirm the proposed a priori model; that is, the IS benefits measurement model in SMEs in developing countries.

The benefits of IS in SMEs were identified from a consolidated literature review and content analysis before conducting the survey. Consequently, the two-stage data collection process converged in a triangulating fashion, as shown in Figure 3-2.

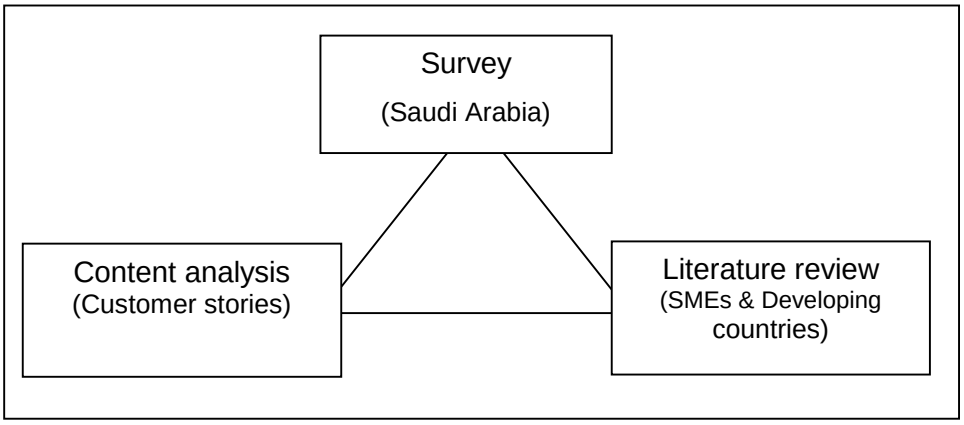


Figure 3-2: Example of data collection triangulation

The sampling frame for data collection was identified as including companies, designated as SMEs, in Saudi Arabia. The main stakeholders in this study were: (1) the owner; (2) the manager if different than the owner; and (3) the operational employees.

As the type of data collected in the survey stage was quantitative, the analysis of this research was also quantitative, using SPSS software. The researcher understands the importance of quantitative and qualitative methodology, and undertook a training course and workshops in quantitative data analysis methods (SPSS). SEM was employed to quantitatively analyse the data collected from the questionnaires. These techniques were considered suitable for the present study as they provide for the analysis of complex data sets with many independent and dependent variables (Tabachnick & Fidell, 2007). More details of this method are discussed in Chapter 4.

Table 3-4 below identifies the different types of data sources used at each stage of this research, as well as the data collected, the procedures applied, the techniques used in analysis and the output from each stage.

Table 3-4: Data sources, data, procedures and output for each stage

Stage	Data sources	Data to be collected	Procedures	Analysis	Output
Stage (A)	Academic	Problem definition	Literature review		Research questions Research objectives
Stage (B)	Academic papers	SME definition	Literature review Content analysis	Content analysis	Definition of SMEs
Stage (C)	Academic	Characteristics of SMEs and developing countries	Literature review	Content analysis	Characteristics of SMEs and developing countries that affect IS benefits measurement model
Stage (D)	Cases of customers' stories from commercial press - Academic papers	Benefits of IS in SMEs in developing countries	Literature review Content analysis	Content analysis	Creation of an a priori model for measuring the IS benefits in SME context
Stage (E)	SMEs in Saudi Arabia	Benefits of IS in SMEs	Survey Content analysis	Content analysis SPSS	Confirmed the benefits measurement model for IS in SMEs

3.6 Chapter Summary

This chapter has presented the research phases of the research design. It has described the method used in each phase and justified the choice of each method over other methods. The next chapter reviews the qualitative phase; that is, the content analysis used to develop the research model.

Chapter 4. RESEARCH METHODOLOGY

4.1 Chapter Introduction

Given the prominence of multi-method research (Johnson, Onwuegbuzie, & Turner, 2007) and the fact that it may provide a more complete view of the study under investigation (Cooper & Schindler, 2006; Johnson et al., 2007), this study has combined qualitative and quantitative research.

This chapter discusses the qualitative and quantitative phases, which represent the major research methods in this study. The objective of the two phases was to develop and validate IS success in developing country SMEs. The chapter first details the qualitative method of content analysis. It includes a discussion of the steps involved in the content analysis method and then presents the hypotheses based on the resultant measurement model. Thereafter, Section 4.3 details the second phase of this research: the quantitative method. This section mainly describes the validation survey, which tested the IS benefits measurement model empirically to confirm the findings from the quantitative step.

This chapter concludes by introducing the data analysis and the interpretation of the findings, whichare presented in the following chapter. The current chapter then concludes with a summary.

4.2 Qualitative Method

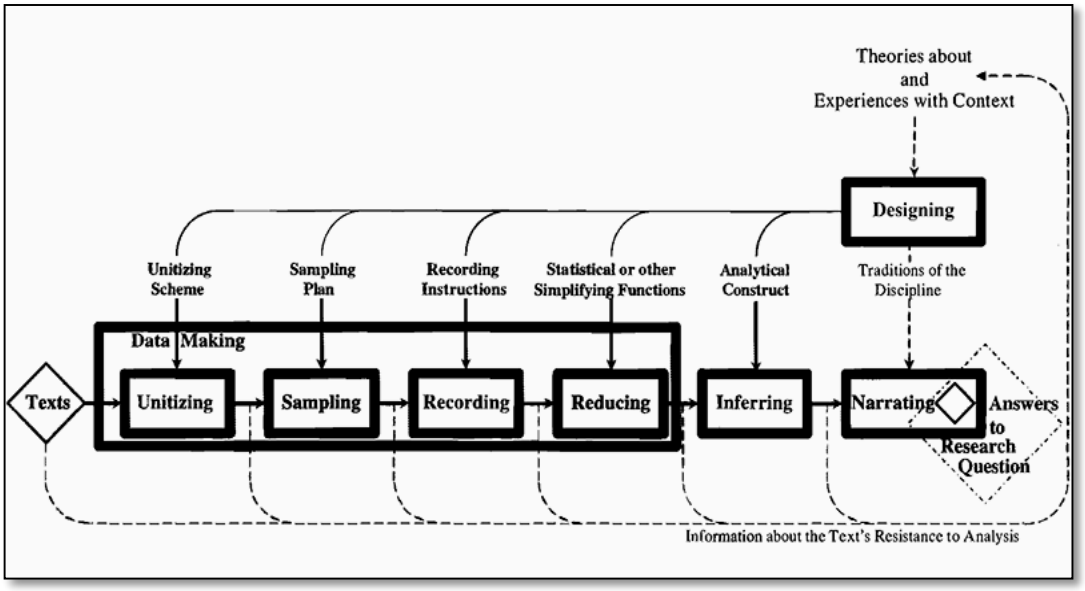
This section discusses the qualitative phase, which is represented by the content analysis method. The objective of this phase was to develop the a priori model for IS success in developing country SMEs. The section first details the content analysis method, discussing the required steps and confirming the method's reliability. The section then describes the process, which involved collecting the benefits of IS in developing country SMEs from two streams: practice and academic research. A pool of benefits was produced as discussed, followed by the mapping procedure. Section 4.5 shows the resultant measurement model. The hypotheses are then established and the research question is re-specified before the section concludes with a summary. Thereafter, the focus is on the next step: the quantitative method.

4.2.1 Content Analysis as a Method

The content analysis technique is used by this study to identify the benefits of IS in developing country SMEs; this will then be used to create the benefits measurement model. Content analysis, as defined by many scholars (Krippendorff, 2013; Myers, 1997; Neuendorf, 2002; Stemler, 2001; Weber, 1990), is a systematic, replicable technique for compressing many words of text into fewer content categories, based on explicit rules of coding. Content analysis is deemed appropriate in this context as it allows the researcher to gain an understanding of information derived from a range of rich data that form an effective new data source for this study's context.

To understand the steps required for content analysis, Krippendorff's (2013) components of content analysis are followed, as shown in Figure 4-1 and Table 4-1.

Krippendorff's (2013) components of content analysis make it easy to adopt and follow the content analysis procedure of establishing why a phenomenon is to be observed and what is to be observed, determining the observation method for coding, summarising the data and ensuring that a useful, clear data set is produced. The following sections provide details of the components described in Table 4-1.



Note: Sourced from original diagram in Krippendorff (2013)

Figure 4-1: Components of content analysis

Table 4-1: Content analysis data description

Component	General meaning (Krippendorff, 2013)	Study description	Section of the chapter
Unitising	Why were the data chosen?	New context—SMEs in developing countries	Collecting the benefits of IS in SMEs (Section 4.3)
Sampling	How are the data representative of the population?	Customer stories among SMEs in developing countries; academic research in IS in SMEs in developing countries	
Recording	What is the interpretation of the data?	Pool of benefits	
Reducing	Aggregating units of analysis or summarising the data	Mapping to IS impact model—synthesising according to SMEs' characteristics and developing countries' characteristics	Mapping the benefit citations into the IS impact model (Section 4.4)
Inferring	What do the data mean or cause?	Developing the model to measure IS success in SMEs in developing countries	Developing the a priori model for this study (Section 4.5)
Narrating	Make results comprehensible to the reader	Discussion, justifications and referencing	All sections

Source: Based on Krippendorff (2013)

4.2.2 Collecting the Benefits of IS in SMEs

The data for content analysis were collected from two main streams: practice and academic research. The practice stream comprised customers' success stories on vendors' websites in the commercial press. This stream was sustained by another source of data: the academic stream in which studies in the SME context were selected from a range of academic outlets. The following sections provide the details of each stream.

4.2.2.1 Practice Stream

Collecting data from practice is the first step in developing a pool of benefits for IS in developing country SMEs. The practice stream's data source in this phase comprised customers' success stories on vendors' websites in the commercial press. This type of data represents a rich source of up-to-date information about IS benefits.

Shang and Seddon (2002) describe these data as providing a detailed picture of IS investment, including the business environment, background, objectives, competitive strategy, system support, system implementation and the benefits realised, wherein the data can be traceable for verification purposes (Shang & Seddon, 2002). The inclusion of the commercial press as a source of evidence can be justified for several reasons. First, the inclusion of benefits in the form of a quoted statement or a video interview represents the customer's exact statement about the system. In addition, vendors would have had to gain approval from customers' companies to publish stories about them. Second, two leading vendors' websites were examined to avoid an emphasis on specific benefits related to a specific product. To reduce potential limitations arising from bias through selective approaches by vendors in choosing desirable customer statements, the development of the model in this study was guided by previous studies and models. It was also analysed and justified in consideration of the characteristics of SMEs and of developing countries. Hence, this strategy facilitates the triangulation of data, reduces bias and boosts validity (Boudreau, Gefen, & Straub, 2001; Carson, Gilmore, Gronhaug, & Perry, 2001).

Two leading IS companies were selected (the information system [IS] or [ES] represents the IS with its integration and innovative IS technology): Microsoft for Microsoft Dynamics NAV (their solution for SMEs) and SAP for three SME solutions: SAP Business One, SAP Business ByDesign and SAP Business All-in-One. The rationale for choosing these vendors was based primarily on their leadership in IS in SMEs. Further, that Microsoft Dynamics NAV and SAP are the two leading vendors was not the only reason to choose their customers' reports. Customer reports for Microsoft Dynamics NAV and SAP were well organised and linked to traceable organisational details for further verification. Customers' success stories were selected only from developing country contexts. All customers' success stories from these two vendors that belonged to a developing countries' context and were published before 2013 were selected. Accordingly, an analysis was conducted on 30 published customers' 'success stories from ten different developing countries. The objective of this exercise was to develop a simple and generalisable IS benefits model for SMEs in developing countries.

Customers' quotations representing benefits statements were selected from each success story, with an average of ten customers' quotations selected from each. These customers' quotations underwent content analysis by identifying keywords

and then synthesising the benefits using guidelines for content analysis similar to those of Shang and Seddon (2002).

A critical stage of the study was synthesising the pool of benefits into a useful, rational and coherent classification of benefit dimensions and measures. The synthesis procedure aimed to reduce the identified benefits by removing overlapping measures to achieve mutual exclusivity and parsimony of the model. The steps employed in the synthesis comprised: (1) identifying synonyms of the keyword benefits, (2) merging identical/similar benefits into a single benefit and (3) linking the derived IS benefits to a measurement dimension. As a result of these steps, a pool of benefits of IS in developing country SMEs was produced. Appendix G shows examples of some selected cases and the derived IS benefits associated with customers' quotations from the vendors' websites.

The process of content analysis of 30 published case studies containing 299 customers' quotations yielded 566 identified benefits. Synthesising the IS benefits by removing duplications and combining similar benefits resulted in 60 non-overlapping benefits (see Table 4-2).

Table 4-2: Pool of IS benefits from practice stream

Employee effectiveness (6)	Generated more revenue (1)	Increased capacity (7)	User friendliness (3)	Scalability (22)
Employee productivity (5)	Improved customer management relationship (9)	Overall productivity (17)	System accuracy (6)	Customis-ation (2)
Self-confidence (1)	Increased competitiveness (1)	Improved outcomes/ outputs (20)	Transparency (4)	Integration (51)
Decision effectiveness (16)	Organisational cost (6)	Compatibility (1)	User requirements (5)	Access to online help (1)
Importance (2)	Improved resource utilisation (2)	Database content (3)	Ease of learning (14)	Deployment (25)
Availability (8)	Saves time (2)	Improved access to information (1)	Ease of use (16)	Vendor reliability (2)
Better information (2)	Staff requirements (5)	Multi-language (2)	Reliability (6)	Affordable (5)
Accurate (8)	Strengthened the organisation (2)	Quick response (2)	Standardis-ation (8)	Locally available vendor (2)
In real time (28)	Overall efficiency (19)	Robust solution (3)	Security (9)	Vendor popularity (3)
Visibility (24)	Business process change (17)	Sophistication (2)	Efficiency (14)	Expertise (8)
Support of centralised management (1)	Improved control (17)	Comprehensive (3)	Automated (19)	Training (8)
Improved administrative function (11)	Cost reduction (19)	Familiarity (3)	Flexibility (14)	Vendor support (18)
Total: 60 IS benefits from 566 citations				

4.2.2.2 Academic Stream (Comparison with Other Studies)

Comparing models with other existing, similar models is another way to ensure the validity of newly developed models (Otieno, 2010). Therefore, several academic studies concerning the success measurement model for SMEs were evaluated to confirm and complete the IS benefits list derived from customers' success stories. In addition, researching the IS benefits in SMEs as documented in the academic field enabled expression of the benefit in academic style, rather than the style used commercially. The development of a benefits measurement model for IS in developing country SMEs is a still-developing area of research. As only a few studies were found that related to IS success in developing country SMEs, the search was combined with SME studies conducted in developed nations. With the study's purpose being to collect a comprehensive list of benefits for later synthesis and analysis before being added to the model, it was desirable to extend the search in the context of developed country SME. This reliable source of data was added to the content analysis process, seeking completeness in the list and aiming to overcome any potential limitation of bias through selective approaches by vendors in choosing desirable customer statements.

During the search in databases (e.g., ProQuest, ScienceDirect, Web of Knowledge and Scopus) for academic studies published from 2000 to 2013 on the benefits of IS in SMEs, 14 different studies that mentioned the benefits of IS/ERP in SMEs were selected. The selection of the studies was based initially on the type of IS to be evaluated. While many studies used the concept of IS to refer to any system that included manual systems, basic computer systems or mobile and internet concepts (Osterwalder, 2002), some studies used the concept of IS in a specific IS area such as e-business, SCM or computer security (Grama & Fotache, 2007). Thus, the selection of studies was undertaken with the help of Haddara and Zach's (2012) extended review. Haddara and Zach (2012) reviewed the literature on ERP within the domain of SMEs. For the streams of ERP benefits, use and impact, they identified 24 studies: of those, 13 were found to be related to the current study's focus. One more study was added to that list, as it was closely related: this study was conducted among New Zealand's SMEs (Mathrani & Viehland, 2009).

In a comprehensive examination of these studies for ERP benefits in SMEs, 181 different benefits were identified. Table 4-3 presents a summary of the selected studies, and the identified benefits are shown in Table 4-4.

Table 4-3: Selected studies on IS/ERP benefits in SMEs

#	Study	Country	Research methods	Benefits
1	Argyropoulou, Ioannou, Koufopoulos, & Motwani (2009)	Greece	Interview	19
2	Bohórquez & Esteves (2008)	Spain	Panel data approach	18
3	Equey & Fragnière (2008)	Switzerland	Survey	2
4	Esteves (2009)	Spain	Survey and interview	21
5	Federici (2009)	Italy	Interview	5
6	Gupta, Priyadarshini, Massoud, & Agrawal (2004)	India	Case study	32
7	Kale et al. (2010)	India	Survey and interview	17
8	Koh & Simpson (2007)	UK	Survey and interview	1
9	Lee, Lee, & Kang (2008)	Korea	Case study	8
10	Mabert et al. (2003b)	USA	Case study and survey	19
11	Marsh (2000)	Australia	Case study	10
12	Mathrani & Viehland (2009)	New Zealand	Semi-structured interview	16
13	Reuther & Chattopadhyay (2004)	Australia	Survey and interview	7
14	Seethamraju (2008)	Australia	Case study and in-depth interview	6
Total				**181**

Table 4-4: Pool of IS benefits from academic stream

Improve inter-organisational communications (3)	Business innovation (3)	Standardisation (2)	Learning (2)	Increased capacity (1)
Leaner hierarchical structure (1)	Materials and resources benefits (1)	Automate processes (2)	Awareness/ recall (1)	Business process change (7)
Improved management (11)	Improved maintenance (2)	Improved response time (2)	Improved decision making (6)	Ease of use (2)
Cycle time reduction (13)	Improved supplier relationship (2)	Increased IT infrastructure capability (1)	Individual productivity (2)	Access (3)
Reduce inventory (2)	Drive efficiencies in supply chain (1)	Information transparency (2)	Indirect organisational costs (2)	User requirements (1)
Improved customer service (8)	Quality improvement (3)	Information visibility (2)	Staff requirements (4)	System feature (2)
Improved planning (7)	Support business growth (2)	Profitability (1)	Reduced inventory (15)	Flexibility (6)
Create a competitive advantage (10)	Performance improvement (1)	Improve information flow (1)	Overall productivity (9)	Sophistication (2)
Conciseness (1)	Improve process efficiencies (1)	Information effectiveness (4)	Improved outcome (1)	Integration (5)
Content accuracy (5)	Become more agile and efficient (1)	Efficiency (3)	Reliability (1)	Customisation (1)
Relevance (1)	Availability (1)			
Total: 53 different IS benefits (181 total frequencies)				

4.2.3 Mapping Benefits Statements into the IS Impact Model

After identifying the salient benefits of IS in SMEs, the next step was to map these benefits statements into the conceptual foundation of this study: namely, the IS impact model. The literature suggests two main approaches for developing a model: (1) a 'bottom-up' process, also identified as a data-driven and open-coding approach,

and (2) a ‘top-down’ approach, described as a structured-coding and framework approach (Gable et al., 2008). The top-down approach employs deduction and starts with a logical framework or model with which to categorise responses, while the bottom-up approach employs induction, starting with the data in hand, which are arranged in a logical classification. This study employed a top-down approach using Gable et al.’s (2008) IS impact model. This approach was deemed appropriate as it was built on a theoretical foundation and extended this model, thus ensuring this study’s solid theoretical contribution.

The IS impact model was adopted for the study for the following reasons: (1) the IS impact model represents the wide and qualitative benchmarking of IS; (2) it measures the current impact of IS and simultaneously seeks the potential of IS in the future; and (3) it is easy to understand and can be used in an organisation from multiple staff perspectives.

The main objectives of the mapping exercise were two-fold: (1) to provide a basis for the intended research and (2) to demonstrate the possible inadequacies of existing models for measuring the success of IS in developing country SMEs.

In addition, most studies have evaluated the D&M model (6,000 studies as reported by [Tate et al., 2014]). Despite the widely acknowledged validity and strength of the D&M model, focusing on one model or theory in a particular area is considered flawed, as many valid aspects of other models could be missed or underestimated. Thus, as a contribution of this study, another valid and promising model was used: the IS impact model. The differences between the IS impact and D&M models were discussed in Chapter 2.

For the practice stream, the procedure of mapping the 566 measures to the IS impact model showed 318 mapped measures and 248 unmapped measures. In the academic stream, the procedure of mapping the 181 measures to the IS impact model showed 91 mapped measures and 90 unmapped measures. Tables 4-5, 4-6 and 4-7 show the results of the mapping procedure.

Table 4-5: Result of mapping procedure

Stream	Cases	Benefits	Mapped	%	Unmapped	%
Practice	30	566	318	56.18	248	43.82
Academic	14	181	91	50.28	90	49.72
Total	44	747	409	54.75	338	45.25

Table 4-6: Mapped benefits to the IS Impact model

Individual impact	Organisational impact	System quality	Information quality
Learning (0)(2)* Awareness/recall (1)(1) Decision effectiveness (16)(6) Individual productivity (5)(2)	Organisational costs (6)(2)* Staff requirements (5)(4) Cost reduction (19)(15) Overall productivity (17)(9) Improved outcome (20)(1) Increased capacity (7)(1) e-Government (0)(0) Business process change (17)(7)	Data accuracy (0)(0)* Data currency (0)(0) Database contents (3)(0) Ease of learning (14)(0) Ease of use (16)(2) Access (1)(3) User requirements (5)(1) System feature (0)(2) System accuracy (6)(0) Flexibility (14)(6) Reliability (6)(1) Efficiency (14)(3 Sophistication (2)(2) Integration (51)(5) Customisation (27)(1)	Importance (2)(0)* Availability (8)(1) Usability (0)(0) Understandable (0)(0) Relevance (0)(1) Content accuracy (8)(5) Conciseness (0)(1) Timeliness (28)(7) Uniqueness (0)(0)
(22)(11)	(91)(39)	(159)(26)	(46)(15)
Total: (318) + (91)/566 + 181 = 409/747 = 54.75%			

Note: * Frequencies from practice stream; frequencies from academic stream

Table 4-7: Unmapped benefits to the IS Impact model

Individual impact	Organisational impact	System quality	Information quality	Vendor quality
Improved individual efficiency (6)(0)*	Visibility (24)(0)* Support of centralised management (1)(0) Improved administrative processes (11)(0) Generated more revenue (1)(0) Improved customer management relationship (9)(0) Increased competitiveness (1)(0) Improved resource utilisation (2)(0) Saved time (2)(0) Strengthened the organisation (2)(0) Overall efficiency (19)(0) Improved control (17)(0) Improved inter-organisational communications (0)(3) Leaner hierarchical structure (0)(1) Improved management (0)(11) Cycle time reduction (0)(13) Reduced inventory (0)(2) Improved customer service (0)(8) Improved planning (0)(7) Created a competitive advantage (0)(10) Business innovation (0)(3) Materials/resources benefits (0)(1) Improved maintenance (0)(2)	Compatibility (1)(0)* Multi-language (2)(0) Quick response (2)(2) Robust solution (3)(0) Comprehensive (3)(0) Familiarity (3)(0) User friendliness (3)(0) Transparency (4)(0) Standardisation (8)(2) Security (9)(0) Automated (19)(2) Scalability (22)(0) Increased IT infrastructure capability (0)(1)	Better information (2)(0)* Information transparency (0)(2) Information visibility (0)(2) Improved information flow (0)(1) Information effectiveness (0)(4)	Access to online help (1)(0)* Deployment (25)(0) Vendor reliability (2)(0) Affordable (5)(0) Locally available vendor (2)(0) Vendor popularity (3)(0) Expertise (8)(0) Training (8)(0) Vendor support (18)(0)

Individual impact	Organisational impact	System quality	Information quality	Vendor quality
	Improved supplier relationship (0)(2) Drive efficiencies in the supply chain (0)(1) Quality improvement (0)(3) Support business growth (0)(2) Performance improvement (0)(1) Improved process efficiencies (0)(1) Become more agile/efficient (0)(1) Empowerment (0)(1) Profitability (0)(1)			
6 + -0	89 + 74	79 + 7	2 + 9	72 + 0
Total: (248 + 90)/(566 + 181) = 338/747 = 45.25%				

Note: * Frequencies from practice stream; frequencies from academic stream

4.2.4 Developing the A Priori Model

The model developed in this study has resulted from the mapping and synthesis processes. This combination responded to two main issues associated with IS success modelling: the theoretical basis and validity in the SME context, with both providing rationality and generality for the measurement model (Ahlan, 2014).

The process of developing the benefits measurement model in this study was based on the following guidelines suggested by Gable et al. (2008): (1) model completeness—all relevant dimensions and measures are included; (2) model parsimony—where only the simplest and smallest relevant dimensions and measures are included; and (3) mutual exclusivity—where each measure addresses a unique benefit of IS in SMEs without any overlapping measures (Gable et al., 2008). Further, Gregor (2006) (in describing analytic theory) has mentioned three important points. First, the logic for placing phenomena into categories and the characteristics that define each category should both be clear. Second, in seeking a complete and exhaustive process, important categories or elements should not be omitted from the classification system. Third, a previous classification system could

be revised as new entities emerge or by regrouping or naming categories in a more preferable way (Gregor, 2006, p. 19).

Thus, to ensure the synthesis process was clear, complete and exhaustive, the benefits mapped into the IS impact model were further checked and associated with the SME context. In addition, keywords and synonyms were used for both the derived benefits and the IS impact model measures for possible combinations. Unmapped benefits were checked against the characteristics of SMEs and developing countries to determine the appropriateness of adding and linking them to the IS impact model's dimensions, or if a new dimension was applicable. Hence, where it was possible, this study's preference was to develop measurement items adopted from validated existing scales from the existing literature, with the exception of new measures or measures that had been significantly adapted or changed (Ghobakhloo & Tang, 2015). In those cases, content analysis was used to identify the measures based on the analysis of practical case studies, together with the meta-analysis of current studies on SMEs, in addition to the IS impact model.

Finally, the IS impact model measures that did not have any matches were analysed critically to decide if they were to be deleted or kept. This decision was justified by the analysis of the characteristics of SMEs and developing countries. The following paragraphs discuss this process in more detail.

All the unmapped measures relate in some way to the characteristics of SMEs or developing countries. For example, the 'scalability' measure reflects the 'growth-seeking' characteristic of developing countries (Chinn & Fairlie, 2006; Vrgovic et al., 2012). Similarly, the existence of the 'support of multiple languages and currencies' measure reflects the 'language barrier' characteristic when adopting IS in developing countries (Grazzi & Vergara, 2012). Another observation is that the 'support of centralised management' measure is an effect of IS on the organisation, which reveals directly the centralised organisational structure of SMEs (Ein-Dor & Segev, 1978; Kartiwi & MacGregor, 2007; Seibert, 2004; Snider et al., 2009). Other examples include the 'security of the system' measure, which indicates the risk faced by SMEs and their reluctance to take such a risk (Kartiwi & MacGregor, 2007). In addition, the 'transparency' requirement of the system imitates the structure of SMEs, which is criticised for being fragile with poor management skills (Ein-Dor & Segev, 1978; Kartiwi & MacGregor, 2007; Snider et al., 2009).

Further, it is clear that the technology and skill limitations of SMEs and developing countries have a great effect on many measures. First, the existence of measures such as ‘user friendliness’, ‘familiarity’, ‘ease of use’ and ‘ease of learning’ reflects their low level of IS knowledge. Moreover, this limited IS knowledge also affects the way in which SMEs express the benefits of IS. For example, ‘better information’ is an expression that would include all the measures relating to the ‘information quality’ dimension, such as ‘Importance’, ‘usability’, ‘content accuracy’, ‘conciseness’, ‘timeliness’ and ‘uniqueness’. Similarly, ‘strengthened the organisation’ and ‘generated more revenue’ are consequences of many positive effects at the organisational level, such as ‘productivity’, ‘effectiveness’, ‘increased capacity’ and ‘improved outcomes/output’.

In many cases, ‘automation’ is a frequently reported benefit. The main reason for this is that the adoption of IS within SMEs was primarily for automation (Ndiege et al., 2012). This reflects that most SMEs in developing countries had been reliant on manual tasks before adopting an IS. Another observation to address was the low number of quotations related to individual impact, which reflects the organisational orientation within SMEs (Yap et al., 1992). Blili and Raymond (1993) have indicated the dominant role of SME owners, with limited information sharing and limited decision-making delegation. SMEs seldom have senior management involvement in IS decisions (Levy & Powell, 2000; Snider et al., 2009). As reported by Kartiwi and MacGregor (2012), SME owners often withhold information from colleagues.

For model simplicity, some different measures with minor differences representative of SMEs in developing countries were combined. This includes ‘productivity’ and ‘efficiency’; ‘data accuracy’ and ‘content accuracy’; ‘data currency’ and ‘timeliness; and other similar measures in the ‘system quality’ and ’information quality’ dimensions.

A key observation is that many unmapped measures are related largely to benefits associated with the vendor/supplier. In accordance with the revised D&M model (DeLone & McLean, 2003), ‘service quality’ was added to the new model as a dimension of IS success and not as a sub-set of ‘system quality’. This dimension is not included in the IS impact model. Gable et al. (2008) justified this omission by stating that ‘as the unit of analysis herein is the IS, not the IT function, Service Quality was considered inappropriate’ (p. 13).

Given the characteristics of SMEs and developing countries, and that many citations in this study strongly emphasised vendor/supplier support, a new dimension, tentatively labelled 'vendor quality' as a substitute for 'service quality', was created in the proposed model. In the context of SMEs and developing countries, an external vendor/supplier provides IS service, because of the lack of IT staff and IT departments within organisations (Cragg & Zinatelli, 1995; DeLone, 1981; Gable & Highland, 1993; Kartiwi & MacGregor, 2007; Levy & Powell, 2000; Snider et al., 2009; Yap et al., 1992). This dimension consists of many measures related to the vendor, such as 'vendor support', 'local access to the vendor' and 'vendor popularity'. Other measures are related to 'training', 'access to expertise', 'quality of the deployment process' and 'affordability of the system' provided by the vendor. When adding a new construct to the model, the measures of this construct should be clearly established. A number of studies have used this construct with a different number of measures. A review of these measures was performed to determine an established set of measures that were proof of the construct's validity in previous studies.

The synthesis and analysis processes yielded the preliminary model of this study, the a priori model, as shown in Figure 4-2. Details of the dimensions of IS success in SMEs are shown in Table 4-8, and the set of measures for each dimension is shown in Table 4-9.

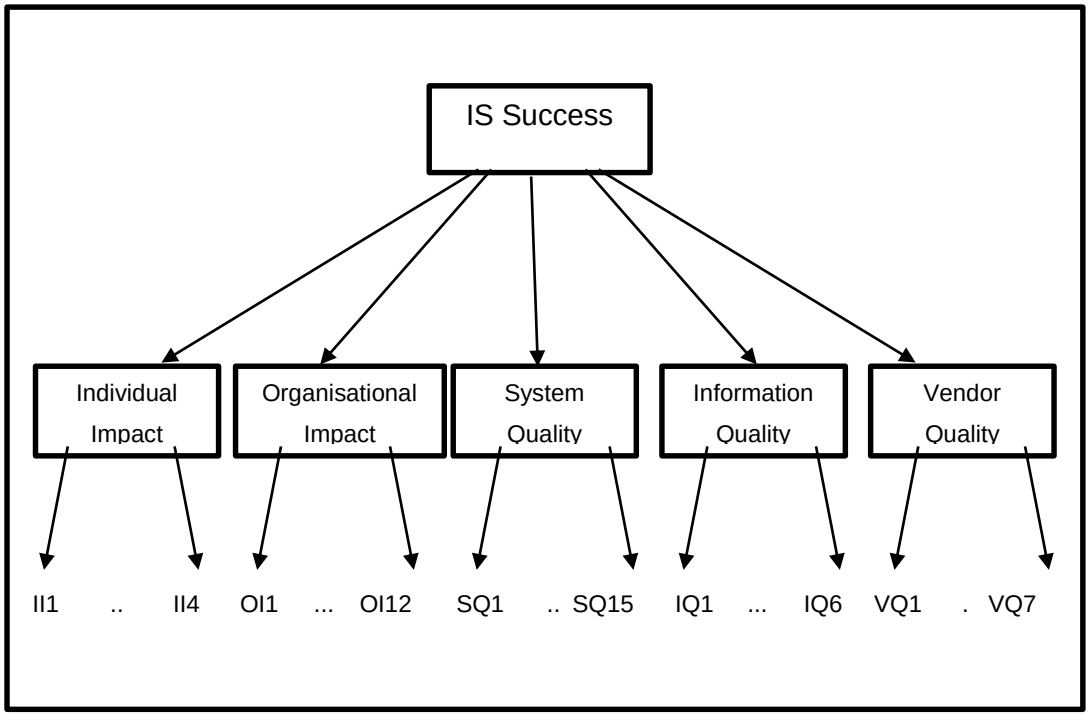


Figure 4-2: The a priori model of IS success measurement in SMEs in developing countries

Table 4-8: Dimensions of IS success in SMEs in developing countries

Dimension	# Items	Definition
Individual impact	4	The benefits received by the IS recipient due to IS applications (DeLone & McLean, 1992).
Organisational impact	12	The firm-level benefits received by an organisation due to IS applications (Gorla, Somers, & Wong, 2010).
System quality	15	The desirable characteristics of the IS applications (Petter et al., 2008).
Information quality	6	The desirable characteristics of the system's outputs (Petter et al., 2008).
Vendor quality	7	The quality of the support that system users receive from the IS vendor (Petter et al., 2008).
Total	**44**	

Table 4-9: Set of measures for each dimension

Individual impact	Organisational impact	System quality	Information quality	Vendor quality
II1 Learning	OI1 Organisational costs	SQ1 Ease of learning	IQ1 Importance	VQ1 Maintenance
II2 Awareness	OI2 Staff requirements	SQ2 Ease of use	IQ2 Availability	VQ2 Online service
II3 Decision effectiveness	OI3 Cost reduction	SQ3 Access	IQ3 Usability	VQ3 Reliability
II4 Individual productivity	OI4 Overall productivity	SQ4 User requirements	IQ4 Format	VQ4 Popularity
	OI5 Improved outcome	SQ5 System feature	IQ5 Content accuracy	VQ5 Expertise

Individual impact	Organisational impact	System quality	Information quality	Vendor quality
	OI6 Increased capacity	SQ6 System accuracy	IQ6 Timeliness	VQ6 Locally available
	OI7 Business process change	SQ7 Flexibility		VQ7 Support (empathy)
	OI8 Improved planning	SQ8 Reliability		
	OI9 Improved management	SQ9 Efficiency		
	OI10 Increased competitiveness	SQ10 Sophistication		
	OI11 Business innovation	SQ11 Integration		
	OI12 Improved resource utilisation	SQ12 Multi-language		
		SQ13 Standardisation		
		SQ14 Security		
		SQ15 Scalability		
4	**12**	**15**	**6**	**7**
Total 44				

4.2.5 Validity of the Developed Model

The use of qualitative, interpretive approaches to generate a model is usually criticised as lacking rigour (Gasson, 2004). This section discusses the rigour of the developed benefits measurement model for IS in SMEs in developing countries.

Validity and rigour can be addressed in a variety of ways. This study uses Whittemore, Chase, and Mandle's (2001) techniques for demonstrating validity. Their study shows that different techniques can be used during the qualitative method process to ensure validity. Table 4-10 lists the techniques applied by this study to ensure the validity of the content analysis methods in the four main stages of the qualitative method: design, data generating, analytic and presentation.

As suggested by Whittemore, Chase, and Mandle (2001), some techniques that accentuate the validity of the content analysis design stage include: developing a research design based on Krippendorff (2013), as detailed in Section 4.2.1; sampling decisions as detailed in Section 4.2.2; and employing triangulation with other methods (the literature review and the survey). In the data generating stage, techniques for demonstrating validity involved demonstrating persistent observation by using the frequencies of benefits in customers' stories, providing verbatim transcriptions represented by the output tables and mapping to the IS impact model (Section), and demonstrating saturation in the form of gathering data from both academic and practice streams. The analytic stage includes many techniques that demonstrate validity, all supported by the content analysis guideline, synthesis process and mapping procedure. These techniques include: member checking, expert checking, drawing data reduction tables (see Tables H.1, H.2 in Appendix H), exploring rival explanations, performing a literature review and writing an interim report. The presentation stage demonstrates validity by providing evidence that supports interpretations, acknowledging the researcher's perspective and providing descriptions.

Thus, examination of the validity within each stage adds to the internal validity of the research findings upon which the research model has been developed. However, the developed model still required validation in the next phase of this research, where a survey-based quantitative research method would test the validity of this model in Saudi Arabian SMEs.

Table 4-10: Techniques used in this study for demonstrating validity

Type of technique	Techniques adopted in this study
Design consideration	Developing a research design Sampling decisions (i.e., sampling adequacy) Employing triangulation
Data generating	Demonstrating persistent observation Providing verbatim transcriptions Demonstrating saturation
Analytic	Member checking Expert checking Drawing data reduction tables Exploring rival explanations Performing a literature review Writing an interim report
Presentation	Providing evidence that supports interpretations Acknowledging the researcher's perspective Providing descriptions

Note: Adapted from Whittemore et al. (2001)

4.2.6 Setting Up the Hypotheses

Research hypotheses were created, with the above model as the basis, so they could be tested in the quantitative phase of this study. These hypotheses were established to answer the final research question: 'is the developed model valid in the context of Saudi Arabian SMEs?', where Saudi Arabia served as an example of a developing country context.

Thus, the hypotheses all stemmed from the dimensions of the newly developed model, which suggested five dimensions as factors for IS success. These dimensions were defined in Table 4-8. To operationalise them, a list of measures that emerged from the content analysis was assigned to each dimension: the following subsections discuss each hypothesis.

4.2.6.1 First Hypothesis: Individual Impact is a Significant Factor of IS Success

The first hypothesis refers to the 'individual impact' dimension. Individual impact is the most studied impact domain in IS success research (Herbst, Urbach, & Brocke, 2014). The term 'individual impact' refers to the effect of the IS on the user.

In the 10-year update of DeLone and McLean's model (DeLone & McLean, 2003), 'individual impact' and 'organisational impact' became one border construct referred to as 'net benefits'. This construct contains other impacts such as work group, society and environmental impacts (DeLone & McLean, 2003). However, the IS impact model of Gable et al. (2008), which is the theoretical base of this study, has these two impacts as separate constructs.

In the context of SMEs, it was anticipated that organisational impact would be the dominant impact over others, whereas the individual, work group and society impacts would only represent a small portion overall. Thus, it was reasonable to combine them into one construct. However, this idea was neither supported by the qualitative data nor by the IS impact model. Consequently, this study kept the two impact dimensions as supported by the mapping procedure.

'Individual impact' is operationalised, as shown in Table 4-9, by four measures: 'learning', 'awareness', 'decision effectiveness', and 'individual productivity'. In fact, this list was identical to the measures of the IS impact model. The only new benefit that emerged from the content analysis of the customer success stories was 'improve individual efficiency', which was removed in the synthesis process for simplicity, as it had the same impression as the 'decision effectiveness' and 'individual productivity' measures.

To be specific, the 'learning' measure was not identified from the customer success stories. However, two citations for 'learning' were found in academic studies on SMEs (Argyropoulou et al., 2009; Kale et al., 2010); therefore, it was considered as a measure in the new model. 'decision effectiveness' was the most-cited benefit in the customer stories for this dimension with 16 different quotation statements: this was supported by six citations from the academic stream. Both 'awareness' and 'individual productivity' were cited in the customer success stories and supported by

academic studies as shown in the mapping tables (see Tables 4-6 and 4-7). Appendix H contains detailed tables of the synthesis process.

The first hypothesis assumed that individual impact was one dimension of the hypothesised model (latent variable [LV]). It will be measured using four variables: 'learning', 'awareness', 'decision effectiveness' and 'individual productivity'.

4.2.6.2 Second Hypothesis: Organisational Impact is a Significant Factor of IS Success

The second hypothesis concerns the 'organisational impact' dimension. The term 'organisational impact' refers to the effect of IS on the whole organisation's performance (Herbst et al., 2014). According to most IS success, it is evident that IS can provide a variety of benefits for organisations (Ghobakhloo & Tang, 2015). While at the organisational level, profitability measurements are preferred (Petter et al., 2008), in the context of SMEs, the benefits of IS are generally characterised as the effects of IS on the organisational performance of these businesses (Petter, DeLone, & McLean, 2012)

Measuring the impact of IS on organisations was proposed in the original IS success model (DeLone & McLean, 1992). As discussed above, the D&M model understood that IS could have impacts beyond the individual and the organisation. Therefore, in the updated D&M model, these were expanded into the more comprehensive variable of 'net benefits' (Petter et al., 2012).

'Organisational impact' had the most citations of all benefits from the customer success stories, with a total of 91 mapped and 89 unmapped citations. All the IS impact measures in this dimension were cited, except for the 'e-government' measure. In all, 31 unmapped benefits emerged from the content analysis; of these, 11 emerged from the customer success stories and were not supported by academic studies. Moreover, 20 benefits were identified only in academic studies. This variation again confirmed the inconsistency of IS dimension measures.

Following the synthesis process, 12 measures were selected: the others were either removed or merged for simplicity. Thus, the second hypothesis assumes that 'organisational impact' is another dimension (construct or LV) of the proposed model. It was measured using 12 items: 'organisational costs', 'staff requirements',

‘cost reduction’, ‘overall productivity’, ‘improved outcome’, ‘increased capacity’, ‘business process change’, ‘improved planning’, ‘improved management’, ‘increased competitiveness’, ‘business innovation’ and ‘improved resource utilisation’.

4.2.6.3 Third Hypothesis: System Quality is a Significant Factor of IS Success

The third hypothesis concerns the ‘system quality’ dimension. The term ‘system quality’ refers to IS performance characteristics (DeLone & McLean, 1992, 2003). Derived from the results of the qualitative phase of this study, the proposed items that shaped this construct were ‘ease of learning’, ‘ease of use’, ‘access’, ‘user requirements’ and ‘system features’, as well as ‘system accuracy’, ‘flexibility’, ‘reliability’, ‘efficiency’, ‘sophistication’, ‘integration’, ‘multi-language’, ‘standardisation’, ‘security’ and ‘scalability’.

‘System quality’ had the second highest number of citations of all benefits from the customer success stories, with a total of 159 mapped and 79 unmapped citations.

All the IS impact measures in this dimension were cited, except for ‘data accuracy’ and ‘data currency,’ which had also been removed from the final IS impact model following a validation process (Gable et al., 2008).

In all, 13 unmapped benefits emerged from the content analysis: of these, 12 emerged from the customer success stories with four benefits also supported by academic studies.

The synthesis process yielded 15 measures, four of which were new in the context of SMEs in developing countries: ‘multi-language’, ‘standardisation’, ‘security’ and ‘scalability’. The other 11 measures were ‘ease of learning’, ‘ease of use’, ‘access’, ‘user requirements’, ‘system feature’, ‘system accuracy’, ‘flexibility’, ‘reliability’, ‘efficiency’, ‘sophistication’ and ‘integration’. In total, these 15 measures were operationalised to measure the construct system quality, hypothesised as one of the dimensions of the proposed model**.**

4.2.6.4 Fourth Hypothesis: Information Quality is a Significant Factor of IS Success

The fourth hypothesis concerns the 'information quality' dimension. The term 'information quality' refers to the quality of the output produced by the IS (DeLone & McLean, 1992, 2003). In many previous studies, the 'information quality' scale was designed to capture the degree to which the IS generated information that possessed three attributes: 'content', 'accuracy' and 'format' (Sun & Mouakket, 2015). The items used on the scale for this hypothesis were listed in Table 4-9. These have been merged with the IS impact model, with no new item added from the content analysis.

Accordingly, the fourth hypothesis assumes 'information quality' to be a dimension of the proposed model, with six items to operationalise this construct: 'importance', 'availability', 'usability', 'format', 'content accuracy' and 'timeliness'.

4.2.6.5 Fifth Hypothesis: Vendor Quality is a Significant Factor of IS Success

The fifth hypothesis reflects a new dimension called 'vendor quality'. The term 'vendor quality' describes a new factor added by this study to the IS success scale that imitates 'service quality' in other studies. The items of the 'service quality' scale emerged mainly from the SERVQUAL construct used previously to measure the impact of IS. 'Service quality' was then added and designed as a construct in DeLone and McLean's (2003) model. The IS impact model was missing a representation of this construct, as discussed in Chapter 2. It was important to address this limitation of the IS impact model in the context of SMEs, because of the resource and human expertise limitations of SMEs, which caused them to rely on the quality of the IS service provider (the vendor). Further, other similar studies that validated the IS impact model found that 'service quality' ('IT support or service quality' or 'vendor quality') was a necessary addition to the IS impact model. In Rabaa'i's (2012) study, the IS support model was added to the IS impact model, and both were indicators of IS satisfaction. In addition, Ifinedo's (2006) that evaluated the IS impact model incorporated the dimension of 'vendor/consultant quality (VQ)' into the IS impact model. He argued that the role and quality of vendors/consultants throughout the life cycle of ERP, including the pre-implementation and post-implementation stages, were imperative for its success (Ifinedo, 2006).

Many issues regarding this dimension were discussed in the 'Panel Report from the Pacific Asia Conference on Information Systems (PACIS), 2011' (Tate et al., 2014). This report emphasised that '[s]ervices play a much more prominent role in the economies of countries, making the "service" context of ISs increasingly important' (p. 1235). The report further argued that 'service' was a frequently used and abused term, as it has many conflicting meanings (Tate et al., 2014).

From the content analysis, 72 citation benefits were identified as being related to this dimension. These citations were then synthesised into seven measures as shown in Table 4-9.

As such, for the fifth hypothesis, vendor quality is assumed to be part of the proposed model, which has added a new dimension to the study's theoretical base (IS impact model). The seven operationalised items of this construct are 'maintenance', 'online service', 'reliability', 'popularity', 'expertise', 'locally available' and 'support'.

4.2.7 Summary of the Qualitative Method Section

This section has presented the proposed primary model of the study. The model was developed using the content analysis of 30 published case studies from different developing countries in the Middle East and Africa. By analysing customers' quotations, the study identified 566 benefits, which were then synthesised into non-overlapping benefits. To ensure the completeness and validity of the identified benefits, academic studies were used to identify and compare IS benefits with the benefits collected from customers' success stories, thus giving a total of 181 identified benefits. Further, in contrast to existing studies based on the D&M model (DeLone & McLean, 1992, 2003), this study builds on and extends the IS impact measurement model (Gable et al., 2008), which is deemed suitable in this context. The benefits were mapped to the IS impact model, which provided the conceptual foundation of this research. Many benefits that emerged were not covered by the existing IS impact model, thus demonstrating the necessity for a new benefits measurement model for IS in developing country SMEs. By combining the identified benefits with the characteristics of both SMEs and developing countries, this study has consolidated a preliminary measurement model for IS in developing country SMEs. The model consists of four dimensions with 44 benefits measures. After the development of this model, hypotheses were created for testing in the next phase.

The next phase of this study was the validation phase in which the model was tested using the quantitative survey method. The next section is dedicated to the survey development as the first stage in the quantitative phase.

4.3 Quantitative Method

In the previous phase, the IS benefits measurement model was developed using content analysis, employing the qualitative research methodology. The following phase validates the model, discussing the quantitative research methodology used. This section describes the validation survey that tested the benefits measurement model empirically to confirm the findings and/or identify further improvements and enhancement.

Chapter 3 described and justified the use of the survey method. The current section starts with details of the survey phase, including the instrument design, the sample and the data collection process. Preparation for the data analysis phase is then discussed, with a description of the technique and process of data cleansing used to ensure the data's validity before performing the required analysis. Finally, the section concludes with a summary of the quantitative phase.

4.3.1 The Survey

A validated instrument for measuring the success of IS in developing country SMEs will be a key output of this research. This section details the process used to design and produce the survey and the steps taken to collect the data. Owing to the importance of this stage, the researcher attended many workshops and courses, in addition to reviewing pertinent literature, to learn and determine the most effective ways to produce the questionnaire.

This section is organised into subsections, each of which details a stage in the survey process activity.

4.3.2 Survey Instrument

This study used an online tool to design the questionnaire. A review of online tools was conducted and involved comparing the available applications in relation to the research requirements. The major research requirements included reliability, survey design facilities (e.g., variety of questions and number of questions per survey), survey administration facilities (e.g., number of responses and time available),

support for other languages (i.e., Arabic in this research), ease of use, data privacy, content management and cost effectiveness (Evans & Mathur, 2005).

Flinders University is a member of the Australian Consortium for Social and Political Research Incorporated (ACSPRI). Being a member of this organisation allows use of ACSPRI members' surveys, which are a low-cost yet effective tool. The ACSPRI service is powered by LimeSurvey—an open-source survey system developed with support from ACSPRI's contribution (ACSPRI, 2014). Some of the ACSPRI members' survey features are shown in Table 4- below.

Table 4-11: Features of the ACSPRI members' survey

Feature	Description
Unlimited responses	No restrictions on unlimited participants in the survey
Unlimited questions	No limits on the size or number of questions in the questionnaire
Email invitations	Email addresses can be loaded from a spreadsheet and used as the list of participants to whom to send customised invitations
Secure transmission	All survey set up and participant responses conducted over HTTPS (SSL)
Randomisation	Questions, responses or question groups can be randomised
Multi-lingual surveys	The questionnaire can be created in multiple languages with an easy-to-use translation interface
Anonymous surveys	Allows for sensitive research to be conducted by not linking the respondent list with the survey responses
Data export	The data can be exported to CSV, PDF, SPSS, R, STATA and MS Excel
No lock-in	The entire questionnaire and data can be exported at any time

Source: ACSPRI (2014)

4.3.3 Survey Questions

The developed questionnaire comprises four distinct parts. Parts 1, 2 and 3 represent the demographic questions. Part 4 comprises the study's model questions to measure the impact of IS in Saudi Arabian SMEs.

The phrasing of questions is another challenge that researchers must consider when creating a questionnaire (Dillman, 1978). Using inappropriate terms and expressions may lead to unexpected problems. As Dillman (1978) states, these can range from 'from excessive vagueness to too much precision, from being misunderstood to not being understood at all, from being too objectionable to being too uninteresting and irrelevant' (p.95).

Another issue with the phrasing of questions is whether to include negatively worded questions. While the negatively worded question technique has been used by researchers for many years to check survey data against acquiescent bias and extreme response, many disadvantages still remain when using this technique, such as misinterpretation, mistakes and miscoding (Sauro & Lewis, 2011). In addition, it could reduce the response rate as it causes respondent confusion (Colosi, 2005; Roszkowski & Soven, 2010; Sauro & Lewis, 2011; van Sonderen, Sanderman, & Coyne, 2013). Other studies have argued that although a response bias may exist, it often has a minimal effect on participant response (Campbell, Converse, & Rodgers, 1976; Clancy & Gove, 1974; Gove, McCorkel, Fain, & Hughes, 1976; Lalwani, Shavitt, & Johnson, 2006). For this study, only positively worded questions have been used in the questionnaire.

4.3.3.1 Demographic Questions

As stated above, Parts 1, 2 and 3 in the questionnaire represent the demographic questions. Demographic questions assess the representativeness of a sample, categorising the response data into meaningful groups of respondents. For example, questions concerning the 'size of the organisation', 'organisation's starting year' and 'number of employees' help to verify the size of SMEs.

Basic demographic information such as gender, age, position, qualifications and experience help to break down response data into groups in accordance with the organisation's stakeholders. Answers to demographic questions about IS in the respondents' organisations provides more information on IS usage in SMEs. It is also

worth mention that the term Enterprise System (ES) was used in the survey, as it was popular for the sample to understand the term ES instead of IS. The demographic questions are listed in Table 4-12.

Table 4-12: Demographic questions

Part #	Title	Items	Names of variables
Part 1	Information about organisation	6	Organisation's main sector
			Size of the organisation
			Organisation starting year
			Number of employees
Part 2	Information about respondent	6	Gender
			Age
			Position
			Qualifications
			Experience/number of years
			Do you have an IT-related qualification at undergraduate/postgraduate level?
Part 3	Information about ES	2	The ES was introduced by:
			Number of staff members who use the ES
Total		14	

4.3.3.2 Measurement Questions

Part 4 in the questionnaire comprises the measurement questions in relation to the benefits of IS in SMEs: this is the main part of the study. The questions (benefits, items or measures) represent the study's model. Development of the measures reflects the qualitative aspect of the study: this was based on the content analysis of 30 case studies and the literature review of 14 existing SME models, as detailed in Chapter 4. The measurement model consists of five dimensions: individual impact', 'organisational impact', 'system quality', 'information quality' and 'vendor quality', respectively. Table 4-13 summarises the definitions of these dimensions.

The first dimension, ‘individual impact’, consists of four items (Questions 1–4): these indicate measures (benefits) that relate to the individual. They include ‘learning’, ‘awareness’, ‘decision effectiveness’ and ‘individual productivity’.

The second dimension, ‘organisational impact’, consists of 12 items (Questions 5–16): these indicate measures (benefits) that relate to the organisation, such as ‘organisational costs’, ‘productivity’, ‘planning’ and ‘resource utilisation’.

The third dimension is ‘system quality’: it consists of 15 items (Questions 17–31) indicating measures (quality) that relate to the system, such as ‘ease of use’, ‘flexibility’ and ‘reliability’.

‘Information quality’ is the fourth dimension and consists of six items (Questions 32–37): these indicate measures (quality) that relate to information, including items such as ‘content accuracy’, ‘format’ and ‘timeliness’.

The last dimension, ‘vendor quality’ consists of seven items (Questions 38–44): these indicate measures (quality) that relate to vendors such as ‘maintenance’, ‘online services’, ‘popularity’ and ‘support (empathy)’.

Finally, in addition to checking the validity of each dimension of the model, this analysis was undertaken at the appropriate dimension level. For this purpose, in addition to the 44 items above, six criterion measures were included in a separate section of the survey instrument. These are listed in Questions 45 to 51. These criterion measures assist in the overall satisfaction of each dimension and of the IS in the general measures. Appendix A contains all survey items.

Table 4-13: Definitions of dimensions

Construct name (LV)	No of items	Definition
Individual impact	4	The benefits received by the IS recipient due to IS applications (DeLone & McLean, 1992).
Organisational impact	12	The firm-level benefits received by an organisation due to IS applications (Gorla et al., 2010).
System quality	15	The desirable characteristics of the IS applications (Petter et al., 2008).
Information quality	6	The desirable characteristics of the system outputs (Petter et al., 2008).

Vendor quality	7	The quality of the support that system users receive from the IS vendor (Petter et al., 2008).
Total	44	

4.3.3.2.1 Scale

A 6-point Likert scale was used to measure the items representing the impact of IS in SMEs. A 6-point scale was chosen deliberately to avoid a 'neutral' response and encourage respondents to ponder the questions instead of selecting the middle option passively (Ary, Jacobs, Razavieh, & Sorensen, 2009; Patten, 2001).

4.3.3.2.2 Language and Translation

The official language of Saudi Arabia is Arabic. Therefore, it was necessary to translate the questionnaire into Arabic. The researcher, as a native Arabic speaker, translated the questionnaire. To ensure the translation's validity, it was checked by a PhD colleague who speaks both Arabic and English, and has an IT background. The PhD colleague studies at the Computer Science, Engineering and Mathematics School at Flinders University. The translation-checking process was organised under the direction of the researcher's supervisor. In addition, the Arabic version was translated back into English, as suggested by Abu-Shanab and Pearson (2009), to improve the first translation attempt. A comparison between these two versions was then made, and only minor differences were found. If participant responses were in Arabic, they were translated into English by the researcher. The Arabic and English versions of the questionnaire are available in Appendix A.

4.3.4 The Sample

A sample is a sub-set of a population that is analysed by a researcher to generalise results to the entire population (Bartlett, Kotrlik, & Higgins, 2001; Cochran, 1977). This section provides details of the study sample. It is divided into three subsections: sampling frame, sample size and sampling technique.

4.3.4.1 Sampling Frame

The sampling frame is used to define the population from which the sample has been drawn. A representative sample of that population will normally share similar characteristics. This enables a generalisation to be made about the phenomenon of interest from the sample to the population (Pinsonneault & Kraemer, 1993).

The population of this research comprised SMEs in Saudi Arabia that had already implemented IS. According to the Comprehensive Economic Census report published by the Central Department of Statistics and Information (2010), 785,407 companies in Saudi Arabia have up to 20 employees (see Table 4-14). These companies are considered SMEs according to the Central Department of

Statistics and Information (Saudi Arabia) (CDSI) (2010) definition; however, as discussed in Chapter 1, other definitions of SMEs are also used in Saudi Arabia.

Due to the absence of an official or governmental agency for SMEs in Saudi Arabia, information and contact details of SMEs were difficult to obtain. Information about SMEs already using IS in Saudi Arabia was lacking. As such, the researcher identified a list of resources that contained an accessible population of SMEs in Saudi Arabia from which a sample could be drawn. The researcher then attempted to find information about SMEs that would suggest their IS use. The resources included databases, government departments and ministries, customers' success stories from vendors' websites and social network accounts.

Table 4-14: Number of companies in Saudi Arabia by size

Less than 5 employees (small)	5–19 employees (medium-sized)	20+ employees (large)	Total
677,390	108,017	20,970	All = 806,377 SMEs = 785,407

Source: CDSI (2010)

This research used commercial and public databases. The public databases comprised the King Abdulaziz City for Science and Technology database at <http://babrizqjameel.com> and the freely accessible Arab Library database at <http://www.arabo.com>.Commercial databases were used to gain access to companies in Saudi Arabia, such as Data Arabia: <http://www.datarabia.com/biz/mailMerge.do>; the UAE database store, which contains data for many Gulf countries including Saudi Arabia <ghttp://www.uaedatabasestore.com/Saudi_Arabia_Database.html>; and the Saudi Arabia Business Database.

Government departments and ministries were also approached during the exploration of information and statistics about SMEs in Saudi Arabia. Examples of these government departments and ministries include the following: CDSI, Saudi Arabian Monetary Agency, General Authority of Civil Aviation, Ministry of Communications and Information Technology, Ministry of Commerce and Industry (MCI), Ministry of Education, Ministry of Higher Education, Ministry of Health and Ministry of Finance.

Further, the researcher considered other sources for information about SMEs to ensure that the selected Saudi Arabian SMEs had already implemented IS. These sources included customers' success stories from vendors' websites and companies' websites. Saudi Arabia already accounts for approximately 50 per cent of the installed base of the enterprise software leader (SAP) in the Middle East and North Africa (MENA) region (Business Monitor International, 2012b).

The researcher endeavoured to include only SMEs that had implemented IS by reviewing information related to each SME before considering it as part of the targeted population. Further, the invitation to respond to the questionnaire clarified the target population. The invitation, worded as follows, was used with the link to the questionnaire:

> Do you own or work for an SME? Does the company use an IS? If you answered 'yes' to both questions, please fill out this questionnaire'.

Indications as to whether or not an SME in Saudi Arabia had IS were sourced through the company webpage or social network account; for example, through Twitter accounts marked with SMEs, or by following an IS for SME-related accounts such as SAP. In addition, customers' success stories from vendors' websites, webpages of SMEs and social network accounts were used as a data source to determine organisational contacts such as email addresses and/or physical locations where the survey could be distributed.

Another issue with the sample was that companies might have IS but might not be connected to the internet. In this case, face-to-face administration of the questionnaire was used.

4.3.4.2 Sampling Technique

Sampling is the process of systematically selecting the group of people or cases to be included in a research project (Bartlett et al., 2001; Cochran, 1977; Gable, 1994; Neuman, 2006; Newsted et al., 1998; Pinsonneault & Kraemer, 1993).In general, data are sampled using probability and non-probability sampling (Cochran, 1977; Pinsonneault & Kraemer, 1993).

The probability sampling technique is one in which every unit in the population has a chance of being selected in the sample, which makes it possible to produce unbiased estimates for that total population. This probability can be estimated precisely by weighting sampled units according to their probability of selection. Probability sampling includes random sampling, systematic sampling and stratified sampling (Gable, 1994; Newsted et al., 1998; Pinsonneault & Kraemer, 1993).

In contrast, the non-probability sampling technique is one in which some units in the population have no chance of being selected, or where the probability of selection cannot be accurately determined. It comprises the selection of elements based on assumptions regarding the population of interest, which form the criteria for selection. The sampling error (i.e., the degree to which a sample might differ from the population) cannot be estimated during non-probability sampling as the sample is not random (Kitchenham & Pfleeger, 2002).

A range of alternative sampling techniques is provided in non-probability sampling based on the particular subject area. These include convenience, judgement, quota and snowball sampling.

This study used two non-probability sampling techniques, the first of which was judgement sampling. To select the sample based on judgement (Bartlett et al., 2001), an email list was obtained from customer websites and reports on SMEs published by government departments and ministries in Saudi Arabia. The invitation letter with a link to the questionnaire was sent to 877 email addresses obtained in this way. To increase the response rate, a follow - up email was sent one week after the questionnaire's distribution, thanking those who had completed the questionnaire and reminding those who had not yet participated. Due to the absence of an official department or governmental agency for SMEs in Saudi Arabia, both sampling techniques were used. In cases like this, it is very difficult to obtain a list of SMEs or

of contact details, thus making it impossible to use a probability sampling technique such as random sampling. Further, as the sample was to include SMEs in Saudi Arabia that had implemented an IS, further assessment was required to select those SMEs that met this criterion.

Snowball sampling, a non-probability sampling method, was the second sampling technique used. Based on email network logic, people within the same organisation are linked together (Carrington, Scott, & Wasserman, 2005). Through this link, the researcher targeted owners, managers and employees of SMEs in Saudi Arabia. An invitation letter was sent to the list of email addresses gathered from different sources using judgement sampling. The invitation message within the email was written in Arabic, and a link to the questionnaire was included. This sampling method was used to reach other stakeholders within the organisation who might not have their contact email address publicly available. Thus, more than one response was expected per organisation. Nevertheless, the snowball sampling technique's main weakness is the difficulty of obtaining figures in relation to the sample representation (Petersen & Valdez, 2005).

4.3.4.3 Sample Size

Although some researchers have claimed there is no particular size parameter prerequisite for a research sample (Cochran, 1977), other researchers believe that a large population should be a sample size requirement as the sample should be substantial enough to estimate the mean of the selected population (Maxwell, Kelley, & Rausch, 2008). Therefore, to ensure sufficient data were collected, this research used two channels to reach participants: online (a list of emails was collected from databases, social networks [mainly Twitter] and government documents) and hard copy (paper). In previous studies in this field, authors have identified sample sizes ranging from 130 (Kale et al., 2010) to 750 (Knapp, 2005). Further, estimating the required sample size can be obtained by using the following statistical formula (Cochran, 1977):

$$N/(1 + N*e^2)$$

Where: N = the size of the entire population you wish to represent[1]; e = the percentage margin of error you are willing to accept (in decimal form).

Therefore, with an estimation of the number of SMEs that had implemented an IS of 100,000 and with a 5 per cent margin of error, the number of respondents needed would be:

N/(1 + N*e2)
100,000/(1 + 100,000*.052)
100,000/(3.5) = 398

This means that approximately 400 respondents were needed. A basic chart to use when estimating the required number of respondents is shown in Table 4-15 below.

Table 4-15: Number of respondents needed at margins of error

Population Size	±3%	±5%	±10%
500	345	220	80
1,000	525	285	90
3,000	810	350	100
5,000	910	370	100
10,000	1,000	400	100
100,000	1,100	400	100
1,000,000	1,100	400	100
10,000,000	1,100	400	100

Source: Adapted from SurveyMonkey Help Center (2014)

In planning how to achieve this sample size, the researcher identified the normal response rate of similar studies. The response rates for similar studies in Saudi Arabia with an online-based survey and a paper-based survey were identified as 14 and 17 per cent, respectively (Alfaadhel, 2010; Alsaleh, 2012). Therefore, the researcher decided to target at least 3,000 participants. Thus, with an average expected return of around 15 per cent, it was assumed that 400 responses satisfactory for statistical analysis would be produced. Further, some specific

[1] Due to the lack of information about the number of SMEs using IS in Saudi Arabia, the estimation of N was based on a study by Adaileh (2012), which found that 14.4% of SMEs in Saudi Arabia were using IS.

techniques for data analysis require a sample size that meets a certain low limit to be performed effectively. For instance CFA, which was used in this study (see Chapter 6), requires a sample size of at least 5 to 20 cases per parameter estimate (Marsh, Hau, Balla, & Grayson, 1998). The hypothesised model (see Chapter 4) has 44 items, and therefore the lower limit for the sample size is 220 (5 multiplied by 44) cases, which falls within the previous estimation. The actual response rate is shown in the section on survey administration (Section 5.3.2).

4.3.5 Research Ethics

As required by the Flinders University Human Research Ethics Committee, ethics approval was obtained (ethics approval is shown in Appendix A).

4.3.6 Data Collection

This section concerns the data collection process required for this study. It begins with the pilot test procedure and then focuses on the survey administration and an evaluation of the survey procedure.

4.3.6.1 Pre-testing of the Questionnaire

Pre-testing the questionnaire is an important aspect of survey research quality. This involves pre-testing the entire questionnaire on a small sample before finally inviting participants to commence participation (Pinsonneault & Kraemer, 1993). Using a pre-test, researchers can clean and 'remove bugs' from the questionnaire. The pre-test also aids researchers in checking their research instruments in terms of respondents' understanding of the questions and the time taken to complete it (Cooper & Schindler, 2006). In addition, a pre-test decreases the unexpected nuances in the questions, thus minimising errors (Moore & Benbasat, 1991).

The pre-test occurred in Saudi Arabia. Two versions of the questionnaire, one in English and one in Arabic, were piloted in two phases with Saudi participants who owned or were employed in SMEs. The first phase of the pre-test had six participants: four answered the Arabic version and two answered the English version. Table 4-16 shows the details of pre-test participants.

After the pre-test, changes were made accordingly, and a revised edition was used for the pilot study's second phase. The second phase had nine participants, four of

whom answered in Arabic and five of whom responded in English. The respondents were asked to provide more comments on the translation and the use of Arabic.

Both phases contributed to the design and content of the final questionnaire. Some modifications to the questionnaire were made, such as item rewording, re-categorising, changing the question type (open-ended to multiple choice) and, in some instances, changing the options in the multiple choice questions.

Table 4-16: Pre-test participants

Pre-test phase	Company	Size	Position	Method	Responses
First Phase	SME 1	Small	owner	interview	1/1
			manager	interview	1/1
	SME 2	Medium-large	manager	interview	1/1
			employees	interview	3/4
Second Phase	SME 3	Medium	CEO	interview	1/1
	SME 4	Medium	owner	interview	1/1
			manager	interview	1/1
	SME 5	Medium-large	CEO	interview	1/1
	SME 6	Small	owner	interview	1/1
			manager	interview	1/1
			employee	interview	1/1
	SME 7	Small	Owner-manager	interview	1/1

4.3.6.2 Survey Administration

As stated above, questionnaires can be either paper-based or online surveys. The paper-based survey was conducted in person. The researcher obtained the physical addresses of 30 SMEs, each with a total number of 200 employees randomly selected from the pool of potential respondents, as discussed in Section 5.2.2. A paper-based survey was chosen to reach those employees and owners of SMEs who might not have access to the online survey. Questionnaires completed face-to-face were used to reach senior owners and managers who might not find the online

or written survey convenient, and/or to include companies with IS not connected to the internet.

A total of 180 questionnaires were distributed, and 18 invitations were issued for the face-to-face questionnaire interviews. From the paper-based survey, 27 usable questionnaires were returned; a total of 14 face-to-face questionnaire interviews were conducted. This provided a total of 41 from 198 questionnaires, therefore generating a 20.7 per cent response rate for the paper-based survey. As noted above, a response rate of between 5 and 39 per cent might be expected from a survey of this type (Alfaadhel, 2010; Alsaleh, 2012).

Access to the online survey was provided via respondents' email addresses and, as previously stated, was hosted by ACSPRI (2014). The email invitation, including a link to the survey, was sent to those in a list that contained 877 email addresses. Follow-up emails were sent to thank those who had participated and to encourage others to participate.

Due to the nature of online surveys that use emails, the statistics relating to how many SMEs received the invitation to participate in the survey are unknown. Thus, the response rate cannot be calculated. A possible estimation of how many people may have received the invitation via email can be estimated by multiplying the number of emails with the average number of employees in SMEs. Thus, if the person receiving the invitation (usually the owner, CEO or manager, as they were usually the contacts in databases and/or on webpages) forwarded it to other employees in the same organisation (average number 5), then the number would be 877 (the number of emails issued) multiplied by 5 (the average number of employees in SMEs), which equals 4,385.In all, 390 responses were returned from the online survey, achieving an 8.9 per cent response rate (assuming that the survey was accessible to 4,385 people as estimated above).

In total, 431 suitable questionnaires (paper-based and online surveys) were gathered for analysis, therefore achieving a 9.4 per cent response rate (assuming that the online survey was accessible to 4,583 people in total). A response rate of 5 to 20 per cent is considered acceptable in similar studies.

Given the average use of IS in SMEs and the number of SMEs in Saudi Arabia, it was assumed in this study that the number of SMEs using IS would represent 14.4

per cent of the total number of SMEs in Saudi Arabia (Adaileh, 2012). Thus, approximately 120,000 SMEs in Saudi Arabia would be using IS. For a PhD project, receiving 431 responses with a response rate of 9.4 per cent is considered satisfactory. Table 4-17 summarises these results.

Table 4-17: Survey response rate

Methods		Distributed	Responses	Response rate
Paper-based survey	Semi-structured interview	18	14	20.7%
	Drop-off/pick-up questionnaire	180	27	
Online survey	Online questionnaire	4385	390	8.9%

As the targeted sample comprised SMEs in Saudi Arabia that had already implemented IS, the selection of SMEs was very difficult. There was no way to ensure that the participating SMEs met this criterion. The sample selection was based on signs that those SMEs were using IS, such as being a customer of an IS product or being linked with IS-related issues such as attendance at conferences of SMEs, and connection with agencies providing financial help to SMEs or with IS vendors of SMEs. In addition, signs of IS usage included Twitter accounts that referred to SMEs in their biographical profile and followed SME-related accounts. A double-check of the company's website was also performed to search for evidence of whether or not they used IS.

Further, to ensure that only the appropriate SMEs participated, clarification was sought in the invitation letter asking for participation if the SMEs had already implemented IS. The questionnaire contained a section regarding the IS type and provider, which could only be answered if the SME had already implemented an IS.

The targeted respondents were owners, managers and system end users within SMEs; they were identified as the most appropriate stakeholders for this study.

4.3.7 Survey Evaluation

Before starting the data analysis process, it was crucial that the survey used in this study be assessed. Survey assessment criteria can be divided into the three main dimensions of research design, sampling process and data collection (Fowler Jr, 2008; Pinsonneault & Kraemer, 1993). For each dimension, a number of criteria can be used to evaluate a survey. Table 4-18 details the evaluation dimensions and criteria applied to this study.

In addition, this research uses the concept of face validity. Face validity is a general measure of how representative a research study is at face value. In this research, the face validity concept is used in the form of the questionnaire pre-test (discussed in Section 5.3.1). Moreover, another form of face validity in this study is the researcher's manual check of the returned questionnaire to be accepted or rejected, based on concerns such as extreme answers (all positive, all negative or all neutral), contradictory answers and almost empty questionnaires.

In the survey design, five criteria are essential for evaluation. Regarding the survey's purpose, in which the purpose of the survey is stated clearly, the survey here is explanatory, as it tests and evaluates the a priori model developed in the previous phase. For survey type criteria, it is clear that the survey in this study is a cross-sectional design, as it collects data at one point in time from a sample that represents the population of interest at that time. Another criterion is the mix of research methods. This study used triangulation, consisting of a literature review, content analysis and the survey. It is also essential to define the survey's UoA, which is SMEs that had implemented IS/ES applications. Finally, respondents must be defined clearly as users of the IS application, either employees, owners or managers.

The second dimension in the evaluation criteria is the sampling procedure, and how it is representative of the sampling frame; this was explained by the use of estimation based on the normal response rate for similar studies. In addition, the sample size was sufficient to include the range of the phenomenon of interest.

The third dimension is data collection, which should include the pre-testing of questionnaires. This was undertaken in this study with a sub-set of the sample. Another criterion with data collection is the use of different methods to collect the

survey data; this study used a face-to-face questionnaire, a paper-based questionnaire and an online questionnaire distributed by email. This information is summarised in Table 4-18.

Table 4-18: Evaluation of survey criteria as applied to this study

Dimension	Criteria	Survey criteria as applied to this study
Research Design	Purpose of the survey	The survey in this study is explanatory. It tests and evaluates the a priori model developed in the previous phase.
	Survey type	The survey in this study is a cross-sectional design as it collects data at one point in time from a sample that represents the population of interest at that time.
	Mix of research Methods	Triangulation is used in this study as the model is developed using the qualitative method (content analysis) and a literature review.
	Unit(s) of analysis	SMEs that had implemented IS/ES applications are clearly defined as the UoA.
	Respondents	Users of the IS application, either employees, owners or managers.
Sampling Procedures	Representativeness of sampling frame	Estimation based on the normal response rate for similar studies.
	Sample size	Sufficient to include the range of the phenomenon of interest.
Data Collection	Pre-testing of Questionnaire	The pilot test is used with a sub-set of the sample.
	Mix of data collection methods	Face-to-face questionnaire, paper-based questionnaire, and online questionnaire distributed by email.

4.3.8 Descriptive Data Analysis

This section is dedicated to an account of the descriptive data analysis performed on the survey instrument items. This is an important part in any study and serves as an introduction to the data analysis. It confirms the sample's suitability and provides alerts about any bias or presumption problems in the sample data (Rogers, 1998).

As described earlier, the survey instrument comprised four parts that contained items associated with the constructs of the research model. Parts 1, 2 and 3 represented the demographic questions. Part 4 comprised questions related to measurement of the study's model to measure the impact of IS in Saudi Arabian SMEs. Therefore, the descriptive data analysis of the study comprised three main subsections: the frequencies of demographic variables, a description of the instrument items and comparative statistics for different groups.

4.3.8.1 Frequencies of Demographic Variables

As previously discussed, a total of 431 responses were received; 410 were complete, and 365 were valid for analysis. Respondents were classified according to the demographic questions, which sought information about their organisation, personal information and information about their organisation's ES. The next sections provide more details.

Classification according to Information about Respondents

Information about respondents, such as their gender, age, position, qualifications and experience divides the response data into groups according to the respondents' characteristics. Table 4-19 summarises the research participants' demographic characteristics according to their age, education level and sector.

In relation to gender classification, Table 4-19 shows that the majority (66.8%) of participants were male, with fewer (31.5%) females. This finding indicates that the sample represented the population well, as women in the labour force make up 21 per cent of employees in Saudi Arabia. The number of males in the labour force exceeding the number of females by more than 70 per cent (MCI, 2015). The reasons for the small percentage of female workers in comparison to male workers are related to cultural restrictions (Saudi Committee for International Trade [SCIT], 2015). Such issues include the total segregation between the sexes in Saudi Arabia, which makes

it extremely difficult for women to find suitable jobs in the wider community (Al-Asmari, 2008).

Many studies conducted in Saudi Arabia have an even smaller (or no) representation of female participants (Ahmad, 2012). This outcome might also be due to cultural restriction issues (Al-Asmari, 2008; SCIT, 2015), especially when the research is conducted with a male student in charge of data collection, whether in the form of interviews, paper-based questionnaires or online questionnaires. Total segregation between the sexes, including any communication between them, is an identifiable characteristics of Saudi society (Al-Asmari, 2008; Tuncalp, 1988). Hence, the distribution of sexes in this sample is highly representative, according to the statistics provided. It also overcomes the limitations of some Saudi studies in which samples are anticipated to have male bias.

Responses to the question about age were divided into five age groups. As indicated in Table 4-19, most participants were in their 20s and 30s (with 33.2% and 43.3% of participants, respectively). This age range was followed by participants in their 40s with 15.1 per cent. Further, only 4.7 per cent of participants were aged less than 20, and those aged over 50 comprised only 2.2 per cent of respondents. The two edge categories illustrate the real-life situation in Saudi Arabia where people under 20 are high school students or in their first years at university and are likely to be unemployed (Alnahdi, 2014). People aged over 50 are likely to be retired or senior managers of SMEs who do not like to use computers to respond to online questionnaires. For this reason, some data were collected using face-to-face questionnaires to reach these people. However, due to the time constraints of this research, only a few responses were obtained using this method.

Answers to the question about the respondent's position were predefined into three different groups. Management staff represented 25.8 per cent, 8.5 per cent were operational staff and IT staff comprised 14 per cent of the respondents. In addition, about half of the participants (47.9%) owned their companies. This particular finding reflected one characteristic of SMEs, which is that owners are usually involved in the work of their SMEs (Daily & Dollinger, 1993; McMahon, 2007) In these cases, the owner was assumed to be the manager of the SME. Therefore, when the owner is involved in the SME, he (or she) is likely to be the manager or in a higher position in the hierarchy, with more power than the manager (Kartiwi & MacGregor, 2007; Levy

& Powell, 2000; Snider et al., 2009; Yap et al., 1992). It is possible that the owner is not the SME manager, and this difference might affect the research model. However, this detail was ignored for simplicity and due to the study's main objectives and scope.

Four categories represented the participants' level of qualifications: less than high school, high school, bachelor degree and postgraduate degree. About half of the respondents had bachelor degrees (53.2%); a quarter had high school qualifications (25.8%); only 12.3 per cent had a postgraduate degree; while 7.4 per cent had qualifications less than high school level. Education levels in Saudi Arabia have increased dramatically in recent years (Alnahdi, 2014). The reasons for this dramatic increase are as follows: education is free; a university degree considerably increases the chances of securing government employment or another highly paid position; and a social premium is associated with having a university degree (Al-Asmari, 2008). According to the Saudi Ministry of Labor (2013), among the 9,679,635 workers in the private sector, 4,738,955 (49%) do not have formal education; 1,376,333 (14%) have qualifications below the high school level; 2,620,967 (27%) have the qualifications of high school level or higher; and 917,120 (9.5%) have higher education (graduate and postgraduate) qualifications.

The study's sample showed different representations of qualifications for the above statistics published by the Saudi Ministry of Labor (2013); the reason could relate to the study's data collection method. This method primarily relied on the online questionnaire; as such, it may not have reached workers with less or no education. In addition, with the context of this study being SMEs who had already implemented IS, it is also likely that their workers would be among those with higher levels of education. Further, the sample complies with that of a similar study on SMEs in Saudi Arabia by (Ahmad, 2012), in which the education level was dominated by bachelor degrees rather than high school qualifications. Thus, the descriptive analysis of the education level could indicate an acceptable level in terms of the representation of the sample, as shown with other demographic data in Table 4-19.

Table 4-19: Descriptive analysis of information about respondents

Class	Group	Frequency	Percentage
Gender	Male	244	66.8%
	Female	112	30.7%
	Missing	9	2.5%
Age	Less than 20	17	4.7%
	Between 20 and 29	121	33.2%
	Between 30 and 39	158	43.3%
	Between 40 and 49	55	15.1%
	50 or over	8	2.2%
	Missing	6	1.6%
Position	Owner	175	47.9%
	Management staff	94	25.8%
	Operational staff	31	8.5%
	IT staff	51	14.0%
	Missing	14	3.8%
Qualifications	Less than high school	27	7.4%
	High school	94	25.8%
	Bachelor degree	194	53.2%
	Postgraduate degree	45	12.3%
	Missing	5	1.4%
	Total for each class	365	100.0

Classification according to Information about the Organisation

Information about the organisation, such as the organisation's main sector, the size, the number of employees and the organisation's starting year helps break down response data into groups according to organisational characteristics. Table 4-20 summarises the descriptive analysis information about the organisation.

Information about the organisational sector was predefined into the three categories of manufacturing, trade and services, representing 21.1, 39.7 and 37.5 per cent of the responses, respectively. According to statistics from the CDSI (2010), the trade sector accounts for 48 per cent of the total organisations in Saudi Arabia, followed by the manufacturing sector with 11 per cent and then the services sector with 10 per cent (CDSI, 2010). Other sectors, such as construction, combine to form the remaining percentage. While the CDSI statistics include all organisations in Saudi Arabia, they can still provide some idea of the organisational classifications of SMEs, which represent the majority of all organisations (Saudi Ministry of Labor, 2013). Thus, it can be argued that the sample was a good representation of total organisations, as total organisations in Saudi Arabia are also dominated by the trade sector. In addition, the manufacturing and services sectors are close to each other in terms of their respective percentages of total organisations in Saudi Arabia. However, due to the difficulty of reaching manufacturing companies, which might be located in rural areas of Saudi Arabia, and also because the services sector might use computers more, the representation of services organisations was higher in the study's sample than that of manufacturing organisations.

Both the size of the organisation and the number of employees were used to confirm the representation of the sample, with only respondents from organisations considered small- and medium-sized organisations (i.e., with up to 100 employees) deemed valid. However, due to inconsistent SME definitions across different government agencies (Alshardan, Goodwin, & Rampersad, 2015), some respondents indicated they were from large organisations, even though the number of employees was equal to or less than 100 employees. In these cases, those respondents were considered valid respondents, provided they used another definition to classify themselves according to their size. Nevertheless, the sample had good coverage of SMEs with 47.4 per cent being from small organisations and 48.8 per cent from medium-sized organisations.

Table 4-20: Descriptive analysis of information about the organisation

Class	Groups	Frequency	Percentage
Organisation's main sector	Manufacturing	77	21.1%
	Trade	145	39.7%
	Services	137	37.5%
	-9 (Missing)	6	1.6%
Size of the organisation	Small	173	47.4%
	Medium-sized	178	48.8%
	Large	12	3.3%
	-9 (Missing)	2	0.5%
Number of employees	< 10	134	36.7%
	10 to < 50	126	34.5%
	50 to < 100	69	18.9%
	> or = 100	32	8.8%
	-9 (Missing)	4	1.1%
Organisation's starting year	< 1 year	45	12.3%
	1 to < 5 years	128	35.1%
	5 to < 10 years	63	17.3%
	> or = 10 years	108	29.6%
	-9 (Missing)	21	5.8%
	Total in each group	365	100.0%

The majority of organisations (36.7%) had fewer than ten employees: this category can be referred to as very small or micro-organisations (see Chapter 2). The next category comprised small organisations with employees ranging in number from 10 to 50 (34.5%). This was followed by medium-sized organisations, which represented 18.9 per cent of the sample. As mentioned in the previous category, small organisations represented 47.4 per cent of all organisations in Saudi Arabia, while medium-sized organisations represented 48.8 per cent. Although not consistent with the classification based on the number of employees, it reflected the different applications of SME definitions in Saudi Arabia (see Chapter 2).

The question about the organisation's starting year was intended to reflect the life cycle of the organisation. With seven years being the average life of SMEs (RCC, 2015), the ability of an IS to be helpful differs at various times along the SME's life cycle. IS provides minimal help in the SME's start-up stage with the level of assistance rapidly increasing until the SME reaches a stable position (Chin-Yueh, 2007). The many causes contributing to this include the problems that SMEs face at their start-up and establishment stages and the resources required. Therefore, this question can be used to further validate the sample and/or justify some of the findings. Responses to the question were predefined into four different groups: less than one year ago, which represented 12.3 per cent of responses; from 1 to 5 years ago (35.1%); from five to fewer than 10 years ago (17.3%); and 10 years or more ago with 29.6 per cent. This outcome reflected the average maturity of the organisations in the study's sample.

Classification according to Information about the ES

Information about the ES[2] in the target organisation was collected, including IT qualifications, the vendor and the number of users of the system. This information breaks down responses from the data into groups according to the ES. Table 4-21 summarises the descriptive analysis information about the ES.

For the question about an IT qualification, responses from the sample were divided into two groups: respondents with an IT qualification (34.8%) and those without (63.0%). Previous studies have found that a characteristic of SMEs is the lack of IT-qualified people or those with IT expertise (Deros et al., 2006; Snider et al., 2009). This was shown clearly in this study's sample, as more than half of the respondents did not have an IT qualification. In addition, with the lack of further description in the survey methodology, people may have considered any formal training they had received during high school or for their bachelor degree as an IT qualification. However, what was meant by IT qualification was an IT qualification that would help them operate an IS/ES in their SME: this could include training in SAP or Oracle, or any advanced IT training.

[2] ES is used here instead of IS. Please refer to Chapter 2 for more information about ES and IS.

The answers to the vendor question were categorised into three groups: international vendor (20.8%), local vendor (26.0%) and in-house software (27.9%). These three categories represent the types of IS in Saudi Arabia according to the pilot study and the market review conducted by the researcher. Examples of each group were provided in the questionnaire to clarify their meaning as follows: international vendor (e.g., Oracle, Microsoft and SAP) and local vendor (e.g., Arab Seas, Al-mada and Al Moammar).

Answers to the question about the number of users were divided into five groups. As indicated in Table 4-21, most organisations had 2 to 5 users (30.7%), while those with from 5 to 10 and 10 to 50 users were close to each other in percentage (12.3% and 12.9%, respectively). On the outer edges of the five groups, 11.8 per cent of organisations had only one user, while 4.9 per cent had 50 or more users. The latter percentage was not surprising given the smaller size of the organisations with which the study was concerned. However, the 'only one user' is somewhat surprising, although it is anticipated that the number of human resources, as well as other resources, in SMEs is limited (Love & Irani, 2004; Vrgovic et al., 2012).

Based on the respondents' demographics, it can be argued that respondents represented the wider SME community using IS in Saudi Arabia. The demographic data on respondents, in terms of gender, age group and qualifications, aligned with the current Saudi Arabia labour statistics and were in agreement with other studies in the same context. The participants represented a wide spectrum of different SMEs in terms of industries and the number of employees. In addition, both SMEs were part of the sample. Further, the majority of data were obtained from stable SMEs that had been in business for more than one year. The respondents' SMEs used IS/ES from both international and local vendors and had varying numbers of users using the system, regardless of whether they had an IT qualification.

It should also be noted that no official statistics or records of SMEs are available in Saudi Arabia; thus, it is not possible to compare the sample with the whole population. However, a comparison with labour statistics and with other studies in the same context (with a justification given for each classification) serves to calculate the sample's representativeness.

Table 4-21: Descriptive analysis of information about the ES

Class	Group	Frequency	Percentage
IT qualification	Yes	127	34.8%
	No	230	63.0%
	Missing	8	2.2%
Vendor	International vendor	76	20.8%
	Local vendor	95	26.0%
	In-house software	102	27.9%
	Missing	92	25.2%
Number of users	Only one	43	11.8%
	2 to < 5	112	30.7%
	5 to < 10	45	12.3%
	10 to < 50	47	12.9%
	50 or more	18	4.9%
	Missing	100	27.4%
	Total in each class	365	100.0%

4.3.8.2 Descriptive Analysis of Instrument Items

Descriptive statistics of scale measurement items have several roles in data analysis. By summarising a set of variables, descriptive statistics enable the variables to be compared. They also help the researcher select appropriate techniques for analysing the relationships between variables (inferential statistics). In addition, the coefficients (numbers that summarise the information) of descriptive statistics are the basis for most of the more advanced analyses (Schneider, 2009).

This section is dedicated to reporting the descriptive data analysis performed on the scale measurement items. As described earlier, the measurement items comprised five sections of the questionnaire (the instrument) and were associated with the research model constructs, 44 items in total: 'individual impact' (4 items), 'organisational impact' (12 items), 'system quality' (15 items), 'information quality' (6

items) and ‘vendor quality’ (7 items). In addition, six overall items for IS success were added to measure the constructs directly.

All items in the instrument were investigated and described using the following statistics: frequency, mean, standard deviation and standard error of the mean. It is important to note that the mean and standard deviation are invalid parameters for descriptive statistics whenever data are on ordinal scales (Allen & Seaman, 2007; Pallant, 2010). The data in this study are ordinal and thus cannot produce mean values, as means assume an interval scale and are not consequential for ordinal categorical data. However, it is common to treat data from Likert scales as interval data (Brown, 2011). In this case, it is recommended to report the percentage or frequency of participants who selected each option when producing the mean and standard division (Brown, 2011). Therefore, the descriptive analysis in this study includes the mean to show central tendency, standard deviation for variability and frequencies, as recommended for this type of scale (Brown, 2011).

This information is reported in Table 4-22 for all variables. A general examination of the variables reveals that the descriptive statistics are oriented towards a central tendency of 4, indicating that a majority of the responses to these questions were in agreement (the mean ranges from 4.08 to 4.65). The standard deviation reveals that responses for ‘awareness’ on the individual impact dimension had the highest variation in the distribution of observations (SD = 1.536), while responses to ‘flexibility’ on the ‘system quality’ dimension (SD = 1.207) were spread narrowly. A general inspection of the variables revels that all variables are within the accurate range; thus, the data have no outliers. This can be proved by the value of the mean, which reflects the central tendency of the data distributions. For all variables, the mean ranges from 4.08 to 4.65, which reflects that the data are distributed evenly. In addition, the standard deviation, which is the measure of the spread of data around the mean, gives a small number (less than 2 in all variables). This means the data contain no extreme answers. Frequencies show the actual responses for each number in the scales by the participants, as the average for each number in the scales below. It seems that the data are skewed to the right (most answers are for the number 4, 5 and 6)

Other information about the scale items, including normality, outliers and missing data analysis is verified in Chapter 5. A full description of the original scale can be found in Appendix D.

Table 4-22: Descriptive analysis of all items

Code	Variable name	Frequency*						N	Mean**	SD***
		1	2	3	4	5	6			
Individual impact										
II1	Learning	23	41	33	71	97	57	322	4.08	1.505
II2	Awareness	24	39	35	84	74	77	333	4.13	1.536
II3	Decision effectiveness	19	16	48	82	82	93	340	4.39	1.423
II4	Individual productivity	21	22	34	105	88	75	345	4.28	1.397
Organisational impact										
OI1	Organisational costs	20	23	38	93	87	72	333	4.26	1.412
OI2	Staff requirements	17	26	44	107	70	67	331	4.17	1.381
OI3	Cost reduction	17	17	40	94	101	55	324	4.27	1.316
OI4	Overall productivity	16	6	30	84	104	81	321	4.55	1.286
OI5	Improved outcome	15	14	24	94	92	90	329	4.53	1.323
OI6	Increased capacity	22	13	27	76	98	93	329	4.50	1.423
OI7	Business process change	16	14	22	77	95	110	334	4.65	1.360
OI8	Improved planning	18	14	29	88	92	86	327	4.47	1.369
OI9	Improved management	17	17	27	81	123	89	354	4.53	1.332
OI10	Increased competitiveness	15	10	41	96	126	64	352	4.42	1.235
OI11	Business innovation	18	24	44	98	112	60	356	4.24	1.336
OI12	Improved resource utilisation	19	16	27	95	125	68	350	4.41	1.310

Code	Variable name	Frequency*						N	Mean**	SD***
		1	2	3	4	5	6			
System quality										
SQ1	Ease of learning	18	32	40	98	90	58	336	4.14	1.388
SQ2	Ease of use	14	18	32	97	128	68	357	4.43	1.258
SQ3	Access	10	20	38	87	133	67	355	4.45	1.233
SQ4	User requirements	20	17	35	91	94	71	328	4.33	1.384
SQ5	System features	19	15	30	107	123	55	349	4.33	1.275
SQ6	System accuracy	18	16	29	99	124	60	346	4.37	1.286
SQ7	Flexibility	15	12	37	118	116	53	351	4.33	1.207
SQ8	Reliability	21	21	37	123	101	52	355	4.18	1.310
SQ9	Efficiency	19	12	36	95	133	55	350	4.36	1.270
SQ10	Sophistication	19	17	50	113	99	48	346	4.16	1.287
SQ11	Integration	17	9	53	97	118	54	348	4.30	1.253
SQ12	Multi-language	17	11	34	74	139	73	348	4.51	1.283
SQ13	Standardisation	18	18	40	88	126	49	339	4.28	1.299
SQ14	Security	23	14	43	111	109	42	342	4.15	1.298
SQ15	Scalability	25	5	34	83	134	71	352	4.45	1.337
Information quality										
IQ1	Importance	22	10	30	73	143	72	350	4.49	1.328
IQ2	Availability	14	12	33	106	122	56	343	4.39	1.209
IQ3	Usability	14	17	38	92	126	59	346	4.38	1.257
IQ4	Format	17	13	26	101	138	51	346	4.40	1.226
IQ5	Content accuracy	14	17	44	111	114	47	347	4.25	1.223
IQ6	Timeliness	15	8	43	100	136	47	349	4.36	1.185
Vendor quality										
VQ1	Maintenance	22	16	38	103	126	39	344	4.20	1.287
VQ2	Online services	17	21	43	103	127	31	342	4.15	1.238
VQ3	Reliability	16	14	38	104	124	44	340	4.29	1.226

Code	Variable name	Frequency*						N	Mean**	SD***
		1	2	3	4	5	6			
VQ4	Popularity	14	20	35	97	118	54	338	4.32	1.266
VQ5	Expertise	13	17	30	103	123	51	337	4.36	1.217
VQ6	Locally available	16	15	32	84	128	64	339	4.43	1.284
VQ7	Support (empathy)	20	19	29	104	127	43	342	4.25	1.284
Criterion Measures										
ALL1	Individual impact	19	23	55	82	93	78	350	4.26	1.416
ALL2	Organisational impact	11	17	44	90	104	88	354	4.48	1.289
ALL3	System quality	17	10	37	107	126	58	355	4.38	1.232
ALL4	Information quality	15	17	32	107	142	43	356	4.33	1.199
ALL5	Vendor quality	17	14	30	116	128	45	350	4.31	1.212
ALL6	Overall user satisfaction	16	10	35	100	141	55	357	4.41	1.207

Notes: *1 = strongly disagree to 6 = strongly agree
**The mean is not the most appropriate way to show the average because individual scales are different: it is shown here as a simple figure from the data.
***SD does not reflect the actual statistics because the data are not totally normal.

4.3.8.3 Comparative Statistics

This section reports on the further analyses conducted to investigate the potential differences between groups of interest. This was done to examine if respondents with specific characteristics expressed different views regarding the IS success measures. While the comparative investigation was included in the research questions, it was deemed useful to conduct this investigation to understand the model analysis results. The three investigations performed related to gender, employee cohort and IT qualifications. Criterion variables were used instead of computing composite variables for each construct. The analyses were performed using a one-way analysis of variance (ANOVA) test and a post-hoc test. The following sections present an analysis of each group.

Comparison by Gender

In Saudi Arabian society, gender is an issue, as females are disadvantaged in comparison with males (Alenaizan, 2014). Many gender-related legal and social restraints on women's employment outside the home are a result of lifestyle, cultural and religious factors and have received considerable attention from researchers over the past few years (Hutchings, Dawn Metcalfe, & Cooper, 2010; Tlaiss & Mendelson, 2014). Although Saudi Arabia now has more educated women than men (at the undergraduate degree level), women's participation in the labour force remains at such low levels that it generates considerable concern, with very few educated women involved in full-time employment (Alenaizan, 2014).

However, the situation has begun to change, with recently issued new regulations in favour of women's participation. According to the Ministry of Labor Saudi Arabia (2015), a number of regulations and decisions have been issued that aim to open up new areas of employment for Saudi women that are aligned with the (supposed) nature of women and compliant with Islam in the work with which they are able to engage. Examples of this new approach include : the 'feminisation' of shops through female staff selling women's necessities, such as cosmetics, gowns, bridal dresses and accessories. Other regulations aim to organise women's employment in sales accounting, to regulate decisions about women's employment in line with Islamic law and to provide women with a decent employment environment so they can maintain their rights. An example of this women working under codified regulations to deal with the public by identifying services for families and requiring physical barriers between male and female workers in work areas (Ministry of Labor Saudi Arabia, 2015) (Alenaizan, 2014; Tlaiss & Mendelson, 2014).

Therefore, to assess whether gender leads to expressed differences in the results, a ANOVA test was conducted using criterion measures. Table 4-23, which presents the result of the comparison, also shows the descriptive analysis of the two groups (males and females).

The ANOVA test results are then shown in Table 4-24. As can be observed, there are no significant differences between the two groups at the 0.05 significance level. Therefore, in this sample, it is concluded that male and female respondents expressed no differences in relation to the IS success measures. The current justification of this finding may vary in accordance with changes over time, new regulations and increased job opportunities among women.

Table 4-23: Comparative test and descriptive analysis of gender groups

						95% Confidence interval for mean			
		N	Mean	Std. dev.	Std. error	Lower bound	Upper bound	Min.	Max.
Individual impact	Male	234	4.26	1.417	.093	4.08	4.45	1	6
	Female	107	4.23	1.431	.138	3.96	4.51	1	6
	Total	341	4.26	1.419	.077	4.10	4.41	1	6
Organisational impact	Male	237	4.56	1.293	.084	4.40	4.73	1	6
	Female	108	4.31	1.271	.122	4.06	4.55	1	6
	Total	345	4.48	1.290	.069	4.34	4.62	1	6
System quality	Male	236	4.33	1.269	.083	4.17	4.50	1	6
	Female	110	4.48	1.147	.109	4.27	4.70	1	6
	Total	346	4.38	1.232	.066	4.25	4.51	1	6
Information quality	Male	237	4.38	1.203	.078	4.22	4.53	1	6
	Female	110	4.24	1.188	.113	4.01	4.46	1	6
	Total	347	4.33	1.198	.064	4.20	4.46	1	6
Vendor quality	Male	232	4.23	1.200	.079	4.07	4.38	1	6
	Female	109	4.46	1.206	.116	4.23	4.69	1	6
	Total	341	4.30	1.205	.065	4.17	4.43	1	6
Overall	Male	238	4.36	1.230	.080	4.20	4.51	1	6
	Female	110	4.54	1.147	.109	4.32	4.75	1	6
	Total	348	4.41	1.206	.065	4.29	4.54	1	6

Table 4-24: Comparative test and ANOVA test of gender groups

		Sum of squares	*df*	Mean square	*F*	Sig.
Individual impact	Between groups	.072	1	.072	.036	.850
	Within groups	684.732	339	2.020		
	Total	684.804	340			
Organisational Impact	Between groups	4.848	1	4.848	2.931	.088
	Within groups	567.280	343	1.654		
	Total	572.128	344			
System quality	Between groups	1.623	1	1.623	1.069	.302
	Within groups	522.019	344	1.517		
	Total	523.642	345			
Information quality	Between groups	1.455	1	1.455	1.013	.315
	Within groups	495.433	345	1.436		
	Total	496.888	346			
Vendor quality	Between groups	3.932	1	3.932	2.721	.100
	Within groups	489.956	339	1.445		
	Total	493.889	340			
Overall	Between groups	2.416	1	2.416	1.665	.198
	Within groups	501.997	346	1.451		
	Total	504.414	347			

Comparison by Employment Cohort

Previous studies have confirmed the differences among various employee groups within organisations in relation to their views of IS success (Sedera et al., 2006). The case of SMEs needs to be investigated to assess whether or not this also applies in the SME context. Therefore, ANOVA tests were conducted using criterion measures for four employee cohorts: owner, management staff, operational staff and IT staff. The results are shown in the following tables: Table 4-25 shows the descriptive analysis of the four groups, while Table 4-26 shows the ANOVA test results.

At a significance level of 0.05, statistically significant differences were present among the four groups for 'individual impact' and 'organisational impact' (p-value < 005). However, in the other dimensions ('system quality', 'information quality', 'vendor quality') and the overall IS success criterion measures, no statistically significant differences were apparent among the four groups. This result contradicts previous studies, such as those by Gable et al. (2008) in which different employee cohorts possessed diverse views of IS success in all dimensions.

ANOVA tests indicate whether an overall difference exists among groups, but it does not show which specific group or groups differ. To explore which group was different, the study constructed a multiple comparison table using post-hoc tests.

Various post-hoc could have been applied. As recommended by Abdi and Williams (2010), this study used Tukey's honestly significant difference (HSD) test. Tukey's HSD test is recommended by statisticians if data meet the assumption of homogeneity of variances (Fiedler, Grover, & Teng, 1996). The result of the post-hoc test is shown in Table 4-27. It is evident in this table that, in relation to the 'individual impact' dimension, the differences occurred between the owner and management staff and between the owner and IT staff. However, in relation to the 'organisational impact' dimension, the differences occurred between the owner and operational staff and between the owner and IT staff.

As may be recalled from the characteristics of SMEs (see Chapter 2), it is difficult to isolate tasks and functions within a particular employee cohort, as the manager of an SME might undertake employee tasks and vice versa. Therefore, this sample assumes that the four employee cohorts did not perceive any differences regarding the IS success measures. This is justified by referring to the difficulty of function

segregation, which is a confirmed characteristic among SMEs (Gable & Highland, 1993).

Table 4-25: Comparative test and descriptive analysis of four employment cohort groups

						95% Confidence interval for mean			
		N	Mean	Std. dev.	Std. error	Lower bound	Upper bound	Min.	Max.
Individual impact	Owner	170	4.62	1.380	.106	4.41	4.83	1	6
	Management staff	92	4.00	1.375	.143	3.72	4.28	1	6
	Operational staff	30	4.03	1.066	.195	3.64	4.43	2	6
	IT staff	46	3.67	1.431	.211	3.25	4.10	1	6
	Total	338	4.27	1.405	.076	4.12	4.42	1	6
Organisational impact	Owner	170	4.79	1.259	.097	4.60	4.98	1	6
	Management staff	92	4.36	1.201	.125	4.11	4.61	1	6
	Operational staff	31	4.06	1.237	.222	3.61	4.52	1	6
	IT staff	48	3.98	1.229	.177	3.62	4.34	1	6
	Total	341	4.50	1.273	.069	4.36	4.63	1	6
System quality	Owner	169	4.56	1.219	.094	4.37	4.74	1	6
	Management staff	91	4.16	1.128	.118	3.93	4.40	1	6
	Operational staff	31	4.48	1.288	.231	4.01	4.96	1	6
	IT staff	50	4.24	1.255	.177	3.88	4.60	1	6
	Total	341	4.40	1.215	.066	4.27	4.53	1	6
Information quality	Owner	169	4.51	1.171	.090	4.33	4.69	1	6
	Management staff	91	4.23	1.106	.116	4.00	4.46	1	6
	Operational staff	31	4.23	1.146	.206	3.81	4.65	1	6
	IT staff	51	4.10	1.315	.184	3.73	4.47	1	6
	Total	342	4.35	1.181	.064	4.22	4.47	1	6

		N	Mean	Std. dev.	Std. error	95% Confidence interval for mean		Min.	Max.
						Lower bound	Upper bound		
Vendor quality	Owner	167	4.37	1.205	.093	4.19	4.56	1	6
	Management staff	90	4.31	1.196	.126	4.06	4.56	1	6
	Operational staff	31	4.19	1.138	.204	3.78	4.61	1	6
	IT staff	49	4.27	1.186	.169	3.92	4.61	1	6
	Total	337	4.32	1.190	.065	4.20	4.45	1	6
Overall	Owner	170	4.58	1.215	.093	4.39	4.76	1	6
	Management staff	92	4.29	1.144	.119	4.06	4.53	1	6
	Operational staff	30	4.33	1.093	.200	3.93	4.74	1	6
	IT staff	51	4.25	1.214	.170	3.91	4.60	1	6
	Total	343	4.43	1.190	.064	4.31	4.56	1	6

Table 4-26: Comparative test and ANOVA test of four employment cohort groups

		Sum of squares	*df*	Mean square	*F*	Sig.
Individual impact	Between groups	45.977	3	15.326	8.270	.000
	Within groups	618.981	334	1.853		
	Total	664.959	337			
Organisational impact	Between groups	35.436	3	11.812	7.717	.000
	Within groups	515.807	337	1.531		
	Total	551.243	340			
System quality	Between groups	10.654	3	3.551	2.437	.065
	Within groups	491.105	337	1.457		
	Total	501.760	340			
Information quality	Between groups	9.274	3	3.091	2.241	.083
	Within groups	466.320	338	1.380		
	Total	475.594	341			
Vendor quality	Between groups	1.084	3	.361	.254	.859
	Within groups	474.661	333	1.425		
	Total	475.745	336			
Overall	Between groups	7.205	3	2.402	1.707	.165
	Within groups	476.935	339	1.407		
	Total	484.140	342			

Table 4-27: Comparative test and multiple comparisons (Tukey's HSD) test of four employment cohort groups

Dependent variable	(I) Position	(J) Position	Mean difference (I-J)	Std. error	Sig.	95% Confidence interval	
						Lower bound	Upper bound
Individual impact	Owner	Management staff	.624*	.176	.003	.17	1.08
		Operational staff	.590	.270	.128	-.11	1.29
		IT staff	.950*	.226	.000	.37	1.53
	Management staff	Owner	-.624*	.176	.003	-1.08	-.17
		Operational staff	-.033	.286	.999	-.77	.71
		IT staff	.326	.246	.547	-.31	.96
	Operational staff	Owner	-.590	.270	.128	-1.29	.11
		Management staff	.033	.286	.999	-.71	.77
		IT staff	.359	.319	.674	-.47	1.18
	IT staff	Owner	-.950*	.226	.000	-1.53	-.37
		Management staff	-.326	.246	.547	-.96	.31
		Operational staff	-.359	.319	.674	-1.18	.47
Organisational impact	Owner	Management staff	.435*	.160	.035	.02	.85
		Operational staff	.730*	.242	.014	.11	1.35
		IT staff	.815*	.202	.000	.29	1.34
	Management staff	Owner	-.435*	.160	.035	-.85	-.02
		Operational staff	.294	.257	.662	-.37	.96
		IT staff	.380	.220	.313	-.19	.95
	Operational staff	Owner	-.730*	.242	.014	-1.35	-.11
		Management staff	-.294	.257	.662	-.96	.37

Dependent variable	(I) Position	(J) Position	Mean difference (I-J)	Std. error	Sig.	95% Confidence interval	
						Lower bound	Upper bound
		IT staff	.085	.285	.991	-.65	.82
	IT staff	Owner	-.815*	.202	.000	-1.34	-.29
		Management staff	-.380	.220	.313	-.95	.19
		Operational staff	-.085	.285	.991	-.82	.65

Note: *The mean difference is significant at the 0.05 level.

Comparison by IT Qualification

SMEs are characterised by a lack of IT expertise (Snider et al., 2009). An IT qualification can enhance IS use within an organisation. In addition, a respondent with an IT qualification might express a different perspective on the required IS success measures, particularly regarding the 'system quality' dimension (Deros et al., 2006) Therefore, ANOVA tests were conducted using criterion measures to assess whether or not having an IT qualification altered the result. The results are shown in Tables 4-28 and 4-29: Table 4-28 shows the descriptive analysis of the four groups and Table 4-29 shows the ANOVA test results.

At the 0.05 significance level, no significant differences existed between the two groups in any dimension, with the exception of 'individual impact'. As there were only two groups, an additional test was not required.

The differences in the 'individual impact' dimension regarding having an IT qualification were to be expected, as the questions for this dimension concerned the impact on an individual resulting from IS (or ES) use. This impact included the effects of 'learning awareness', 'decision effectiveness' and 'individual productivity', which would naturally be different between people who already had qualifications and expertise in IS (through their IT qualification) and those who did not.

Table 4-28: Comparative test and descriptive analysis of IT qualification groups

						95% Confidence interval for mean			
		N	Mean	Std. dev.	Std. error	Lower bound	Upper bound	Min.	Max.
Individual impact	Yes	121	4.46	1.373	.125	4.22	4.71	1	6
	No	221	4.14	1.431	.096	3.95	4.33	1	6
	Total	342	4.25	1.417	.077	4.10	4.41	1	6
Organisational impact	Yes	122	4.46	1.318	.119	4.22	4.70	1	6
	No	225	4.48	1.279	.085	4.31	4.65	1	6
	Total	347	4.47	1.291	.069	4.34	4.61	1	6
System quality	Yes	125	4.46	1.254	.112	4.23	4.68	1	6
	No	222	4.32	1.223	.082	4.16	4.49	1	6
	Total	347	4.37	1.234	.066	4.24	4.50	1	6
Information quality	Yes	125	4.45	1.208	.108	4.23	4.66	1	6
	No	223	4.26	1.191	.080	4.10	4.42	1	6
	Total	348	4.33	1.199	.064	4.20	4.45	1	6
Vendor quality	Yes	124	4.37	1.278	.115	4.14	4.60	1	6
	No	218	4.29	1.181	.080	4.13	4.45	1	6
	Total	342	4.32	1.216	.066	4.19	4.45	1	6
Overall	Yes	125	4.52	1.222	.109	4.30	4.74	1	6
	No	224	4.36	1.204	.080	4.20	4.52	1	6
	Total	349	4.42	1.211	.065	4.29	4.54	1	6

Table 4-29: Comparative test and ANOVA test of IT qualification groups

		Sum of squares	*df*	Mean square	*F*	Sig.
Individual impact	Between groups	8.134	1	8.134	4.087	.044
	Within groups	676.734	340	1.990		
	Total	684.868	341			
Organisational impact	Between groups	.035	1	.035	.021	.885
	Within groups	576.455	345	1.671		
	Total	576.490	346			
System quality	Between groups	1.387	1	1.387	.910	.341
	Within groups	525.657	345	1.524		
	Total	527.043	346			
Information quality	Between groups	2.828	1	2.828	1.974	.161
	Within groups	495.827	346	1.433		
	Total	498.655	347			
Vendor quality	Between groups	.531	1	.531	.359	.550
	Within groups	503.729	340	1.482		
	Total	504.260	341			
Overall	Between groups	2.128	1	2.128	1.452	.229
	Within groups	508.629	347	1.466		
	Total	510.756	348			

4.3.9 Summary of the Quantitative Method

This section has presented the design and application of the research instrument for the validation stage using a survey. It has detailed the survey phase, including the survey instrument design, the sample and the research ethics. Data collection and administration of the survey were also detailed along with a survey evaluation. The section then provided descriptive data analyses of the survey, including frequencies

of demographic variables, descriptive statistics of the model items and comparative statistics among three groups of interest.

4.4 Chapter Summary

The methodology chapter has presented the main qualitative and quantitative methods used in this study. In the qualitative phase, the model was established using the content analysis of 30 published case studies from different developing countries. By analysing customers' quotations, the study identified 566 benefits, which were then synthesised into non-overlapping benefits. To ensure the completeness and validity of the identified benefits, academic studies were used to identify and compare IS benefits with the benefits collected from customers' success stories, giving a total of 181 identified benefits. Further, in contrast to existing studies based on the D&M model (DeLone & McLean, 1992, 2003), this study has built on and extended the IS impact measurement model (Gable et al., 2008), which is deemed suitable in this context. Finally, the benefits were mapped to the IS impact model, which provided the conceptual foundation of this research. Many benefits that emerged were not covered by the existing IS impact model, demonstrating the necessity for a new benefits measurement model for IS in developing country SMEs. By combining the identified benefits with the characteristics of both SMEs and developing countries, this study has consolidated a preliminary measurement model for IS in developing country SMEs. The model consists of four dimensions with 44 benefits measures. After development of this model, hypotheses were established to be tested in the next phase: the validation phase, using the quantitative survey method.

In the quantitative phase, the design and application of the research instrument for the validation stage were presented. An overview of the survey phase was provided, including the survey instrument design, the sample and the research ethics. Details were also given concerning the data collection method and administration of the survey, followed by an evaluation of the survey. Discussion was then made of the descriptive data analyses used in the survey, including frequencies of demographic variables, descriptive statistics of the model items and comparative statistics among the three groups of interest. The next chapter, Chapter 5, presents the data analysis, including pre-analysis and model testing.

Chapter 5. QUANTITATIVE RESULTS

5.1 Chapter Introduction

To achieve the research objective through gaining understanding of the questionnaire results, data analysis was undertaken using IBM's SPSS Version 22 and SPSS AMOS, Version 22 software (IBM Corp, released 2013).

This chapter first discusses the data analysis methods applied in this study, which mainly comprised analyses using the formative and reflective models, SEM and CFA. The technical data analyses in this chapter are divided into two main sections. The first section comprises the preparation for data analysis, which includes the data screening methods. The second section includes all the results from applying the SEM and CFA analysis techniques in the research model at both construct and structural model levels. The chapter presents the results of the reliability and validity tests performed on the final model. Finally, the chapter summary is presented.

The researcher understands the importance of quantitative methodology and undertook a training course in quantitative data analysis methods using SPSS and SEM. Further, the researcher organised consultant sessions when deciding on which analysis techniques to use in the study, as well as to learn the techniques.

5.2 Data Analysis Methods

This section provides an overview of the data analysis methods and techniques used in this study. It addresses three measurement topics: formative and reflective measurement models, SEM and CFA. The section then identifies the analysis techniques used in this study.

5.2.1 Formative and Reflective Measurement

Valid measurements are a necessary condition for model development and testing. The current research in IS and other disciplines has differentiated between two types of measurement models: reflective and formative. These two models differ in their underlying assumptions regarding the causal relationship between the LV and its indicators (Christophersen & Konradt, 2012).

Choosing between formative and reflective measurement models continues to be an important issue (Christophersen & Konradt, 2012). This development can result in

many changes when structuring and testing a final model. The current research in IS and other disciplines has delivered contradictory recommendations on the use of both reflective and formative measures. This is especially so with IS (Bagozzi, 2011; Cadogan & Lee, 2013; Christophersen & Konradt, 2012; Coltman, Devinney, Midgley, & Venaik, 2008; Diamantopoulos, 2011; Diamantopoulos, Riefler, & Roth, 2008; Diamantopoulos & Winklhofer, 2001; Edwards, 2011; Finn & Wang, 2014; Freeze & Raschke, 2007; Gable & Sedera, 2009; Hardin, Chang, Fuller, & Torkzadeh, 2010; Hardin & Marcoulides, 2011; Howell, Breivik, & Wilcox, 2007, 2013; Jarvis, MacKenzie, & Podsakoff, 2003; Kim, 2011; Lee & Cadogan, 2013; Lee, Cadogan, & Chamberlain, 2013; Petter, Straub, & Rai, 2007; Rigdon, 2014; Simonetto, 2012; Wilcox, Howell, & Breivik, 2008). Appendix B provides an overview of both types of measurement, a discussion of the differences between them and justification for the type used in this study.

The conclusions from this review (presented in Appendix B) suggested that a reflective model should be used in this study. Recommendations to use reflective measures over formative ones criticise formative measures as being 'plagued with more problems than their proponents have acknowledged' (Lance, 2011, p. 238). Reasons for this conclusion are highlighted in Table 5-1 below.

Table 5-1: Justification for the use of reflective measures over formative measures

Reasons	Description
Theoretical background	Traditional (reflective) indicators are applied based on classical test theory; however, the application of causal (formative) indicators is based on practical application rather than on supported psychometric theory (Hardin et al., 2010). In addition, Edwards (2011) argues that using formative measurement is misguided, and that justifications given for measures are based on expressed beliefs about constructs, measures, causality and other measurement issues that are difficult to defend.
Misunderstanding of formative variables	Howell et al. (2013) claim that the precise meaning of formative indicators remains unclear. This misunderstanding occurs among researchers who tend to use formative indicators as, in most cases, they are actually using a composite variable. Accordingly, their empirical tests do not provide information on the relationships between antecedent and formative LVs (Cadogan & Lee, 2013). Further, Bollen (2011) emphasises that causal indicators are distinct from composite (formative) indicators with this difference having significant implications for the applicability of formative measurement validation techniques because these techniques do not apply to composite variables (Hardin & Marcoulides, 2011).
Statistical problems	Two major problems occur when dealing with formative LVs statistically. First, the formative measurement approach does not allow estimation of the parameters of a formative model within a structural equation model without linking the LV to at least one other LV. Second, the estimates are biased if a critical degree of multi-collinearity exists between the formative indicators (Christophersen & Konradt, 2012).

5.2.2 SEM Overview

SEM is a comprehensive statistical approach to testing hypotheses about the relationships among observed and LVs (Hoyle, 1995). It is classified as a second-generation data analysis technique that can be used to find and simultaneously test complex relationships. Unlike first-generation statistical approaches such as

regression, SEM allows researchers to answer a set of interrelated research questions in a single, systematic and comprehensive analysis (Gefen, Straub, & Boudreau, 2000).

The measurement model in this study is a complex. It has five latent constructs with causal relationships among these latent constructs. Thus, the relationships to be assessed are not only those between single observed variables. Therefore, conventional regression and path analyses were not suitable here. As a more advanced technique was required, SEM was conducted to evaluate and test statistically significant relationships between the model constructs. SEM uses generic tools and provides many different statistical methods (Bagozzi & Yi, 2012). The SEM methods for use can be identified from the structure and relationships among constructs in the model. The structure of the current study's model is known as second-order CFA; thus, second-order CFA techniques were used to analyse the model.

5.2.3 Factor Analysis

Factor analysis is a collection of methods that examine how underlying constructs influence responses on a number of measured variables (DeCoster, 1998). Two categories of factor analysis are used: exploratory and confirmatory. The purpose of exploratory factor analysis (EFA) is to discover the nature of the constructs influencing a set of responses, whereas CFA aims to investigate whether a specified set of constructs is influencing responses in a predictable way (DeCoster, 1998).

According to Hurley et al. (1997), both EFA and CFA are appropriate in different situations: EFA is appropriate for scale development, while CFA is preferred when an underlying existing theory is in place. This study has used CFA, although EFA could have been used to validate the new instrument. However, EFA is relatively data driven and would only confirm the model in accordance with the sample data. The model in the current study was driven according to qualitative methods, which included content analysis and literature reviews. As such, EFA was not used in this study. CFA is undertaken in two stages: the first stage occurred at the construct level (first order) to analyse the constructs and refine the scale. The second stage again used CFA, this time to analyse the measurement model (second order) that had already been hypothesised according to the qualitative data analysis.

Another reason for not using EFA is that many studies have assumed that the two tests should be performed in separate samples. However, the pre-test study only had 14 cases, which was not enough (according to the factorability test). Another method would have been to split the data randomly between EFA and CFA; however, this would have decreased the sample size, which is not preferable when working with CFA (see Section 5.2.3). Therefore, the study followed the recommendation to use only CFA.

SEM and second-order CFA were conducted sequentially to evaluate and test statistically significant relationships between the model constructs. Based on these results, the model was further refined by removing non-significant links and then reassessed to produce the final model. The final model was assessed for goodness-of-fit, reliability and validity, as discussed in the next sections.

5.2.4 CFA

CFA is a special form of factor analysis used to test whether the data fit a hypothesised measurement model (Schreiber, Nora, Stage, Barlow, & King, 2006). CFA techniques were performed in this study using SPSS AMOS, Version 22 software.

The main reason for choosing CFA was that it is more theoretically driven, unlike EFA, which has been identified as a data-driven technique (Barendse, Oort, & Timmerman, 2015). CFA allows researchers to base their hypothesised models on the required theory to defend the relationships between constructs and justify the number of factors required for each construct. This phase is a validation phase for existing hypothesised models that have an underlying theoretical base. Here, CFA is used to determine the validity of the presumed relationships between the latent construct and measurement items, and the relationships between latent constructs in the structural measurement model. Thus, in accordance with the hypothesised model in this study (see Chapter 4, Figure 4-2:), second-order CFA was chosen for the analysis using guidelines suggested by (Hurley et al., 1997; Schreiber et al., 2006) (see Section 6.2.6).

The assessment process for the model using CFA comprised scale refinement for each construct, then assessment of the structural model fit using estimation methods. Finally, an assessment of reliability and validity was undertaken. Assessing

the model at both construct and structural levels involved multiple iterations of applying goodness-of-fit indices to test statistically significant relationships between the model constructs and variables (independent and dependent variables). Based on the results of the fit indices, the model was refined by removing non-significant links and then reassessed to produce the final model. The following sections provide an overview of the major goodness-of-fit indices. Table 5-2 presents a summary of acceptable cut-off values for selected goodness-of-fit indices. Another modification to the model that helped to achieve an acceptable fit was using correlation between errors of the variable as suggested by (Lance, 2011). Further, under certain conditions of unidimensionality, parcelling can be considered for a better fit (Little, Cunningham, Shahar, & Widaman, 2002; Yang, Nay, & Hoyle, 2009).

5.2.5 Fit Statistics and Residuals

The following sections are all derived from Holmes-Smith (2014).

5.2.5.1 Chi-square

The chi-square (χ^2) statistic tests the hypothesis that states there is no difference between $\hat{\Sigma}$ and S, where $\hat{\Sigma}$ is the matrix of implied variances and covariances, and 'S' is the matrix of empirical sample variances and covariances (Holmes-Smith, 2014). To be precise, it is a test of the exact fit of a model. The acceptable level (cut-off point) of the *p*-value should be greater than 0.05 for multi-variate normal data. However, using χ^2 is complicated by several factors. First, it is sensitive to sample size (Gulliksen & Tukey, 1958). For this reason, researchers working with large samples risk committing a Type I error in which they may reject an acceptable model when it is in fact true (Holmes-Smith, 2014). Second, an χ^2 based on a normal theory estimation method will result in an inflated χ^2 estimate if the data deviate significantly from multi-variate normality, leading to the possible rejection of an acceptable model when it is in fact true. Third, (N-1) times the minimum value of the fit function has an χ^2 distribution only when the model holds exactly in the population (Holmes-Smith, 2014). With a sample size of 365 in the current study being classified as large (more than 100), the study could be affected by this issue arising from using the chi-square statistic (Gefen et al., 2000; Hooper, Coughlan, & Mullen, 2008). As a consequence, this study did not focus on the chi-square statistic: instead, other fit indices, such as the root mean square error of approximation (RMSEA) were used.

5.2.5.2 RMSEA

The root mean square error of approximation (RMSEA) takes into account the error of approximation in the population and relaxes the stringent requirement of χ^2 that the model holds exactly in the population. As such, RMSEA is a measure of the discrepancy per degree of freedom (*df*), having first somewhat diminished the discrepancy function as a function of sample size (Holmes-Smith, 2014).

Browne, Cudeck, Bollen, and Long (1993) have suggested that a RMSEA of 0.05 or less indicates a close fit, suggesting that the model is acceptable. They also recommend a test of the hypothesis that RMSEA ≤ 0.05 (called PCLOSE). If PCLOSE < 0.05, we can conclude it is likely that RMSEA < 0.05 is less than 5 per cent due to chance alone and reject the close fit hypothesis. Alternatively, if PCLOSE > 0.05, we can accept the close fit hypothesis; that is, we accept that the model is a close representation of the data being tenable. In addition, a 90 per cent confidence interval on the population value of RMSEA can be computed. If the lower limit (LO 90) is equal to zero (0), the hypothesis that the model is an exact fit is supported (Holmes-Smith, 2014).

5.2.5.3 Normed Chi-Square

Another problem with χ^2 is that the more complex the model, the larger the χ^2 will be and the more likely it is that the specified model will be rejected. For this reason, a 'normed' χ^2 ($\chi^{2/}df$) is sometimes used where χ^2 is divided by the degrees of freedom for the model, to give an χ^2 measure per degree of freedom. As the $\chi^{2/}df$ accounts for model complexity, it can also be referred to as an index of model parsimony. In this sense, very small values of the normed χ^2 could have been achieved by making χ^2 very small relative to the remaining degrees of freedom. An acceptable level of χ^2/df should be greater than 1.0 but smaller than 2.0 (values less than 1.0 indicate an overfit) (Holmes-Smith, 2014).

5.2.5.4 RMR and SRMR

The root mean square residual (RMR) is a measure of the average difference (residual) between $\hat{\Sigma}$ and S per element of the variance–covariance matrix. However, the standardised RMR (SRMR) should be assessed, rather than the raw RMR as the size of the RMR can be affected significantly by the order of magnitude

of the observed variables' scales. An acceptable level of standardised RMR should be less than 0.06. Very large values for the standardised RMR could suggest the presence of outliers in the raw data (Holmes-Smith, 2014).

5.2.5.5 Incremental (or Comparative) Fit Indices

Incremental fit indices measure how much better fitted the model is when compared to a baseline model. The most often used baseline model for comparison is the null model: here, the only model parameters are the variances of the observed variables. These indices typically lie between zero (0) and one (1), where 0 indicates that the specified model is no better fit than the independent model, and a value of 1 indicates that the specified model is a perfect fit. Incremental fit indices computed by AMOS include: the goodness-of-fit index (GFI); the adjusted goodness-of-fit index (AGFI); the normed fit index (NFI); the non-normed fit index (NNFI) (also called the Tucker–Lewis index [TLI]); the parsimony normed fit index (PNFI); the comparative fit index (CFI); the incremental fit index (IFI); and the relative fit index (RFI) (Holmes-Smith, 2014). A summary of acceptable cut-off values for selected goodness-of-fit indices is shown in Table 5-2.

Table 5-2: Summary of acceptable cut-off values of selected goodness-of-fit indices

Name	Abbrev.	Acceptable level
Chi-square	χ^2 (*df*, *p*)	$p > 0.05$
Root mean square error of approximation	RMSEA	RMSEA < 0.05 PCLOSE > 0.05 LO 90 = 0
Normed chi-square	χ^2/df	$1.0 < \chi^2/df < 2.0$
RMR (standardised)	SRMR	SRMR < 0.06
Goodness-of-fit index and adjusted goodness-of-fit index	GFI AGFI	GFI and AGFI > 0.95
Tucker–Lewis index, Non-normed fit index or rho2	TLI, NNFI or □2	TLI > 0.95
Comparative fit index	CFI	CFI > 0.95

Source: Adapted from Holmes-Smith (2014)

5.2.6 Identification and Selection of Analysis Technique

It is important that the data analysis technique used in a study is planned in the survey design phase to ensure that all the data required are collected to fit the analysis technique (Cooper & Schindler, 2006).

Quantitative data are used in the validation stage of the current study. Therefore, a quantitative analysis is required, using SPSS and AMOS software. It is also important to use guidelines for data analysis, to ensure accepted statistical methods are followed effectively regarding how to display data and summarise the statistical analysis results.

This study, in applying SEM and CFA, has followed Schreiber et al.'s (2006) guide for data analysis techniques. Table 5-3 summarises the techniques identified in these guidelines and refers to the relevant part of the thesis in which the analysis technique is described. The next sections discuss the details of these techniques.

Table 5-3: Data analysis techniques

Stage	Techniques	Part of the thesis/comment
Non-technical evaluative issues	Research questions	Chapter 1
	Theoretical justification	Chapter 4, Chapter 7
	CFA/SEM introduced	Chapter 6, Section 2
	Tables and figures	Throughout the thesis
	Diagram of final model	Chapter 6
	Implications	Chapter 8
Pre-analysis technical issues	Missing data	Chapter 6, Section 3
	Normality	Chapter 6, Section 3
	Outliers	Chapter 6, Section 3
	Linearity/multi-collinearity	Not applicable
	Software and estimation method	Chapter 6, Section 3
Post-analysis technical issues	Assessment of fit	Chapter 6, Section 4
	Modifications	Chapter 6, Chapter 7
	Rationale for modifications	Chapter 6, Chapter 7
	Correlation means and tables	Appendix E
	Standardised and unstandardised estimates	Chapter 6, Section 4 Appendix C

Note: As identified by Schreiber et al. (2006)

Schreiber et al.'s (2006) guidelines comprise three categories of issues: non-technical evaluative, pre-analysis technical and post-analysis technical. As shown in Table 5-3, they have identified six non-technical issues when using CFA or SEM, all of which are addressed in the chapter/section indicated on the table.

The pre-analysis techniques and post-analysis techniques were all applicable in this study, except for collinearity/multi-collinearity, which appeared inapplicable. The reason for this is that SEM resolves problems of collinearity implicitly, whereas multi-collinearity cannot occur as the multiple measures required to describe unobserved variables represent distinct latent constructs (Ashill, 2011; Suhr, 2006).

Consequently, Straub, Boudreau and Gefen's (2004) guidelines for testing different types of research validity were used to identify the validity techniques undertaken in this study. Table 5-4 presents Straub et al.'s (2004) recommendations for the types of research validity; the table also indicates the application of these types of validity in the present study.

Table 5-4: Guidelines for research validity

Validity	Recommendation	Applied in this study?
Content validity	Highly recommended	Yes
Construct validity	Mandatory	Yes
Predictive validity	Optional	No
Reliability (internal consistency)	Mandatory (where appropriate)	Yes
Reliability (split halves)	Optional in mature research streams	No
Reliability (alternative forms)	Optional in mature research streams	No
Inter-rater reliability	Mandatory (where appropriate)	No
Unidimensional reliability	Optional	No
Manipulation validity for experiments	Mandatory (where appropriate)	N/A
Nomological validity	Highly recommended	N/A
Common methods bias	Highly recommended	N/A
Statistical conclusion validity	Mandatory	Yes

Note: Sourced from Straub et al. (2004)

All mandatory recommendations were used, except for inter-rater reliability, which is used to measure the agreement between two people (called raters) on the assignment of categories to variables (Gwet, 2014). This was not applicable in this study. In addition, manipulation validity is a specific validity test for research that conducts experiments, so it was not applicable either.

The study adopted most of the highly recommended types of validity if they were applicable: some were not applicable to this study, such as nomological validity and common methods bias. They tend to be used with formative models (Straub et al., 2004).

Some of the optional recommendations, such as unidimensionality (or unidimensional reliability), which is similar to the concept of internal reliability, were tested and reported on within other types of analysis.

Statistical conclusion validity was used as, through using SEM, statistical conclusion validity could be achieved. Gefen et al. (2000) have noted this.

For those techniques chosen to test validity and reliability, extensive research of the literature and previous studies was undertaken to learn and set guidelines for use in this study. This procedure is described in detail in Section 5.5.3.

5.3 Preparation for Data Analysis

Data preparation (also called data screening) is an important stage in any survey. It has a tremendous influence on the quality of data produced. This is the stage in which data are reviewed for errors prior to conducting analysis. Data screening is essential to ensure that the data are useful, reliable and valid for testing. The screening may involve checking raw data for normality, identifying outliers and dealing with missing data. Further, to identify the analysis technique required, it is important to decide whether the model is formative or reflective. A discussion of this is introduced in the next section, followed by a presentation of the data screening techniques.

5.3.1 Software and Estimation Method

The data analysis was accomplished using IBM software, SPSS Version 22 and SPSS AMOS Version 22 (IBM Corp, released 2013). IBM SPSS Statistics is a well-

known range of computer applications that supports statistical analysis of data. It allows in-depth data access and preparation, analytical reporting, graphics and modelling. This study required the use of SEM techniques (as discussed in Section 5.2.2) to conduct SEM: therefore, SEM software programs (such as AMOS) were necessary for the analysis.

AMOS software helps to specify, estimate, assess and present models of the relationships hypothesised among variables. By using AMOS software, it is easy to build, compare, confirm and refine models. Many other software packages are available to provide support for some SEM statistics functions (refer to Section 5.2.2). The most commonly used programs are AMOS, Mplus, LISREL and EQS.

AMOS software was used in this study for three main reasons. First, AMOS software was available: as AMOS has been included as an 'add-on' module to IBM SPSS, Flinders University has a site licence for this product that allows unlimited use on computers owned by the university. This site licence includes provision for home use by university staff and postgraduate students. Second, in addition to the resources and workshops available for training in AMOS, AMOS is easy-to-use, friendly software and has a graphical user interface that also assists learning. Third, AMOS is a powerful SEM tool and is efficient in using Bayesian analysis to improve estimates of model parameters. It also offers various data imputation methods to create different data sets.

In opting to use AMOS software, it was necessary to choose some estimations. As the data in this study were distributed normally, maximum likelihood (ML) parameter estimation was chosen over other estimation methods, such as weighted least squares, two-stage least squares and asymptotically distribution-free (ADF) interval estimation (Schreiber et al., 2006): other settings and methods of estimation particular to some methods are specified in the method discussion.

5.3.2 Cleansing the Data

Cleansing the data comprises two steps: the first is undertaken before data entry and involves cleansing the returned questionnaire data for completeness, validity and reliability. This is a very important step for ensuring the quality of collected data. The second step is coding and data entry. It is worth noting that, as most of the responses in this study were based on the online survey, minimal work was undertaken to enter

the paper-based questionnaires. Only 41 (14 + 27) paper questionnaires were returned.

For the online questionnaire, the data were transferred from the ACSPRI survey into Microsoft (MS) Excel spreadsheets and then into SPSS format. The ACSPRI survey supports the SPSS format; thus, the data could be transferred directly. However, due to responses in Arabic, it was necessary to transfer responses to MS Excel, perform manual language conversion in MS Excel and then transfer the MS Excel file to SPSS format.

After entering all data, the final step of cleansing ensured the validity of the cases and removed any invalid and overt bias or responses. The typical method used was to identify crucial variables in the data, to define what constituted a complete case. The 44 measures were the crucial variables in the survey: without them, the survey responses were useless and would have had to be deleted. Rahm and Do (2000) have suggested the use of analysis programs to gain metadata about data properties and to detect data quality problems, in addition to a manual inspection of data or data samples (Rahm & Do, 2000).

A very simple validation step in relation to invalid data was performed by accepting only cases that had responses to at least 30 per cent of the measurement factors (crucial variables). Accordingly, 410 cases were returned as valid cases, while 21 cases were omitted due to a high number of missing values, as shown in Table 5-5 below. Some cases were not representative of the sample and hence were removed from the data set. As shown in Table 5-6, 45 organisations had 100 or more employees and were defined as large organisations by respondents. As a validation step, these organisations were removed from the SME sample. However, some medium-sized organisations also had more than 100 employees; however, these were defined by respondents as medium-sized and were classified as SMEs.

Table 5-5: Validation of the received responses

Methods		Received	Valid
Paper-based questionnaires	Interview	14	14
	Drop-off/pick-up	27	27
Online questionnaire	Via emails	390	369
Total		431	410

Table 5-6: Sample according to organisation size

		Size of the organisation		
		Small N	Medium-sized N	Large N
Number of employees	Less than 10	119	15	0
	From 10 to less than 50	47	74	5
	From 50 to less than 100	5	58	6
	100 or more	1	30	45

5.3.3 Assessment of Normality

The normality test refers to testing for the normal distribution of the variables' data. The assumption of normality needs to be checked for many statistical procedures (Ghasemi & Zahediasl, 2012). Many tests are known to assess normality: the Kolmogorov–Smirnov (K–S) test; the Shapiro–Wilk test; the Anderson–Darling test; the Cramer–von Mises test; the D'Agostino skewness test; the Anscombe–Glynn kurtosis test; the D'Agostino–Pearson omnibus test; and the Jarque–Bera test. Among these, the most common normality test is the skewness and kurtosis test (Ghasemi & Zahediasl, 2012). Skewness refers to the symmetry of the distributions, while kurtosis refers to the sharpness of the distributions' peaks (Upton & Cook, 2008). Ghasemi and Zahediasl (2012) have suggested that normality be assessed both visually and through normality tests provided by SPSS software. Therefore, the current study conducted the normality test by testing skewness and kurtosis. Normal distributions have zero values for skewness and kurtosis. When the values of skewness and kurtosis are too large, this means that the data are not normal. As

suggested by many scholars (e.g., Finney & DiStefano, 2006; West, Finch, & Curran, 1995), acceptable values of skewness and kurtosis should not exceed absolute values of 2 and 7, respectively. Accordingly, the data distribution of the variables in this study was determined as normal, given that the largest absolute values of skewness and kurtosis were 1.142 and 1.079, respectively. The normality table is shown in Appendix E.

5.3.4 Screening for Outliers

Outlier analysis can be used to identify respondents who provide responses far from the mean of a set of items (Meade & Craig, 2012). These responses can be detected simply from the descriptive frequencies of each variable or by inspecting the histogram distributions for each variable. Alternatively, inbuilt features of the SEM package using AMOS software provide this screening. Once outliers are detected, they can be dealt with by applying different approaches. In this study, screening for outliers was performed using AMOS software: no outliers were detected.

5.3.5 Missing Data Analysis

Traditionally, researchers have employed a wide variety of techniques to deal with missing values. The most commonly used techniques include deletion and single imputation approaches (Baraldi & Enders, 2010; Enders & Bandalos, 2001; Hernández & Stolfo, 1998; Meade & Craig, 2012; Rahm & Do, 2000; Zhu et al., 2008). Modern techniques for missing data include ML and multiple imputation (Baraldi & Enders, 2010; Schafer & Graham, 2002). The technique used in this study is full information ML (FIML): this direct model-based method computes the case-wise likelihood function with observed variables for each case (Enders & Bandalos, 2001). Enders and Bandalos (2001) are convinced that FIML estimation is the best method for treating missing data as it produces the least bias in the missing value. In this study, missing data were tackled using SPSS (IBM Corp, Released 2013) in which FIML estimation was performed.

5.3.6 Standard Deviation and Standard Error of the Mean

The standard deviation is a numerical value used to indicate how close the entire set of data is to the average (Curran-Everett & Benos, 2004; Hanson, 1975). It reflects the dispersion of individual sample observations about the sample mean. Therefore

the standard deviation, which is derived statistically from the square root of the variance (Livingston, 2004), can detect the variability of the data.

The standard error of the mean is a common statistical term that measures the accuracy of the sample representation of a population. It is the term used when a sample mean deviates from the actual mean of a population. The smaller the standard error, the more representative the sample will be of the overall population (Livingston, 2004). As the standard error of the mean reflects the theoretical dispersion of sample means about some population mean, it characterises the uncertainty about the true value of that population mean (Curran-Everett & Benos, 2004). Statistically, it is calculated using the standard deviation and the population size (Thompson, Schwartz, Davis, & Panacek, 1996). Most statistical software programs, including MS Excel and SPSS, have predefined functions to calculate the standard deviation and standard error of mean. Appendix E shows the standard deviation and standard error of the mean for all variables in the model.

5.4 Model Test

The a priori model (the hypothesis model), developed in Chapter 4 (see Figure 4-2), was first tested using the model test procedure. As there was no fit at this stage, this suggested that model modifications and refinement were needed to determine a proper fit for the model with the sample data. First, in line with the suggestions of many scholars (e.g., Rampersad, Quester, & Troshani, 2010; Schumacker & Lomax, 2004), the model was tested at the construct level using CFA, prior to combining the constructs structurally (the structural model). This was important for diagnosing and reducing problems that could amalgamate at later stages (Rampersad, 2008). Therefore, a test was performed for each construct in isolation and some modification was undertaken to achieve the required fit (a perfect fit is not assumed at the construct level as the final structural model has more combined data to fit the sample in the hypothesised model). After achieving a fit for each construct, the structural model fit was assessed as a second stage with the third stage being the assessment of reliability and validity. Slight modifications were performed to achieve a perfect fit for the structural model, with validity and reliability addressed.

The following sections detail the procedures for the three stages: assessment of constructs' fit; assessment of structural model fit; and assessment of reliability and validity.

5.4.1 Assessment of Constructs' Fit

As a first step in using CFA as the analysis technique, each construct was assessed by applying various measures of model fit, seeking a good fit that could be justified according to previous theories and studies. Checking for model fit at the construct level prior to combining the constructs structurally was important as a scale refinement step to identify and tackle model fit problems that could otherwise emerge later (Rampersad, 2008).

The sequential evaluation and tests indicated the final representation of each construct, with the factor loading of the items on their expected latent constructs being greater than 0.70 and significant at $p < 0.001$. A summary of the acceptable cut-off values of selected goodness-of-fit indices (discussed in Section 5.2.5) is provided in Table 5-2. All constructs show a perfect to acceptable fit, as illustrated below in Table 5-7: Appendix C contains all figures of the AMOS analysis results for each construct.

Table 5-7: Model fit at the construct level

Construct	Chi-sq.	*df*	*p*-value > 0.05	GFI > 0.90	AGFI	CFI > 0.95	TLI > 0.95	RMSEA < 0.08	SRMR < 0.05
Individual impact	3.34	1	0.68	0.99	0.95	0.99	0.99	0.80	0.0059
Organisational impact	65.6	19	0	0.95	0.915	0.98	0.97	0.82	0.0246
System quality	87.42	26	0	0.95	0.912	0.98	0.97	0.061	0.0259
Information quality	14.32	8	0.074	0.99	0.97	0.99	0.99	0.47	0.0123
Vendor quality	7.515	5	0.185	0.99	0.98	0.99	0.99	0.037	0.0126

5.4.2 Assessment of Structural Model Fit

SEM was sequentially conducted to evaluate and test the statistically significant relationships between the model constructs.

Modifications applied to achieve the model fit were subject to theoretical justification, which is discussed in the next chapter. Some adjustments to the scales were required, such as the removal of items and parcelling. In the initial phase, five constructs with 44 items in a second-order CFA (the original hypothesised model) were used to test the structural model. Based on the results, the model was further refined sequentially by removing non-significant links and then reassessed. This produced the first rehearsal result with a perfect fit model, as shown in Figure 5-1. However, this model failed the discriminant validity test (as discussed in the next section). This suggested the need for model refinement by constructing an upper-level construct: this process is called 'parcelling' (Little et al., 2002). Figure 5-2 shows this refinement where the impact constructs are combined into another LV called 'impacts', which refers to both 'individual impact' and 'organisational impact'. Similarly, 'system quality', 'information quality' and 'vendor quality' are combined into the latent construct 'quality'. This refinement fulfils Gable et al.'s (2008) IS impact definition and the IS impact conceptual model (see Figure 2-5 in Chapter 2). This result was also supported by Rabaa'i's (2012) study in which the original IS impact model was combined with the IS support model in a structural model that related to satisfaction. This refinement shows good fit, convergent validity and discriminant validity (discussed in the next section). Therefore, this model was chosen as the final model for the study. Table 5-2 illustrates the summary of acceptable cut-off values of selected goodness-of-fit indices. Table 5-8 shows the goodness-of-fit indices for the two models. Table 5-9 summarises the results of the model test at the construct and structural levels. Appendix E contains the correlation matrix and covariance matrices of the final model. The figures detailing the measurement properties for the five final constructs in isolation are presented in Appendix C.

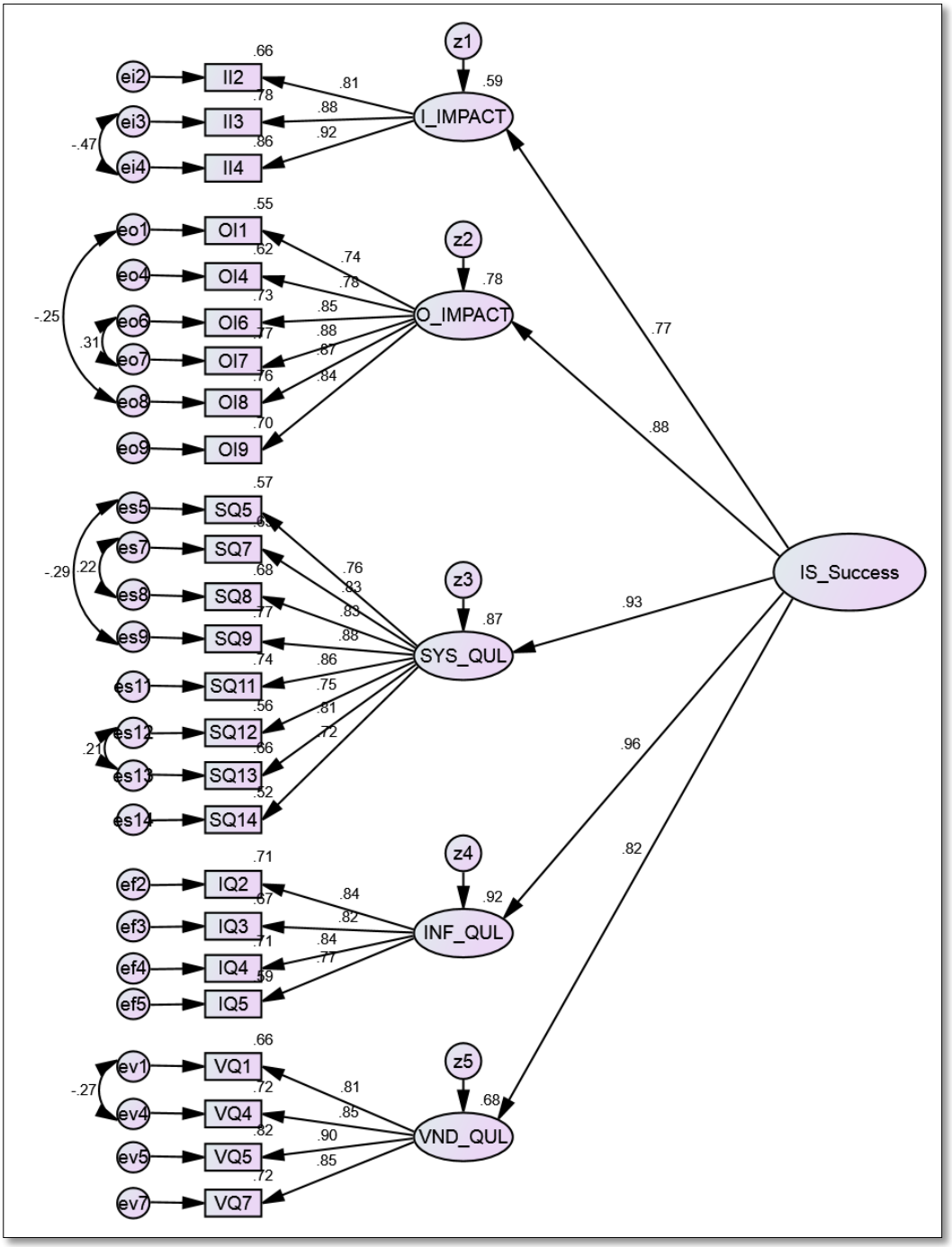


Figure 5-1: First rehearsal model

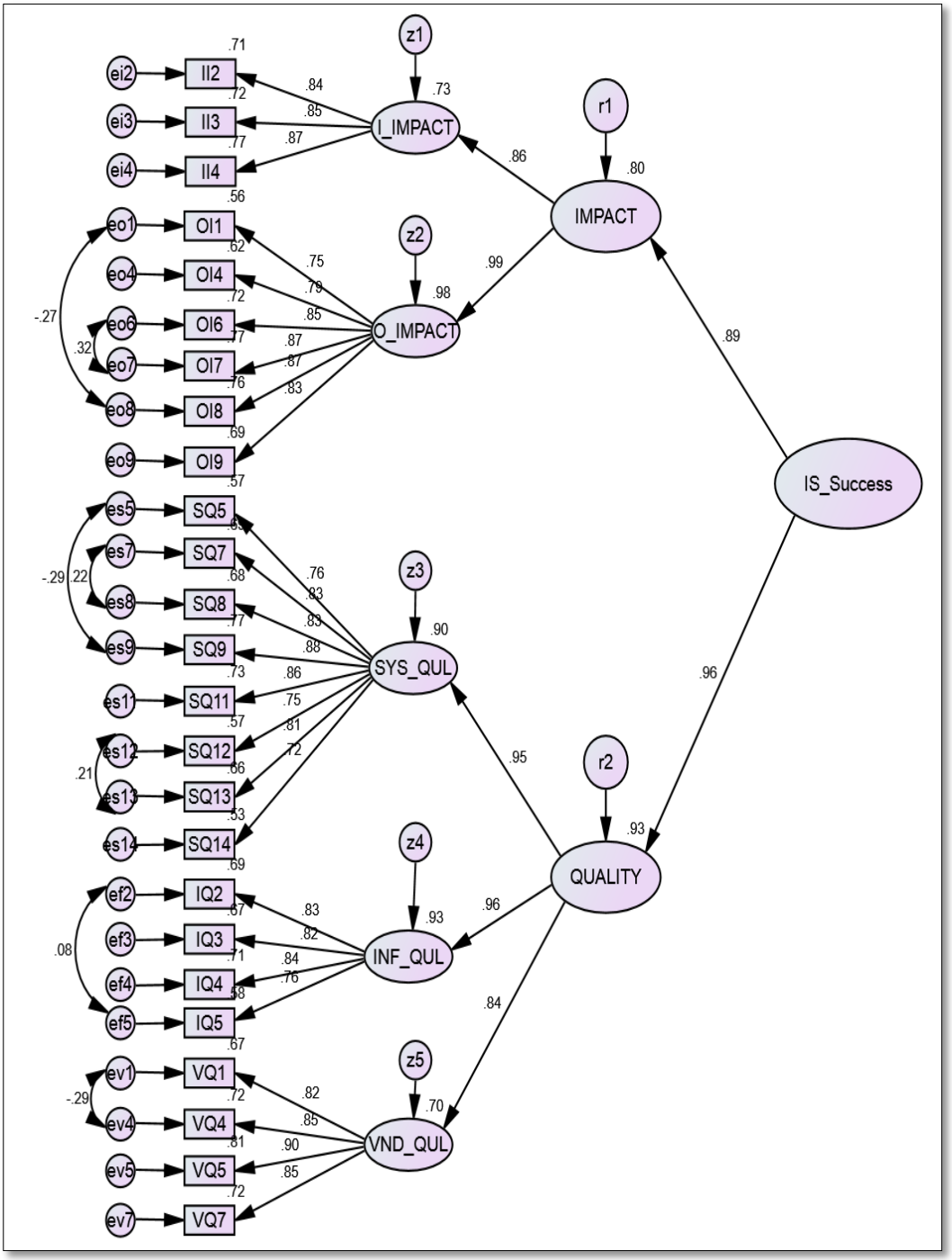


Figure 5-2: Second rehearsal model (final model)

Table 5-8: Goodness-of-fit indices for the two models

IS_success	Chi-sq.	*df*	*p*-value > 0.05	X^2	GFI > 0.90	AGFI	CFI > 0.95	TLI > 0.95	RMSEA < 0.08	SRMR < 0.05
First model (Figure 5-1)	561.5	263	0	2.1	0.89	0.87	0.96	0.96	0.056	0.047
Second model (Figure 5-2)	485.8	262	0	1.9	0.90	0.88	0.97	0.97	0.048	0.036

Table 5-9: Summary of variables' removal applied to the model

Construct	# Variables		# Removed Variables		Variables Removed
	Original	Current	Construct level	Final model	
Individual Impact	4	3	0	1	II1
Organisational Impact	12	6	4	6	OI2, OI3, OI5, OI10, OI11, OI12
System Quality	15	9	6	6	SQ1, SQ2, SQ3, SQ4, SQ6, SQ10
Information Quality	6	4	0	2	IQ1, IQ6
Vendor Quality	7	4	2	3	VQ2, VQ3, VQ6
Total	44	26	12	18	-

5.4.3 Assessment of Reliability and Validity

All scales were evaluated for reliability and validity. Owing to the importance of this validation, Straub et al. (2004) have suggested using more than one method to test validity and reliability, arguing that 'establishing construct validity should be a mandatory research practice' (p. 398).

In this study, each construct was assessed against the following aspects: indicator reliability, internal consistency reliability, convergent validity and discriminant validity. Details of each method are presented in the following sections. The assessment techniques and criteria used in this study for reliability and validity are summarised in Table 5-10.

5.4.3.1 Reliability

Reliability is a crucial analysis to be performed on a scale to ensure it is valid and possesses practical utility. Reliability is defined as 'the degree to which an instrument measures the same way each time it is used under the same conditions with the same subject' (Pallant, 2013). To be concise, reliability of the scale refers to its consistency, given the same conditions. Reliability can be assessed in different ways, such as test–retest reliability for stability, inter-item reliability for internal consistency and parallel scale for equivalence (Bannigan & Watson, 2009; Hinkin, 1995).

In this study, the analysis of scale reliability was performed through assessing the indicator reliability and internal consistency reliability.

5.4.3.2 Internal Consistency Reliability

Internal consistency refers to the homogeneity of items in the measure, or the extent to which item responses correlate with the total test score. Internal consistency can be measured using different methods; for instance, split halves, Kuder–Richardson approaches (KR-21) and Cronbach's alpha (Fraenkel & Wallen, 2009). The current study evaluated internal consistency using Cronbach's alpha, as it is the most frequently employed method for determining internal consistency (Cooper & Schindler, 2006; Fraenkel & Wallen, 2009; Gliem & Gliem, 2003; Kimberlin & Winterstein, 2008). The values of Cronbach's alpha range between 0 and 1. A value between 0.8 and 0.95 refers to very good reliability, between 0.7 and 0.8 good reliability, between 0.6 and 0.7 fair reliability and below 0.6 poor reliability of the scale (Gliem & Gliem, 2003).

Five independent scales were used in the survey questionnaire that constructed the proposed model: 'individual impact', 'organisational impact', 'system quality', 'information quality' and 'vendor quality'. Table 5-10 summarises the results of Cronbach's alpha for all constructs, showing that the internal reliability for all

variables/dimensions was very good, as their values are greater than 0.92. Based on these scores, the internal consistency (or homogeneity) of the measures was confirmed.

5.4.3.3 Indicator Reliability

Indicator reliability refers to how much of the indicator's variance is explained by the corresponding factor that it measures (Bannigan & Watson, 2009; Gliem & Gliem, 2003; Kimberlin & Winterstein, 2008). It explains the degree of the indicator's consistency with regard to what it intends to measure. Some researchers have proposed that at least 50 per cent of the indicator's variance should be explained by the LV that it measures (Gliem & Gliem, 2003; Kimberlin & Winterstein, 2008). However, others have suggested that construct reliability (CR) scores should exceed 0.7 (Bagozzi & Yi, 2012; Gefen et al., 2000; Gliem & Gliem, 2003).

In the current study, the reliability of the indicators was calculated using the information from AMOS on standardised item loadings and error measurement from the congeneric models for each construct. The indicator reliability for each construct is shown in Table 5-10. (For information on the item loadings and error measurement from the congeneric models, refer to Appendix C.)

Thus, the estimations of the standardised regression weights (factor loadings) for the common factor and each of the indicators were checked. A factor should have a minimum of two items and each item factor loading should be greater than 0.60, or ideally 0.7, and should be statistically significant (Sun & Mouakket, 2015).

Table 5-10: Reliability results for the final model

Construct	Cronbach's alpha	Indicator reliability*
Individual impact	.925	.716
Organisational impact	.962	.888
System quality	.963	.955
Information quality	.928	.949
Vendor quality	.938	.846

Note: *Indicator reliability = standardised regression weights = factor loadings

5.4.3.4 Validity

Validity is the measure of accuracy of an instrument used in a study: checking the validity is essential to ensure that a scale measures what it is intended to measure (Bannigan & Watson, 2009; Hair, Black, Babin, Anderson, & Tatham, 2006; Said, Badru, & Shahid, 2011). Validity can be tested using several methods: convergent validity, factorial validity, variance extracted (VE) and discriminant validity. This study has checked for convergent validity and discriminant validity, which are usually termed 'construct validity' (Doll, Xia, & Torkzadeh, 1994; Hurley et al., 1997). Further, as these two validity methods measure how well the measurement items relate to the constructs, they capture some goodness-of-fit aspects of the measurement model (Gefen & Straub, 2005).

5.4.3.5 Convergent Validity

Convergent validity is intended to assess the extent to which the indicators are related to the same construct (Davis, 1989). To demonstrate convergent validity, the magnitude of the direct structural relationship between the indicator and latent construct should be statistically different from 0; that is, the final items should be loaded highly on one construct (Anderson & Gerbing, 1988) with a factor loading of 0.50 or greater (Hair et al., 2006). In addition to the standardised factor loadings, convergent validity in this study was examined by observing the value of composite or CR and VE for each construct (Fornell & Larcker, 1981; Hair et al., 2006).

According to Hair et al. (2006), composite or CR values should be greater than 0.6, while VE should be above 0.5. Values outside these limits indicate that the items have a convergent validity issue and might not measure the hypothesised model consistently. Composite or CR can be calculated using the formula below:

$$\text{CR} = (\text{sum of standardised loadings})^2/([\text{sum of standardised loadings}]^2 + [\text{sum of indicator measurement errors}])$$

Further, average VE (AVE) was used in this study as an indicator for supporting convergent validity (Fornell & Larcker, 1981). The AVE is the average amount of variance in a set of indicators explained by their latent construct (Fornell & Larcker, 1981). According to Fornell and Larcker (1981), AVE can be calculated using the formula below:

AVE = (summation of squared factor loadings)/(summation of squared factor loadings)*(summation of error variances)

If the AVE is less than 0.50, this means that the variance due to measurement error is greater than the variance due to the construct; in this case, the convergent validity of the construct is doubtful.

The values of composite or CR and AVE were computed as shown in Table 5-11. The results confirm the convergent validity of all constructs.

5.4.3.6 Discriminant Validity

Discriminant validity assesses if each measurement item does not correlate too highly with all other constructs, except the one to which it is theoretically associated. AVE is also used to substantiate evidence regarding the latent constructs' discriminant validity (Fornell & Larcker, 1981). The values of AVE between the constructs are compared to their squared multiple correlations (SMCs) (Hair et al., 2006). Thus, the AVE for a latent construct should be greater than the variance shared between the construct and other latent constructs in the model (Fornell & Larcker, 1981; Hair et al., 2006).

The model in the first rehearsal (Figure 5-1) failed to show discriminant validity. Three discriminant validity concerns were present, with the 'organisational impact', 'system quality' and 'information quality' constructs, where the square roots of the AVE for these constructs were less than the absolute values of the correlations with another factor. This problem was solved by the suggested parcelling refinement (see Figure 5-2).

As shown in Table 5-11, all constructs in this study exhibited discriminant validity, as their values for VE (AVE) were all above 0.500. This exceeded the square of the highest shared variance between factors.

Table 5-11: Validity results for the final model

Construct	CR*	AVE*	MSV*	ASV*
Impact	0.92	0.85	0.74	0.74
Quality	0.94	0.84	0.74	0.74

Note: *CR = composite reliability; AVE = average VE; MSV = maximum shared variance; and ASV = average shared variance.

Table 5-12: Assessment criteria for reliability and validity

Assessment	Criterion/ criteria	Accepted values or conditions	Related references
Indicator reliability	Factor loading	Factor loading should be > 0.60, or ideally > 0.7, and statistically significant	(Bagozzi & Yi, 2012; Gefen et al., 2000; Gliem & Gliem, 2003)
Internal consistency reliability	Cronbach's alpha	For confirmatory research, value should be > 0.8	(Cronbach, 1951)
Convergent validity	AVE	AVE > 0.5	(Fornell & Larcker, 1981; Hair et al., 2006)
	CR	CR > 0.7	(Hair et al., 2006)
	Factor loading	Factor loading ≥ 0.50	(Anderson & Gerbing, 1988; Hair et al., 2006)
Discriminant validity	Fornell and Larcker's (1981) criterion using AVE	LV's AVE is greater than the squared bivariate correlations between it and other LVs in the model	(Fornell & Larcker, 1981; Hair et al., 2006)

5.5 Chapter Summary

This chapter has detailed the main data analysis for the quantitative research phase. It has provided details of the data analysis methods used in this study. The chapter has described testing the measurement scale using second-order CFA and SEM with AMOS, Version 22 software. The preparation for data analysis was also presented and discussed in six sections, followed by an evaluation of the model at both the construct and structural levels.

In addition, the chapter described the validity and reliability assessments undertaken as part of the model assessment. The results have demonstrated that the proposed model has an acceptable goodness-of-fit, following refinements that included removing some items, and parcelling.

The hypothesised model contains five constructs and 44 items in total. Reducing the number of items to 26 represented in a third-order CFA model has provided a rational and perfect statistical fit. The model refinement is discussed in the next chapter, as are the testing of the hypotheses, justification of the changes and the study's conclusions.

Chapter 6. DISCUSSION OF RESEARCH FINDINGS

6.1 Chapter Introduction

With the statistical analysis completed and the results produced, this chapter is dedicated to discussing the findings from testing the IS benefits measurement model in Saudi SMEs. The main objective of this study is to identify the dimensions and measures of IS success in the context of developing country SMEs.

To achieve this objective, a conceptual model was developed based on qualitative content analysis of data from both practical situations and academic sources. As presented in Chapter 4, the model proposed five dimensions (constructs) to measure the success of IS in developing country SMEs: 'individual impact', 'organisational impact', 'system quality', 'information quality' and 'vendor quality'.

Accordingly, five hypotheses associated with the conceptual model were formulated, and all five constructs were then operationalised using results from the qualitative phase for accurate measurement. As a result, a set of measurement variables was developed to gauge the model constructs. In the quantitative phase, the model was tested using data from a survey conducted in Saudi SMEs: when SEM and CFA techniques were applied, the model exhibited a good fit, confirming the hypotheses. Some changes were required to fit the model. However, the five dimensions demonstrated significant association with IS success.

This chapter begins with a summary of the hypothesis testing and its results. This is followed by a critical discussion of the anticipated and obtained results. The justifications with reference to the relevant literature are then discussed, and the IS benefits measurement model is identified with all its associated dimensions and items.

6.2 Testing of Hypotheses

As shown in the previous chapter, the final model (see Figure 5-2) exhibited good fit and had acceptable reliability and validity. As mentioned previously, the hypotheses were formulated as the model was developed; therefore, the model is suitable to discuss a review of the hypotheses at this point.

The research hypotheses were set based on the a priori model developed in Chapter 4 (see Figure 4-2) and sought to answer the research question: 'is the developed model valid in the context of Saudi Arabian SMEs?' Following is the list of hypotheses:

H1: Individual impact is a significant factor of IS success.
H2: Organisational impact is a significant factor of IS success.
H3: System quality is a significant factor of IS success.
H4: Information quality is a significant factor of IS success.
H5: Vendor quality is a significant factor of IS success.

These hypotheses represent the dimensions of the second-order IS benefit measurement model (see Figure 5-1) and their associated items. Significant relationships and support among all dimensions and IS success were shown by the analyses. However, the relationships were refined further to meet the model fitness, reliability and validity requirements. Thus, the two impact dimensions were joined, along with the three quality dimensions (see Figure 5-2) to form the study's final model. It is not surprising that 'impact' and 'quality' represented new upper-level latent constructs, as this was the way in which the IS impact model was represented conceptually (see Figure 2-5). The addition of 'vendor quality' as an external dimension was also supported by Rabaa'i (2012). In his study, the original IS impact model was combined with the IS support model, reflecting the need to add factors related to the vendor service and support. Further discussion of the final model dimensions and related variables is undertaken in Section 6.4.

As the hypotheses were set to test the developed model, testing the model using SEM and CFA (as presented in the previous chapter) is a good response to the hypotheses (Hurley et al., 1997; Schreiber et al., 2006). The relationships between the five dimensions and IS success were confirmed; in addition, the reliability and validity tests provided more verification. Thus, all hypotheses were supported in this study. In other words, this research confirmed that the five dimensions are factors for an IS benefits measurement model for Saudi SMEs.

6.3 Anticipated and Actual Results

Differences between the expected results and those obtained occur commonly in many research studies, for reasons such as inadequate sample size and inappropriate data collection methods and/or data analysis procedures.

Despite sufficient effort being undertaken during the qualitative phase of a study to produce a reliable model, mistakes are usually associated with qualitative methods, where some human mistakes cannot be prevented.

Survey data are also subject to error due to self-reporting and self-administration by participants (Cooper & Schindler, 2006). In addition, it is anticipated that participants in developing countries may provide careless data, as they may attribute little importance to research (Tuncalp, 1988).

Further reasons for discrepancies between anticipated and obtained results might result from the incorrect calibration of instruments, which can be attributed to the sample size and its representation.

Some researchers have issued warnings about the iterative process of the model fit procedure using CFA and SEM; modifications might produce a final model that deviates from the initial theoretical model if such changes are irrational in terms of the theory (Schreiber et al., 2006).

Even if sufficient effort has been made during the qualitative phase to produce a reliable model based on data from practice and previous academic studies, it is still not appropriate to assume that a definite group of items found in another study will be an entirely equally valid construct when measured in a different context (Schreiber et al., 2006).

Further, in this study, the measurement items were collected in the qualitative phase from content analyses of different cases of customer success stories, in addition to from a number of previous studies in the same context. Use of the IS impact model provided a theoretical basis for the study; therefore, the measurement dimensions and items were not a replica of the IS impact model. The measurement items were then used to identify the IS success dimensions and to operationalise the developed measurement model. The removal of some items is a reasonable consequence of the model fit procedure. In addition and where possible, justifications from the

perspective of the characteristics of SMEs and developing countries were provided. The next section reviews the resultant IS success dimensions and measures in the context of Saudi SMEs with justifications for changes in the anticipated model.

6.4 Identifying IS Success in Saudi SMEs: Dimensions and Measures

The original dimensions and measures of the IS success model, as included in the questionnaires, are summarised in Table 6-1, which refers to their use in the final model. Subsequently, each dimension is discussed.

Table 6-1: Original dimensions and measures of IS success model

Dimension	Original items	Used in the final model
Individual impact	II1 Learning	No
	II2 Awareness	Yes
	II3 Decision effectiveness	Yes
	II4 Individual productivity	Yes
Organisational impact	OI1 Organisational costs	Yes
	OI2 Staff requirements	No
	OI3 Cost reduction	No
	OI4 Overall productivity	Yes
	OI5 Improved outcome	No
	OI6 Increased capacity	Yes
	OI7 Business process change	Yes
	OI8 Improved planning	Yes
	OI9 Improved management	Yes
	OI10 Increased competitiveness	No
	OI11Business innovation	No
	OI12 Improved resource utilisation	No
System quality	SQ1 ease of learning	No
	SQ2 ease of use	No
	SQ3 Access	No
	SQ4 User requirements	No
	SQ5 System features	Yes

Dimension	Original items	Used in the final model
	SQ6 System accuracy	No
	SQ7 Flexibility	Yes
	SQ8 Reliability	Yes
	SQ9 Efficiency	Yes
	SQ10 Sophistication	No
	SQ11 Integration	Yes
	SQ12 Multi-language	Yes
	SQ13 Standardisation	Yes
	SQ14 Security	Yes
	SQ15 Scalability	Yes
Information quality	IQ1 Importance	No
	IQ2 Availability	Yes
	IQ3 Usability	Yes
	IQ4 Format	Yes
	IQ5 Content accuracy	Yes
	IQ6 Timeliness	No
Vendor quality	VQ1 Maintenance	Yes
	VQ2 Online services	No
	VQ3 Reliability	No
	VQ4 Popularity	Yes
	VQ5 Expertise	Yes
	VQ6 Locally available	No
	VQ7 support (empathy)	Yes

6.4.1 Individual Impact

The 'individual impact' construct showed a factor loading of 0.77 (see Figure 5-1), with this value being the lowest of all the constructs. Therefore, the data suggest that this construct is a significant dimension (value above 0.70); however, it is the least important dimension of the five dimensions. As discussed previously, IS in the context of SMEs are focused more on achieving effectiveness for the organisation than on improving individual impact, according to SME characteristics (see Chapter 2).

Another reason for this low value relates to the survey participants: the majority of participants in this study were owners of SMEs (47.9%), followed by managers of SMEs (25.8%). These groups tend to focus on the organisation rather than on the individual. For that reason, a comparison test was performed in this study (see Chapter 4) between the employee cohorts. The results determined that the four employee cohorts did not perceive any differences regarding IS success measures. Justification for this viewpoint may be found in the difficulty of function segregation, which is a confirmed characteristic among SMEs (Gable & Highland, 1993).

Given the original hypotheses model, no measurement items were removed during assessment at the construct level. However, when combining the constructs into the structural model, the removal of one item was necessary to reach an acceptable model fit, leaving the other three items as final measures of the 'individual impact' dimension (see Table 5-1). The removed item was 'learning', which was operationalised in the survey as 'the ES enhanced individual learning'. While much of the literature supported this (Herbst et al., 2014), in the SME context, this item could be of less importance than larger organisations, given SMEs' focus on organisations rather than on individuals (Goldberg et al., 2003; McMahon, 2007). Ambiguity was another reason for removing this item: the operationalised statement did not specify that the learning was related to IS, which might have confused the participants.

The measures of 'awareness', 'decision effectiveness' and 'individual productivity' represent the 'individual impact' construct in the final model.

Thus, for SMEs in Saudi Arabia, IS has a significant impact on individuals that can be measured using three factors: the increased awareness of IS users, the enhancement made in decisions, and the enhancement in individual productivity.

6.4.2 Organisational Impact

The 'organisational impact' construct showed a factor loading of 0.89 (see Figure 5-1), which ranked third among the five constructs. During assessment at the construct level, four items were removed: 'staff requirements', 'cost reduction', 'improved outcome' and 'improved resource utilisation'. The first two items relate to costs, and were covered by another item ('organisational costs'). Therefore, removal to enhance the model fit was considered reasonable.

The items ‘improved outcome’ and ‘improved resource utilisation’ were removed due to their high correlations with other items in the model. Variable elimination is often a highly effective technique to avoid multi-collinearity (Paul, 2006).

The remaining six items represented the ‘organisational impact’ construct on the final model: ‘organisational costs’, ‘overall productivity’, ‘increased capacity’, ‘business process change’, ‘improved planning’ and ‘improved management’. With the exception of the last two items—‘improved planning’ and ‘improved management’—all items were part of the IS impact model. These two new items emerged from the qualitative phase and were also supported by the literature (e.g., Kale et al., 2010).

Thus, the results of data analysis show that organisational impact is an important dimension of the model. This means that it has a significant impact on the implementation of IS in Saudi SMEs. This impact is revealed by six items: ‘organisational cost’, which means that the value of SME organisation is increased by implementing IS and ‘overall productivity’. Additionally, from an organisational perspective, the implementation of IS in Saudi SMEs would lead to ‘increased capacity’ of the organisation, ‘improved planning’ and ‘improved management’. Other positive impacts also include changes in the business process.

6.4.3 System Quality

The term ‘system quality’ refers to the IS performance characteristics (DeLone & McLean, 1992, 2003). Derived from the results of the qualitative phase, the proposed items that shaped this construct were: ‘ease of learning’, ‘ease of use’, ‘access’, ‘user requirements’ and ‘system features’, as well as ‘system accuracy’, ‘flexibility’, ‘reliability’, ‘efficiency’, ‘sophistication’, ‘integration’, ‘multi-language’, ‘standardisation’, ‘security’ and ‘scalability’.

The interrelationships between these items (and the fact that they were of different technical levels) led to the removal of many to achieve the model fit. At the construct level, six items were removed due to high correlations between them and other items in the model; however, no more items were removed at the structural level. The six removed items were: ‘ease of learning’, ‘ease of use’, ‘access’, ‘user requirements’, ‘system accuracy’ and ‘sophistication’.

The ‘system quality’ construct showed a factor loading of 0.94 (see Figure 5-1), which ranked second among the five constructs. The relatively high loading of this factor might relate to the tangible nature of most of its indicators.

The remaining nine items that represented this construct on the final model were: ‘system features’, ‘flexibility’, ‘reliability’, ‘efficiency’, ‘integration’, ‘multi-language’, ‘standardisation’, ‘security’ and ‘scalability’.

In comparison to the IS impact model, four of these items were new contributions to the ‘system quality’ scale: ‘multi-language’, ‘standardisation’, ‘security’ and ‘scalability’. Most of these items emerged from the content analysis stage (see Chapter 4). Elias's (2011) study, which validated the IS impact model in the Malaysian context, also added ‘security’ as a new measure to the ‘system quality’ dimension. The item ‘multi-language’ related to the Saudi Arabian context, where most businesses use both Arabic and English. The literature also supported the items ‘standardisation’ and ‘scalability’ as measures of ‘system quality’ (e.g., Geier, Schulze, Yusuf, & Musa, 2012; Marsh, 2000).

Accordingly, the system quality plays a significant role in the implementation of IS in Saudi SMEs. The system quality will lead to successful IS implementation, and this quality can be assured by nine factors, each of which relates to an important part of system quality: ‘system features’, ‘flexibility’, ‘reliability’, ‘efficiency’, ‘integration’, ‘multi-language’, ‘standardisation’, ‘security’ and ‘scalability’.

6.4.4 Information Quality

The items used on the ‘information quality’ scale for this hypothesis are listed in Table 7-2. These items from the IS impact model have not been merged with any new items added from the content analysis. However, some items needed to be removed to achieve a proper model fit: ‘importance’ and ‘timeliness’. High correlation justified removing the first item (‘importance’). The relative age of the variable ‘timeliness’ provided justification for removing that item. While timeliness was an important variable in older IS, in which obtaining up-to-date information did not occur, with most current software it now seems that timeliness is taken as given.

The construct ‘information quality’ showed a factor loading of 0.96 (see Figure 5-1) which surprisingly suggested that ‘information quality’ was the dominant dimension

of IS success. The high loading of this factor might relate to the simplicity and directness of its indicators.

The remaining items representing the ‘information quality’ construct on the final model were: ‘availability’, ‘usability’, ‘format’ and ‘content accuracy’.

Hence, qualitative information is an important dimension of IS success. SMEs in Saudi Arabia have four indicators of information quality: ‘availability’; ‘usability’; ‘format’; and ‘content accuracy’.

6.4.5 Vendor Quality

The construct ‘vendor quality’ was measured in this study using a 7-item scale. The measures proposed for this construct were all new measures developed from the content analysis of customer success stories, as well as from previous studies in the SME context.

In the validation analysis, three of these items needed to be removed to achieve an acceptable fit, thus shortening the final list to four items. The removed items were ‘online services’, ‘reliability’ and ‘locally available’. The reason for removing these items related to their high correlation with other items. It also appeared that ‘online services’ was part of the item ‘maintenance’ and that the item ‘locally available’ may not be very important with today’s ease of communication.

The remaining items that represented the ‘vendor quality’ construct in the final model were: ‘maintenance’, ‘popularity’, ‘expertise’ and ‘support (empathy)’.

Thus, the quality of the vendor is a new important dimension in IS success of SMEs. This quality is dictated by four items. The first is the ability to provide good maintenance and support to SMEs. In addition, popularity and expertise in the field increase trust. All of these quality factors are necessary to form the vendor quality dimension, which is a necessary dimension in the IS benefits measurement model for Saudi SMEs.

6.4.6 Criterion Measures

In the survey, six criterion measures were used to measure participants’ satisfaction directly, with each dimension as an immediate consequence of IS success.

The purpose of these items was to test the nomological validity of the IS benefits measurement model, in case the model was formative and not reflective when implemented in this study. The reason for this is that in the early stages of survey development, the researcher was uncertain about whether to implement the model as formative or reflective. Nevertheless, these items were used in the comparative statistics (see Section 5.4.3) instead of computing composite variables for each construct. In addition, the criterion measures were compared with the factor loading for each construct to confirm its validity and this was another way to check convergent validity.

6.5 Chapter Summary

This chapter has discussed the findings of the study, referring to the hypotheses and justifying the differences between the anticipated and actual results. In concluding this chapter, the findings of this research suggest that a significant relationship exists between the five dimensions and IS success, and that the developed scale for each factor is rational and supported by other studies. The contexts of SMEs and developing countries have been found to affect many parts of the model.

The next chapter presents a review of the thesis, along with the implications of this research in regard to both theory and practice. The chapter then presents the study's limitations and offers some directions for further study.

Chapter 7. CONCLUSIONS

7.1 Chapter Introduction

This chapter presents the overall conclusions of the research. It begins by providing a review of the thesis and then revisits the research aim, objectives and questions. In addition, the chapter presents the contributions of this research to theory and practice, discusses the research's limitations and makes suggestions for future research.

7.2 Thesis Review

This study has focused on the development of an IS benefits measurement model for SMEs in Saudi Arabia as a case study of the developing countries' context. Two main phases were undertaken, applying qualitative and quantitative methodology.

In the first phase, qualitative methods were used to collect secondary data to develop the conceptual model through content analysis. Unlike previous studies focusing on one country, in this study the model was derived from 30 published case studies from different developing countries in the Middle East and Africa. Further, the results were mapped to an established theoretical model. In contrast to existing studies based on the D&M model, this study has built on and extended the IS impact model, which is deemed suitable in this context.

Further validation was added to the qualitative phase by comparing the content analysis results with other academic studies undertaken in the same context. In analysing customer quotations and previous academic studies, the study identified 566 benefits, which were then synthesised into 60 non-overlapping benefits. The benefits were next mapped to the IS impact measurement model, which provided the conceptual foundation of this research. Many of the benefits that emerged were not covered by the existing IS impact model, demonstrating the need for a new benefits measurement model for IS in developing country SMEs. By combining the characteristics of both SMEs and developing countries with the identified benefits, the study constructed a preliminary measurement model for IS in developing country SMEs. This model consists of five dimensions with 44 benefit measures.

The second phase was the quantitative validation phase, in which the model was tested using a survey in the Saudi Arabian context. Using SPSS and AMOS, data

from 365 valid responses were analysed by SEM and CFA techniques, in addition to undergoing tests for reliability and validation. The results demonstrate the validity of the model in this new context.

Further, qualitative and quantitative methodologies were considered for their reliability and validity through rigorous approaches. These include Whittemore et al.'s (2001) techniques for demonstrating validity for qualitative methods, and survey assessment criteria and statistical tests for quantitative methods. In addition, the study used triangulation, or a mix of research methods. This is considered a major validation technique.

The following section presents a brief assessment of the research aim and objectives, in addition to an evaluation of the results in terms of answering the research questions.

7.3 Revisiting the Research Aim, Objectives and Research Questions

The main research aim was to develop a benefits measurement model for IS in Saudi SMEs, as a case study of a developing country context.

In pursuing this primary aim, the following objectives were identified: (1) to understand the characteristics and needs of SMEs in developing countries and how they differ from large organisations (from an IS perspective); (2) to understand the existing models used to measure the success of IS in different contexts other than in SMEs; (3) to summarise the benefits of IS in SMEs in developing countries; (4) to identify the different dimensions of IS success in the context of SMEs in developing countries; (5) to identify the different measures in each dimension of IS success in the context of SMEs in developing countries; (6) to generate the benefits measurement model for IS in SMEs in developing countries, based on a qualitative method and guided by the existing IS impact model developed by Gable et al. (2008); and (7) to further validate the new model in the context of Saudi Arabian SMEs as an example of a developing country context.

To achieve these research objectives, the following research questions were formulated, with rigorous research methods applied to answer each question, as summarised in Table 7-1 below.

Table 7-1: Research questions with methods used to answer them

Research question	Investigative questions	Methods used	Section of thesis
1: What are SMEs?	What size criteria are used to define the size of SMEs?	Literature review	Chapter 2
	Is the definition different according to countries, sectors and industries?	Archival analysis for size definition analysis	Chapter 2
	What characteristics differentiate SMEs and large organisations from the IS perspective?	Literature review	Chapter 2
2: How can we measure the success of IS in SMEs in the developing countries' context?	What are the benefits of IS in the context of SMEs in developing countries?	Literature review Content analysis	Chapter 2 Chapter 4
	What are the main dimensions for a benefits measurement model in SMEs in the developing countries' context?	Literature review Content analysis	Chapter 2 Chapter 4
3: Is the IS Impact model suitable for measuring the impact of IS in SMEs in the developing countries' context?	Are all the existing dimensions and measures applicable in the new context?	Literature review Content analysis Data analysis	Chapter 2 Chapter 4 Chapters 4, 5 and 6
	Is any additional dimension or measure required for the new context?	Literature review Content analysis Data analysis	Chapter 2 Chapter 4 Chapters 4, 5 and 6
4: Is the new measurement model valid for measuring the impact of IS in SMEs in Saudi Arabia?	Are all the dimensions in the new model valid and significant?	Literature review Survey and data analysis using SEM and CFA	Chapter 2 Chapters 4, 5 and 6
	Are all the measures in each dimension valid and significant?	Literature review Survey and data analysis using SEM and CFA	Chapter 2 Chapters 4, 5 and 6

7.4 Research Contributions

The literature review in this study revealed that only a few of the cited sources addressed the need for a comprehensive assessment of IS in SMEs in developing countries. This study addressed that deficiency by proposing an IS benefits

measurement model for SMEs in Saudi Arabia. By responding to research questions and following rigorous methodology, this study has contributed to both theory and practice. The following subsections detail these contributions.

7.4.1 Implications for Academic Theory

This research has contributed to academic theory pertaining to SMEs and their measurement of IS success. The focus of previous studies in measuring IS success was on developed countries, whereas very few studies have focused on IS success in developing countries (Alghamdi et al., 2011a; Alshardan et al., 2013; Grazzi & Vergara, 2012; Roztocki & Weistroffer, 2011; Vrgovic et al., 2012). This research introduces a theoretical model to measure the success of IS in Saudi Arabian SMEs as a paradigm for such measurements in other developing countries.

This study has also contributed to theory by extending the IS impact model developed by Gable et al. (2008) into a setting different from that used in previous studies. This study has argued that the previously implemented IS impact model was deficient in the 'vendor (service) quality' dimension in the context of developing country SMEs, whereas the other four dimensions of the IS impact model have been confirmed. This study incorporates the 'vendor quality' dimension into the existing dimensions of the IS impact model. Empirical tests have confirmed it as relevant in the discourse of SME IS success. Moreover, the operationalised set of measures offers comprehensive measures that can be used as a basis for research in other contexts.

From a methodology perspective, this study has successfully demonstrated the value of secondary data. Using qualitative analysis on customer success stories (the secondary data), the study collected the benefits of SME IS in various developing countries. Another contribution of this research is that it has employed both quantitative and qualitative approaches to study a single phenomenon. A dearth of research using mixed methods to study IS in the SME context (Haddara & Zach, 2012) was identified. This study, by employing a mixed-method methodology, uses its strengths and advantages. Integrating these two approaches has provided a better understanding of IS success in SMEs. The study demonstrates that quantitative and qualitative data can complement each other when investigating a single phenomenon.

This research has contributed significantly to the literature on Saudi Arabian SMEs, which suffers from a paucity of attention in general and on IS aspects in particular. Although this research was conducted in the Saudi context, its findings may be applicable to SME IS environments in other developing countries, particularly those in the GCC: Kuwait, UAE, Qatar, Bahrain and Oman.

7.4.2 Contributions to Practical Knowledge

This study has provided valuable insights for both government and businesses as they develop strategies to realise the anticipated benefits of IS for SMEs in developing countries. Regarding the public sector, this research could help policy makers optimise the monitoring of IS initiatives, thereby ensuring effective allocation of scarce public funding. Consequently, development goals pertaining to redressing the digital divide between developing and developed countries in relation to IS success could be achieved. Regarding the private sector, SMEs could use this research to better manage IS implementations so that they maximise downstream benefits. Useful guidelines could be provided for the senior management of SMEs that suggest which particular factors SME management should use when assessing IS success in their companies. In addition, IS vendors could use this study to develop customer solutions that provide the maximum benefits with the lowest implementation risks.

7.5 Research Limitations

The limitations of this study have been acknowledged. First, the secondary data sources of vendor-published customer success stories used in this study could reflect biases by vendors who may overstate the success and benefits of their products, perhaps avoiding mentioning their failures. However, given that the focus of the study was to develop a benefits model that could later be employed to measure the 'level of success' in different organisations, issues regarding the use of such success stories are not significant (Shang & Seddon, 2002). Further, combining the cases of those success stories with content analysis of academic data and further validating the model with a primary data source through the survey has created a realistic view of the findings.

Even though the participants in the survey came from a wide range of industry sectors, which included SMEs of different sizes and ages, the participants' SMEs are

not guaranteed to be representative, for the following reasons. First, the inconsistent definition of SME between studies makes it difficult to compare and generalise research findings. Second, it could not be guaranteed that the participants' SMEs were actually using IS, due to the absence of an official directory for SMEs in Saudi Arabia. Third, the use of an online survey as the main method to reach participants might have prevented SMEs that did not receive the survey from having the chance to participate. The researcher tried to tackle this problem by conducting face-to-face administration of the survey; however, only 14 cases participated in this way. The researcher was unable to conduct more cases due to practical difficulties, such as the absence of a directory from which to obtain postal addresses, in addition to poor postal services. Based on these conditions, the online survey was the main option for the researcher in communicating with SMEs.

Moreover, as many types of IS software were used by the participants, the responses might relate to one type of IS over other types; therefore, restricting the research to SMEs using one type of IS might be a useful for future research.

Cultural factors were not introduced in this study: using a theory such as the technology–organisation–environment (TOE) framework (Tornatzky & Fleischer, 1990) might help to introduce new items related to Saudi Arabian culture. Future research could address this cultural component.

Although the qualitative data covered many developing countries, the validation phase limited the context of this study to the perspective of Saudi Arabian SMEs, thus limiting the generalisability of the study's findings. Drawing data from other developing countries would naturally convey generalisability to the findings and create the possibility of further comparisons.

Nevertheless, this study is instrumental as a necessary first step in equipping SMEs in developing countries with a useful model by which to assess IS benefits.

7.6 Future Research

The limitations of this research provide a natural guide to future research. As is typical, the investigation of more SMEs could result in more accurate findings. This could include SMEs in the Saudi Arabian context, in the context of other developing countries or even in the context of developed countries. Although the major

implications of this study are not solely limited to SMEs in the Saudi Arabian context, differences in the business environments between developing and developed countries cannot be ignored. Thus, future research that examines any extension of the developed IS benefits measurement model to other SMEs in developed and developing countries may improve the generalisability of the study's findings. Moreover, the original set of measurement items that emerged from the qualitative phase could be included in future research. This set of items could be validated or mapped to any model of SMEs in a developing country context to investigate the items' influence on IS success in SMEs: comparing the results could lead to a comprehensive standardised model for SMEs in developing countries.

Future research could focus on IS success scales. Established scales for IS success dimensions do not exist; thus, there is an opportunity for IS researchers to develop contextualised but still generalisable measures based on the type of IS being evaluated and the scope of the evaluation (Tate et al., 2014). The demand to advance the IS success literature is challenged by two factors: understanding the scope of each dimension of IS success and establishing a standardised set of measures for each dimension.

In applying theories to the developed model, it certainly helps to have standardised, reliable measures. Examples of theories that could be used include: transaction cost theory (TCT) (Williamson, 1981), resource-based theory (RBT) (Wernerfelt, 1984), expectancy theory (Thompson, Higgins, & Howell, 1991; Vroom, 1964) and the theory of reasoned action (TRA) (Davis, Bagozzi, & Warshaw, 1989; Fishbein & Ajzen, 1975). These measures could also be combined with culture factors, using a theory such as the technology–organisation–environment (TOE) framework (Tornatzky & Fleischer, 1990).

Future research could examine the use of other types of IS, such as CRM, SCM and content management systems (CMS). In addition, more advanced technical systems could be involved by incorporating cloud computing elements, such as software as a service (SaaS) that provides users with complete software applications on the internet (Tate et al., 2014).

Therefore, studies on major differences in the success factors of different IS projects in the organisation could form a key direction for future research.

Another area that deserves research attention is the actual measurement of the IS divide between large businesses and SMEs. The idea would be to establish an index of important IS issues that could make a difference in IS use, such as the number of computers, server complexity, type of system and number of user accounts.

Finally, based on findings from the extensive literature review, it would be important to address several questions, as listed below:

- How are IS used by SMEs to improve their businesses?
- In using customised IS, what are the common features for SMEs?
- What is the impact of culture in the context of specific countries?
- What is the impact of social media in promoting some types of IS and the relationship of social media to IS success?
- What is the life cycle of IS in SMEs? What upgrades do they usually require?
- Are there any special IS functions found missing by SMEs that could help them gain more advantage from using the system? How does this compare between IS for large and small companies?
- What is the comparison between IS success in developing and developed countries?
- What is the use level of IS in SMEs in terms of infrastructure, internet connection, IT staff and types of website?
- What types of enterprise software are used by SMEs? Why are these preferred?
- What percentage of the SME total budget is allocated to IS?
- What are the long-term business goals for IS investment in SMEs?
- What are the barriers to IS investment in SMEs?
- What internal capabilities and processes have SMEs established for managing IS?

This study has made an important contribution in paving the way for such future research by providing a more holistic model for measuring IS benefits in the context of SMEs and developing countries. It is anticipated that the findings of this research, along with the areas identified for guiding future research, will motivate researchers to pursue this exciting research stream.

7.7 Final Remarks

> We need to design our research so that it provides an intimate understanding of the practical problems facing the profession. Equally important, we need to appreciate and strengthen our skills in developing good theory so that research conducted about these problems will advance the knowledge that is relevant to both the discipline and the profession. (Van de Ven, 1989)

This research has endeavoured to contribute both to research and the discipline by applying theories and using rigorous academic methods. At the same time, this research has contributed to the profession and the practice by providing a tangible instrument to measure the success of IS in Saudi Arabian SMEs.

Hard work and extraordinary effort were only some of the factors involved in taking this research from the beginning to this point, to achieve success.

> There are no secrets to success. It is the result of preparation, hard work, and learning from failure. (Colin Powell)

To this, I would add patience and love.

APPENDICES

APPENDIX A: SURVEY ITEMS AND SURVEY-RELATED LETTERS

A.1 Survey Items

Table A-1: Measurement questions

	Code	Operational definitions of variables
Individual impact	II1	The enterprise system (ES) enhanced individual learning
	II2	The ES enhanced individual awareness and recall of job-related information
	II3	The ES improved decision effectiveness
	II4	The ES improved individual productivity
Organisational impact	OI1	The ES is cost effective
	OI2	The ES reduced staff costs
	OI3	The ES reduced cost (e.g. inventory holding costs, administration expenses)
	OI4	The ES improved overall productivity
	OI5	The ES improved outcomes or outputs
	OI6	The ES increased capacity to manage a growing volume of activity (e.g. transactions, population growth)
	OI7	The ES improved business processes
	OI8	The ES improved visibility and planning

	OI9	The ES improved management and control
	OI10	The ES increased competitiveness
	OI11	The ES improved business innovation
	OI12	The ES improved resource utilisation
System quality	SQ1	The ES is easy to learn
	SQ2	The ES is easy to use
	SQ3	It is easy to get access to information that is in the ES
	SQ4	The ES meets the user's requirements
	SQ5	The ES includes necessary features and functions
	SQ6	The ES always does what it should
	SQ7	The ES is flexible to use
	SQ8	The ES is reliable (always up-and-running, powerful in all cases)
	SQ9	The ES is efficient (i.e. effective without wasting time, effort or expense). The ES responds quickly enough.
	SQ10	The ES requires only the minimum number of fields and screens to achieve a task.
	SQ11	All data within the ES are fully integrated and consistent
	SQ12	The ES interface/output can be converted between the English and Arabic languages
	SQ13	The ES meets international standards
	SQ14	The ES is secure enough

	SQ15	The ES system can be upgraded as the organisation grows
Information quality	IQ1	Information available from the ES is important
	IQ2	Information needed from the ES is always available
	IQ3	Information from the ES is in a form that is readily usable
	IQ4	Information from the ES appears readable, clear and well formatted
	IQ5	Information from the ES is always accurate
	IQ6	Information from the ES is timely
Vendor quality	VQ1	The ES vendor provides enough maintenance support
	VQ2	The ES vendor provides access to online help and services
	VQ3	The ES vendor is dependable
	VQ4	The ES vendor has a good reputation in Saudi Arabia
	VQ5	The ES vendor's employees have the knowledge to do their job
	VQ6	The ES vendor is available in Saudi Arabia
	VQ7	The ES vendor gives users attention and support
Criterion measures	ALL1	Overall, the impact of the ES on me has been positive
	ALL2	Overall, the impact of the ES on the organisation has been positive
	ALL3	Overall, the system quality of the ES is satisfactory
	ALL4	Overall, the information quality of the ES is satisfactory
	ALL5	Overall, the vendor quality of the ES is satisfactory
	ALL6	Overall, the ES is satisfactory

A.2 Employer Permission Request Letter

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CRICOS Provider No. 00114A

EMPLOYER PERMISSION REQUEST LETTER
(By questionnaire)

A benefits measurement framework for Enterprise Systems (ES) in Small and Medium-Sized Enterprises (SMEs)

Dear Sir
This letter is to introduce Amal Alshardan who is a Ph.D. student in the School of Computer Science, Engineering and Mathematics at Flinders University. She will produce her student card, which carries a photograph, as proof of identity.

She is undertaking research leading to the production of a thesis and other publications on the subject of measuring the benefits of enterprise systems in small and medium sized organizations.

She would be most grateful if you would volunteer to assist in this project, by consenting to your employees completing questionnaires which cover certain aspects of this topic. No more than 10 minutes would be required.

Be assured that any information provided will be treated in the strictest confidence and none of the participants will be individually identifiable in the resulting thesis, report or other publications. participants are, of course, entirely free to discontinue at any time or to decline to answer particular questions.

Any enquiries you may have concerning this project should be directed to me at the address given above or by telephone on (+61 8 8201 3113), fax (+61 8 8201 2904) or e-mail (robert.goodwin@flinders.edu.au).

If you agree for your employees to participate please sign below:

I .....

being over the age of 18 years hereby give my permission to my employees to participate as requested in the Information Sheet for the research project on "A benefits measurement framework for Enterprise Systems (ES) in Small and Medium-Sized Enterprises (SMEs)".

Participant's Manager signature.....**Date**..13/11/2013

Thank you for your attention and assistance.

Yours sincerely

R D Goodwin

Dr Robert Goodwin
Senior Lecturer in Information Technology
School of Computer Science, Engineering and Mathematics

This research project has been approved by the Flinders University Social and Behavioural Research Ethics Committee. For more information regarding ethical approval of the project the Secretary of the Committee can be contacted by telephone on 8201 5962, by fax on 8201 2035 or by email human.researchethics@flinders.edu.au

A.3 Information Sheet

Dr Robert Goodwin
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CRICOS Provider No. 00114A

INFORMATION SHEET

Title: 'A benefits measurement framework for Enterprise Systems (ES) in Small and Medium-Sized Enterprises (SMEs)'

Investigator:
Mrs Amal Alshardan
School of Computer Science, Engineering and Mathematics
Flinders University
Ph: +61 481264757

Description of the study:
This study is part of the project entitled '*A benefits measurement framework for Enterprise Systems (ES) in Small and Medium-Sized Enterprises (SMEs)*'. This project will investigate the characteristics of small and medium enterprises that differentiate them from large organizations to develop a benefits measurement model that appropriate for SMEs. This project is supported by Flinders University, Computer Science, Engineering and Mathematics School.

Purpose of the study:
This project aims to develop a benefits measurement framework for enterprise systems in Small and Medium Sized Enterprise (SMEs). It is anticipated that the outcome of the research will provide some guidelines to benchmark and track the performance of Enterprise systems in use in SMEs, exploiting the maximum benefits. The model will help the practitioners in SMEs to understand the tangible and intangible positive impacts of ES, encouraging more selection of such systems. The model will help to justify the ES investment in the post-implementation phase in SMEs.

What will I be asked to do?
You are invited to answer the questionnaire about the current and expected benefits of the Enterprise system in your organisation. The survey questionnaire is composed of three parts: the first part pertains to demographic information, the second part relates to general information about the current enterprise system in your organization, and the

third part is concerned with the realized benefits of the enterprise system in your organisation. The survey time is estimated at 10 -15 minutes.
Completing the questionnaire is voluntary and you have the right to refuse participation in this study.

What benefit will I gain from being involved in this study?
The sharing of your experiences will improve the result of this study. By collecting all the benefits of enterprise system in your organisation, the research team will be able to develop a comprehensive measurement model to evaluate the enterprise system in small and medium sized enterprise.

Will I be identifiable by being involved in this study?
We do not need your name and you will be anonymous. Once you answered the questionnaire you will put it in the provided sealable envelope and put them in the collection box. There are no identifying information will be written in the questionnaire form or on the envelope.

Are there any risks or discomforts if I am involved?
Other group members may be able to identify your contributions even though they will not be directly attributed to you.
The investigator anticipates few risks from your involvement in this study. If you have any concerns regarding anticipated or actual risks or discomforts, please raise them with the investigator.

How do I agree to participate?
Participation is voluntary. You may answer 'no comment' or refuse to answer any questions and you are free to withdraw from the focus group at any time without effect or consequences. If you agree to participate please answer the questionnaire and put it back in the sealable envelope and then put it in the collection box.

How will I receive feedback?
Outcomes from the project will be summarised and given to you by the investigator if you would like to see them.

Thank you for taking the time to read this information sheet and we hope that you will accept our invitation to be involved.

This research project has been approved by the Flinders University Social and Behavioural Research Ethics Committee (6367). For more information regarding ethical approval of the project the Executive Officer of the Committee can be contacted by telephone on 8201 3116, by fax on 8201 2035 or by email human.researchethics@flinders.edu.au

A.4 Letter of Introduction

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LETTER OF INTRODUCTION

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She is undertaking research leading to the production of a thesis and other publications on the subject of measuring the benefits of enterprise systems in small and medium sized organizations.

She would be most grateful if you would volunteer to assist in this project, by completing a questionnaire which covers certain aspects of this topic. No more than 10 minutes would be required. There are two versions of the questionnaire, English and Arabic. Please choose the version you prefer.

Be assured that any information provided will be treated in the strictest confidence and none of the participants will be individually identifiable in the resulting thesis, report or other publications. You are, of course, entirely free to discontinue your participation at any time or to decline to answer particular questions.

Any enquiries you may have concerning this project should be directed to me at the address given above or by telephone on (+61 8 8201 3113), fax (+61 8 8201 2904) or e-mail (robert.goodwin@flinders.edu.au).

Thank you for your attention and assistance.

Yours sincerely

R D Goodwin

Dr Robert Goodwin
Senior Lecturer in Information Technology
School of Computer Science, Engineering and Mathematics

This research project has been approved by the Flinders University Social and Behavioural Research Ethics Committee. For more information regarding ethical approval of the project the Secretary of the Committee can be contacted by telephone on 8201 5962, by fax on 8201 2035 or by email human.researchethics@flinders.edu.au

A.5 Questionnaire (Arabic)

استبيان عن فوائد أنظمة الحاسب في الشركات الصغيرة و المتوسطة

السلام عليكم ورحمة الله و بركاته
أنا طالبة دكتوراه في قسم علوم الحاسب والهندسة في جامعة فلندرز بإستراليا.
هذا الاستبيان جزء أساسي من مرحلة التقييم لبحث الدكتوراه. دراستي تستهدف تطوير أداة لقياس فوائد أنظمة الحاسب في الشركات الصغيرة و المتوسطة في المملكة العربية السعوديه. هذه الأداة يمكن أن تستخدم كمرجعية لقياس نجاح أنظمة الحاسب في هذه الشركات.
جميع الاجابات و الردود ستكون مجهولة وتستخدم فقط لغرض هذا البحث.
شاكرة لك تعاونك
أمل

يوجد عدد من الأسئلة في هذا الاستبيان.

ملاحظات حول الخصوصية
هذا الاستبيان لا يسجل أي معلومات هوية
The record of your survey responses does not contain any identifying information about you, unless a specific survey question explicitly asked for it. If you used an identifying token to access this survey, please rest assured that this token will not be stored together with your responses. It is managed in a separate database and will only be updated to indicate whether you did (or did not) complete this survey. There is no way of matching identification tokens with survey responses.

تحميل استبيان سابق | التالي | الخروج ومسح الأستبيان

إلى أي قطاع تنتمي الشركة:
اختر احدى الاجابات التالية:

- التصنيع
- التجارة
- الخدمات
- بدون إجابة

حجم الشركة

اختر احدى الاجابات التالية:

- صغير
- متوسط
- كبير
- بدون إجابة

عدد العاملين في الشركة
اختر احدى الاجابات التالية:

- أقل من 10
- ما بين 10 إلى 49
- ما بين 50 إلى 100
- أكثر من 100
- بدون إجابة

منى تأسست الشركة
اختر احدى الاجابات التالية:

- أقل من سنة
- سنة إلى أقل من 5 سنوات
- 5 سنوات إلى أقل من 10 سنوات
- أكثر من 10 سنوات
- بدون إجابة

عدد مواقع أو فروع الشركة
اختر احدى الاجابات التالية:

- فرع واحد فقط
- من 2 إلى أقل من 5
- من 5 إلى أقل من 10
- من 10 إلى أقل من 50
- خمسين فرع أو أكثر
- بدون إجابة

الجنس :
أختر احدى الاجابات التالية:

- ذكر
- أنثى
- بدون إجابة

الفئة العمرية
أختر احدى الاجابات التالية:

- أقل من 20 سنة
- بين 20 إلى29
- بين 30 إلى 39
- بين 40 إلى 49
- 50 سنة أو أكثر
- بدون إجابة

مركزك في الشركة:
أختر احدى الاجابات التالية:

- مالك الشركة
- موظف في الإدارة
- موظف في التشغيل
- موظف في قسم تكنولوجيا المعلومات
- بدون إجابة

المستوى تعليمي
أختر احدى الاجابات التالية:

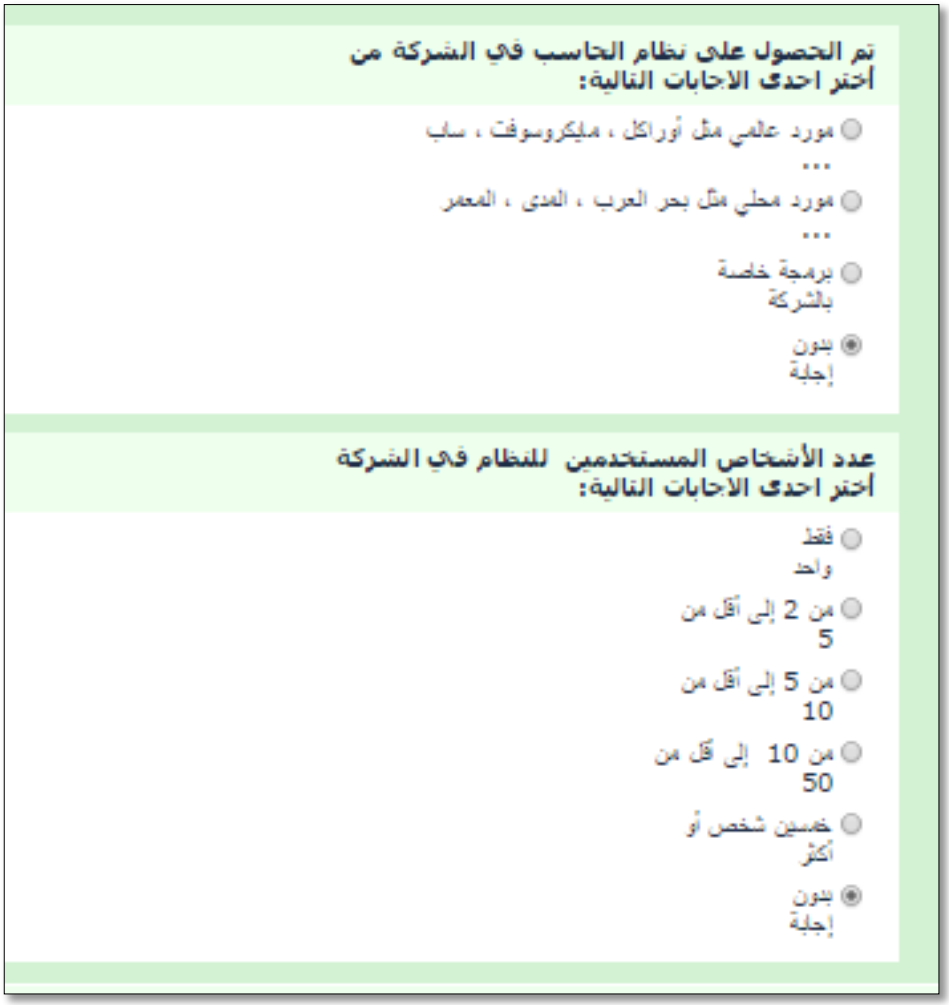
- أقل من الثانويه العامة
- الثانوية العامة
- درجة البكالوريوس
- دراسات عليا
- بدون إجابة

عدد سنوات الخبرة
أختر احدى الاجابات التالية:

- أقل من سنة
- من 1 إلى أقل من 5
- من 5 إلى أقل من 10
- 10 سنوات أو أكثر
- بدون إجابة

هل لديك مؤهلات معلقة بتكنولوجيا المعلومات في المستوى الجامعي أو الدراسات العليا؟
أختر احدى الاجابات التالية:

- نعم
- لا
- بدون إجابة


تم الحصول على نظام الحاسب في الشركة من
أختر احدى الاجابات التالية:
مورد عالمي مثل أوراكل ، مايكروسوفت ، ساب ...
مورد محلي مثل بحر العرب ، المدى ، المعمر ...
برمجة خاصة بالشركة
بدون إجابة
عدد الأشخاص المستخدمين للنظام في الشركة
أختر احدى الاجابات التالية:
فقط واحد
من 2 إلى أقل من 5
من 5 إلى أقل من 10
من 10 إلى أقل من 50
خمسين شخص أو أكثر
بدون إجابة

التأثير على الفرد

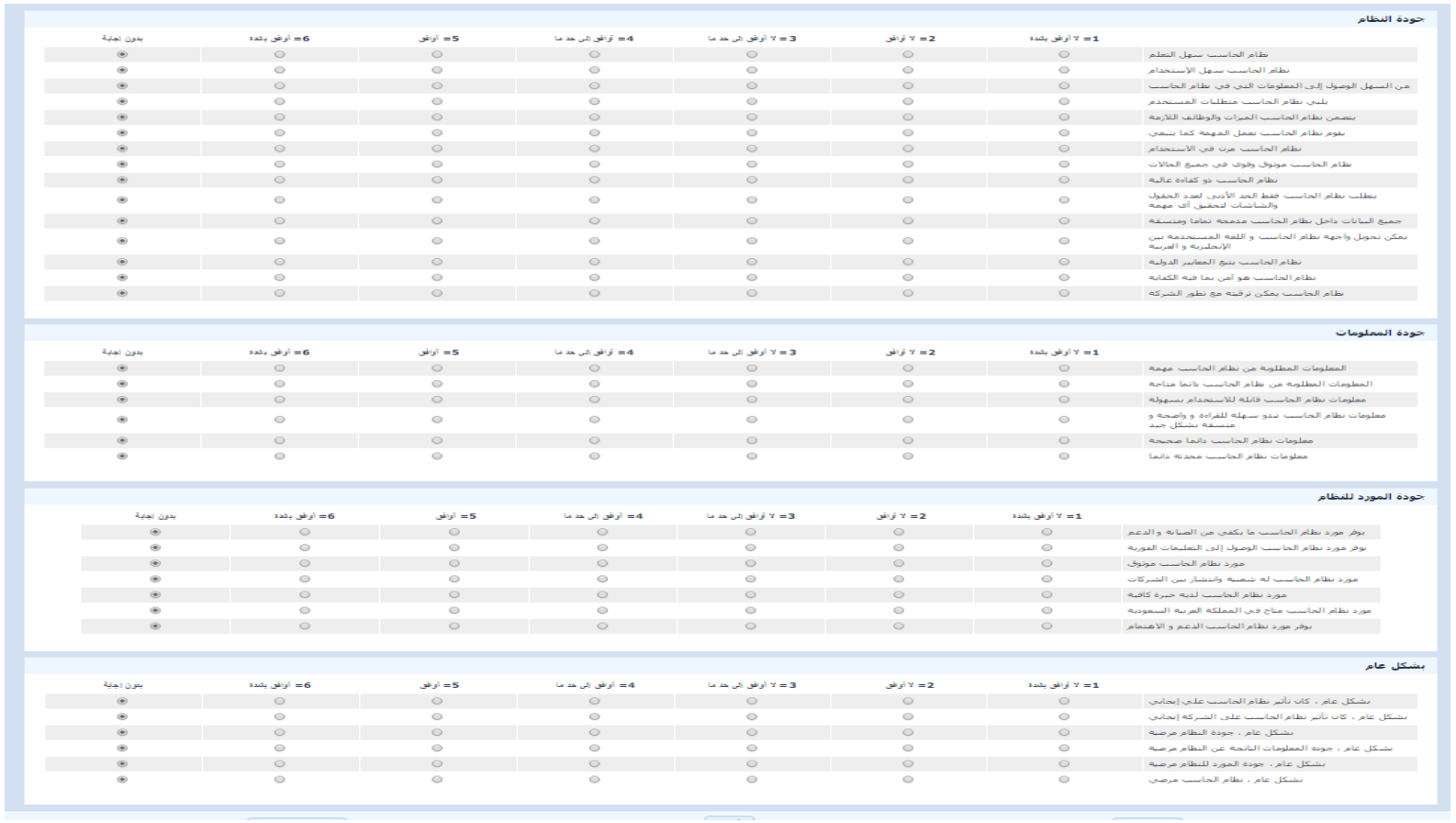
	1= لا أوافق بشدة	2= لا أوافق	3= لا أوافق إلى حد ما	4= أوافق إلى حد ما	5= أوافق	6= أوافق بشدة	بدون إجابة
عزز نظام الحاسب التعلم الفردى	○	○	○	○	○	○	◉
عزز نظام الحاسب الوعى الفردى	○	○	○	○	○	○	◉
حسن نظام الحاسب فعالية اتخاذ القرار	○	○	○	○	○	○	◉
حسن نظام الحاسب الكفاءة الفردية	○	○	○	○	○	○	◉

التأثير على الشركة

	1= لا أوافق بشدة	2= لا أوافق	3= لا أوافق إلى حد ما	4= أوافق إلى حد ما	5= أوافق	6= أوافق بشدة	بدون إجابة
نظام الحاسب فعال من حيث التكلفة	○	○	○	○	○	○	◉
خفض نظام الحاسب تكاليف الموظفين	○	○	○	○	○	○	◉
خفض نظام الحاسب التكاليف مثل تكاليف المخزون ، ونفقات الإدارة	○	○	○	○	○	○	◉
حسن نظام الحاسب الإنتاجية الإجمالية	○	○	○	○	○	○	◉
حسن نظام الحاسب النتائج و المخرجات	○	○	○	○	○	○	◉
زاد نظام الحاسب من القدرة على إدارة توسيع النشاط و زيادة المعاملات	○	○	○	○	○	○	◉
حسن نظام الحاسب من طريقة العمل	○	○	○	○	○	○	◉
حسن نظام الحاسب الرؤية المستقبلية و التخطيط	○	○	○	○	○	○	◉
حسن نظام الحاسب من الادارة	○	○	○	○	○	○	◉
زاد نظام الحاسب من القدرة التنافسية	○	○	○	○	○	○	◉
حسن نظام الحاسب من الابتكار في مجال العمل	○	○	○	○	○	○	◉
حسن نظام الحاسب من استخدام الموارد	○	○	○	○	○	○	◉

جودة النظام

	1= لا أوافق بشدة	2= لا أوافق	3= لا أوافق إلى حد ما	4= أوافق إلى حد ما	5= أوافق	6= أوافق بشدة	بدون إجابة
نظام الحاسب سهل التعلم	○	○	○	○	○	○	◉
نظام الحاسب سهل الإستخدام	○	○	○	○	○	○	◉
من السهل الوصول إلى المعلومات التي في نظام الحاسب	○	○	○	○	○	○	◉
يلبي نظام الحاسب متطلبات المستخدم	○	○	○	○	○	○	◉
يتضمن نظام الحاسب المميزات والوظائف اللازمة	○	○	○	○	○	○	◉
يقوم نظام الحاسب بعمل المهمة كما ينبغي	○	○	○	○	○	○	◉
نظام الحاسب مرن في الاستخدام	○	○	○	○	○	○	◉
نظام الحاسب موثوق وقوى في جميع الحالات	○	○	○	○	○	○	◉
نظام الحاسب ذو كفاءة عالية	○	○	○	○	○	○	◉
يتطلب نظام الحاسب فقط الحد الأدنى لعدد الحقول والشاشات لتحقيق أى مهمة	○	○	○	○	○	○	◉
جميع البيانات داخل نظام الحاسب مدمجة تماما ومتسقة	○	○	○	○	○	○	◉
يمكن تحويل واجهة نظام الحاسب و اللغة المستخدمة بين الإنجليزية و الفرنسة	○	○	○	○	○	○	◉
نظام الحاسب يتبع المعايير الدولية	○	○	○	○	○	○	◉
نظام الحاسب هو أمن بما فيه الكفاية	○	○	○	○	○	○	◉
نظام الحاسب يمكن ترقيته مع تطور الشركة	○	○	○	○	○	○	◉



جودة النظام

	1= لا أوافق بشدة	2= لا أوافق	3= لا أوافق إلى حد ما	4= أوافق إلى حد ما	5= أوافق	6= أوافق بشدة	بدون إجابة
نظام الحاسب سهل التعلم							
نظام الحاسب سهل الاستخدام							
من السهل الوصول إلى المعلومات التي في نظام الحاسب							
يلبي نظام الحاسب متطلبات المستخدم							
يتضمن نظام الحاسب المميزات والوظائف اللازمة							
يقوم نظام الحاسب بعمل المهمة كما ينبغي							
نظام الحاسب مرن في الاستخدام							
نظام الحاسب موثوق وثوق في جميع الحالات							
نظام الحاسب ذو كفاءة عالية							
يتطلب نظام الحاسب فقط الحد الأدنى لعدد الحقول والشاشات لتحقيق أي مهمة							
جميع البيانات داخل نظام الحاسب مدمجة تماما ومنسقة							
يمكن تحويل واجهة نظام الحاسب و اللغة المستخدمة بين الانجليزية و العربية							
نظام الحاسب يتبع المعايير الدولية							
نظام الحاسب هو أمن بما فيه الكفاية							
نظام الحاسب يمكن ترقيته مع تطور الشركة							

جودة المعلومات

	1= لا أوافق بشدة	2= لا أوافق	3= لا أوافق إلى حد ما	4= أوافق إلى حد ما	5= أوافق	6= أوافق بشدة	بدون إجابة
المعلومات المطلوبة من نظام الحاسب مهمة							
المعلومات المطلوبة من نظام الحاسب دائما متاحة							
معلومات نظام الحاسب قابلة للاستخدام بسهولة							
معلومات نظام الحاسب تبدو سهلة للقراءة و واضحة و منسقة بشكل جيد							
معلومات نظام الحاسب دائما صحيحة							
معلومات نظام الحاسب محدثة دائما							

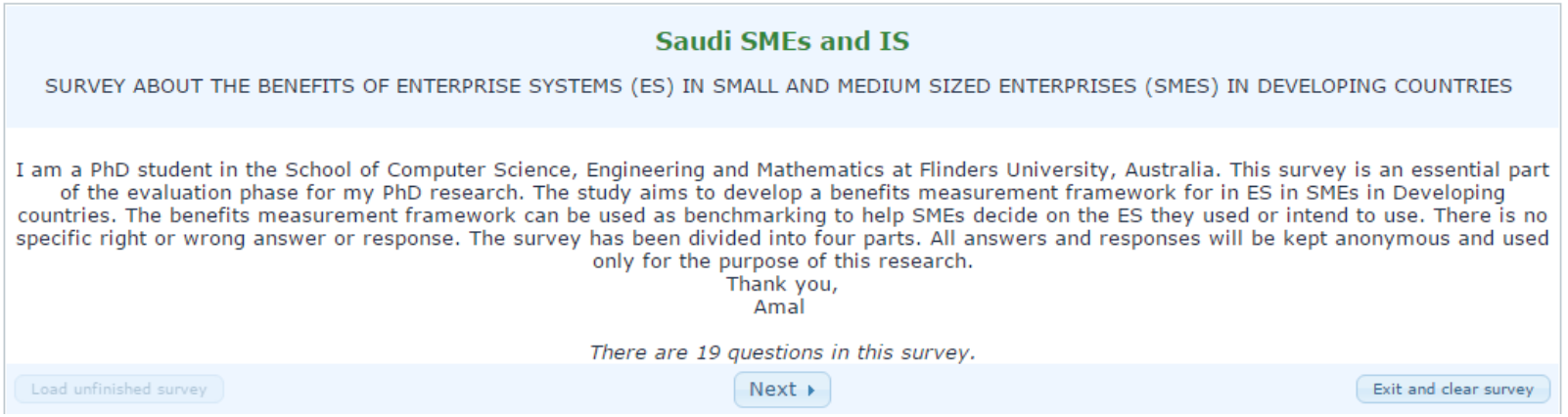
جودة المورد للنظام

	1= لا أوافق بشدة	2= لا أوافق	3= لا أوافق إلى حد ما	4= أوافق إلى حد ما	5= أوافق	6= أوافق بشدة	بدون إجابة
يوفر مورد نظام الحاسب ما يكفي من الصيانة و الدعم							
يوفر مورد نظام الحاسب الوصول إلى التعليمات الفورية							
مورد نظام الحاسب موثوق							
مورد نظام الحاسب له شعبية وانتشار بين الشركات							
مورد نظام الحاسب لديه خبرة كافية							
مورد نظام الحاسب متاح في المملكة العربية السعودية							
يوفر مورد نظام الحاسب الدعم و الاهتمام							

بشكل عام

	1= لا أوافق بشدة	2= لا أوافق	3= لا أوافق إلى حد ما	4= أوافق إلى حد ما	5= أوافق	6= أوافق بشدة	بدون إجابة
بشكل عام ، كان تأثير نظام الحاسب علي إيجابي							
بشكل عام ، كان تأثير نظام الحاسب على الشركة إيجابي							
بشكل عام ، جودة النظام مرضية							
بشكل عام ، جودة المعلومات الناتجة عن النظام مرضية							
بشكل عام ، جودة المورد للنظام مرضية							
بشكل عام ، نظام الحاسب مرضي							

A.6 Questionnaire (English)



Saudi SMEs and IS

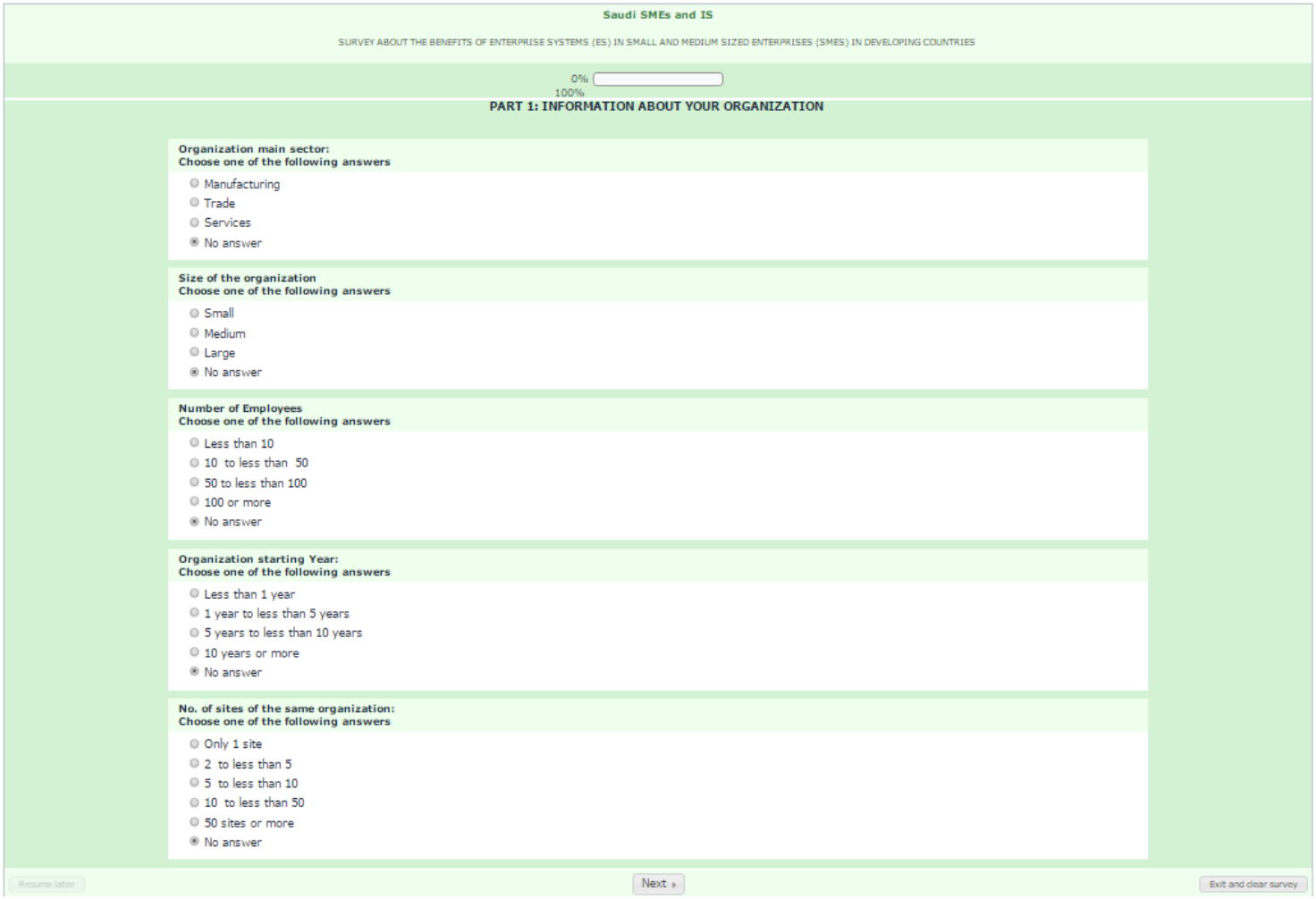
SURVEY ABOUT THE BENEFITS OF ENTERPRISE SYSTEMS (ES) IN SMALL AND MEDIUM SIZED ENTERPRISES (SMES) IN DEVELOPING COUNTRIES

I am a PhD student in the School of Computer Science, Engineering and Mathematics at Flinders University, Australia. This survey is an essential part of the evaluation phase for my PhD research. The study aims to develop a benefits measurement framework for in ES in SMEs in Developing countries. The benefits measurement framework can be used as benchmarking to help SMEs decide on the ES they used or intend to use. There is no specific right or wrong answer or response. The survey has been divided into four parts. All answers and responses will be kept anonymous and used only for the purpose of this research.

Thank you,
Amal

There are 19 questions in this survey.

Load unfinished survey | Next ▸ | Exit and clear survey



Saudi SMEs and IS

SURVEY ABOUT THE BENEFITS OF ENTERPRISE SYSTEMS (ES) IN SMALL AND MEDIUM SIZED ENTERPRISES (SMES) IN DEVELOPING COUNTRIES

0%
100%

PART 1: INFORMATION ABOUT YOUR ORGANIZATION

Organization main sector:
Choose one of the following answers

- Manufacturing
- Trade
- Services
- No answer

Size of the organization
Choose one of the following answers

- Small
- Medium
- Large
- No answer

Number of Employees
Choose one of the following answers

- Less than 10
- 10 to less than 50
- 50 to less than 100
- 100 or more
- No answer

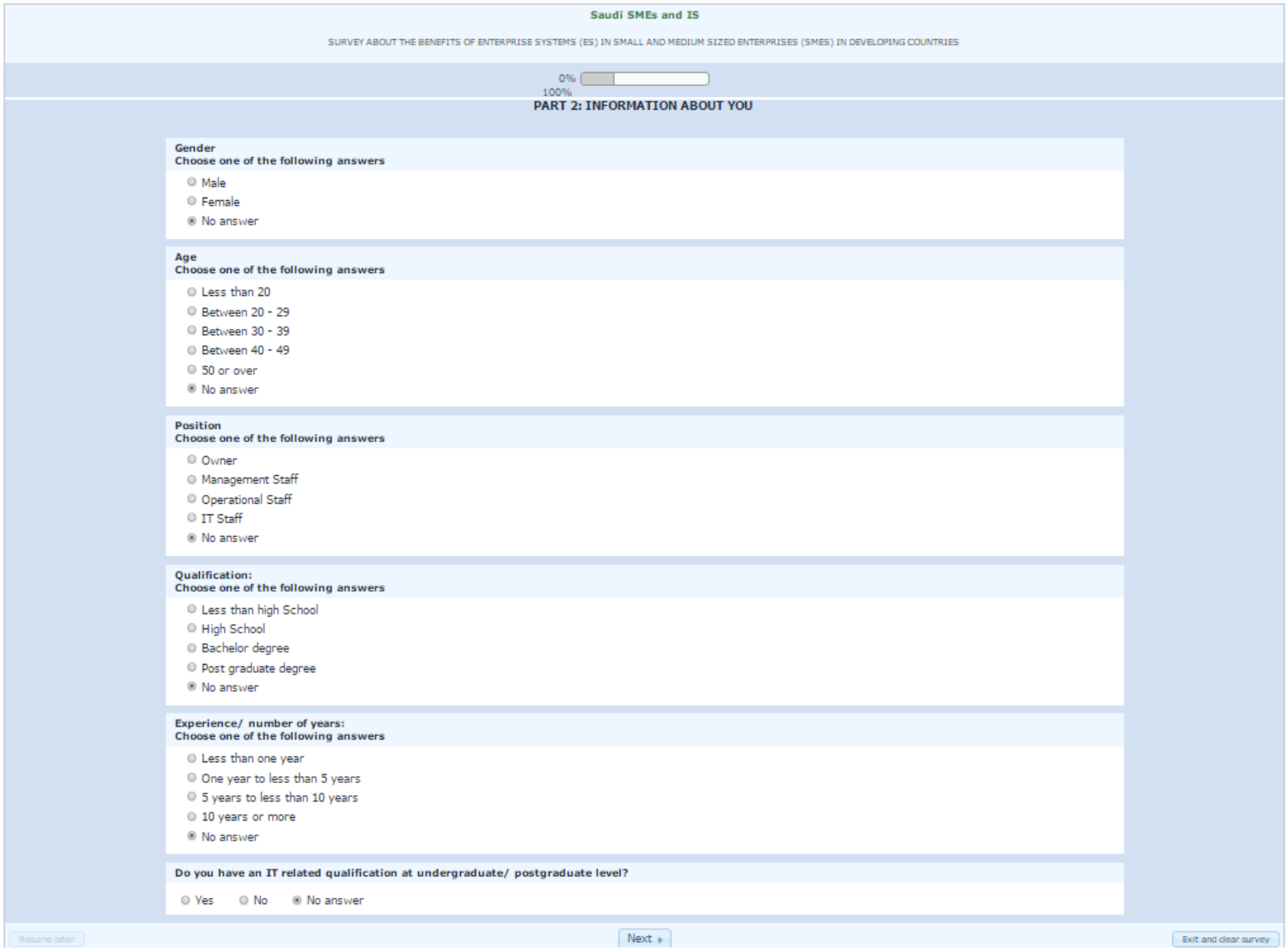
Organization starting Year:
Choose one of the following answers

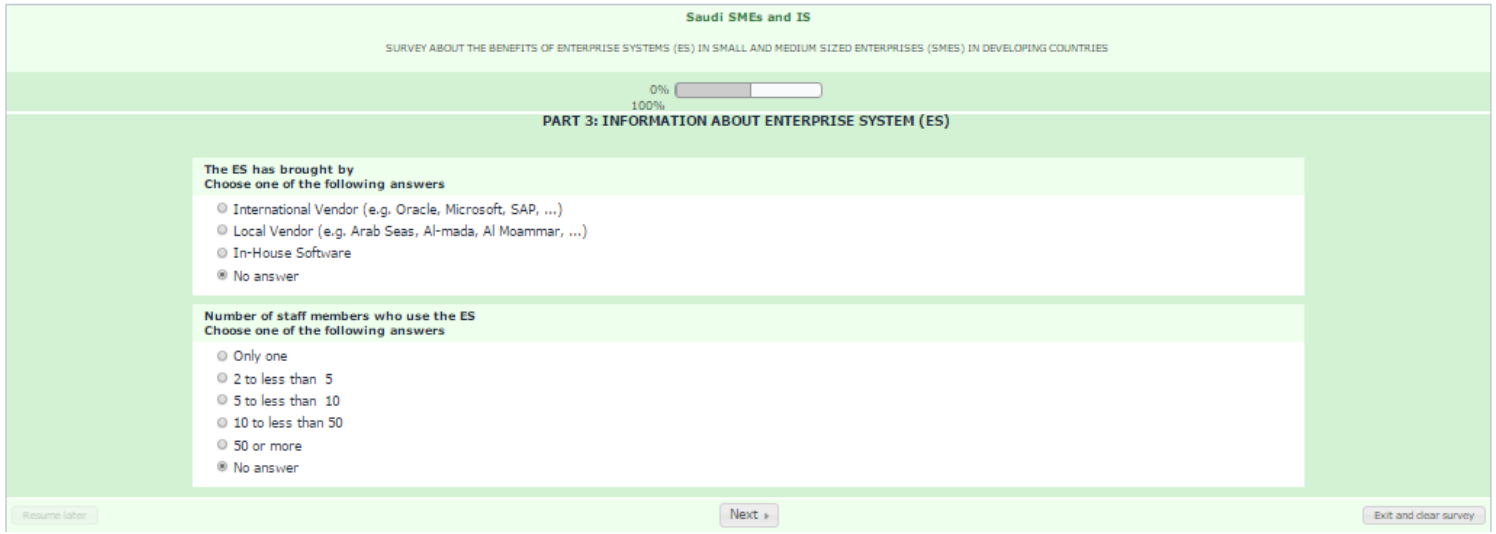
- Less than 1 year
- 1 year to less than 5 years
- 5 years to less than 10 years
- 10 years or more
- No answer

No. of sites of the same organization:
Choose one of the following answers

- Only 1 site
- 2 to less than 5
- 5 to less than 10
- 10 to less than 50
- 50 sites or more
- No answer

Resume later | Next | Exit and clear survey


Saudi SMEs and IS
SURVEY ABOUT THE BENEFITS OF ENTERPRISE SYSTEMS (ES) IN SMALL AND MEDIUM SIZED ENTERPRISES (SMES) IN DEVELOPING COUNTRIES
0%
100%
PART 2: INFORMATION ABOUT YOU
Gender
Choose one of the following answers
Male
Female
No answer
Age
Choose one of the following answers
Less than 20
Between 20 - 29
Between 30 - 39
Between 40 - 49
50 or over
No answer
Position
Choose one of the following answers
Owner
Management Staff
Operational Staff
IT Staff
No answer
Qualification:
Choose one of the following answers
Less than high School
High School
Bachelor degree
Post graduate degree
No answer
Experience/ number of years:
Choose one of the following answers
Less than one year
One year to less than 5 years
5 years to less than 10 years
10 years or more
No answer
Do you have an IT related qualification at undergraduate/ postgraduate level?
Yes
No
No answer
Resume later
Next »
Exit and clear survey


Saudi SMEs and IS
SURVEY ABOUT THE BENEFITS OF ENTERPRISE SYSTEMS (ES) IN SMALL AND MEDIUM SIZED ENTERPRISES (SMES) IN DEVELOPING COUNTRIES
0%
100%
PART 3: INFORMATION ABOUT ENTERPRISE SYSTEM (ES)
The ES has brought by
Choose one of the following answers
International Vendor (e.g. Oracle, Microsoft, SAP, ...)
Local Vendor (e.g. Arab Seas, Al-mada, Al Moammar, ...)
In-House Software
No answer
Number of staff members who use the ES
Choose one of the following answers
Only one
2 to less than 5
5 to less than 10
10 to less than 50
50 or more
No answer
Resume later
Next
Exit and clear survey

Saudi SMEs and IS

SURVEY ABOUT THE BENEFITS OF ENTERPRISE SYSTEMS (ES) IN SMALL AND MEDIUM SIZED ENTERPRISES (SMES) IN DEVELOPING COUNTRIES

0%
100%

PART 4: ENTERPRISE SYSTEM (ES) BENEFITS

Please indicate to what extent you agree/disagree with the following statements.

Individual Impact

	1 = Strongly Disagree	2 = Disagree	3 = Disagree somewhat	4 = Agree somewhat	5 = Agree	6 = Strongly Agree	No answer
ES enhanced individual learning	○	○	○	○	○	○	◉
ES enhanced individual awareness and recall of job related information	○	○	○	○	○	○	◉
ES improved decision effectiveness	○	○	○	○	○	○	◉
ES improved individual productivity	○	○	○	○	○	○	◉

Organizational Impact

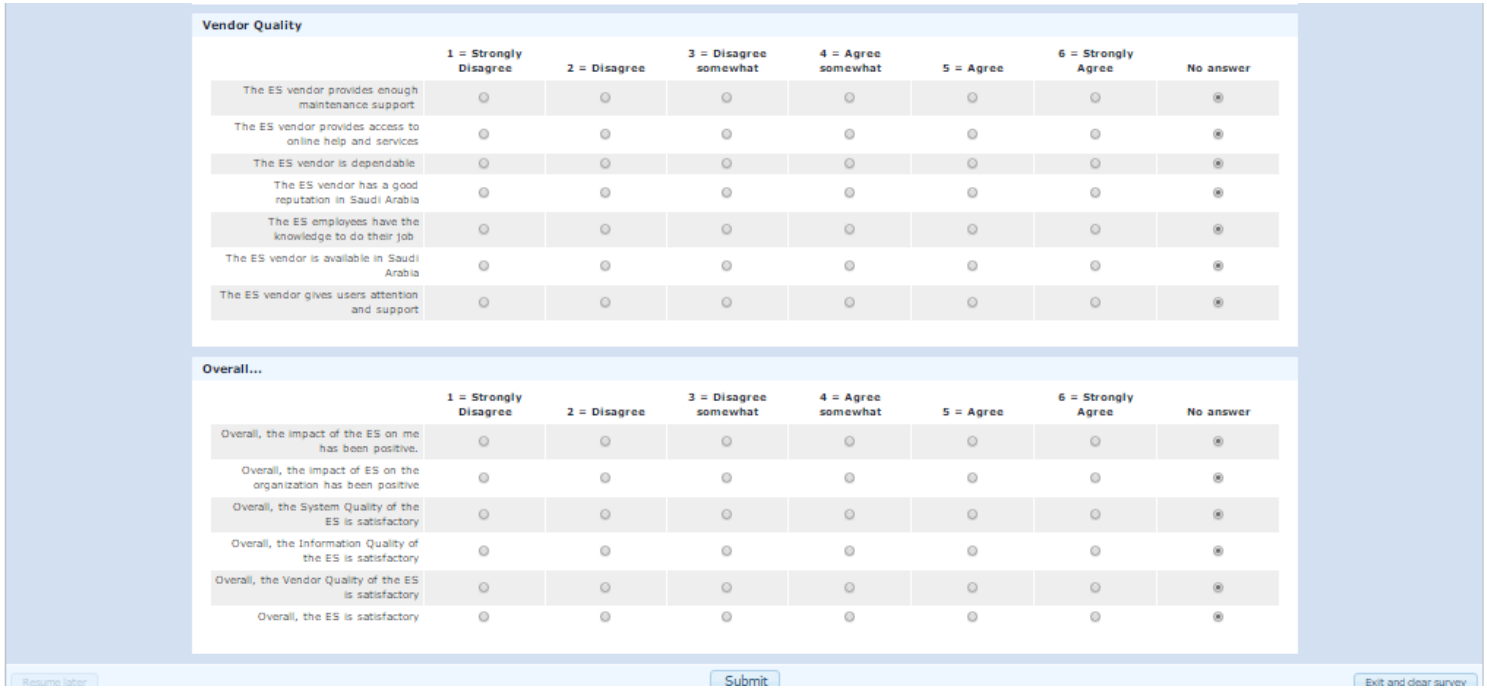
	1 = Strongly Disagree	2 = Disagree	3 = Disagree somewhat	4 = Agree somewhat	5 = Agree	6 = Strongly Agree	No answer
ES is cost effective	○	○	○	○	○	○	◉
ES reduced staff costs	○	○	○	○	○	○	◉
ES reduced cost (e.g. inventory holding costs, administration expenses)	○	○	○	○	○	○	◉
ES improved overall productivity	○	○	○	○	○	○	◉
ES improved outcomes or outputs	○	○	○	○	○	○	◉
ES increased capacity to manage a growing volume of activity (e.g. transactions, population growth)	○	○	○	○	○	○	◉
ES improved business processes	○	○	○	○	○	○	◉
ES improved visibility and planning	○	○	○	○	○	○	◉
ES improved managements and control	○	○	○	○	○	○	◉
ES increased competitiveness	○	○	○	○	○	○	◉
ES improved business innovation	○	○	○	○	○	○	◉
ES improved resource utilization	○	○	○	○	○	○	◉

System Quality

	1 = Strongly Disagree	2 = Disagree	3 = Disagree somewhat	4 = Agree somewhat	5 = Agree	6 = Strongly Agree	No answer
ES is easy to learn	○	○	○	○	○	○	◉
ES is easy to use	○	○	○	○	○	○	◉
It is easy to get access to information that is in the ES	○	○	○	○	○	○	◉
The ES meets the user's requirements	○	○	○	○	○	○	◉
The ES includes necessary features and functions	○	○	○	○	○	○	◉
The ES always does what is should	○	○	○	○	○	○	◉
ES is flexible to use	○	○	○	○	○	○	◉
The ES is reliable (always up-and-running, powerful in all cases	○	○	○	○	○	○	◉
The ES is efficient (i.e. effective without wasting time or effort or expense)	○	○	○	○	○	○	◉
The ES requires only the minimum number of fields and screens to achieve a task	○	○	○	○	○	○	◉
All data within the ES is fully integrated and consistent	○	○	○	○	○	○	◉
ES interface/output can be converted between English/Arabic languages	○	○	○	○	○	○	◉
The ES meets international standards	○	○	○	○	○	○	◉
The ES is secure enough	○	○	○	○	○	○	◉
The ES system can be upgrade as the organization grow	○	○	○	○	○	○	◉

Information Quality

	1 = Strongly Disagree	2 = Disagree	3 = Disagree somewhat	4 = Agree somewhat	5 = Agree	6 = Strongly Agree	No answer
Information available from the ES is important	○	○	○	○	○	○	◉
Information needed from the ES is always available	○	○	○	○	○	○	◉
Information from the ES is in a form that is readily usable	○	○	○	○	○	○	◉
Information from the ES appears readable, clear and well formatted	○	○	○	○	○	○	◉
Information from the ES is always accurate	○	○	○	○	○	○	◉
Information from the ES is timely	○	○	○	○	○	○	◉



Vendor Quality

	1 = Strongly Disagree	2 = Disagree	3 = Disagree somewhat	4 = Agree somewhat	5 = Agree	6 = Strongly Agree	No answer
The ES vendor provides enough maintenance support	○	○	○	○	○	○	◉
The ES vendor provides access to online help and services	○	○	○	○	○	○	◉
The ES vendor is dependable	○	○	○	○	○	○	◉
The ES vendor has a good reputation in Saudi Arabia	○	○	○	○	○	○	◉
The ES employees have the knowledge to do their job	○	○	○	○	○	○	◉
The ES vendor is available in Saudi Arabia	○	○	○	○	○	○	◉
The ES vendor gives users attention and support	○	○	○	○	○	○	◉

Overall...

	1 = Strongly Disagree	2 = Disagree	3 = Disagree somewhat	4 = Agree somewhat	5 = Agree	6 = Strongly Agree	No answer
Overall, the impact of the ES on me has been positive.	○	○	○	○	○	○	◉
Overall, the impact of ES on the organization has been positive	○	○	○	○	○	○	◉
Overall, the System Quality of the ES is satisfactory	○	○	○	○	○	○	◉
Overall, the Information Quality of the ES is satisfactory	○	○	○	○	○	○	◉
Overall, the Vendor Quality of the ES is satisfactory	○	○	○	○	○	○	◉
Overall, the ES is satisfactory	○	○	○	○	○	○	◉

Resume later Submit Exit and clear survey

Appendix B. FORMATIVE AND REFLECTIVE MEASUREMENT

B.1 Introduction

This appendix is dedicated to the discussion of formative and reflective measures, their respective meaning, the difference between them and the recommendation for using either of them in this study.

B.2 Overview of Formative and Reflective Measurement

In recent times, measurement models are being identified as either formative or reflective with strong arguments on the viable use of both types of measure (Christophersen & Konradt, 2012; Coltman et al., 2008; Finn & Wang, 2014; Gable & Sedera, 2009; Howell et al., 2013; Lee & Cadogan, 2013; Simonetto, 2012; Willoughby, 2014). These two types of models differ in the underlying assumption of the causal relationship between the LV and its indicators (Christophersen & Konradt, 2012).

Traditionally, scale development draws on reflective measurement models where the observed indicators are assumed to be caused by the LV. Figure B-1(A) shows a LV that is assessed by three reflective indicators. In this causal relationship, changes in the value of the LV result in changes in the values of all reflective indicators (Christophersen & Konradt, 2012).

However, when the causal relationship is in the opposite direction between the LV and the manifest indicators, this forms the formative measurement model (see Figure B-1[B]). In this case, changes in the indicators cause changes in the LV (Christophersen & Konradt, 2012). This means that the measures (indicators) cause changes in the construct (LV) and that the construct is fully derived by its measurement (Freeze & Raschke, 2007).

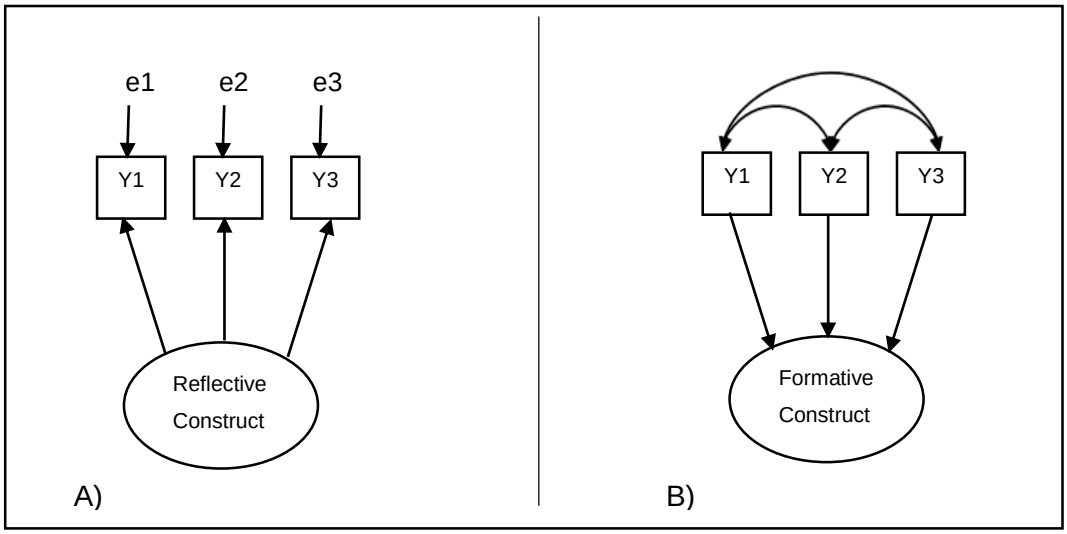


Figure B-1: Reflective and formative constructs

B.3 Difference between Formative and Reflective Measures

A number of key features distinguish reflective and formative measures including: causality, measurement error, internal consistency, correlations, identification and measurement interchangeability. Table B-1 summarises these differences.

Table B-1: Summary of the key features of reflective and formative models

Key feature	Reflective	Formative
Causality	From construct to indicators	From indicators to construct
Measurement error	yes	no
Internal consistency	yes	no
Correlations	yes	no

As shown in Table 1, three more differences exist between reflective and formative models in addition to the causality mentioned above. In the reflective model, the indicators are subjected to errors of measurement as an increase in the construct is reflected by an increase in all indicators and all the measures are expected to be correlated. However, in the formative model, the measurement error is at the construct level, meaning that part of the construct is not explained by the measures:

an increase in one indicator would not require a simultaneous increase in all indicators. Due to the direction of causality with formative models, high correlations between the indicators is also not expected, not required nor a cause for concern (Christophersen & Konradt, 2012; Freeze & Raschke, 2007).

These differences continue when it comes to the validation of each type of model. Reflective models are usually evaluated using classical test theory to validate the construct, such as CFA, convergent and discriminant validity and measurement reliability. However, formative models are validated by nomological validity methods, assessing the strength of path coefficients from the indicators to the construct and addressing any multi-collinearity issues (Finn & Wang, 2014).

B.4 Justification of the Type of Measurement Model Used in this Study

Accordingly, choosing between formative or reflective measurement models is an important issue (Christophersen & Konradt, 2012), which can cause many changes in structuring and testing the final model.

In relation to this choice, researchers are divided into two main groups: formative supporters and reflective supporters in addition to some researchers who use both types of measurement.

With a strong trend towards formative measures, some researchers have argued that formative indicators are reliable. They have also argued that, in some cases, prior IS research has misapplied reflective measurement where formative measurement should have been used and that these misspecifications could significantly bias structural coefficients (Diamantopoulos, 2011; Diamantopoulos et al., 2008; Diamantopoulos & Winklhofer, 2001; Gable & Sedera, 2009; Lee et al., 2013; Petter et al., 2007).

On the other hand, many researchers have been against the use of formative measures and have questioned the validity of formative measurement even when structural models were correctly specified. They have concluded that the use of formative measurement remains problematic in theory-testing research and they further caution against its use except in very limited circumstances (Edwards, 2011; Howell et al., 2013; Jarvis et al., 2003); (Bagozzi, 2011; Borsboom, Mellenbergh, &

van Heerden, 2004; Cadogan & Lee, 2013; Hardin & Marcoulides, 2011; Howell et al., 2007; Ping Jr, 2004; Rigdon, 2014; Wilcox et al., 2008)

Many problems are associated with the use of formative constructs. As stated by Hardin et al. (2010), traditional (reflective) indicators are applied based on classical test theory; however, the application of causal (formative) indicators is based on practical application rather than on supported psychometric theory. In addition, (Edwards, 2011) argued that using formative measurement is misguided, and that justifications given for measures are based on expressed beliefs about constructs, measures, causality and other measurement issues that are difficult to defend. Lance (2011) added that formative models are plagued with more problems than their proponents have acknowledged and that the objectives of formative measurement models can actually be achieved at least as effectively using reflective indicators.

Some researchers have argued that there is misunderstanding and confusion between composite and formative variables. (Howell et al., 2013) claimed that the precise meaning of formative indicators remains unclear. This misunderstanding occurs among researchers who tend to use formative indicators as, in most cases, they are actually using a composite variable. Accordingly, their empirical tests do not provide information on the relationships between antecedent and formative LVs (Cadogan & Lee, 2013). Furthermore, (Bollen, 2011) emphasised that causal indicators are distinct from composite (formative) indicators with this difference having significant implications for the applicability of formative measurement validation techniques because these techniques do not apply to composite variables (Hardin & Marcoulides, 2011).

From another perspective, two major problems occur when dealing with formative LVs statistically. Firstly, the formative measurement approach does not allow estimation of the parameters of a formative model within a structural equation model without linking the LV to at least one other LV. Secondly, the estimates are biased if a critical degree of multi-collinearity exists between the formative indicators (Christophersen & Konradt, 2012). Furthermore, some variables may be assessed by both a reflective and a formative measurement model (Christophersen & Konradt, 2012). Another confusing point is that one should consider the formative or reflective nature of the response rather than the formative or reflective nature of the measure (Gable et al., 2008).

Other researchers, however, have taken a middle path between the two types of measurement (Bollen, 2011; Christophersen & Konradt, 2012; Finn & Wang, 2014; Kim, 2011). They suggested that researchers can use either type but need to be clear about the construct's conceptual domain, and whether the construct's relationship with its indicators is formative or reflective for each facet.

Undesirably, as a result of this series of disjointed contradictory research, consumers have become confused: a greater hazard is that this threatens the advancement of knowledge in IS research (Hardin & Marcoulides, 2011).

(Hardin & Marcoulides, 2011) have recommended that, where the objectives of formative measurement can be achieved using alternative models with reflective measures, reflective measures should be used to avoid further confusion and the problems associated with the use of formative models. This study, therefore, has used reflective measures

B.5 References

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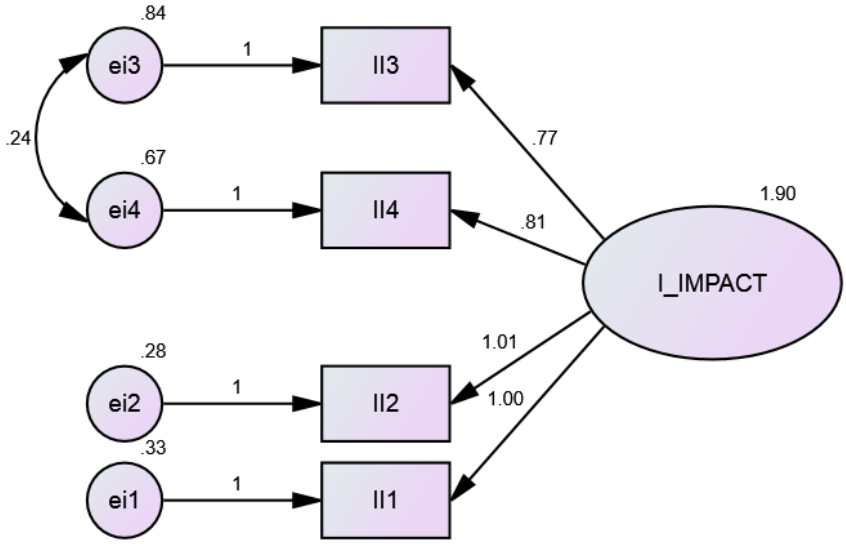
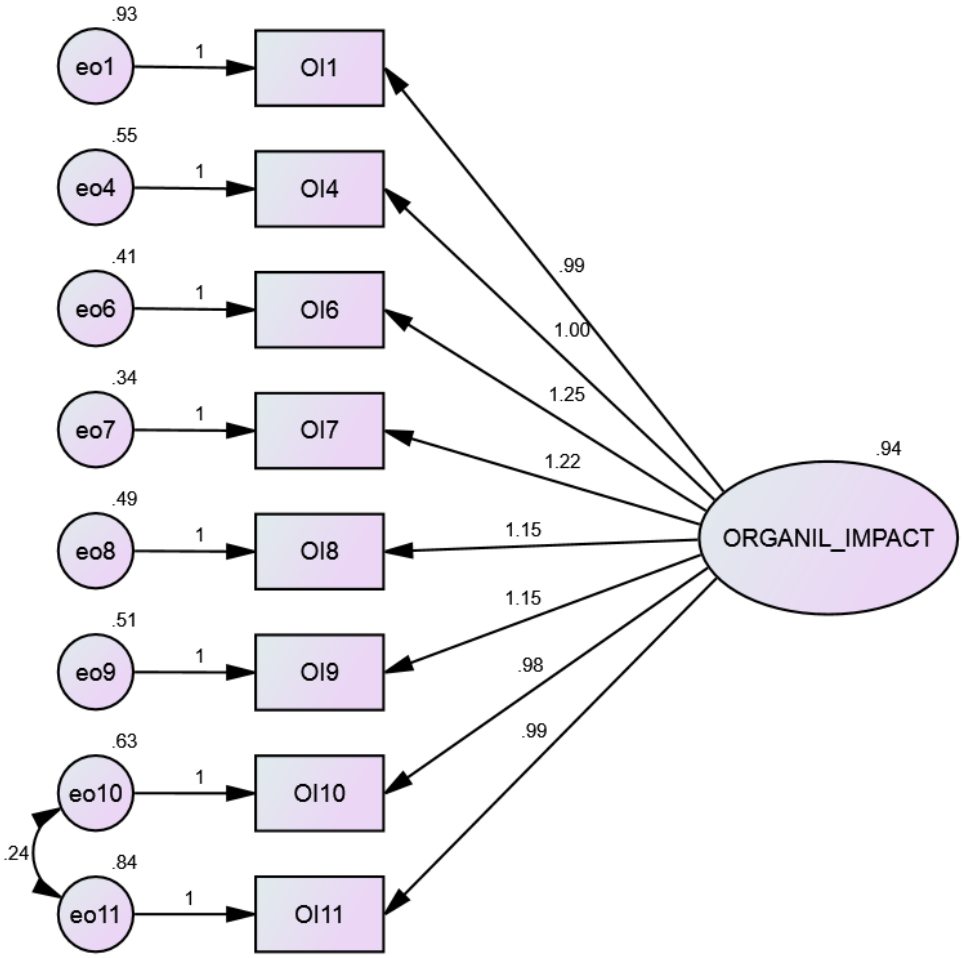
Appendix C. **CONGENERIC MODELS**

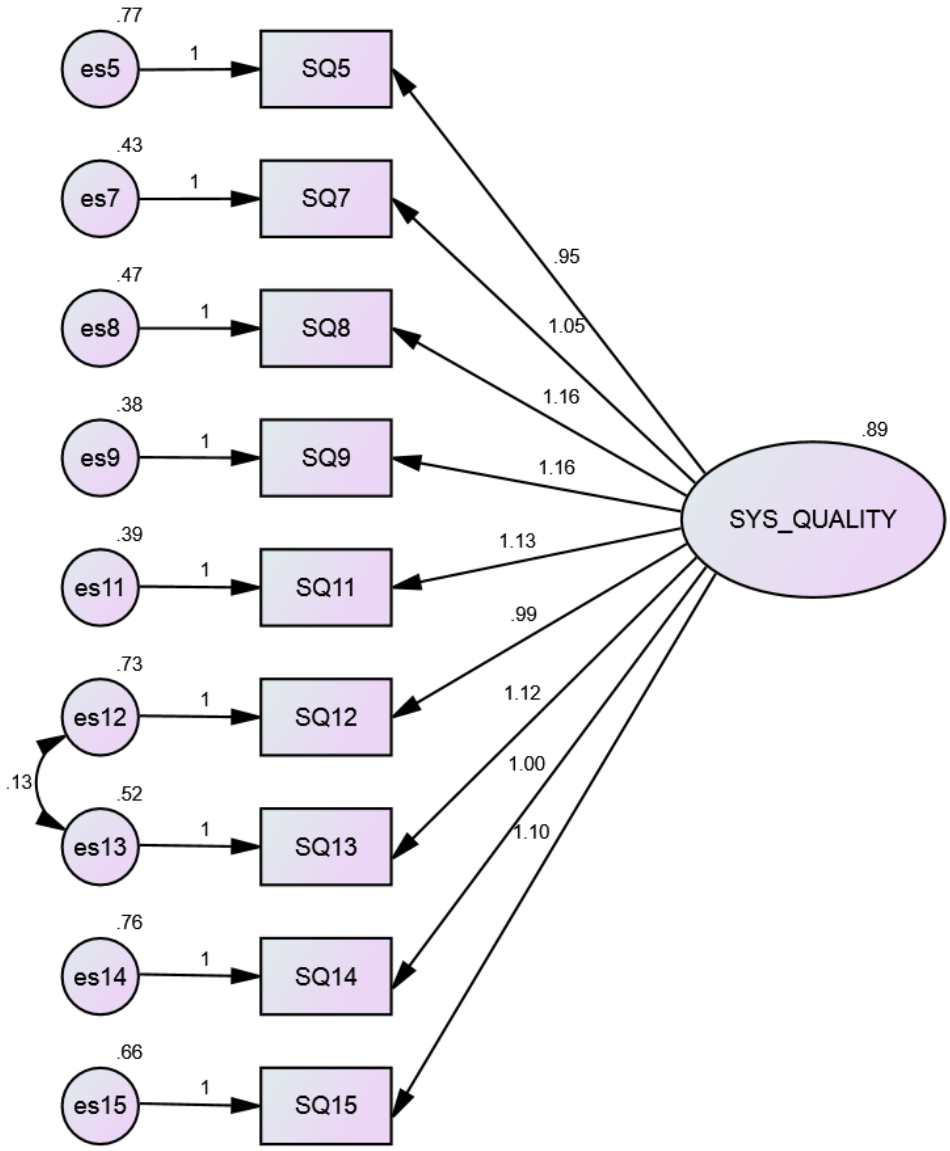
C.1 Individual Impact



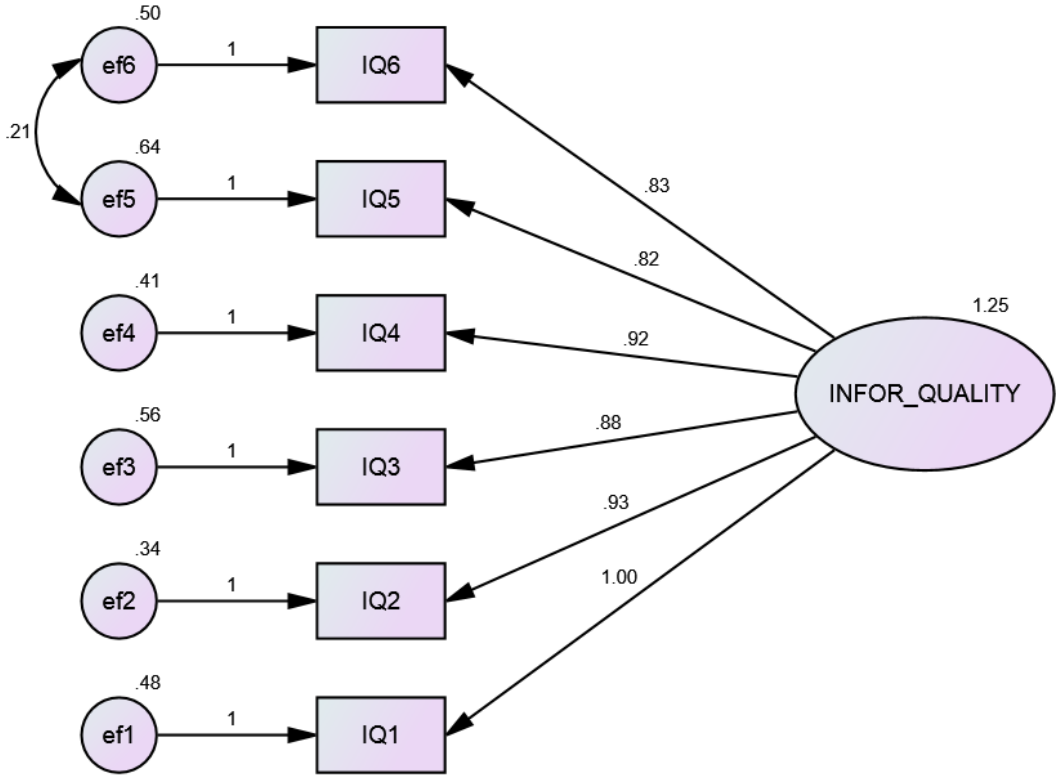
C.2 Organisational Impact



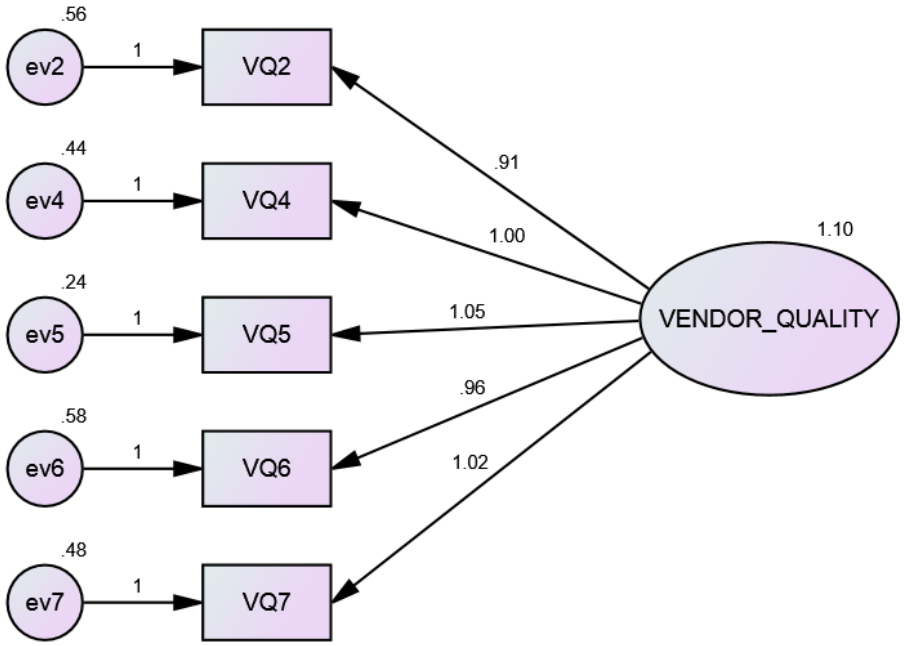
C.3 System Quality



C.4 Information Quality



C.5 Vendor Quality



Appendix D. **DESCRIPTION OF THE ORIGINAL SCALE**

Table D-1: Descriptive Statistics

	N	Range	Minimum	Maximum	Mean		Std. Deviation	Variance	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
II1	322	5	1	6	4.08	.084	1.505	2.264	-.563	.136	-.715	.271
II2	333	5	1	6	4.13	.084	1.536	2.360	-.509	.134	-.744	.266
II3	340	5	1	6	4.39	.077	1.423	2.025	-.696	.132	-.219	.264
II4	345	5	1	6	4.28	.075	1.397	1.953	-.711	.131	-.078	.262
OI1	333	5	1	6	4.26	.077	1.412	1.995	-.671	.134	-.218	.266
OI2	331	5	1	6	4.17	.076	1.381	1.907	-.500	.134	-.341	.267
OI3	324	5	1	6	4.27	.073	1.316	1.731	-.746	.135	.141	.270
OI4	321	5	1	6	4.55	.072	1.286	1.655	-1.01	.136	.848	.271
OI5	329	5	1	6	4.53	.073	1.323	1.750	-.920	.134	.493	.268
OI6	329	5	1	6	4.50	.078	1.423	2.025	-.983	.134	.329	.268
OI7	334	5	1	6	4.65	.074	1.360	1.850	-1.06	.133	.612	.266
OI8	327	5	1	6	4.47	.076	1.369	1.875	-.888	.135	.297	.269
OI9	354	5	1	6	4.53	.071	1.332	1.774	-1.01	.130	.570	.259
OI10	352	5	1	6	4.42	.066	1.235	1.526	-.896	.130	.680	.259
OI11	356	5	1	6	4.24	.071	1.336	1.784	-.706	.129	-.046	.258
OI12	350	5	1	6	4.41	.070	1.310	1.716	-.985	.130	.617	.260
SQ1	336	5	1	6	4.14	.076	1.388	1.926	-.568	.133	-.374	.265
SQ2	357	5	1	6	4.43	.067	1.258	1.583	-.908	.129	.546	.257
SQ3	355	5	1	6	4.45	.065	1.233	1.519	-.840	.129	.340	.258
SQ4	328	5	1	6	4.33	.076	1.384	1.915	-.782	.135	.058	.268
SQ5	349	5	1	6	4.33	.068	1.275	1.625	-.944	.131	.664	.260
SQ6	346	5	1	6	4.37	.069	1.286	1.655	-.953	.131	.616	.261
SQ7	351	5	1	6	4.33	.064	1.207	1.456	-.844	.130	.746	.260
SQ8	355	5	1	6	4.18	.070	1.310	1.717	-.733	.129	.194	.258
SQ9	350	5	1	6	4.36	.068	1.270	1.612	-.980	.130	.719	.260
SQ10	346	5	1	6	4.16	.069	1.287	1.657	-.663	.131	.140	.261
SQ11	348	5	1	6	4.30	.067	1.253	1.570	-.783	.131	.418	.261
SQ12	348	5	1	6	4.51	.069	1.283	1.645	-1.07	.131	.842	.261
SQ13	339	5	1	6	4.28	.071	1.299	1.686	-.861	.132	.292	.264
SQ14	342	5	1	6	4.15	.070	1.298	1.686	-.808	.132	.334	.263
SQ15	352	5	1	6	4.45	.071	1.337	1.786	-1.10	.130	.864	.259
IQ1	350	5	1	6	4.49	.071	1.328	1.763	-1.14	.130	.891	.260
IQ2	343	5	1	6	4.39	.065	1.209	1.462	-.912	.132	.828	.263

IQ3	346	5	1	6	4.38	.068	1.257	1.580	-.861	.131	.432	.261
IQ4	346	5	1	6	4.40	.066	1.226	1.504	-1.07	.131	1.079	.261
IQ5	347	5	1	6	4.25	.066	1.223	1.496	-.743	.131	.375	.261
IQ6	349	5	1	6	4.36	.063	1.185	1.404	-.948	.131	.941	.260
VQ1	344	5	1	6	4.20	.069	1.287	1.658	-.909	.131	.446	.262
VQ2	342	5	1	6	4.15	.067	1.238	1.533	-.838	.132	.323	.263
VQ3	340	5	1	6	4.29	.067	1.226	1.504	-.893	.132	.651	.264
VQ4	338	5	1	6	4.32	.069	1.266	1.602	-.819	.133	.326	.265
VQ5	337	5	1	6	4.36	.066	1.217	1.482	-.901	.133	.675	.265
VQ6	339	5	1	6	4.43	.070	1.284	1.648	-.972	.132	.607	.264
VQ7	342	5	1	6	4.25	.069	1.284	1.649	-.947	.132	.525	.263

Appendix E. **CORRELATION AND COVARIANCE MATRICES AND NORMALITY TABLE**

E.1 Correlation Matrices

	IQ5	OI7	SQ5	SQ9	OI6	IQ4	VQ4	SQ8	VQ1	IQ2	IQ3	SQ11	SQ7	OI8	OI9	II3	II4	II2	VQ7	VQ5	SQ12	SQ13	SQ14	OI1	OI4
IQ5	1.000																								
OI7	.549	1.000																							
SQ5	.527	.536	1.000																						
SQ9	.610	.620	.574	1.000																					
OI6	.533	.824	.520	.602	1.000																				
IQ4	.645	.607	.583	.675	.589	1.000																			
VQ4	.521	.530	.509	.590	.515	.577	1.000																		
SQ8	.576	.585	.627	.726	.569	.637	.556	1.000																	
VQ1	.501	.509	.489	.566	.495	.554	.607	.534	1.000																
IQ2	.664	.599	.575	.666	.582	.704	.569	.628	.547	1.000															
IQ3	.625	.588	.565	.653	.571	.691	.559	.617	.537	.682	1.000														
SQ11	.595	.606	.649	.751	.588	.659	.576	.708	.553	.650	.638	1.000													
SQ7	.577	.586	.628	.727	.569	.638	.557	.754	.535	.629	.618	.710	1.000												
OI8	.547	.763	.534	.618	.741	.605	.528	.583	.507	.597	.586	.603	.584	1.000											
OI9	.523	.729	.511	.591	.708	.578	.505	.558	.485	.571	.560	.577	.559	.726	1.000										
II3	.458	.629	.448	.518	.611	.507	.443	.489	.426	.501	.491	.506	.490	.626	.599	1.000									
II4	.473	.649	.462	.535	.630	.523	.457	.505	.439	.517	.507	.522	.506	.647	.618	.742	1.000								
II2	.455	.624	.445	.515	.606	.504	.440	.486	.423	.497	.488	.502	.487	.622	.595	.714	.736	1.000							
VQ7	.520	.529	.508	.588	.514	.576	.721	.555	.693	.568	.558	.574	.556	.527	.504	.442	.456	.439	1.000						
VQ5	.553	.562	.540	.625	.546	.612	.766	.590	.736	.604	.592	.610	.591	.560	.536	.470	.485	.467	.765	1.000					
SQ12	.523	.532	.570	.660	.517	.579	.506	.622	.486	.571	.560	.644	.623	.530	.507	.445	.459	.441	.505	.536	1.000				
SQ13	.565	.575	.615	.712	.558	.625	.546	.672	.524	.617	.605	.695	.673	.572	.547	.480	.496	.477	.545	.579	.692	1.000			
SQ14	.504	.513	.549	.636	.498	.558	.487	.600	.468	.550	.540	.620	.601	.511	.488	.428	.442	.425	.486	.517	.545	.589	1.000		

	IQ5	OI7	SQ5	SQ9	OI6	IQ4	VQ4	SQ8	VQ1	IQ2	IQ3	SQ11	SQ7	OI8	OI9	II3	II4	II2	VQ7	VQ5	SQ12	SQ13	SQ14	OI1	OI4
OI1	.468	.653	.457	.529	.634	.518	.453	.500	.435	.511	.502	.517	.500	.561	.622	.537	.554	.533	.452	.480	.454	.490	.437	1.000	
OI4	.494	.689	.482	.558	.669	.546	.477	.527	.458	.539	.529	.545	.528	.686	.656	.566	.584	.562	.476	.506	.479	.517	.461	.588	1.000

E.2 Covariance Matrices

	IQ5	OI7	SQ5	SQ9	OI6	IQ4	VQ4	SQ8	VQ1	IQ2	IQ3	SQ11	SQ7	OI8	OI9	II3	II4	II2	VQ7	VQ5	SQ12	SQ13	SQ14	OI1	OI4
IQ5	1.487																								
OI7	.884	1.746																							
SQ5	.804	.886	1.565																						
SQ9	.935	1.031	.902	1.581																					
OI6	.893	1.496	.894	1.041	1.887																				
IQ4	.956	.975	.887	1.031	.984	1.478																			
VQ4	.789	.870	.791	.920	.878	.870	1.539																		
SQ8	.909	1.001	1.015	1.181	1.011	1.002	.893	1.675																	
VQ1	.771	.849	.772	.898	.857	.850	.950	.873	1.592																
IQ2	.963	.942	.857	.997	.951	1.019	.841	.968	.821	1.417															
IQ3	.943	.962	.874	1.017	.971	1.040	.858	.988	.838	1.005	1.534														
SQ11	.893	.984	.997	1.160	.993	.985	.878	1.127	.857	.951	.971	1.512													
SQ7	.836	.922	.935	1.087	.931	.922	.823	1.160	.803	.891	.910	1.038	1.415												
OI8	.881	1.331	.882	1.026	1.344	.971	.866	.997	.846	.938	.958	.980	.918	1.745											
OI9	.845	1.278	.847	.985	1.290	.932	.831	.957	.812	.901	.920	.941	.881	1.272	1.759										
II3	.784	1.165	.786	.914	1.176	.865	.771	.888	.753	.836	.853	.873	.818	1.160	1.114	1.967									
II4	.796	1.183	.798	.928	1.195	.878	.783	.902	.765	.849	.866	.886	.830	1.179	1.132	1.436	1.905								
II2	.829	1.232	.831	.966	1.244	.914	.815	.939	.796	.883	.902	.922	.864	1.227	1.178	1.494	1.518	2.229							
VQ7	.810	.893	.812	.945	.902	.894	1.143	.918	1.116	.864	.882	.902	.845	.889	.854	.792	.804	.837	1.630						
VQ5	.809	.892	.811	.944	.901	.893	1.141	.917	1.115	.862	.881	.901	.844	.888	.853	.791	.804	.836	1.172	1.441					
SQ12	.808	.890	.902	1.050	.899	.891	.794	1.020	.776	.861	.879	1.002	.939	.886	.851	.789	.802	.834	.816	.815	1.603				
SQ13	.879	.969	.982	1.143	.978	.969	.864	1.110	.844	.936	.956	1.091	1.022	.965	.926	.859	.872	.908	.888	.887	1.117	1.627			

	IQ5	OI7	SQ5	SQ9	OI6	IQ4	VQ4	SQ8	VQ1	IQ2	IQ3	SQ11	SQ7	OI8	OI9	II3	II4	II2	VQ7	VQ5	SQ12	SQ13	SQ14	OI1	OI4
SQ14	.788	.868	.880	1.024	.877	.869	.775	.995	.757	.840	.857	.978	.916	.865	.830	.770	.782	.814	.796	.795	.885	.963	1.643		
OI1	.778	1.176	.780	.907	1.187	.858	.765	.881	.747	.829	.846	.866	.811	1.010	1.124	1.025	1.041	1.084	.786	.785	.783	.852	.764	1.857	
OI4	.736	1.113	.738	.858	1.123	.812	.724	.834	.707	.784	.801	.819	.767	1.108	1.064	.970	.985	1.026	.744	.743	.741	.806	.723	.979	1.495

E.3 Normality Table

Variable	Min	Max	Skewness		Kurtosis	
			Stat.	Std. Error	Stat.	Std. Error
II2	1.000	6.000	-0.509	0.134	-0.744	0.266
II3	1.000	6.000	-0.696	0.132	-0.219	0.264
II4	1.000	6.000	-0.711	0.131	-0.078	0.262
IQ2	1.000	6.000	-0.912	0.132	0.828	0.263
IQ3	1.000	6.000	-0.861	0.131	0.432	0.261
IQ4	1.000	6.000	-1.076	0.131	1.079	0.261
IQ5	1.000	6.000	-0.743	0.131	0.375	0.261
OI1	1.000	6.000	-0.671	0.134	-0.218	0.266
OI4	1.000	6.000	-1.007	0.136	0.848	0.271
OI6	1.000	6.000	-0.983	0.134	0.329	0.268
OI7	1.000	6.000	-1.061	0.133	0.612	0.266
OI8	1.000	6.000	-0.888	0.135	0.297	0.269
OI9	1.000	6.000	-1.018	0.130	0.570	0.259
SQ5	1.000	6.000	-0.944	0.131	0.664	0.260
SQ7	1.000	6.000	-0.844	0.130	0.746	0.260
SQ8	1.000	6.000	-0.733	0.129	0.194	0.258
SQ9	1.000	6.000	-0.980	0.130	0.719	0.260
SQ11	1.000	6.000	-0.783	0.131	0.418	0.261
SQ12	1.000	6.000	-1.072	0.131	0.842	0.261
SQ13	1.000	6.000	-0.861	0.132	0.292	0.264
SQ14	1.000	6.000	-0.808	0.132	0.334	0.263
VQ1	1.000	6.000	-0.909	0.131	0.446	0.262
VQ4	1.000	6.000	-0.819	0.133	0.326	0.265
VQ5	1.000	6.000	-0.901	0.133	0.675	0.265
VQ7	1.000	6.000	-0.947	0.132	0.525	0.263

Appendix F. LIST OF ACADEMIC STUDIES IN ARCHIVAL ANALYSIS OF SMES' DEFINITION

Study	Discipline	Size				Country	Organisation characteristics used to define its size			
							Size measure			Industry
		SME	Medium-sized	Small	Micro		Monetary $ (Million EUR)	No. of employees	Other	
(Chen & Williams, 1998)	Business	X	x	x	x	UK		< 250		Manufacturing, wholesale & retail
(Fink, 1998)	IS	X	x	x		Australia		> 10 < 500		-
(Lin, 1998)	Business	X	x	x	x	Taiwan		< 500		-
(Dierckx & Stroeken, 1999)	IS	X	x	x	x	Netherlands		< 100		Car disassembly industry
(Levy et al., 1999)	IS	X	x	x		UK	Turnover 2.1–16.3	24–85		Manufacturing
(Levy & Powell, 2000)	IS	X	x	x	x	UK		<500		Manufacturing, trade & services
(Peres & Stumpo, 2000)	IS	X	x	x	x	USA		< 500		Manufacturing
(Kendall et al., 2001)	IS	X	x	x	x	Singapore	Turnover < 12.2 Assets < 6.5	< 100		
(Mehrtens, Cragg, & Mills, 2001)	IS	X	x	x	x	New Zealand		< 200		IT, manufacturing, retail, transport
(Kannan & Boie, 2003)	Business	X	x	x	x	Germany	Turnover 51.1	<500		Manufacturing
(McCartan-Quinn & Carson, 2003)	Economic			x		UK		< 100	x	
(Grandon & Pearson, 2004)	IS	X	x	x	x	USA		< 500		
(Huang & Chou, 2004)	IS	X	x	x	x	Taiwan	Revenue 1000M–10B	< 250		
(Huang, Soutar, & Brown, 2004)	Business	X	x	x	x	Australia		< 200		Manufacturing
(Huin, 2004)	Business	X	x	x	x	Singapore	Assets < 7.3	< 200		

(Love & Irani, 2004)	IS	X	x	x	X	Australia	Turnover 175	< 250		
(Taylor, McWilliam, England, & Akomode, 2004)	IS	X	x	x	X	UK		60		Wholesale, marketing & retail
(Acar et al., 2005)	Economic	X	x	x	X	Turkey			x	Building construction
(Beck, Wigand, & König, 2005)	IS	X	x	x		3 European countries, USA		25–249		Manufacturing
(Deros et al., 2006)	Business	X	x	x	X	Malaysia		< 250		Manufacturing
(Courseault Trumbach et al., 2006)	IS			x		USA	Revenue 12.2	60		
(Desouza & Awazu, 2006)	IS	X	x	x	X	USA	Revenue < 0.32	100		
(Harada, 2006)	Economic	X	x	x	X	Japan	Assets 2.7	< 300		Manufacturing
(Morgan, Colebourne, & Thomas, 2006)	IS	X	x	x	X	UK		< 250		-
(Sharma & Bhagwat, 2006)	Business	X	x	x	X	India		< 100		Manufacturing, high tech engineering, finance, packaging and distribution sectors
(Bhutta, Rana, & Asad, 2007)	IS	X	x	x	X	Pakistan		< 100		Manufacturing
(Eikebrokk & Olsen, 2007)	IS	X	x	x	X	3 European countries	Turnover 40 Assets < 27	< 250		
(Hussain, Wallace, & Cornelius, 2007)	IS	X	x	x	X	UK		< 500		
(Hussey & Eagan, 2007)	Business	X	x	x	X	USA		≤ 500		Manufacturing
(Lee et al., 2007)	IS			x		Korea		< 100		
(Wiesner et al., 2007)	Business		x	x		Australia		20–200		All industry excluding agriculture
(Bohórquez & Esteves, 2008)	IS	X	x	x	X	Spain	Revenue 2–50	< 250		-
(De Sousa-Brown, 2008)	Economic			x		West Virginia, USA		< 250		
(Francalanci & Morabito, 2008)	IS	X				Italy		6–500		Manufacturing, services, other

(Karjalainen & Kemppainen, 2008)	Business	X	x	x	x	Finland	Turnover 50 Assets < 43	< 250		All industries
(Martin-Tapia et al., 2008)	Economic	X				Spain		< 250		Food industry
(Redoli, Mompó, García-Díez, & López-Coronado, 2008)	IS	X	x	x	x	Spain		0–250		Manufacturing, services
(Saini & Budhwar, 2008)	Business	X	x	x	x	India	Assets 0.036–1.5			
(Webb & Schlemmer, 2008)	IS	X	x	x	x	UK		< 250		e-Business SMEs
(Barton & Thomas, 2009)	IS	X				UK	Turnover 0.6–23	10–200		
(Dyerson, Harindranath, & Barnes, 2009)	IS	X	x	x	x	UK		1–50		Food, manufacturing & financial
(Federici, 2009)	IS	X	x	x	x	Italy		< 250		Industry, services and commerce
(Fink & Ploder, 2009)	IS	X	x	x	x	Austria and Switzerland	Turnover 50 Assets < 43	< 250		Consulting, IT, trade, services, transportation & tourism
(Hussinger, 2009)	IS	X				Germany		< 250		
(Koh et al., 2009)	Economic	X	x	x	x	UK		< 250		Manufacturing, services
(Radas & Bozic, 2009)	IS	X	x	x		Croatia		10–250		Manufacturing, services
(Shen, Shen, Xu, & Bai, 2009)	Business	X				China	Turnover < 30 Assets < 40			
(Snider et al., 2009)	Business		x	x		Canada		< 499	x	Manufacturing, distribution
(Chen et al., 2010)	IS	X	x			China	Assets 59.7	< 2000		-
(Terziovski, 2010)	Business	X	x	x		Australia		21–99		Manufacturing

Appendix G. **CONTENT ANALYSIS EXAMPLES**

Code	Identified benefit	Mapped (Y/N)	Dimension	Quotation statement	Country
C1091	Staff requirements	Y	Organisational Impact	The solution is saving between 25 and 30 person days a month in payroll, accounting, and contract management.	Turkey
C1092	Business process change	Y	Organisational Impact	… while the cash-in-transit division moves towards a paperless office.	Turkey
C1093	Integration	Y	System Quality	A fully integrated business management system, including functions for contracts, billing, timesheet management, payroll and finance modules.	Turkey
C2101	Learning	Y	Individual Impact	Finally, we wanted to eliminate errors caused by manual systems and transfer knowledge to our staff.	Nigeria
C2102	Vendor support	N	Vendor Quality	High-quality locally available technical and training support was also a consideration.	Nigeria
C2103	Locally available vendor	N	Vendor Quality	High-quality locally available technical and training support was also a consideration.	Nigeria
C3111	Customisation – update	N	System Quality	Management realised there was potential to implement a better solution that could support the expansion of the business.	Lithuania

C3112	Ease of learning	Y	System Quality	What really impressed us was its intuitive user interface. Our employees could quickly learn to use it and integrate it into our existing systems.	Lithuania
C3113	Cost reduction	Y	Organisational Impact	The system is less expensive to manage and the company halved its operational costs.	Lithuania
C4121	Standardisation	N	System Quality	We wanted a standardised solution that could be implemented in all our schools, worldwide.	Lebanon
C5131	Timeliness	Y	Information Quality	… and managers could not get a real-time view of sales orders and financial reports.	UAE
C5132	Scalability	N	System Quality	Now, the company is well prepared to meet its global expansion plans.	UAE
C6141	Ease of use	Y	System Quality	User-friendly analysis tools were essential to help them examine sales data in detail and gauge peaks in business.	Ukraine
C6142	Secure	N	System Quality	Employees can also import inventory data directly from secure terminals in other stores, eliminating the need for error-prone, manual data transfer.	Ukraine

C6143	Support multiple languages/ currencies	N	System Quality	Microsoft Dynamics NAV also supports multiple languages and currencies, lending itself to rapid deployment in any new location.	Ukraine
C7151	Decision effectiveness	Y	Individual Impact	The ability to integrate real-time data and business systems improves the execution of informed business decisions exactly when and where required.	India
C7152	Organisational cost	Y	Organisational Impact	Closely monitored schedules and tight check over the budgets ensure that the costs incurred fall within the budgets.	India
C9111	Increased capacity	N	Organisational Impact	Packing and shipment process took as much as a day. Automation with Cuero Dynamix, we are able to complete the same task in less than 10 minutes.	India
C9151	Improve control	N	Organisational Impact	Thanks to Microsoft Dynamics NAV, we can control all our operations and get more refined information shared across parts of the business production cycle.	UAE
C1053	Access	Y	System Quality	While our controls were always top notch, the improved access to information that SAP gives us takes the administrative effort out of being accountable and transparent.	South Africa
J2212	Standardisation	N	System Quality	… which was based as much as possible on standard.	Uganda

J0126	Vendor popularity	N	Vendor Quality	We evaluated local software companies, but the feedback we got about SAP from other organisations was so strong and convincing that we had to have SAP.	India
J1628	Improved outcomes/ output	Y	System Quality	To meet the donors' requests for transparency, we have to be able to provide a full overview of all transactions, activities, data and documentation.	South Africa
J4831	Maintenance	N	Vendor Quality	Also, because of our small IT organisation, we needed an implementation and software maintenance that was straightforward.	Korea

Appendix H. EXAMPLES OF THE SYNTHESIS PROCESS

H.1 Stage 1 Synthesis Process – Benefits with the same meaning

Table H-1: Synthesis process Stage 1 – Benefits with the same meaning

Identified measure	N	Other measures – Same meaning	Study
Improve inter-organisational communications	3	Improving communications Better coordination in between managers	(Kale et al., 2010)
		Increased interaction across the enterprise	(Mabert, Soni, & Venkataramanan, 2003)
Improved planning	7	Reduced planning cycle time Improved forecasting	(Kale et al., 2010)
		More focus on post-development	(Lee, Lee, & Kang, 2008)
		Improved planning	(Geier et al., 2012)
		Focus	(Gupta et al., 2004)
		Better forecasts and planning	(Marsh, 2000)
		Planning performance improvement	(Esteves, 2009)
Cycle time reduction	13	Reduced manufacturing cycle time Decreased lead time	(Kale et al., 2010)
		Improved order management/order cycle	(Mabert et al., 2003b)
		Reduction of delivery time Processing time along critical path Reduction in order fulfilment time	(Argyropoulou et al., 2009)
		Improved on-time delivery Decreased financial close cycle	(Mabert, Soni, & Venkataramanan, 2003)
		Cycle time reduction	(Geier et al., 2012)
		Lowered lead times	(Gupta et al., 2004)
		Cycle time reduction	(Esteves, 2009)

		Reduce month-end closure time Reduce work-in-progress	(Mathrani & Viehland, 2009)
Improved customer service	8	Improved customer service	(Kale et al., 2010)
		Customer service improvement Increased customer relationship	(Geier et al., 2012)
		Improved interaction with customers Customer responsiveness/ flexibility	(Mabert, Soni, & Venkataramanan, 2003)
		Better customer satisfaction	(Gupta et al., 2004)
		Better customer responsiveness	(Marsh, 2000)
		Customer services improvement	(Esteves, 2009)
Create a competitive advantage	10	Improved competitive position	(Kale et al., 2010)
		Improvement of corporate image Competitive advantage for marketing	(Lee et al., 2008)
		Generating or sustaining competitiveness	(Geier et al., 2012)
		Good corporate image	(Gupta et al., 2004)
		Create a competitive advantage	(Koh & Simpson, 2007)
		Support business alliance Build cost leadership Generate product differentiation Built common visions	(Esteves, 2009)
Business innovation	3	Process innovation	(Lee et al., 2008)
		Building business innovation	(Geier et al., 2012)
		Build business innovations	(Esteves, 2009)
Very broad measures	13	Information effectiveness	(Argyropoulou et al., 2009)
		Quality of information	(Mabert, Soni, & Venkataramanan, 2003)
		Quality improvement Business growth Performance improvement	(Geier et al., 2012)

		Improved information Quality of work	(Equey & Fragnière, 2008)
		Support business growth Quality improvement	(Esteves, 2009)
		Profitability	(Gupta et al., 2004)
		Improved quality of information	(Seethamraju, 2008)
		Become more agile and efficient Improve process efficiencies	(Mathrani & Viehland, 2009)
Improved maintenance	2	Service maintenance fees	(Argyropoulou et al., 2009)
		Reduction in maintenance and down-time	(Marsh, 2000)
Reduce inventory	2	Lowered inventory levels	(Mabert, Soni, & Venkataramanan, 2003)
		Reduce inventory and reduce out-of-inventory events	(Mathrani & Viehland, 2009)
Improved management	11	Improved cash management Financial management Personnel management Inventory management Supplier management/ procurement	(Mabert, Soni, & Venkataramanan, 2003)
		Control of information	(Seethamraju, 2008)
		Better resource management	(Geier et al., 2012)
		Improved performance management	(Federici, 2009)
		Better inventory management	(Marsh, 2000)
		Better managerial resource	(Esteves, 2009)
		Improve bills-of-material management	(Mathrani & Viehland, 2009)
Improved supplier relationship	3	Improved interaction with suppliers	(Mabert, Soni, & Venkataramanan, 2003)
		Increased supplier relationship	(Geier et al., 2012)
		Build external linkages	(Esteves, 2009)
	2	Information transparency	(Geier et al., 2012)

Information transparency		Transparency in costing information	(Mathrani & Viehland, 2009)
Standardisation	2	Standardised processes	(Geier et al., 2012)
		Standardisation	(Marsh, 2000)
Automate processes	2	Automated	(Gupta et al., 2004)
		Automate processes	(Mathrani & Viehland, 2009)
Materials and resources benefits	1	Materials and resources benefits	(Reuther & Chattopadhyay, 2004)
Information visibility	2	Facilitated enhanced visibility	(Seethamraju, 2008)
		Increase information visibility	(Mathrani & Viehland, 2009)
Increased IT infrastructure capability	1	Increased IT infrastructure capability	(Esteves, 2009)
Empowerment	1	Empowerment	(Esteves, 2009)
Improve response time	2	Improve response time	(Mathrani & Viehland, 2009)
		Service response time	(Argyropoulou et al., 2009)
Supply chain efficiencies	1	Drive efficiencies in the supply chain	(Mathrani & Viehland, 2009)
Leaner hierarchical structure	1	Leaner hierarchical structure	(Gupta et al., 2004)
Improve information flow	1	Improve information flow	(Mathrani & Viehland, 2009)
Total 90			

H.2 Stage 2 Synthesis Process – Benefits with different meanings

Table H-2: Synthesis process Stage 2 – Benefits with different meanings

Measure	Mapped to	Note
Study: (Kale et al., 2010)		
Reduced manufacturing cycle time	OI4 Overall productivity OI6 Increased capacity	Sector-specific
Improved customer service	OI5 Improved outcomes/outputs	Part of it
Decreased lead time	OI6 Increased capacity OI4 Overall productivity	Same meaning
Notes: 'lead time': the period of time between the initial phase of a process and the emergence of results, as between the planning and completed manufacture of a product.[3]		
Improved forecasting	II3 Decision effectiveness	Part of it
Reduced information delay	IQ9 Timeliness	Same meaning
Note: When reducing information delay, we get real-time information which can be expressed as an information measure: timeliness.		
Study: (Lee et al., 2008)		
Change of attitude towards IT	II2 Awareness/recall	Same meaning
Not merely computerisation, but rather process innovation (process change)	OI8 Business process change	As explained by the authors
Note: The authors explained process innovation as process change		
Study: (Argyropoulou et al., 2009)		
Information effectiveness	DI/Information quality	General

[3] Definition of 'lead time'. Random House Kernerman Webster's College Dictionary. (2010). Retrieved 25 September 2013 from <http://www.thefreedictionary.com/lead+time>

Note: Too broad as it can be mapped to any of the information quality items: IQ1 ‘Importance’; IQ2 ‘Availability’; IQ3 ‘Usability’; IQ4 ‘Understandability’; IQ5 ‘Relevance’; IQ7 ‘Content accuracy’: IQ8 ‘Conciseness’; IQ10 ‘Uniqueness’.		
Study: (Mabert et al., 2003b)		
Lowered inventory levels	OI3 Cost reduction	Part of or leads to
Decreased financial close cycle	OI3 Cost reduction	Part of or leads to
Improved on-time delivery	OI5 Improved outcomes/outputs	Part of or leads to
Decreased information technology (IT) costs	OI3 Cost reduction	Part of or leads to
Study: (Geier et al., 2012)		
Cycle time reduction	OI4 Overall productivity - OI6 Increased capacity	Part of or leads to
Business growth	DI/Organisational impact	Very broad
Performance improvement	DI/Organisational impact	Very broad
Building business innovation	DI/Organisational impact	Very broad
Study: (Gupta et al., 2004)		
Profitability	DI/Organisational impact	Very broad
Lowered lead times	OI6 Increased capacity OI4 Overall productivity	Part of or leads to
Improves the efficiency	OI5 Improved outcomes/outputs	Part of or leads to
Note: If it is for the system, then SQ12 ‘Efficiency’; however, here it is most likely to be related to the whole process so efficiency means the overall quality of the process.		
Change manufacturing and planning methods as required without reconfiguring the plant layouts	SQ15 Customisation	Part of it or SQ10 ‘Flexibility’

Simulation features to select shorter production development cycles	SQ13 Sophistication	Part of or leads to
Minimising waste	OI3 Cost reduction	Part of it
(Reuther & Chattopadhyay, 2004)		
Materials and resources benefits	OI3 Cost reduction	Part of it
Reporting benefits from accurately reporting on business performance	OI4 Overall productivity OI5 Improved outcomes/outputs	Part of it
Other benefits – specific benefits critical to the target	SQ7 User requirements	Not specified, too general
(Equey & Fragnière, 2008)		
Improved information	DI/Information quality	Too broad
Quality of work	OI5 Improved outcomes/outputs	Same meaning
(Seethamraju, 2008)		
Improved quality of information for decision making	II3 Decision effectiveness DI/information quality measures	Too broad
(Federici, 2009)		
Internal procedure simplification	OI8 Business process change	Similar meaning
Much easier information retrieval	IQ2 Availability SQ4 ease of use	Similar meaning
Note: Easier retrieval means an easy-to-use system and availability of information: SQ4 ‘ease of use’		
Lower administrative costs	OI3 Cost reduction	Part of it
(Esteves, 2009)		

Cycle time reduction	OI4 Overall productivity OI6 Increased capacity	Part of or leads to
Better managerial resource	DI/Organisational impact	Part of it
Performance improvement	DI/Organisational impact	Very broad
Support business growth	DI/Organisational impact	Very broad
IT costs reduction	OI3 Cost reduction	Part of it
(Mathrani & Viehland, 2009)		
Transparency in costing information	IQ7 Content accuracy – IQ8 conciseness -IQ10 Uniqueness	Similar meaning
Reduce inventory and reduce out-of-inventory events	OI3 Cost reduction	Part of or leads to
Improve process efficiencies	SQ12 Efficiency OI8 Business process change	Part of or leads to
Reduce month-end closure time	OI3 Cost reduction	Part of or leads to

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Appendix I. OTHER RESEARCH OUTCOMES

The researcher's belief that the PhD journey is a learning process has led her to advocate for herself to learn as much as she could during her study. This has included attending courses, workshops and conferences. She has also engaged in supervising a Master's degree student in undertaking research for their final project. In addition, the researcher has published three papers and is in the process of publishing another journal paper.

The courses and workshops undertaken during the researcher's PhD study include those outlined below in Table I-1.

Table I–1: Courses and workshops during PhD study

Advanced Information Retrieval Skills (AIRS)	Introduction to Research
Induction for Research: Higher Degree Candidates	Introduction to Qualitative Methods
Introduction to Statistical Analysis	IBM SPSS – Introduction
Literature Review: Linking to Methodology	Effective Scientific Writing and Publishing (attended one of two parts)
Literature Review	Approaches to Qualitative Data Analysis
IBM SPSS – Intermediate: Basic Statistical Techniques for Difference Questions	IBM SPSS – Intermediate: Understanding Your Data (Descriptive Statistics, Graphs and Custom Tables)
IBM SPSS – Intermediate: Missing Data Analysis	IBM SPSS – Intermediate: Correlation
IBM SPSS – Advanced: Structural Equation Modelling Using AMOS	Questionnaires and Questionnaire Design
NVivo Version 8 Workshop	Ethics in Research
Writing Abstracts	Time Management
Advanced Research Methodologies	Turbocharge Your Writing
Word – Managing Long Documents	Writing Series 3: Defeating Waffle and Wordiness – Producing Perfect Sentences
Writing Your Thesis: Tom Cooper	Working with a Professional Editor

Confirmation/Presentation Skills	Survey
Mixed Research Methods	Editing Your Thesis
Options for Publishing	Applied Structural Equation Modelling Using AMOS – ACSPRI Program
Formative Construct Validity	Writing for Publication
Submitting Your Thesis	Word – Thesis Preparation

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