



A PROPOSED MODEL FOR ENTERPRISE RESOURCE PLANNING BENEFITS FOR SMEs

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DECLARATION

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In accordance with Rule G5.6.3, I, PAULO SERGIO DOS SANTOS DE MATOS 214258513, hereby declare that the treatise for Masters in Business Administration to be awarded is my own work and that it has not previously been submitted for assessment or completion of any postgraduate qualification to another University or for another qualification.

A handwritten signature in black ink, appearing to read 'Paulo de Matos', written over a light blue rectangular background.

SIGNATURE: _____

PAULO DE MATOS

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ABSTRACT

Small to medium sized enterprises (SMEs) play a significant role in global and national economies, both in developed and developing countries, contributing significantly to economic growth and job creation. Yet, SMEs face ongoing survival issues as their limited access to resources often constrains their ability to compete and realise their potential. Enterprise Resource Planning (ERP) systems are known to be a crucial component in realising benefits for any organisation and are seen as significant contributors to an organisation's performance. However, only a portion of SMEs report that their value expectations have been met in adopting an ERP system. SMEs require a better understanding of how to extract value from ERP adoption in order to remain competitive. An on-going SME problem is a lack of low-level awareness of the benefits that an ERP system is capable of providing them. The problem is stated as "*SMEs do not understand the benefits derived from the adoption of an ERP system*".

The purpose of this treatise was to determine a clearer understanding of how ERP systems can be considered a technological innovation that may be exploited by an SME to deliver business value by increasing the performance of the SME and thereby increasing the SME's competitive advantage. A literature review was conducted on ERP and SMEs which identified benefit models grounded in the theories of Diffusion of Innovation (DOI) and Resource Based View (RBV). DOI explains the benefits derived from ERP use as the technology diffuses throughout the social organisation and RBV measures the business value extracted from ERP adoption and use. A model for ERP benefits for SMEs was proposed based on the extant literature and empirical evaluation on a sample of 107 SYSPRO ERP users in South Africa. The model was statistically assessed as to the relationships between the independent variables of ease of use, collaboration, capabilities, efficiencies, analytics, industry sector and maturity against the dependent variable of ERP business value.

The variables of analytics, capabilities and ease of use together explain 68.9% of the variance of ERP business value, while analytics and capabilities explain

53.8%. No significant relationship was found for efficiencies, collaboration, industry or maturity, being a measure of length of years' experience in ERP use. The results indicate that SMEs perceive analytics to be a valuable determinant of ERP value contributing to the competitiveness of SMEs. The higher the SME focuses on analytics, the greater the organisation's performance increases due to the enhancement of analytical-based decisions aiding in a better decision-making process. Capabilities are the degree to which an ERP system caters for the functional needs of the SME. This treatise argues that SMEs should pay particular focus on their operational requirements and whether the ERP system is capable of providing them as customisation of the ERP is costly. Organisational personnel utilising ERP must be comfortable utilising it. Perceptions as to an ERP's complexity and usefulness define the ease-of-use. SMEs should consider the inherent aspects of a given ERP system that support the adoption rate of their personnel of an ERP system. Practically, SMEs should assess the degree of system intuitiveness both during ERP selection and during the adoption lifecycle phases.

ERP providers should focus on the provisioning of aspects both in the software and during the implementation of an ERP system at an SME in ensuring the system is intuitive, useful, easy to use, functionally addresses the SME requirements simply and surfaces meaningful analytics in support of decision-making process.

Keywords: ERP, SME, Ease of Use, Analytics, Capabilities, DOI, RBV.

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LIST OF ACRONYMS AND ABBREVIATIONS

Acronyms and Abbreviations	Terms in Full
AN	Analytics
API	Application programming interface
AVE	Average variance extracted
CA	Capabilities
CO	Collaboration
CSF	Critical success factors
DOI	Diffusion of innovation theory
EF	Efficiencies
ERP	Enterprise resource planning
EU	Ease of use
EV	ERP business value
HRM	Human resource management
IMC	In-memory computing
IoT	Internet of Things
IS	Information systems
ISIC	International Industry Classification System
IT	Information Technology
MNE	Multi-national enterprise
MRP	Material resource planning
MRP II	Manufacturing resource planning
NAICS	North American Industry Classification System
NDP	National development plan
NMMU	Nelson Mandela Metropolitan University
OECD	Organisation for economic co-operation and development
OITP	Organisational information processing theory
RBV	Resource based view theory
RO	Research objective
RQ	Research question
SaaS	Software as a Service
SBC	Small business corporation
SME	Small to medium sized enterprise
TAM	Technology acceptance model
VAR	Value-added reseller

CHAPTER 1: Overview

1.1 Introduction

Enterprise resource planning (ERP) systems are configurable, enterprise-wide information systems that integrate both processes and information across functional business areas within an organisation, into a single information database (Kumar & Hillegersberg, 2000). ERP systems are a crucial component in realising benefits for any organisation wishing to harmonise its functions and are seen as a significant contributor to an organisation's performance (Annamalai & Ramayah, 2011). Such benefits include; improved efficiencies from operations (Benders, Batenburg, & Van Der Blonk, 2006), adding to an organisation's competitive and strategic advantage (Beard & Sumner, 2004; Uwizeyemungu & Raymond, 2012), improving productivity and utilisation of resources (Hitt, Wu, & Zhou, 2002) and improving decision-making capabilities, (Utecht, Hayes, & Okonkwo, 2004) which is seen as an important instrument for the attainment of competitive advantage.

Initially ERP's adoption resided with large multi-national enterprises (MNEs), due in part, to significant associated costs of the adoption (Davenport, 1998). However, applicability and the allure of benefits are universal, irrespective of organisation size, and therefore apply equally to small to medium sized enterprises (SMEs) (Buonanno, Faverio, Pigni, Ravarini, Sciuto & Tagliavini, 2005). Findings relating to the decision process for ERP adoption between SMEs and MNEs differ in that SMEs reasons are exogenous and opportunistic, rather than related to specific business issues (Buonanno et al., 2005), while MNEs are focused on the management of business processes, integration amongst business units and the effective use of information (Buonanno et al., 2005). This consideration is a key differentiator when examining organisations' views on value-realisation through the adoption of ERP.

Infrastructural and resource constraints, a lack of strategic planning, financial capital requirements and a lack of IT expertise are all factors cited as strongly influencing ERP adoption by SMEs (Buonanno et al., 2005). From an ERP

vendor perspective, considerable efforts have been made to address these challenges by offering solutions that are simplified and pre-configured, templatised to best practices and at a fractional cost of MNE implementations (Al-Johani & Youssef, 2013; Haddara & Elragal, 2013).

This treatise argues that it is of significance to ERP vendors to ascertain the benefits derived from ERP adoption by SMEs. This would allow the respective vendors to align the value expectations from the onset and ensure the adoption process is framed for the purpose of value realisation. The purpose of this treatise is therefore to understand the benefits derived to SMEs through ERP system's adoption and the nett resulting business value to the organisation. SMEs are deemed to play a critical role in economies as numerous studies demonstrate their contribution to job creation (Sbp, 2013). Of importance, their increased productivity, competitiveness and innovativeness fuels growth and employment. As such, the resultant value attained by SMEs from ERP adoption is a critical factor contributing to organisation performance (Ruivo, Oliveira, & Neto, 2012b). This is of importance to South Africa as the country continues to face on-going unemployment pressures (Kahn, 2013; Sbp, 2013) and improving the sustainability of SMEs and providing them a catalyst of growth, could promote job creation.

1.1.1 Background to the Study

1.1.1.1 Historical Review

In 1990, The Gartner Group originally termed Enterprise Resource Planning as the next generation of MRP II systems (Nazemi, Tarokh, & Djavanshir, 2012). MRP II (Manufacturing Resource Planning) evolved from Material Resource Planning (MRP) systems from the 1970s and 1980s. Early in the 1990s, important research and literature evolved quickly around ERP, highlighting the importance and significance of ERP to deliver timeous, crucial decision-making information and the integration of departments for operational efficiency gains in an organisation (Davenport, 1998; Kumar & Hillegersberg, 2000). In the early years of the ERP systems' evolution, due to technological and economic constraints, ERP systems remained in the realm of large corporations. But due

to this market being increasingly saturated, ERP vendors begun to turn their focus on SMEs (Christofi, Nunes, Peng, & Lin, 2013; Deep, Guttridge, Dani, & Burns, 2008). Despite ERP systems' generally accepted benefits, post adoption benefits have not always been realised (Scott & Vessey, 2000) and some researchers have estimated failed ERP projects to be over 60% (Chung, Skibniewski, Lucas, & Kwak, 2008). Huang and Yasuda (2016) note that a significant portion of the research literature regarding ERP focuses on organisational culture and readiness of organisations towards an adoption of ERP and planning and implementation factors during the adoption phase. These factors, termed critical success factors (CSFs), aid in the reduction of the likelihood of costly project failures (Huang & Yasuda, 2016).

1.1.1.2 Theoretical Background

This treatise focuses less on the antecedents contributing to failure factors or CSFs to be considered pre and during an implementation of ERP by an SME, but the benefits derived post adoption and the business value contribution to SMEs. In considering the focus of the treatise, a brief review of theories is discussed in the context of existing ERP research literature.

Madapusi and D'Souza (2012) anchored their research in the influence of ERP's implementation on the operational performance of an organisation and grounded it in the theory of Organisational Information Processing Theory (OIPT). They argued that the OIPT was the correct theoretical lens as it sheds insights into how organisations resolve the uncertainty concerned with information flow. Ruivo et al. (2012b) argued that post adoption refers to the use of an ERP system and its general utilisation and that ERP is considered an innovation injected into an organisation's business processes in order to leverage business performance. Their research is grounded in the theories of Diffusion of Innovation (DOI) and Resource Based View (RBV). The use of DOI argues that the theory seeks to explain and predict how an innovation is used within a social system leading to adoption (Ruivo et al., 2012b). The use of the DOI theory in measuring ERP use benefits has been utilised by a number of researchers and verified as to the theory's DOI determinant variables (Bradford

& Florin, 2003; Dwivedi, Papazafeiropoulo, Shiau, Hsu, & Wang, 2009; Ruivo, Johansson, Oliveira, & Neto, 2012a; Ruivo, Oliveira, & Neto, 2014; Ruivo et al., 2012b). Further, an understanding as to how these ERP benefits derived through use relate to an increase in organisation performance is therefore important (Ruivo et al., 2012b). The theory of RBV argues that when an organisation's resources are valuable, rare, non-substitutable, non-copy able, they are able to create competitive advantage, which adds to the value of the organisation (Barney, 1991; Grant, 1991; Mata, Fuerst, & Barney, 1995). Mata, et al. (1995) provide a framework which concludes that information technology (IT) when viewed as an organisational resource, can lead to sustained competitive advantage. It is therefore useful to measure ERP's value-adding ability based on the theoretical constructs of RBV. The link between business value creation and improvement in an organisation's performance derived through the use of ERP has been researched by a number of authors grounded in the RBV theory (Hsu, 2013b; Ram, Corkindale, & Wu, 2014; Uwizeyemungu & Raymond, 2012). Recent research in ERP has utilised both theories of DOI and RBV in understanding the benefits and value to SMEs (Ruivo et al., 2012a; Ruivo et al., 2014; Ruivo et al., 2012b).

However, research regarding ERP and SMEs using DOI and RBV theories to date has been limited to specific countries where the IT maturity may differ to that of a developing nation such as South Africa. As noted by Ruivo et al., (2014) differences were noted between Iberian countries and Scandinavian countries and calls for future research were made to investigate cross-country variation in use and value by ERP in SMEs. On a similar note, Ram et al., (2014) noted that their research was based in a country which could be regarded as being technologically advanced and caution should be applied in applying their findings in other industries or in less advanced infrastructures. Ram et al., (2014) made further calls for studies to understand if the findings could be replicated in other countries and whether other factors in the ERP lifecycle have an influence on competitive advantage. In conducting this treatise, in the context of a developing country such as South Africa, this treatise answers these calls to extend research on ERP and SMEs via the

selection of both a developing country and a lesser technologically advanced nation. Where possible, this treatise will highlight notable differences and offer possible explanations to the differences.

1.1.2 Chapter Outline

Figure 1.1-1 presents Chapter one's overview structure containing the following sub-sections:

- **1.1:** The introduction contextualises the subject matter of this treatise, provides a historical review and a brief theoretical background to ERP and SMEs. An outline of Chapter 1 is provided in this sub-section;
- **1.2:** In this sub-section a problem statement is provided and discussed offering an ideal situation and the extent of the problem;
- **1.3** The main research objective is defined in this sub-section with the antecedent research objectives required to be met in order to achieve the main research objective;
- **1.4:** The main research question is indicated in this sub-section with the antecedent research objectives identified and required to be met in order to achieve the main research question;
- **1.5:** Scope, key assumptions and delimitations of this treatise are briefly discussed in this sub-section;
- **1.6:** A research alignment plan is provided to establish the framework undertaken in this research treatise. The research alignment plan depicts research questions and linkages to research objectives that are addressed in their respective chapters;
- **1.7:** The significance of this treatise is briefly discussed, outlining the intention and purpose, the potential benefits and threats should the research problem not be solved;
- **1.8:** This sub-section provides a brief overview of the research design and methodology adopted in this treatise;
- **1.9:** Data analysis techniques used in this treatise are briefly discussed and framed as to the insights they provide in the analysis sections of this treatise;
- **1.10:** Provides the overall structure of this treatise;

- **1.11:** The chapter summary concludes the chapter, highlighting salient points identified in the preceding sub-sections and provides a short introduction to Chapter two.

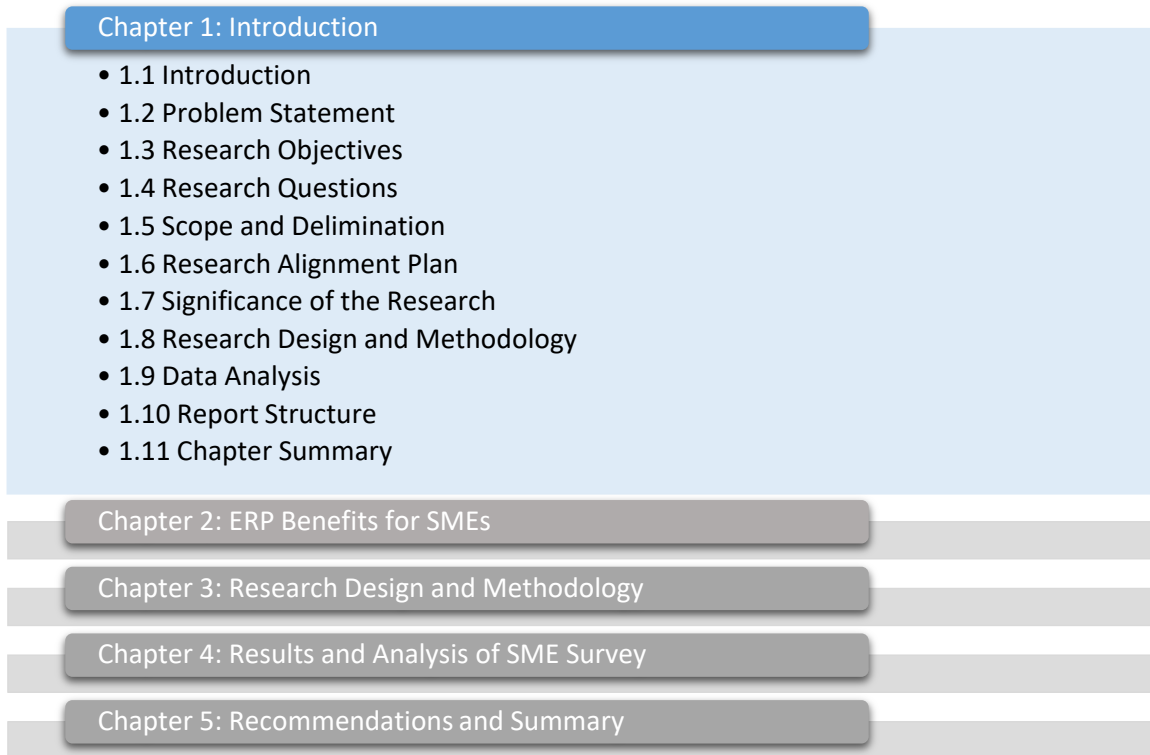


Figure 1.1-1 Chapter 1 Outline

1.2 Problem Statement

SMEs have access to limited flexibility pertaining to financial resources when compared to MNEs, making them far more sensitive to project costs associated with ERP adoption and on-going development of IT maturity and competencies. 55% of organisations report having exceeded the original ERP budget by a reported 60% (Doom, Milis, Poelmans, & Bloemen, 2010). Importantly, Buonanno et al., (2005) highlighted that the impact associated with an ERP implementation failure and the associated non-use of ERP, could bring about the demise of the SME.

Against this backdrop, SMEs require a better understanding of how to extract value from technology adoption in order to remain competitive in an increasing competitive world due to globalisation and current economic conditions (Ruivo

et al., 2014). An important on-going SME problem is a lack of low-level awareness of the benefits that an ERP system is capable of providing them (Esteves, 2009). The problem statement is therefore argued that “*SMEs do not understand the benefits derived from the adoption of an ERP system*”.

1.2.1 Problem Discussion

A portion of SMEs report that their value expectations have not been met post implementations (Esteves, 2009; Mukwasi & Seymour, 2014). This could be due to unrealistic expectations, insufficient planning or a poor understanding of matching internal processes to system capabilities (Esteves, 2009). Further, SMEs fail to realise the full potential of benefits capable through ERP, stating that they have experienced costly project delays and overruns during the adoption stage (Garg & Garg, 2013). These unexpected costs limit the implementation’s capability to deliver the value-add capabilities such as critical decision making information as resources are channelled to ensure minimum processing requirements are met (Kale, Banwait, & Laroiya, 2010). Additionally, inexperienced and unskilled staff face ongoing challenges in utilising the ERP system as the SMEs struggle with limited resources and capacity (Zach, 2012). The ERP systems are judged to be complex, unwieldy and place a large onus on data capture and control, limiting flexibility and organisational agility (Zach, 2012).

1.2.2 The Ideal Situation

In an ideal situation, SMEs in South Africa would understand the level of readiness required for ERP adoption, have clearly defined and planned for strategic outcomes with the use of ERP, understand the broader cultural organisational changes necessitated due to the ERP adoption and clearly understand the expected business process improvements that will improve the performance of the organisation, add value and create competitive advantage. In doing so, both the antecedents and determinants of value, would be more likely realised from the adoption and use of ERP. ERP systems should deliver organisational benefits by streamlining business processes, integrating

departments, maximising resource productivity and providing unified data for enhanced decision making.

1.3 Research Objectives

SMEs and ERP providers should equally understand the benefits derived from ERP adoption and the resulting improved organisation performance and business value derived thereof. This treatise aims to resolve the problem statement, “*SMEs do not understand the benefits derived from the adoption of an ERP system*”, by proposing a model for ERP benefits for SMEs and therefore formulates the research objectives as:

Main Research objective (RO_M): To propose a model for ERP benefits for SMEs.

In order to achieve the main research objective, the following secondary research objectives need to be achieved:

Conduct a literature review in order to:

- **RO₁:** Define SME’s classifications in South Africa;
- **RO₂:** Identify the importance and contribution of SMEs to the economy;
- **RO₃:** Identify the current trends in ERP evolution;
- **RO₄:** Identify SME industry sectors that use ERP;
- **RO₅:** To identify existing ERP SME benefit models; and
- **RO₆:** Develop a hypothesised model for ERP benefits for SMEs.

Thereafter,

- **RO₇:** Identify and explain the research methodology used for this treatise enabling future reproducibility;
- **RO₈:** Empirically evaluate the hypothesised model of ERP benefits for SMEs in order to accept or reject the formulated hypotheses;
- **RO₉:** Establish which identified variables in the hypothesised model are significantly related to benefits derived from ERP systems by SMEs; and

- **RO₁₀**: Establish the significance of the difference in relationships of the independent variables to the dependent variable of value, in the hypothesised model.

1.4 Research Questions

In order to achieve the research objectives identified above, the following research questions need to be addressed:

Main research question (RQ_M): What are the key benefits that ERP systems provide to SMEs?

Secondary Research Questions:

- **RQ₁**: What constitutes a SME in South Africa?
- **RQ₂**: Why are SMEs (a) important and (b) what is their contribution to the economy?
- **RQ₃**: What are the current trends in ERP?
- **RQ₄**: Which SME industry sectors use ERP?
- **RQ₅**: What are the existing ERP SME benefit models?
- **RQ₆**: What are the related variables to benefits derived from ERP by SMEs?
- **RQ₇**: How can a detailed description of the research methodology be provided in order to understand and reproduce this treatise in future?
- **RQ₈**: What relationships between the independent and dependent variables of benefits, can be verified through empirical evaluation of the hypothesised model for ERP benefits for SMEs?
- **RQ₉**: Which independent variables in the hypothesised model for ERP benefits for SMEs have a significant relationship to benefits realised from ERP by SMEs?
- **RQ₁₀**: What is the significance of the difference in the relationship between the independent variables and the dependent variable in the hypothesised model for ERP benefits for SMEs?

1.5 Scope and Delimitation

This treatise is limited to SMEs using the SYSPRO ERP system in South Africa only. The scope of this study will be focused on the primary data collected from these users through survey questionnaires. The key assumptions made in this treatise are that the literature review combined with the results obtained through statistical analysis of the collected primary data from the representative sample of SME ERP users in South Africa, will provide relevant and valid information capable of reliably addressing the research questions and satisfying the research objectives outlined in this study.

1.6 Research Alignment Plan

This treatise aims to address the main and secondary research questions by satisfying the corresponding main and secondary research objectives outlined in the chapters illustrated in Table 1.6-1.

Research Question (RQ)	Research Objective (RO)	Chapter
RQ₁ : What constitutes an SME in South Africa?	RO₁ : Define SME's classifications in South Africa	Chapter 2 : Enterprise Resource Planning Benefits for SMEs
RQ₂ : Why are SMEs (a) important and (b) their contribution to the economy?	RO₂ : Identify the importance and contribution of SMEs to the economy	Chapter 2 : Enterprise Resource Planning Benefits for SMEs
RQ₃ : What are the current trends in ERP?	RO₃ : Identify the current trends in ERP evolution	Chapter 2 : Enterprise Resource Planning Benefits for SMEs
RQ₄ : What SME sectors use ERP?	RO₄ : Identify SME sectors that use ERP	Chapter 2 : Enterprise Resource Planning Benefits for SMEs
RQ₅ : What are the existing ERP SME benefit models?	RO₅ : To identify existing ERP SME benefit models	Chapter 2 : Enterprise Resource Planning Benefits for SMEs
RQ₆ : What are the related variables to benefits derived from ERP by SMEs?	RO₆ : Develop a hypothesised model of ERP benefits for SMEs	Chapter 2 : Enterprise Resource Planning Benefits for SMEs
RQ₇ : How can a detailed description of the research methodology be provided in order to understand and reproduce this treatise in future?	RO₇ : Identify and explain the research methodology used for this treatise enabling future reproducibility	Chapter 3 : Research design and Methodology
RQ₈ : What relationships between the independent and dependent variables of benefits, can be verified through empirical evaluation of the hypothesised model for ERP benefits for SMEs?	RO₈ : Empirically evaluate the hypothesised model of ERP benefits for SMEs in order to accept or reject the formulated hypotheses	Chapter 4 : Results and analysis of SME ERP Benefits Survey
RQ₉ : Which independent variables in the hypothesised model for ERP benefits for SMEs have a significant relationship to benefits realised from ERP by SMEs?	RO₉ : Establish which identified variables in the hypothesised model are significantly related to benefits derived from ERP systems by SMEs	Chapter 4 : Results and analysis of SME ERP Benefits Survey
RQ₁₀ : What is the significance of the difference in the relationship between the independent variables and the dependent variable in the hypothesised model for ERP benefits for SMEs?	RO₁₀ : Establish the significance of the difference in relationships of the independent variables to the dependent variable of value, in the hypothesised model.	Chapter 4 : Results and analysis of SME ERP Benefits Survey
RQ_M : What are the key benefits that ERP systems provide to SMEs?	RO_M : To propose a model of for ERP benefits for SMEs	Chapter 5 : Findings, recommendations and Conclusions

Table 1.6-1 Research Alignment Plan

1.7 Significance of the Research

This treatise holds particular interest and significance for SMEs, ERP providers and their ecosystem of resellers and implementers. Over the last two decades, value realisation from ERP and an improvement of organisations' performance has been both a topical and important discussion (May, Dhillon, & Caldeira, 2013). Adding to the understanding of unlocking value and benefits for SMEs, increases their chances of success and long-term sustainability (Lee, Kelley, Lee, & Lee, 2012). It has the ability to expand on existing knowledge in regard to the adoption of ERP by SMEs; significantly in a developing country such as South Africa, where the improvement of competitiveness and growth in SMEs is central to the economy's growth prospects. Further, SMEs being armed with the knowledge of benefits derived from ERP adoption and their influence on improving the value of the organisation, are better equipped to plan for the adoption and managing expectations of benefits realisation. Additionally, unlocking new knowledge on ERP benefits adds value to the extended ecosystem of consultants and implementers in value-added resellers (VARs) typically involved in ERP implementations.

A further benefit is improving the annuity stream of ERP providers by increasing the likelihood of SME survival by improving the SME's competitive advantage. Traditional commercial ERP models apply an annuity annual license fee for the use of their system. This comprises a significant portion of ERP vendors' revenue stream and therefore it is in the ERP vendors' best interest to ensure that the organisations utilising their software and services remain on their solution for an extended period of time. This model of congruent duality is best served by ensuring the longevity and growth of SMEs utilising ERP systems.

In the literature, significant empirical evidence exists that SMEs improve their performance through the adoption of ERP (Aberdeen Research, 2010; Kale et al., 2010; Uwizeyemungu & Raymond, 2012; Yang & Su, 2009), however ERP projects are substantial investments and comprise one of the largest portions of investment by an organisation in Information Systems. An understanding of the benefits as precursors to improvement of value realisation, has an implication to

alter policy as to the approach adopted by an ERP provider to aspects of sales, training, education and project implementation methodologies. This treatise therefore has an ability to contribute knowledge to the alignment of ERP providers and SMEs value-realisation expectations. On completion of this study, the findings are to be shared and used in SYSPRO, a global ERP provider. In the context of South Africa, SYSPRO works in conjunction with certain Government institutions, tasked to assist through; knowledge transfer and funding, in aiding the growth and development of the SME sector.

1.7.1 Intention of the Study

The study intends to empirically assess benefits realised through ERP adoption and ERP's contribution to business value to the organisation, as perceived by South African SMEs. By grounding the treatise in the theories of DOI and RBV, based on prior research in the field of ERP in SMEs, the treatise seeks to confirm and or highlight any significant differences in the results.

The study intends to offer ERP practitioners and ERP providers alike, a perspective and insight as to the determinants of benefits for value realisation in SMEs. This will aid these organisations in their engagement with SMEs, in ensuring that pre and post ERP adoption stages, are aligned to the realisation of these benefits. This is likely to alter sales engagements and ERP implementation strategies focusing on value realisation. Further, this treatise answers research calls for further geographic country studies pertaining to SMEs and ERP to surface any notable differences from both a South African and developing nation perspective.

1.7.2 Potential Benefits

In a South African context, inculcating advantages in SMEs will contribute to their sustainability and aid in growth, in turn, improving the South African economy and aiding in job creation. A greater understanding of business value derived from ERP by SMEs and as to which aspects of ERP realise benefits, will allow for a better realisation of benefits and value, ultimately contributing to an increase in organisation performance. By framing the aspects of focus,

expectations would be better understood, discussed and planned for during the implementation stages in ensuring project costs are not exceeded. The potential benefits have both implications for managers of SMEs and ERP software vendors in South Africa. The benefits model would offer insight into the benefit variables by which value would be added to the SME. For SMEs not yet having adopted ERP, it would shed valuable insight as to the expected value resultant from ERP system adoption.

1.7.3 Threats Should the Problem not be solved

Every management discipline is concerned with the allocation of scarce resources to resolve specific problems. Resource requirements or utilisation, be they financial or personnel, are of critical concern for organisations; more so to SMEs who generally have constraints in both resource areas (Shehab, Sharp, Supramaniam, & Spedding, 2012). Should the problem not be solved, it is expected that costly project overruns, inappropriate utilisation of resources and possible ERP project failures will continue to occur, to the detriment of the SME.

For the ERP provider, project failures are equally costly as they require significant attention to rectify issues and could suffer the consequences associated with negative marketing publicity (Davenport, Harris, & Cantrell, 2002). An important assessment for ERP selection from an organisations' perspective is the ERP vendors' ability to provide other reference organisations in similar industries, which have benefited from their ERP adoption. The cost of project failure may have a negative impact on the ERP provider's ability to sell further ERP systems.

1.8 Research Design and Methodology

1.8.1 Research paradigm

As per Collis and Hussey (2013), the research design is the choice the researcher makes in terms of the methodology and methods which will be used to address the research problem. Selection of the appropriate research paradigm in support of the research project is thus a critical consideration. The research paradigm provides the framework that guides how the research should

be conducted. A comparison of the two major paradigms, Positivism and Phenomenologicalism is firstly observed. A Positivist viewpoint is quantitative and an objective paradigm while a Phenomenological is qualitative and subjective in nature (Saunders, Lewis, & Thornhill, 2008).

The methodological assumption of quantitative research is that you are able to deduct from the sample to the larger population, analyse cause and effect and relationships via scientific statistical analysis in inferring the explanation and understanding of the larger population (Cooper & Schindler, 2014). A positivistic paradigm is value-free and accurate and reliable through validity and reliability testing (Cooper & Schindler, 2014). In contrast, the methodological assumption of qualitative research is that you are able to interpret the context of the research in developing theories and understanding. It is thus inductive in nature (Cooper & Schindler, 2014). Qualitative research is value-laden, subjective and believes that the world is socially constructed. A Phenomenological paradigm is accurate and reliable through verification (Cooper & Schindler, 2014).

A Positivist viewpoint tests hypothesis, produces quantitative data, its constructs are predefined and highly specific. Reliability is regarded as being high, yet validity low and generalisability can be made from the sample (Saunders et al., 2008). A Phenomenological viewpoint generates theories, produces qualitative data which is rich and subjective, utilises small samples and generalisations are made from one setting to another. Its reliability is low yet validity regarded as being high (Saunders et al., 2008).

The main criticisms of the Positivism paradigm are that by separating the people from their social contexts, you are unable to understand the activities without examining the people's perceptions. Its pre-defined research structure and design imposes constraints on the results and may ignore relevant findings (Collis & Hussey, 2013). The main criticisms of the Phenomenological paradigm are that qualitative data is too subjective and susceptible to bias in both its collection and interpretation (Cooper & Schindler, 2014). Results cannot be inferred from the research to a larger population. Phenomenological research is

considered to have an unstable foundation for expensive and critical business decisions (Saunders et al., 2008; Sekaran, 2006).

In considering the achievement of the main and secondary research objectives and the differences noted in the paradigms, the Positivistic paradigm is selected for this treatise. Hypotheses on relationships, cause and effect will be tested with quantitative statistical analysis techniques from the sample so the results can be inferred to the larger population of interest. Measuring instruments will be established to measure DOI independent variables associated to benefits derived from ERP adoption and relationships assessed to the dependent variable of business value to the organisation based on the theory of RBV. A survey will be used as the research strategy.

1.8.2 The sampling design

1.8.2.1 Sample design selection

The unit of analysis is people in a management designation within a SME, as the perception of benefits derived from ERP and overall contribution to organisation performance, are better informed in responding to the survey questionnaire. SYSPRO customers were selected as the population. All customers within the population were contacted electronically via email requesting their participation via the completion of an online questionnaire. The sampling frame is assessed as to whether it is current, complete and accurate (Saunders et al., 2008). As SYSPRO's customer database contains the geographic region of each customer, that being the country they operate in and that the license for SYSPRO use is renewed annually, the selection of current SYSPRO customers in South Africa is assured. All members within the population were then given an equal opportunity to respond removing the possibility of the introduction of bias (Saunders et al., 2008).

Probability sampling holds that generalising results from the sample to population in making statistical inferences, requires that the sample be representative and normally distributed (Saunders et al., 2008). As each unit of analysis will be given an equal chance to participate, the probability that the

sample is representative is high given that a sufficient number of sample cases is observed (Cooper & Schindler, 2014; Saunders et al., 2008). Using this methodology ensures the elimination of sampling bias.

1.8.2.2 Sample Size and Data Collection

Respondents from a known database were contacted electronically via email requesting their participation in the survey. In this regard, a full random sample technique is observed as each participant is given equal opportunity to participate. However, unlike a census, participation is voluntary so a simple random sample is observed. The email explained the aim of the research, the benefits of the research and that respondent anonymity and confidentiality would be ensured. A total of 107 complete responses were recorded over a two week period utilising a survey questionnaire data collection method (Appendix A). Respondents were thanked for their participation and requested to forward the email to other members within their organisation that met the criteria of being in a management designation to collect additional responses. In this regard, aspects of a snowball sampling method were used. An electronic on-line survey tool, SurveyMonkey was utilised (SurveyMonkey,2016). Utilising an electronic on-line medium such as SurveyMonkey to conduct the questionnaire, offers the respondents' convenience, ensures removal of transposition and questionnaire completion errors and assists in the electronic transposition of the results directly into Excel in readiness for statistical analysis.

1.9 Data Analysis

The primary data were analysed utilising univariate analysis and descriptive statistics and multivariate analysis and inferential statistics on the hypothesised model for ERP benefits for SMEs. The Significance and strength of the variables was measured utilising Partial Least Squares multiple regression analysis with path coefficient analysis methods.

1.10 Treatise Structure

An overview of the treatise chapters, research questions and research objectives are depicted in Figure 1.10-1.

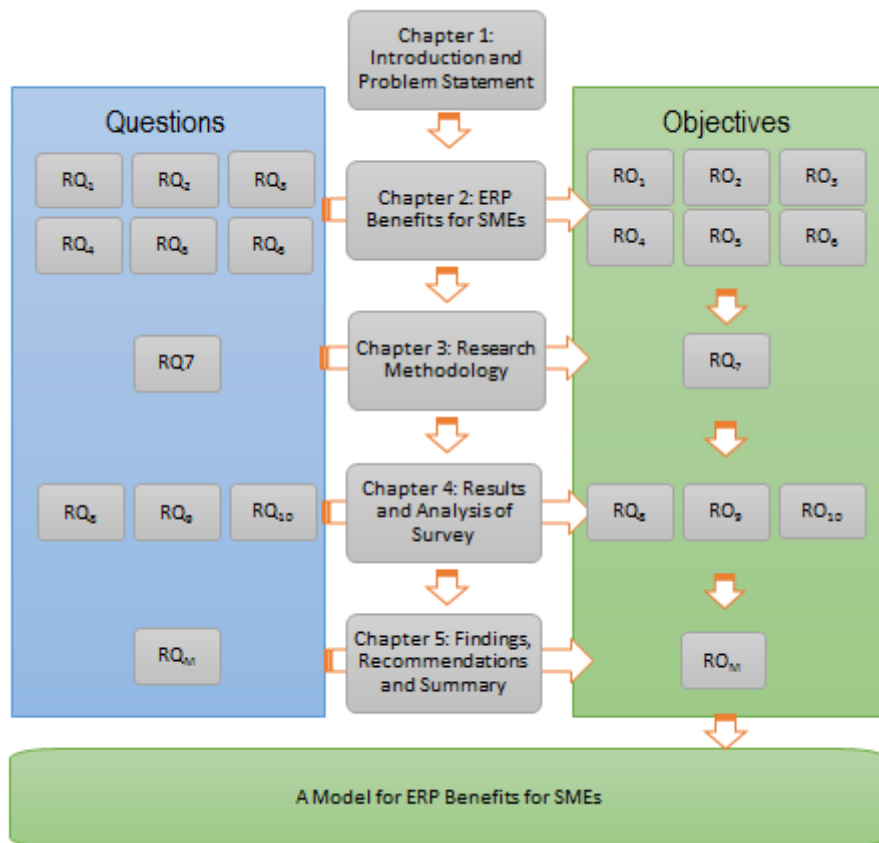


Figure 1.10-1 Treatise Structure, Chapter Research Questions and Objectives

1.11 Chapter Summary

The following topics were discussed in the Chapter sub-sections:

Sub-section 1.1 provided a brief introduction and contextualised the treatise topic of ERP and SMEs. A historical review was outlined and a theoretical background to ERP was discussed. The introduction indicated the importance of ERP to SMEs and outlined the Chapter’s sub-sections. Sub-section 1.2 outlined the problem statement, “*SMEs do not understand the benefits derived from the adoption of an ERP system*”. The problem was further discussed in providing the extent of the problem and an ideal situation was offered.

Sub-section 1.3 stated the main research objective to this treatise, that being, to propose a model for ERP benefits for SMEs. In support of the main research objective, preceding secondary objectives were outlined that this study must achieve beforehand. Sub-section 1.4 highlighted the complementary main

research question being, “What are the key benefits that ERP systems provide to SMEs?” and secondary research questions in order to achieve the research objectives. Sub-section 1.5 discussed the scope, assumptions and delimitations of this study.

Sub-section 1.6 provided the research alignment plan as the framework for this treatise. The research alignment plan depicts the chapter structure and corresponding research questions and objectives to be delivered in each chapter. Sub-section 1.7 discusses the significance of this research, the intention and purpose of this study, potential benefits should the problem statement be addressed and threats should the problem not be resolved. It was noted the relevance to SMEs seeing an improvement to organisation performance, providing decision-support information and the general role SMEs play in the economy. In particular, SMEs are important in South Africa due to their job-creation characteristics.

Sub-section 1.8 provides information with regard to the research design and methodologies employed in this study. Further, the research sampling design is discussed, the rationale for the sample unit selection, the intended sample size to be administered as well as the survey technique used. Sub-section 1.9 discussed data analysis techniques used in this study and framed as to the insights they provided in the analysis sections of this report. Sub-section 1.10 provides an overview of the treatise chapters, research questions and research objectives are depicted in Figure 1.10-1.

In the following chapter, Chapter 2 – Enterprise Resource Planning Benefits for SMEs, will be discussed. A literature review will be conducted in answering research objective RQ₁..RQ₆ in achieving research objectives **RO**₁ to **RO**₆.

CHAPTER 2: Enterprise Resource Planning Benefits for SMEs

2.1 Introduction

In Chapter one, an outline of this treatise is presented through a discussion of the research problem. Additionally, background to this research treatise is provided. The research problem, specific research questions and research objectives are discussed. Chapter one additionally introduces the research methodology to be used in this treatise.

Chapter two addresses the following research questions and objectives through a review of literature:

- **RQ₁**: What constitutes a SME in South Africa?
- **RQ₂**: Why are SMEs (a) important and (b) what is their contribution to the economy?
- **RQ₃**: What are the current trends in ERP?
- **RQ₄**: What SME sectors use ERP?
- **RQ₅**: What are the existing ERP SME benefit models?
- **RQ₆**: What are the related variables to benefits derived from ERP by SMEs?

The research questions in Chapter 2 address the following research objectives:

- **RO₁**: Define SME's classifications in South Africa;
- **RO₂**: Identify the importance and contribution of SMEs to the economy;
- **RO₃**: Identify the current trends in ERP evolution;
- **RO₄**: Identify SME industry sectors that use ERP;
- **RO₅**: To identify existing ERP SME benefit models; and
- **RO₆**: Develop a hypothesised model for ERP benefits for SMEs.

Figure 2.1-1 illustrates both research questions and objectives which are addressed in Chapter 2.

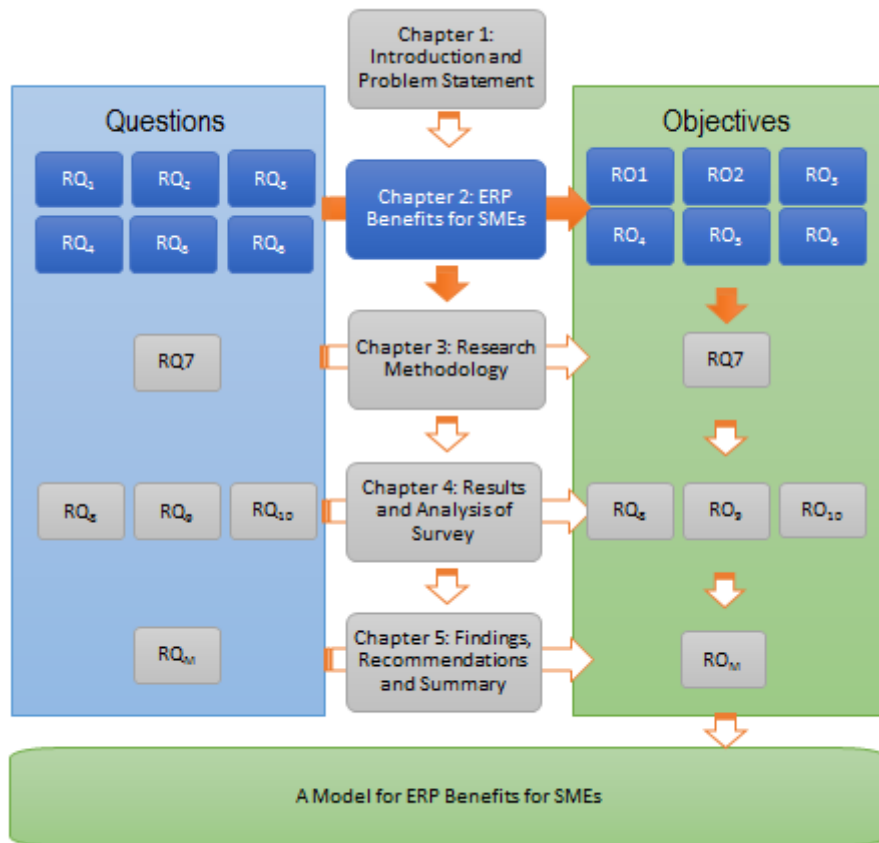


Figure 2.1-1: Chapter 2 Research Questions and Research Objectives

Figure 2.1-2 presents Chapter 2’s overview structure containing the following sub-sections:

- **2.1:** A brief review of Chapter 1, an introduction into the research questions and objectives to be addressed in Chapter 2 and a chapter sub-section outline;
- **2.2:** A review of what constitutes a SME, different SME classifications in use and in particular, the classification in use in South Africa;
- **2.3:** Reviews the importance of SMEs to an economy and its contributing factors. The sub-section concludes with the typical challenges an SME faces in realising its potential and the reasons why the research is aimed at SMEs;
- **2.4:** Reviews the value that ERP systems deliver to organisations and how ERP has evolved to ERP’s current trends. The sub-section

concludes with how ERP systems typically resolve challenges faced by organisations such as SMEs;

- **2.5:** Reviews SME industry sectors that typically use ERP systems and the benefits and advantages that ERP systems deliver to those industry sectors;
- **2.6:** This sub-section reviews existing ERP SME models from literature in order to establish and understand the models relating to benefits and business value derived from use;
- **2.7:** Identifies and reviews the benefit variables of interest and business value in existing models of ERP for SMEs and concludes with the formulation of hypothesis to be tested in a South African context; and
- **2.8:** A chapter summary.

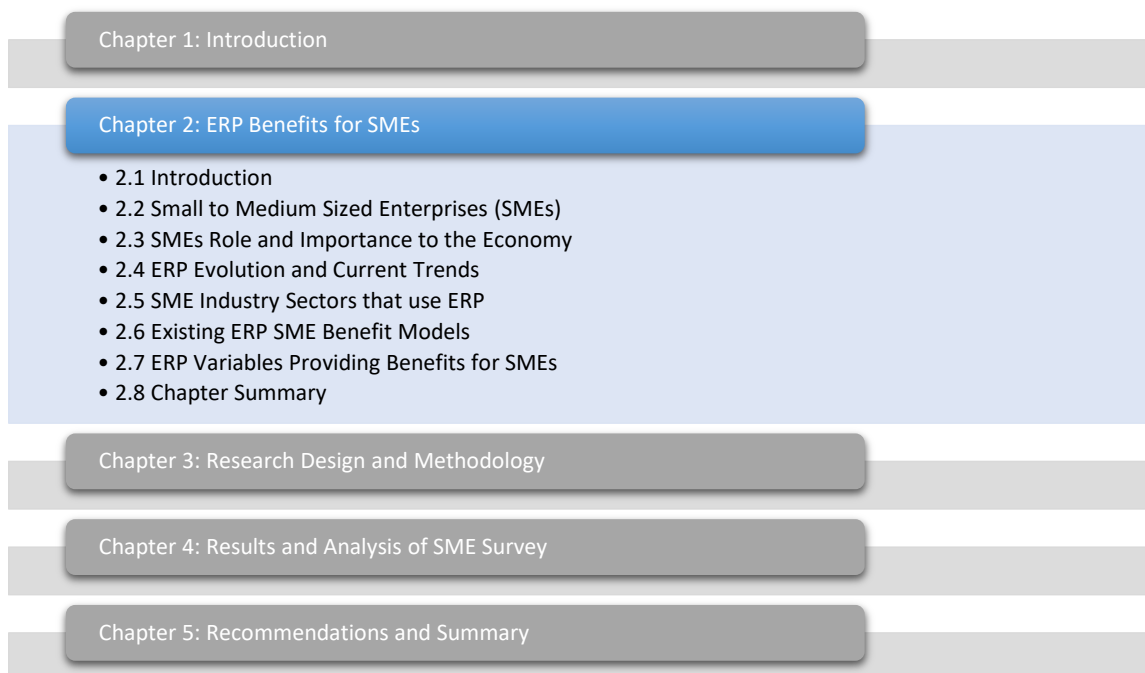


Figure 2.1-2: Chapter 2 Structural Overview

2.2 Small to Medium Sized Enterprises (SMEs)

2.2.1 A Global Definition of an SME

There is no single definition for Small to Medium sized Enterprises (SMEs). Definitions differ by country and utilise a variety of criteria including number of employees, turnover and industry sector (Organisation for Economic Co-

operation and Development, 2005). Further classification complexities exist due to certain countries using a combination of criteria such as employees and revenue, in order to classify organisations and delineate organisational sizing. Additionally, in some instances, the legal definition of a SME differs from the statistical definition due to incentives with regard to governmental grants, rebates and incentives (Lindner & Bagherzadeh, 2005). The Organisation for Economic Co-Operation and Development (OECD) has recommended the following classification methodology, illustrated in Figure 2.2-1, for consistent international statistical analysis comparison.

Classification	Number of Employees	Annual Turnover
Micro Enterprise	1 to 9	Less than 2 million Euro
Small Enterprise	10 to 49	< 10 million Euro
Medium Enterprise	50 to 249	< 50 million Euro
Large Enterprise	More than 250	+50 million Euro

Figure 2.2-1 OECD Commission Recommendation, adapted from (Lindner and Bagherzadeh, 2005)

Following the OECD’s expert group meeting on industrial statistics, the OECD offers the following definition “*Small and medium-sized enterprises (SMEs) are non-subsidiary, independent firms which employ fewer than a given number of employees*” (Organisation for Economic Co-operation and Development, 2005:17).

2.2.2 South Africa’s Definition of a SME

In South Africa there is little consensus between government agencies about the definition and classification of a SME. The National Development Plan (NDP), The National Small Enterprise Act (Act No, 102 of 1996) and the Income Tax (Act No. 58 of 1962), each have their own definitions (Davis Tax Committee, 2014).

The NDP defines three categories within the SME sector:

- **Survivalist** – A home based business or one that transacts as a hawker on the street or an informal single service provider such as taxi operator or building contractor. Typically a cash based business, little to no evidence of capital investment or growth aspirations;
- **Lifestyle** – A home based middle or upper-class business or run from a single office. Typically an artisan or service broker; and
- **Entrepreneurial** – Businesses concerned with expansion, interested to establish a brand and expand market share.

In its broad classification, the NDP due to its locus, is interested in the entrepreneurial category (Davis Tax Committee, 2014). The National Small Enterprises Act classifies SMEs into its constituent categories of micro, very small, small and medium primarily based on full-time equivalent employment, turnover and gross asset value (RSA, 1996) as illustrated in Figure 2.2-2.

Sector or sub-sectors in accordance with the Standard Industrial Classification	Size or class	Total full-time equivalent of paid employees	Total annual turnover	Total gross asset value (fixed property excluded)
		<i>Less than:</i>	<i>Less than:</i>	<i>Less than:</i>
Agriculture	Medium	100	R 4.00 m	R 4.00 m
	Small	50	R 2.00 m	R 2.00 m
	Very small	10	R 0.40 m	R 0.40 m
	Micro	5	R 0.15 m	R 0.10 m
Mining and Quarrying	Medium	200	R30.00 m	R18.00 m
	Small	50	R 7.50 m	R 4.50 m
	Very small	20	R 3.00 m	R 1.80 m
	Micro	5	R 0.15 m	R 0.10 m
Manufacturing	Medium	200	R40.00 m	R15.00 m
	Small	50	R10.00 m	R 3.75 m
	Very small	20	R 4.00 m	R 1.50 m
	Micro	5	R 0.15 m	R 0.10 m
Electricity, Gas and Water	Medium	200	R40.00 m	R15.00 m
	Small	50	R10.00 m	R 3.75 m
	Very small	20	R 4.00 m	R 1.50 m
	Micro	5	R 0.15 m	R 0.10 m
Construction	Medium	200	R20.00 m	R 4.00 m
	Small	50	R 5.00 m	R 1.00 m
	Very small	20	R 2.00 m	R 0.40 m
	Micro	5	R 0.15 m	R 0.10 m
Retail and Motor Trade and Repair Services	Medium	100	R30.00 m	R 5.00 m
	Small	50	R15.00 m	R 2.50 m
	Very small	10	R 3.00 m	R 0.50 m
	Micro	5	R 0.15 m	R 0.10 m
Wholesale Trade,	Medium	100	R50.00 m	R 8.00 m
Commercial Agents and Allied Services	Small	50	R25.00 m	R 4.00 m
	Very small	10	R 5.00 m	R 0.50 m
	Micro	5	R 0.15 m	R 0.10 m
Catering, Accommodation and other Trade	Medium	100	R10.00 m	R 2.00 m
	Small	50	R 5.00 m	R 1.00 m
	Very small	10	R 1.00 m	R 0.20 m
	Micro	5	R 0.15 m	R 0.10 m
Transport, Storage and Communications	Medium	100	R20.00 m	R 5.00 m
	Small	50	R10.00 m	R 2.50 m
	Very small	10	R 2.00 m	R 0.50 m
	Micro	5	R 0.15 m	R 0.10 m
Finance and Business Services	Medium	100	R20.00 m	R 4.00 m
	Small	50	R10.00 m	R 2.00 m
	Very small	10	R 2.00 m	R 0.40 m
	Micro	5	R 0.15 m	R 0.10 m
Community, Social and Personal Services	Medium	100	R10.00 m	R 5.00 m
	Small	50	R 5.00 m	R 2.50 m
	Very small	10	R 1.00 m	R 0.50 m
	Micro	5	R 0.15 m	R 0.10 m

Figure 2.2-2 Small Business Definition source (RSA, 1996)

The Income Tax Act considers a small business corporation (SBC) as any private company, close corporation or co-operative where the gross income for the year does not exceed R20 million per annum (Davis Tax Committee, 2014).

2.2.3 Summary

As noted by the OECD and the Davis Tax Committee, there is no single universal definition as to what constitutes and classifies a SME. Dependent on the area of concern and consideration, agencies adopt classifications to suit their particular requirements, be they for tax, governmental grants or industry statistical analysis (Davis Tax Committee, 2014; Organisation for Economic Co-operation and Development, 2005; RSA, 1996).

Section 2.2 endeavoured to answer the research question RQ₁: “*What constitutes a SME in South Africa?*” with the objective of achieving RO₁: “*Define SME’s classifications in South Africa*”. The researcher has selected to adopt the OECD classification recommendation illustrated in Figure 2.2-1 based on full-time employees for the purpose of this treatise, as it provides for future statistical comparability with other studies.

2.3 SMEs’ Role and Importance to the Economy

2.3.1 SMEs’ Contribution to Global Economic Growth and Employment

In OECD countries, SMEs account for over 95% of all manufacturing enterprises and an even higher share in the services industries. SMEs account for two-thirds of private sector employment amongst most economies. They are generally regarded as the principal creator of jobs and are responsible for growth in economies, growing at a faster rate than large enterprises (Organisation for Economic Co-operation and Development, 2005; Sbp, 2013). The World Bank describes SMEs’ contribution as being relative to larger organisations. SMEs enhance competition, entrepreneurship, job growth and spur economy-wide efficiency, innovation, growth and poverty alleviation (Ayyagari, Demircuc-Kunt, & Maksimovic, 2011).

A further trend is the marked growth in integrated national markets as value chains are increasingly global in nature, thus presenting SMEs with exporting benefits. While SMEs in developed economies have embraced this opportunity to a higher degree than those in developing countries, the opportunities are increasingly available to do so driven by globalisation. The ability to export to

new markets has a potential to increase the growth prospects of the SME further (Sbp, 2013).

2.3.2 SMEs' Importance to South Africa

In South Africa this sentiment is further echoed by the NDP, suggesting that 90% of jobs will be created by small and expanding businesses. As noted in the NDP's definition of SMEs, the category of entrepreneurial businesses, is the most likely to expand due to the wish of the entrepreneur to grow market share and by doing so, create more jobs (Davis Tax Committee, 2014).

Further, evidence exists that SME's contribution to growth is more pronounced in developing countries (Sbp, 2013). However, evidence from several international studies suggests that while there is no inherent lack in entrepreneur numbers in African countries, suggestions are that as few as 1% of entrepreneurs will transition from a micro size to a small company above the 10 employee threshold (Li & Rama, 2015; Mead & Carl, 1998; Rogerson, 2000). Further, in South Africa, SMEs' growth is slower than the economy (Stellenbosch University, 2016). Although this number seems relatively small, it still holds as offering a critical contribution to the economy in meeting the policy objectives of job creation, economic growth and poverty alleviation in South Africa (Rogerson, 2000).

2.3.3 Summary

Section 2.3 answers the research question RQ2: *"Why are SMEs (a) important and (b) what is their contribution to the economy?"* with the objective of achieving RO2: *"Identify the importance and contribution of SMEs to the economy"*.

In concluding Section 2.3, SMEs play a significant role in global and national economies, both in developed and developing countries, contributing significantly to economic growth and job creation. Policy makers are particularly interested in aspects that enhance their innovativeness which will contribute to their growth through improved organisation performance, sustainability, as well

as understanding their constraints and limitations in actualising their entrepreneurial capabilities.

2.4 ERP Evolution and Current Trends

2.4.1 ERP Evolution through the Ages

The roots of ERP systems can be traced back half a century (Huang & Yasuda, 2016), originating from manufacturing companies who had been using computers to improve information flow, improve productivity and provide for integration across manufacturing, sales and distribution processes. Originally, limited to inventory control, these systems expanded to the control of material requirements planning (MRP) and thereafter to manufacturing resource planning (MRP II) (Shehab et al., 2012).

In the 1970s, MRP solved the production time-phased issues with planning the release of production orders and their constituent sub-assemblies in order to meet demand order date compliance. Typical benefits realised by organisations included improvements to operational efficiencies and effectiveness, a reduction in inventories aiding working capital and improved customer service (Siriginidi, 2000).

In the early 1980s, MRP expanded to MRP II including additional business processes such as finance, product costing, marketing, personnel, engineering and purchasing into its company-wide planning of resources as users became more sophisticated and companies strived for differentiation, standardisation and operational efficiencies (Chen, 2001).

In the early 1990s, the Gartner Group based out of Stamford USA, coined the term 'ERP', '*Enterprise Resource Planning*', where Gartner described the next evolutionary step from MRP II, encompassing the scheduling of supplier resources based on forecasts, customer demands and production schedules (Chen, 2001). The scope of ERP has evolved significantly since then, reaching relative maturity in the mid-1990s and continues to expand in incorporating additional "back-office" departments or business processes such as; management of orders, asset management, human resource management

(HRM), warehouse management, supply-chain management and quality (Shehab et al., 2012).

By the turn of the century, ERP systems extended further to front-of-house functions, such as marketing automation, sales force automation and integration into e-commerce and supply-chain management solutions. This evolutionary stage, is commonly referred to as extended-ERP (Kumar & Hillegersberg, 2000). Critically, ERP systems offer the promise of encompassing and assisting organisations with the control of their entire value-chain, managing information commonality and the control of business transactions (Siriginidi, 2000). ERP evolved from major industrial information systems in the industries they served. In order to continue with market penetration, ERP providers focused on downsizing their product offerings to increase their attractiveness to SMEs. Considering the substantial capital investment required for an ERP system, ERP providers looked to simplify the inherent complexity of the overall offering, the system's architecture and the hardware platforms in provisioning for the SME market (Rashid, Hossain, & Patrick, 2002).

SMEs have limited access to resources when compared to larger enterprises (Zach, 2012), have limited IS knowledge and expertise and differ in ownership, structure, culture and market orientation (Buonanno et al., 2005). ERP providers in more recent times have focused on modularising their offerings, simplifying processes, improving on customisation capabilities and ease-of-deployment. These are all factors traditionally regarded as resource-intensive to both aspects of cost and personnel (Mukwasi & Seymour, 2014).

2.4.2 Current ERP Trends

Panorama Consulting Solutions, an independent ERP analyst and consultancy organisation, produces a yearly report on ERP. The overarching trend in ERP both in discussion and consideration, is the deployment options adopted by a business as noted in the report (Panorama Consulting Solutions, 2015). The report further highlights a reduction in ERP deployments occurring on premise, from 85% to 56% in 2015.. The shift sees organisations moving ERP to the cloud. Software-as-a-Service (SaaS) increased from 4% to 33% in 2015 while

11% of organisations implemented cloud-based ERP software (Panorama Consulting Solutions, 2015). Benefits associated with SaaS include a reduction of IT costs, increased reliability, accessible updates, flexibility and scalability. Cloud-based ERP benefits include a reduction in implementation costs.

This market shift is further supported by Gartner in that pure cloud providers (SaaS), consistently delivered higher-than-average revenue growth in 2013 (Pang, Dharmasthira, Eschinger, Brant, & Motoyoshi, 2014). Additionally, ERP providers who focused on best-of-breed industry solutions fared better than the generalists and those who focused on improving their technical architecture to cloud delivery and application programming interface (API) openness, maintained and grew revenue. Lastly, local ERP providers fared better in comparison to large international providers who found it difficult to provide the agility in a changing business environment (Pang et al., 2014).

In recent years Gartner has recommended its strategies to CIO and IT leaders on the latest ERP concept "Postmodern ERP". Gartner defines Postmodern ERP as:

"is a technology strategy that automates and links administrative and operational business capabilities with appropriate levels of integration that balance the benefits of vendor-delivered integration against business flexibility and agility. This definition highlights that there are two categories of ERP strategy: administrative and operational." ("Gartner - Postmodern ERP", n.d., para 1).

In its 2015 Strategic Roadmap research paper on Postmodern ERP, Gartner recommends to industry CIOs that (Drobik & Rayner, 2015):

- Planning for a single monolithic ERP solution encompassing all business needs should no longer be the starting point;
- Hybrid ERP environments encompassing on premise applications and cloud based applications coexisting together are the norm;
- They should consider innovation, differentiation and user-friendliness functionality; incorporating analytics and mobility over architectural coherence or single-vendor sourcing; and

- The use of Big Data, the Internet-of-things (IoT), In-memory computing (IMC) and digital business should be at the forefront of their considerations.

Gartner continues to emphasise the importance of organisations to consider how digital business is re-shaping the ERP landscape and that organisations should consider these aspects in light of offering agility, flexibility and real-time information that will drive business behaviour and provide digital moments; a holistic, wholly integrated, personalised experience, to ERP users (Gartner Inc, 2016).

2.4.3 Summary

Section 2.4 answers the research question **RQ₃**: “What are the current trends in ERP?” with the objective of achieving **RO₃**: “Identify the current trends in ERP evolution”.

In concluding Section 2.4, ERP systems have evolved from industrial manufacturing systems, initially encompassing inventory control, material requirements planning and thereafter material resource planning. As organisations searched to further extract optimisation and operational efficiencies, ERP providers responded by extending the functionality of ERP systems to encompass manufacturing resource planning. Thereafter extended-ERP embraced back-office and front-of-house business functions as well as integration into suppliers, customers and marketing, to cover the complete supply-chain. In more recent times, its subsequent evolution is to look at different deployment options, embracing cloud technologies such as SaaS and Cloud-ERP, with the express aim to lower costs, both infrastructural and implementation related.

ERP providers increasingly targeted SMEs as the larger enterprise market became saturated (Laukkanen, Sarpola, & Hallikainen, 2007). With the advent of globalisation and the appearance of new forms of organisations based on networks of closely cooperating organisations, it seems clear that successfully implementing ERP systems will take on an increased significance for the

survival, growth and competitiveness of many SMEs (Raymond & Uwizeyemungu, 2007). However, SMEs cannot be considered scaled-down versions of larger enterprises (Buonanno et al., 2005).

Current trends see ERP providers shifting from a complex, all-encompassing monolithic application to an open architecture where organisations can easily integrate components in satisfying globalisation and digital business and the provision of business agility. The focus is on improving the intuitiveness, ease-of-use and the provision of real-time analytics and information, driving innovation, differentiation and end-user engagement.

2.5 SME Industry Sectors that use ERP

Numerous environmental factors seen as external-based attributes, drive organisations to diffuse IT systems such as ERP in response to competitive pressures in order to improve efficiencies. Different industry sectors may therefore place different requirements on systems controlling internal processes in support of business strategy to conduct efficient trade (Wu & Chiu, 2015). Wu and Chiu (2015) note that an organisation's competitive performance is benchmarked in relation to its industry peers and therefore external factors such as the industry sector the organisation is in, plays a significant role in affecting the ERP system's ability in providing competitive performance.

Numerous ERP benefit studies base their data on short case studies or draw data from previous literature studies (Nazemi et al., 2012). The limitation in the use of secondary data is the lack of depth and breadth when information is being assessed as to the differences surfaced based on industry sector or company size (Schubert & Williams, 2011). Huang and Yasuda (2016) note in a comprehensive review of literature survey articles in ERP, that the research on SMEs and ERP continues to increase, in particular in developing nations; but warn that research focused on certain SME industries is insufficient as management across industry sectors varies significantly. This view is supported by Hsu (2013b) where it is noted that studies have being concluded where certain industries attained higher business value and cost reductions from IT than others. Specifically in the ERP field, a study conducted on ERP benefits to

end-users notes that the relationships may not apply to specific industries and suggests that industry sector be considered as a variable to end-user satisfaction perception (Calisir & Calisir, 2004).

As recent as 2016, traditional ERP success models have been tested across industry sectors to validate the critical success factors (CSFs). The impact of success factors based on implementing an ERP system was found to vary across industry sectors, implying that CSFs could be industry-specific (Lee & Kim, 2016). A study conducted by Ruivo et al., (2012a) on SMEs and ERP could not empirically discuss issues suggesting different industry sectors having different operating environments and suggested that the factors related to ERP value may differ across industries. On the issue of company size, Zach (2012) found that SMEs are considered different from their large enterprise counterparts. This finding is supported by Buonanno et al. (2005) stating that findings from studies on large enterprises cannot equally be applied to SMEs.

2.5.1 Summary

Section 2.5 answered the research question RQ4: Which SME sectors use ERP?" with the objective of achieving RO₄: "Identify SME industry sectors that use ERP".

In reviewing the literature and in concluding Section 2.5, there appears to be a lack of previous studies specifically identifying SME industry sectors that utilise ERP. Numerous researchers have noted that different industry sectors mediate the perceptions of benefits or value-derived from ERP (Calisir & Calisir, 2004; Hsu, 2013b; Huang & Yasuda, 2016; S. Lee & Kim, 2016; Ruivo et al., 2012a; Schubert & Williams, 2011; Zach, 2012). Therefore, it is probable that SMEs across different industries will have differing perceptions on the value attained from ERP benefits.

2.6 Existing ERP SME Benefit Models

2.6.1 ERP Life-cycle Research Framework

Due to ERP having an extensive impact across an organisation due to its integrative nature, ERP systems impact on a significant number of organisational areas. Thus, the importance of understanding a framework for the identification, realisation and assessment of ERP benefits is crucial (Eckartz, Daneva, Wieringa, & van Hillergersberg, 2009). In particular, as more than 70% of ERP implementations have failed to achieve expected benefits (Al-Mashari, Zairi, & Okazawa, 2006), with ERP adoption success in SMEs expected to be even lower due to common limitations in SMEs such as scarcity of resources, inadequate planning, insufficient systems' knowledge and less formalised business processes (Christofi et al., 2013), the research into ERP across its lifecycle is an important consideration. Due to its rapid growth in the 1990s, researchers acknowledged the vastness of research issues and influencing variables (Esteves & Pastor, 1999). Esteves and Pastor (1999) created an ERP research framework and defined an ERP life-cycle framework, noting the different phases an ERP system exist within an organisation and the dimensions on which each phase could be analysed and researched, see Figure 2.6-1.

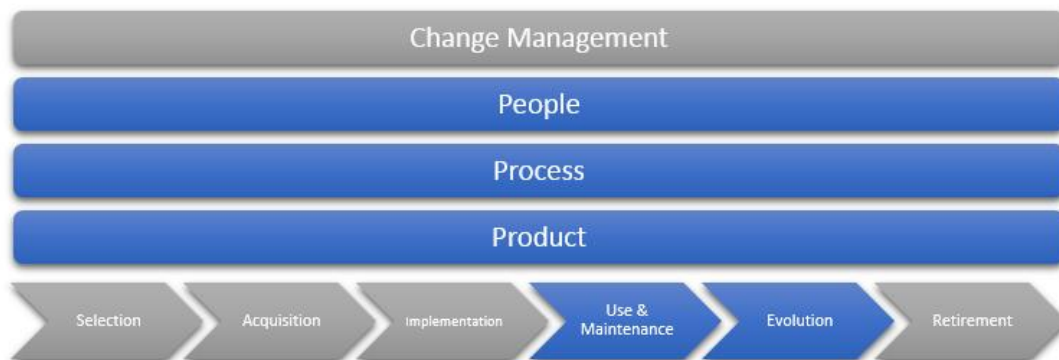


Figure 2.6-1 The ERP life-cycle framework, Adapted from Esteves and Pastor, (1999)

Figure 2.6-1 denotes the areas of importance being, the dimensions of **people**, **process** and **product** in the **use and maintenance** and **evolution** phases of the ERP life-cycle. The **Use and Maintenance** phase of ERP, returns expected benefits and minimises disruption to the organisation. This phase analyses

aspects relating to functionality, usability and adequacy in addressing the organisation's business processes. The maintenance aspect considers aspects relating to further optimisation, general improvements and the removal of malfunctions (Esteves & Pastor, 1999). The **Evolution** phase extends on ERP's current capabilities through integration or extension of further aspects, realising new, additional benefits and exploiting collaboration possibilities to external partners or networks (Esteves & Pastor, 1999). The analysis dimension of **product** focuses on the particular ERP system and considers functional delivery, technical applicability, an understanding of the ERP system's capabilities in aligning with the organisational strategy and furthering the goals of the organisation, whether the ERP system is being utilised effectively and fulfilling the needs of the organisation (Esteves & Pastor, 1999). **Process** considers that every organisation contains their own core competencies and capabilities and that the functionality provided by the ERP system must support these aspects. Further, the ERP system must assist in the decision-making process of the organisation in managing resources and functions. *Process* also considers the improvement of performance and efficiencies in executing business processes (Esteves & Pastor, 1999). The **People** dimension considers aspects such as skills and roles in interaction with the ERP system. The ERP system should reduce complexity and assist in the diffusion of the ERP system throughout the organisation. Aspects such as ease-of-use, intuitiveness and assisting people in their daily functions is considered in this dimension (Esteves & Pastor, 1999).

2.6.2 Existing Models and Frameworks

Various ERP benefit models and frameworks have been proposed and tested by researchers. From the literature, these have been classified using Esteves and Pastor's (1999) life-cycle framework and illustrated in Table 2.6-1.

To Life-Cycle Phase	Orientation
Selection & Planning	What organisational resources and organisation-specific capabilities are required before implementing an ERP to gain competitive advantage? A conceptual model based on RBV (Hsu, 2013a)
Selection & Acquisition	User experience as a mediating role to ERP adoption grounded in theory DOI (Hwang, 2014)
Implementation	A Structured model for ERP II resource allocation to CSFs realisation at implementation time (Norton, Coulson-Thomas, Coulson-Thomas, & Ashurst, 2013)
Implementation	Project success factors during implementation. Best practise question grouping for ERP implementations (Ferratt, Ahire, & De, 2006)
Implementation	Conceptual model for ERP implementation based on 4Ps for general and project managers (Marnewick & Labuschagne, 2005)
Implementation	Factors influencing ERP outcomes in SMEs (Federici, 2009)
Implementation	Planning value-based objectives pre and during implementation, a value-focused-thinking (VFT) approach (May et al., 2013)
Implementation / Use & Maintenance	Chung's ERP Success Model – Synthesis of TAM, Delone and Mclean and Ferratt et al. project success factors (Chung et al., 2008)
Use & Maintenance	The Technology Acceptance Model (TAM) – How users accept and use a new technology (Davis, Bagozzi, & Warshaw, 1989)
Use & Maintenance	TAM2 – Extended on the original TAM theory, included subjective norms and cognitive processes to the perceived usefulness and system usage intent (Venkatesh & Davis, 2000)
Use & Maintenance	Updated Delone and Mclean Information Success Model – IS success is measured by how the system relates to user satisfaction and ease of use and the incorporation of service quality to net benefits outcome (DeLone & McLean, 2003)
Use & Maintenance	DOI and RBV conceptual model for SMEs using ERP - Determinants that influence ERP Use and Value; (Ruivo et al., 2012a) ERP use and Value (Ruivo et al., 2012b); SaaS Value and Organisation Performance (Rodrigues, Ruivo, & Oliveira, 2014); Post-implementation stages of use and value (Ruivo et al., 2014)
Use & Maintenance	Determinants that influence user satisfaction – Grounded in TAM theory (Costa, Ferreira, Bento, & Aparicio, 2016)
Selection, Planning and Use & Maintenance	Contributions of antecedent factors influencing ERP adoption and value creation (Ram et al., 2014)
Evolution	Managerial interventions and customisation to improve implementation factors influencing benefits from ERP post-implementation (Chou & Chang, 2008)

Table 2.6-1 ERP Life-Cycle, Research Models and Frameworks

2.6.3 Research Model's Theoretical Groundings

The **Technology Acceptance Model** (TAM), introduced by Davis (1986) and adapted on the theory of reasoned action (TRA), aims to explain determinants of user acceptance in relation to user behaviour in the adoption of Information Systems (IS) (Chung et al., 2008). TAM identifies external variables and their impact on internal user variables such as beliefs, attitudes and usage intent. Of primary consideration is end-user perceived usefulness and ease of use for IS acceptance and behavioural forming (Davis et al., 1989). Perceived usefulness by definition is an end-user's perception as to how the IS increases their own performance within an organisation. Perceived ease of use is defined as to how the IS alleviates effort on their part in performing an organisation function (Chung et al., 2008). **TAM2**, an enhanced and revised model by Venkatash and Davis (2000), incorporates the additional aspect of covering the voluntary versus involuntary subjective norms, as an additional predictor of system usage and behavioural intent in the instance where mandatory system use by the end-user is the case.

Delone and Mclean's **Information Systems (IS) Success Model**, considers the dependent variables of IS success measures. The six dimensions of IS success are proposed as an interactive model with a support taxonomy featuring the variables of: 1) system quality; 2) information quality; 3) user satisfaction; 4) use; 5) individual impact to the user; and 6) organisational impact (DeLone & McLean, 2003). Understanding the significance and importance of the implementation phase of an ERP system, Ferratt et al. (2006) empirically tested and proposed **four implementation success factors** that correlate significantly to the outcome factor of effectiveness. **Chung's ERP Success Model** combines TAM2, Delone and Mclean's IS Success Model and Ferratt et al.'s implementation success factors in the creation of Chung's ERP Success Model, see Figure 2.6-2.

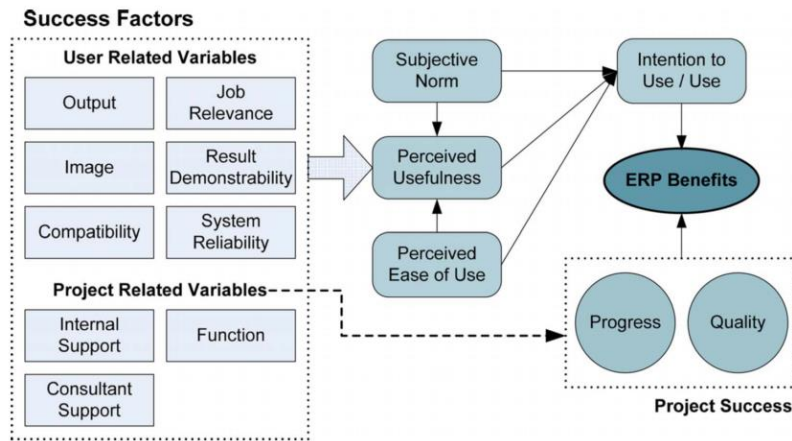


Figure 2.6-2 Chung's ERP Success Model. Source (Chung et al., 2008)

Chung's model is useful in examining and exploring the relationships on the success of the implementation and the success of ERP use. This model was developed in assisting companies to manage uncertainties and risks during the implementation cycle of an ERP system and to management thereof (Chung et al., 2008). Ruivo et al. (2012a), proposed a research model for **ERP use and Value** grounded in the theories of Diffusion of Innovation (DOI) and Resource-based view (RBV). They argued that use reflects the utilisation phase of the ERP life-cycle. where ERP is considered a type of IS innovation, central and core to an organisation's operational processes responsible for the control, input and to provide output that influences improved performance (Nah, Tan, & Teh, 2004; Ruivo et al., 2012a; Ruivo et al., 2012b). The DOI model as developed by Rogers in 1995, contextualises an innovation within a social system; in this case an organisation, in explaining and predicting if the innovation will be used and how it will be used. The second theory, RBV, measures the business value derived from a resource, in this case ERP, in contributing to creating a competitive advantage (Hwang & Min, 2013; Ruivo et al., 2012b). Of all the models reviewed, the model provided by Ruivo et al. (2012a) represents the closest benefits model that could be applicable to this treatise in addressing the main research question and main research objective.

2.6.4 Conclusions

Section 2.6 answers the research question RQ₅: “What are the existing ERP SME benefit models?” with the objective of achieving RO₄: “To identify existing ERP SME benefit models”.

In reviewing the literature and in concluding Section 2.6, it is acknowledged that the research field for ERP is vast due to its extensive application across an organisation. An ERP life-cycle research framework was developed by Esteves and Pastor (1999). This framework is of particular interest as it allows the researcher to ground this research on particular phases of the life-cycle and on specific dimensions. This treatise will consider the “use and maintenance and the evolution” phases along the ERP lifecycle with particular focus on the dimensions of “people, process and system” as indicated in the highlighted areas of selection in figure 2.6-1.

Existing ERP benefits models have been explored in literature and their theoretical groundings discussed. This research is particularly interested in benefits provided to SMEs by the use of ERP systems. Thus, the theoretical models as proposed in literature require to be based on post-implementation stages and on organisations that already are in the use and maintenance or evolution stages of their ERP life-cycle. The researcher concludes that the ERP use and Value model is most applicable for this treatise. Additionally, as the research proceedings from this model specifically targeted SMEs (Rodrigues et al., 2014; Ruivo et al., 2012a; Ruivo et al., 2014; Ruivo, Oliveira, & Neto, 2015), it creates an opportunity for differences to be noted and possible explanations given as to the reasons.

2.7 ERP Variables Providing Benefits for SMEs

This sub-section reviews the variables to be included in the formation of the hypotheses and the hypothesised model. The variables will be grounded in the theories of DOI and RBV. DOI variables previously proposed and validated by research in the fields of ERP studies are examined as independent variables.

2.7.1 RBV and ERP Benefits

This treatise proposes a hypothesised model for defining the relationship between ERP and its capabilities, as seen as an IT innovation grounded in the theory of DOI, in increasing an organisation's competitive advantage, grounded in the theory of RBV. The RBV theory states that organisation-specific resources mediate an organisation's performance (Ruivo et al., 2012b). Competitive performance is measured in relation to competitors (Wu & Chiu, 2015) and is defined as an organisation's ability to earn better than average returns on an investment in a specific industry in relation to its competitors (Mata et al., 1995). When ERP's capabilities, through its use, are used to leverage resource differences amongst competitors, an IT system can be viewed as a source for sustained competitive performance (Ashurst, Freer, Ekdahl, & Gibbons, 2012).

2.7.1.1 ERP Value – Dependent Variable

ERP Value is an organisation's ability to create competitive advantage through the utilisation of an ERP system (Ruivo, et al., 2012), measured as an impact on the organisation's performance through its lifecycle and use (Yang & Bambacas, 2009). The resource based view theory states that an organisations' performance, its competitive and sustained advantages, are based on the organisations' specific resources (Hedman & Kalling, 2003).

2.7.2 DOI and ERP Innovation

The DOI theory has general applicability to many fields of study and in the IS field, ERP systems are classified as intra-organisational innovations with a focus on IT impact within an organisation providing administrative innovations of information, knowledge sharing and decision-making support (Wu & Chiu, 2015).

2.7.2.1 Ease of Use – Independent Variable

Organisation's personnel utilising ERP must be comfortable utilising it. It improves their knowledge of the system, the business processes and improves their skills in manipulating the system in discovering effective ways to resolve

problems (Ruivo et al., 2012b). Research conducted by Cooper and Zmud (1990), indicates that increasing system usage, enhances job performance. Calisir and Calisir (2004) found that ease of use affects perceived usefulness and thus mediates the uptake of use of ERP. This treatise therefore hypothesises that ease of use is positively related with ERP benefits to SMEs and thus proposes the following hypothesis:

- **H₁** – Ease of Use is positively related to ERP value.

2.7.2.2 Collaboration – Independent Variable

Through the integration of multiple business activities into a single system, facilitating standardisation throughout the organisation, increasing availability and access to real time information, improvement of intra- and inter-organisational communication and collaboration, ERP can create value in the organisation and improve decision-making capabilities (Calisir & Calisir, 2004; O’Leary, 2000). IT-supported competitive performance was found by Wu and Chiu to be well realised when used in a collaborative inter-organisational context (2015). This treaty therefore hypothesises that collaboration is positively related with ERP benefits to SMEs and thus proposes the following hypothesis:

- **H₂** – Collaboration is positively related to ERP value.

2.7.2.3 Capabilities – Independent Variable

System capabilities characteristics are the main drivers of ERP value (Ruivo et al., 2014). According to Ruivo, et al. the ease by which organisations adapt their business needs and processes to the best-practices in-built into ERP systems, the greater the use and value is extracted from the ERP to the organisation (2014). Wade and Hulland (2004) argue that through continued use, capabilities become more difficult for competitors to imitate and understand; a core requirement for competitive advantage as described by the resource based view theory. This treatise hypothesises that capabilities are positively related with ERP benefits to SMEs and thus proposes the following hypothesis:

- **H₃** – Capabilities are positively related to ERP value.

2.7.2.4 Efficiencies – Independent Variable

The efficiencies construct measures the effectiveness realised through ERP to execute repetitive tasks and whether operational performance gains are delivered to individual users (Ruivo et al., 2012a; Uwizeyemungu & Raymond, 2012). Management have realised that ERP is an effective tool able to better provide faster information and transactional processing to cut costs and improve efficiencies for organisations to survive and prosper (Esteves, 2009). By doing so, productivity increases due to improved efficiencies (Marciniak, Amrani, Rowe, & Adam, 2014). This treatise therefore hypothesises that improved efficiencies are positively related with ERP benefits to SMEs and thus proposes the following hypothesis:

- **H₄** – Efficiencies are positively related to ERP value.

2.7.2.5 Analytics – Independent Variable

Ruivo et al. (2012a) argue that organisations seeking improved competitiveness use integrated data and set analytics as a strategic initiative. Further, a common data model and visibility across functional departments allows an organisation's metrics to be consistent and unified across the enterprise. Analytics in ERP allow for unique business insights and facilitates managerial decision-making (Ruivo et al., 2014). Information is contextually relevant to differing operational requirements across the organisation due to external factors. Thus, information should be adaptable and available on demand in order to increase its usability and impact (Madapusi & D'Souza, 2012). This treatise therefore hypothesises that analytics are positively related with ERP benefits to SMEs and thus proposes the following hypothesis:

- **H₅** – Analytics are positively related to ERP value.

2.7.3 Demographic Considerations

In noting research limitations from the literature and calls for future research in the areas of further investigation into whether maturity and industry sectors have an influence of perceived ERP business value, (Norton et al., 2013; Ruivo

et al., 2012a; Ruivo et al., 2012b), this treatise considers the inclusion of these independent variables into the hypothesised model for ERP benefits for SMEs.

2.7.3.1 Industry – Independent Variable

As concluded in section 2.5.1 and in review, there appears to be a lack of previous research specifically identifying SME industry sectors that utilise ERP. Numerous researchers have noted or suggest that different industries should mediate the perceptions of benefits or value-derived from ERP (Calisir & Calisir, 2004; Hsu, 2013b; Huang & Yasuda, 2016; Lee & Kim, 2016; Ruivo et al., 2012a; Schubert & Williams, 2011; Zach, 2012). Therefore, it is probable that SMEs across different industry sectors will have differing perceptions on the business value attained from ERP. Therefore, the following hypothesis is formulated:

- **H₆** - The industry sector a SME is in, has a mediating role as to the perception of benefits and value derived from ERP.

2.7.3.2 Maturity – Independent Variable

Organisations utilising ERP in their first year report attaining lower benefits than organisations utilising ERP for a longer period of time (Davenport et al., 2002). In a study conducted by Davenport in conjunction with Accenture, organisations reported greater benefits realisation as usage in years increased, see Figure 2.7-1.

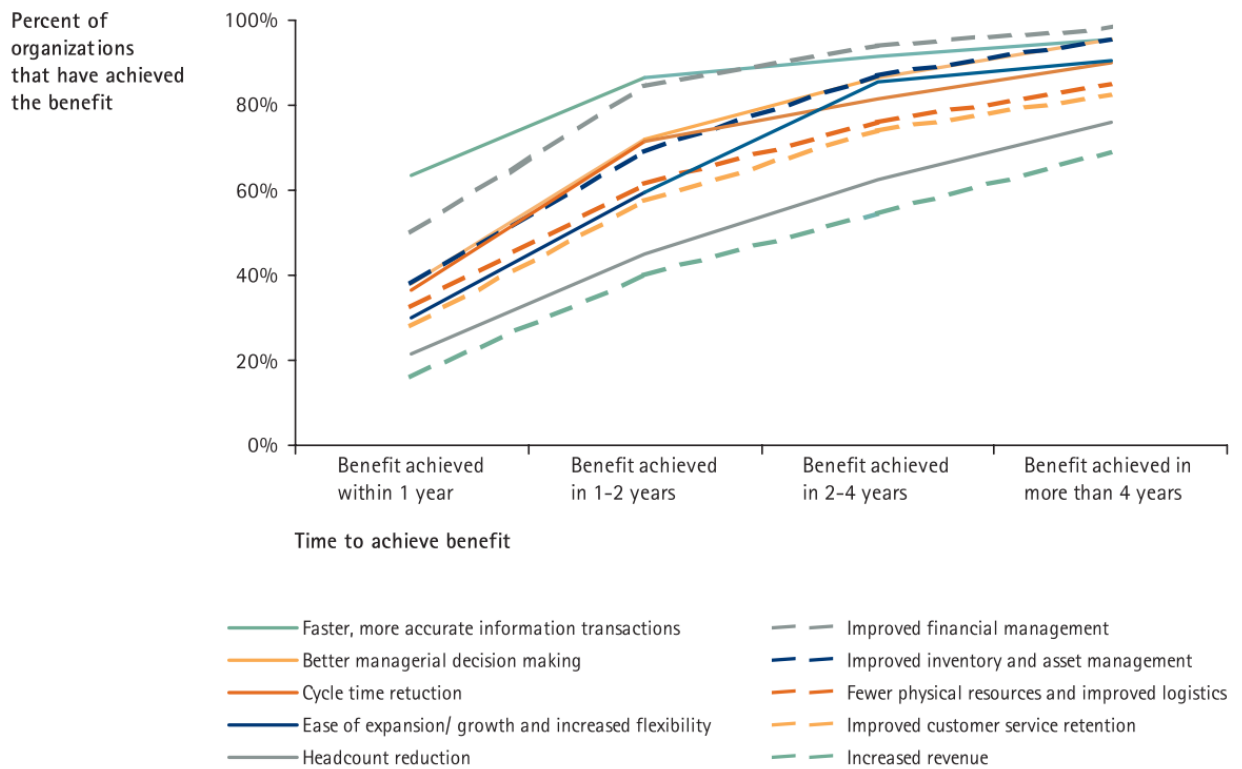


Figure 2.7-1 Enterprise Solutions Benefits Achieved Over Time. Source (Davenport et al., 2002, p. 26)

Further, Ruivo, Oliveira and Neto (2015) note that perhaps the numbers of year’s users have used an ERP system, may influence their perceived ERP value and further research should be done in this area. Therefore, it is probable that SMEs’ perceptions on the value attained from ERP benefits differ based on the length of their use. The researcher thus formulates the following hypothesis to be tested:

- **H₇** – The length of use on an ERP system has a positive mediating role on the perception of ERP value and benefits attained.

2.7.4 Hypothesised Model for ERP Benefits for SMEs

This sub-section proposes a hypothesised model for ERP Benefits for SMEs based on the formulated hypothesis, resulting from the review of literature, in support of the research objectives and research questions. The following hypotheses were formulated from the literature review:

Hypothesis	Literature Review Sub-section
H ₁ - Ease of Use is positively related to ERP value	2.7.2.1
H ₂ - Collaboration is positively related to ERP value	2.7.2.2
H ₃ - Capabilities are positively related to ERP value	2.7.2.3
H ₄ - Efficiencies are positively related to ERP value	2.7.2.4
H ₅ - Analytics are positively related to ERP value	2.7.2.5
H ₆ - The industry sector a SMEs is in, has a mediating role as to the perception of benefits and value derived from ERP	2.7.3.1
H ₇ - The length of use on an ERP system has a positive mediating role on the perception of ERP value and benefits attained	2.7.3.2

Table 2.7-1 Summary of Formulated Hypothesis

Following these formulated hypotheses, the hypothesised model for ERP benefits for SMEs incorporating all the variables is illustrated in Figure 2.7-3.

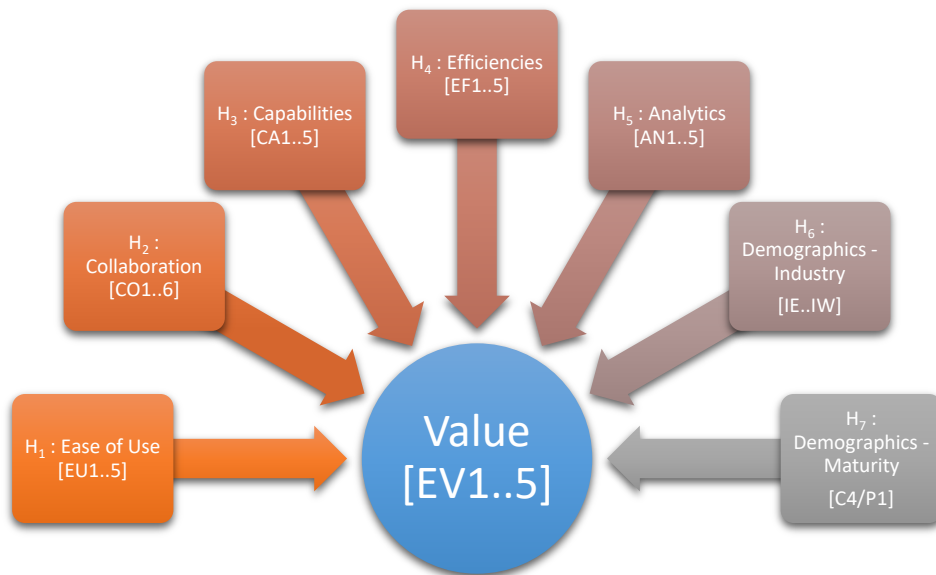


Figure 2.7-3 Hypothesised Model for ERP Benefits for SMEs

2.7.5 Summary

Section 2.7 answers the research question RQ₆: “What are the related variables to benefits derived from ERP by SMEs?” with the objective of achieving RO₆: “Develop a hypothesised model for ERP benefits for SMEs”.

In reviewing the literature and in concluding Section 2.7, the measurement of how to measure value and benefits was examined and concluded to utilise the theories of DOI and RBV. In RBV, an ERP system is viewed as an organisation-specific resource that is a source of competitive advantage, through its use, by leveraging resource differences amongst competitors. The DOI theory has general applicability to many fields of study and in the IS field in particular, ERP systems, are classified as intra-organisational innovations with a locus of IT impact within an organisation providing administrative innovations of information, knowledge sharing and decision-making support (Wu & Chiu, 2015). The DOI variables of “Ease of Use”, “Collaboration”, “Capabilities”, “Efficiencies” and “Analytics” were identified and discussed in answering the research question RQ₆ “What are the related variables to benefits derived from ERP by SMEs?” in relation to benefits and perceived value by SMEs as measured as the dependent variable grounded in the theory of RBV.

Additional demographic factors considered were “Industry” and “Maturity”. Previous research had noted that there would be a probable difference in business value to SMEs dependent on the industry they were in, as this was due to external environmental factors not ordinarily within the control of a specific organisation. A further factor indicated from the literature review was that benefits derived from ERP systems had been observed as being greater the longer you had utilised the system. This treatise has considered these additional factors for inclusion in constructing the hypothesised model for ERP Benefits for SMEs as part of achieving RO₆. “Develop a hypothesised model for ERP benefits for SMEs”.

2.8 Chapter Summary

In reviewing the literature, chapter 2 investigates the research questions **RQ₁** to **RQ₆** in achieving the treatise research objectives **RO₁** to **RO₆**, being:

Chapter Research Questions:

- **RQ₁**: What constitutes a SME in South Africa?
- **RQ₂**: Why are SMEs (a) important and (b) what is their contribution to the economy?
- **RQ₃**: What are the current trends in ERP?
- **RQ₄**: Which SME industry sectors use ERP?
- **RQ₅**: What are the existing ERP SME benefit models?
- **RQ₆**: What are the related variables to benefits derived from ERP by SMEs?

Chapter Research Objectives:

- **RO₁**: Define SME's classifications in South Africa;
- **RO₂**: Identify the importance and contribution of SMEs to the economy;
- **RO₃**: Identify the current trends in ERP evolution;
- **RO₄**: Identify SME industry sectors that use ERP;
- **RO₅**: To identify existing ERP SME benefit models; and
- **RO₆**: Develop a hypothesised model for ERP benefits for SMEs.

Chapter research objectives were achieved and outcomes delivered in the following sub-sections: Sub-section 2.1 reviewed chapter 1 and outlined the objectives to be achieved in Chapter 2. Sub-section 2.2 answers the research question **RQ₁**: *“What constitutes a SME in South Africa?”* and achieves the research objective **RO₁**: *“Define SME's classifications in South Africa”*. In reviewing the literature in sub-section 2.2, the literature revealed that there is no one consistent classification methodology that defines an SME. The researcher has selected to adopt the OECD classification recommendation outlined in Figure 2.2-1, based on full-time employees, for the purpose of this study, as it provides for future statistical comparability with other studies.

Sub-section 2.3 answers the research question **RQ₂**: “*Why are SMEs (a) important and (b) what is their contribution to the economy?*” and achieves the research objective **RO₂**: “*Identify the importance and contribution of SMEs to the economy*”. With support of the literature, it was concluded that SMEs play a significant role in global and national economies, both in developed and developing countries, contributing significantly to economic growth and job creation. Further, policy makers are particularly interested in aspects that enhance their innovativeness and contribute to their growth as well as understanding their constraints and limitations in actualising their entrepreneurship capabilities.

Sub-section 2.4 answers the research question **RQ₃**: “*What are the current trends in ERP?*” and achieves the research objective **RO₃**: “*Identify the current trends in ERP evolution*”. The literature showed that ERP systems have evolved from industrial manufacturing systems and as organisations searched for further optimisation and operational efficiencies, so the ERP providers responded by extending the functionality of ERP systems to back-office and front-of-house business functions as well as integration into suppliers, customers and marketing to cover the complete supply-chain. Subsequent evolution in more recent times looks to deployment options embracing cloud technologies such as SaaS and Cloud-ERP with the express aim to lower costs, both IT and implementation related to ERP. Further, ERP providers have increasingly targeted SMEs as the larger enterprises market has become saturated. However, SMEs cannot be considered scaled-down versions of larger enterprises and current trends sees ERP providers shifting from a complex, all-encompassing monolithic application to an open architecture where organisations can easily integrate components in satisfying globalisation and digital business and the provision of business agility. The focus is on improving the intuitiveness, ease-of-use and the provision of real-time analytics and information, driving innovation, differentiation and end-user engagement.

Sub-section 2.5 answers the research question **RQ₄**: “*Which SME industry sectors use ERP?*” achieving the research **RO₄**: “*Identify SME industry sectors*

that use ERP". In reviewing the literature there appears to be a lack of previous studies specifically identifying SME industry sectors that utilise ERP. However, numerous researchers have noted that different industries probably mediate the perceptions of benefits or value-derived from ERP. Therefore, it is probable that SMEs across different industries will have differing perceptions on the value attained from ERP benefits.

Sub-section 2.6 answers the research question **RQ₅**: "*What are the existing ERP SME benefit models?*" and in doing so achieves the research objective **RO₅**: "*To identify existing ERP SME benefit models*". In reviewing the literature, it is acknowledged that the research field for ERP is vast due to its extensive application across an organisation. Esteves and Pastor (1999) offer a research framework for ERP research. Existing ERP benefits models have been explored in literature and their theoretical groundings discussed. In reviewing existing benefits models from literature, the ERP use and Value model is most applicable for this treatise. Additionally, as this model was based on specifically targeting SMEs, it creates an opportunity for a comparative basis and offering a perspective from a developing country, South Africa.

Sub-section 2.7 answers the research question **RQ₆**: "*What are the related variables to benefits derived from ERP by SMEs?*" and therefore achieves the research objective **RO₆**: "*Develop a hypothesised model for ERP benefits for SMEs*". In reviewing the literature the measurement of value and benefits was determined to utilise the theories of DOI and RBV. With RBV an ERP system is viewed as a organisation-specific resource that is a source of competitive advantage, through its use, by leveraging resource differences amongst competitors. The DOI theory examines ERP use and views ERP as an innovation classified as an intra-organisational innovation with a locus of IT impact within an organisation providing administrative innovations of information, knowledge sharing and decision-making support. The DOI variables of "Ease of Use", "Collaboration", "Capabilities", "Efficiencies" and "Analytics" were identified and discussed in answering the research question **RQ₆** "What are the related variables to benefits derived from ERP by SMEs?" in

relation to benefits and perceived value by SMEs as measured as the dependent variable grounded in the theory of RBV. Additional demographic factors considered were “Industry” and “Maturity”. Previous research noted that there would be a probable difference in SMEs dependent on the industry they were in, as this was due to external environmental factors not ordinarily within the control of a specific organisation. A further factor indicated from the literature review was that benefits derived from ERP systems were observed as being greater the longer you had utilised the system. These additional factors were considered for inclusion in constructing the hypothesised model for ERP Benefits for SMEs as part of achieving **RO₆** - “Develop a hypothesised model for ERP benefits for SMEs”.

Chapter three answers **RQ₇** – *“How can a detailed description of the research methodology be provided in order to understand and reproduce this research study in future?”*. **RQ₇** will be addressed by achieving **RO₇** – *“Identify and explain the research methodology used for this treatise enabling future reproducibility”*. **RO₇** will be addressed by 1) introducing and explaining the concept of research, research methodology, the research paradigm, sample design and selection and measuring instruments 2) selection of the research methodology, research paradigm, sample design and measuring instruments in answering **RQ_m** *“What are the key benefits that ERP systems provide to SMEs?”* to achieve **RO_m** – *“To propose a model for ERP benefits for SMEs”*.

CHAPTER 3: Research Design and Methodology

3.1 Introduction

In Chapter 2, a literature review was conducted to address the chapter's research questions and objectives outlined in Figure 2.1-1. ERP Benefits for SMEs were discussed, previous studies in the field and theoretical basis were explored. The chapter concluded with the formulation of hypothesis to be tested, see Table 2.7-1, and a Hypothesised Model for ERP Benefits for SMEs was developed as seen in Figure 2.7-3.

Chapter 3 answers **RQ₇** – *“How can a detailed description of the research methodology be provided in order to understand and reproduce this treatise in future?”* in addressing **RO₇** – *“Identify and explain the research methodology used for this treatise enabling future reproducibility”*. Figure 3.1-1 illustrates the chapter's research question and research objective.

Figure 3.1-2 presents Chapter 3's overview structure containing the following sub-sections in order to achieve the chapter's objectives:

- **3.1:** A brief review of Chapter 2, an introduction into the research question and objectives to be addressed in Chapter 3 and a chapter sub-section outline;
- **3.2:** The purpose of research is explored and a definition of research is provided. The research problem outlined in Chapter 1 is explained briefly re-visited and contextualised within the research process for this study;
- **3.3:** This sub-section explores different research types, research methodologies and paradigms. The sub-section concludes with the chosen research methodology used in this treatise;
- **3.4:** The concept of research sampling is defined and explored. Different sampling methods are reviewed and discussed as well as concluding the sub-section with the research sampling methodology used in this study;
- **3.5:** Concepts of data collection are explored and discussed with emphasis placed on questionnaire design, measuring instruments used

in this study and the quantitative techniques to be used in the analysis of data, both descriptive and inferential;

- **3.6** This sub-section focuses on the relevance and importance of data analysis, the data analysis techniques used in this study, aspects of data validity, reliability and generalisability in ensuring the goodness-of-data in this study;
- **3.7** Research ethics is briefly discussed in context with this study. Aspects of ethical data collection, protection of the respondents and the ethics clearance attained for this study are discussed; and
- **3.8** This sub-section concludes Chapter 3 with a summary of discussions and choices with regard to the research design applied to this study, achieving the research objective defined as a deliverable for this chapter and a brief outline of Chapter 4 is defined.

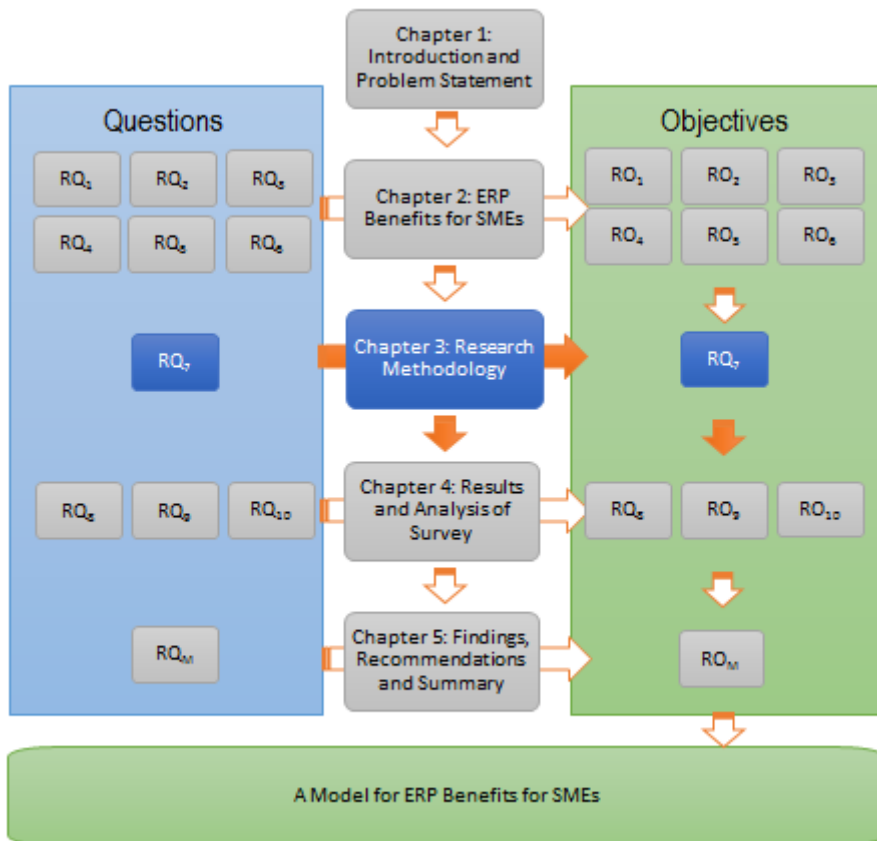


Figure 3.1-1: Chapter 3 Research Question and Research Objective

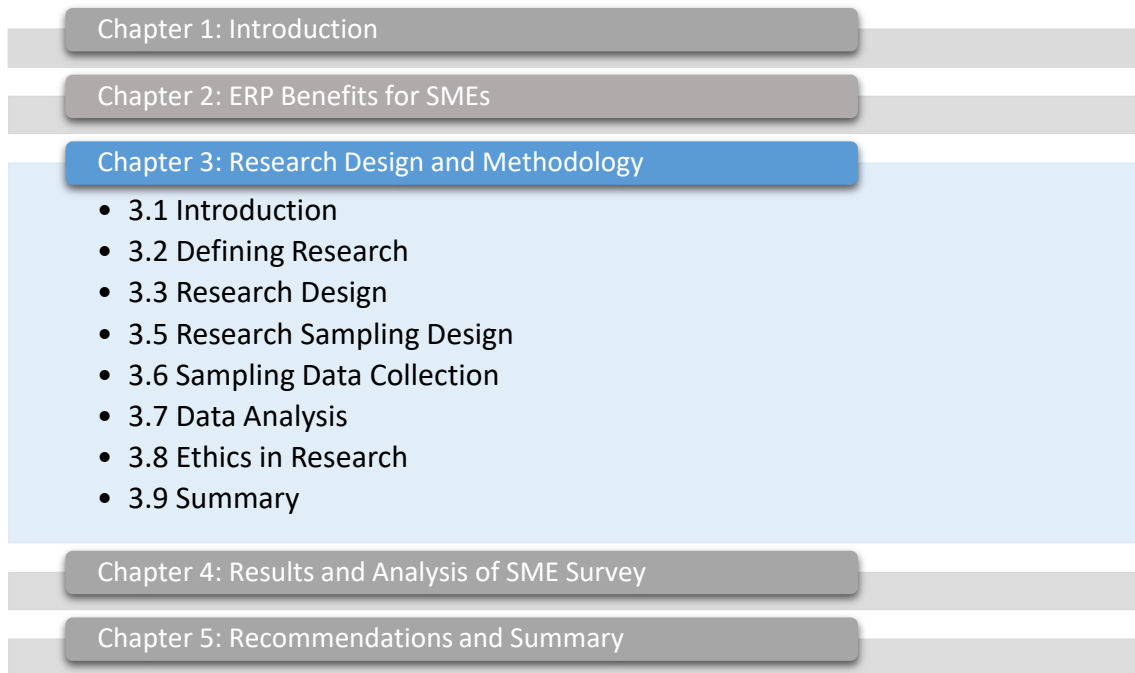


Figure 3.1-2: Chapter 3 Structural Overview

3.2 Defining Research

At its broadest definition, research is defined as an undertaking by people to “*find out things in a systematic way*” in order to increase their knowledge (Saunders et al., 2008:5). Saunders et al. (2008) place particular emphasis on the research’s purpose and the methods adopted to find things out. Ghauri and Grønhaug (2005) suggest that ‘systematic’ implies that research is based on logical relationships and not just beliefs, while the purpose of finding things out, could have multiple results such as describing, understanding, explaining, analysing or criticising. Sekaran (2006) explains that research involves the process of finding solutions to a problem, following a thorough study and analysis of situational factors. Both definitions share the commonality of a requirement for new knowledge in order to address a question, operationalised through a systematic study and analytical process or approach.

Refining the definition further in the context of business, business research is a systematic inquiry, utilising both research tools and research processes, for the provisioning of information to guide managerial decisions in order to reduce risk (Cooper & Schindler, 2014). Cooper and Schindler (2014) emphasise the

disciplined process for conducting an enquiry of a management dilemma. The dilemma either being a problem or opportunity that requires a management decision. Saunders et al. (2008) refine the broader definition defined earlier by adding business and management to the specific things to find out.

The essence of business research is captured and offered in a question; *“Do managers identify where exactly the problem lies, do they correctly recognise the relevant factors in the situation needing investigation, do they know what types of information are to be gathered and how, do they know how to make use of the information so collected and draw appropriate conclusions to make the right decisions, and finally, do they know how to implement the results of this process to solve the problem?”* (Sekaran, 2006, p. 3).

The questions by Sekaran (2006) pose the dilemma of whether managers have the knowledge, appropriate skills and competencies as to the various steps involved in finding solutions to problems. Business research is therefore an organised, objective, systematic, critical, scientific inquiry or investigation into a specific problem, pursued with the purpose of finding answers or solutions to address the business problem (Sekaran, 2006) for the reduction or risk to guide managerial decision-making (Cooper & Schindler, 2014).

The following section defines and discusses research design.

3.3 Research Design for this Study

A research design is the blueprint for fulfilling the research objectives and answering questions. Selecting a research design can be a complicated process due to the large availability of methods, techniques, procedures and sampling plans (Cooper & Schindler, 2014).

Cooper and Schindler (2014) acknowledge varying levels of detail in the definition of research design and offer key essentials amongst the definitions:

- It defines the activities and time-based plan;
- The plan is always based on the research question;
- It offers a guide for selecting sources and types of information;

- It provides a framework for specifying the relationships amongst the study's variables; and
- It offers a procedural outline for every research activity.

In summary, the research design serves as the management of the project that will govern the research study (Cooper & Schindler, 2014). Saunders and Tosey (2013) propose a process for addressing the important aspect of research design. This process coined the 'research onion', works its way from the outside in. The progressive 'onion' layers depict the selections the researcher must undertake during the research design formulation process in order to address critical selection aspects concerning the research, offering the researcher a methodology for selecting and defining the research design (Saunders et al., 2008). The outermost layer of the research onion sees the researcher grounding his research in a given research philosophy, thereafter moving inwards through the onion selecting the research approach, research strategy, research choices, the time horizons and data collection and analysis techniques and procedures (Saunders et al., 2008:108). The 'research onion' is depicted in Figure 3.3-1.

Researchers design a piece of research to answer a question or address a problem but this invariably is constrained by both practical implications and ethics. An understanding of the outer layers provide both context and boundaries within which data collection techniques and analysis procedures are selected (Saunders & Tosey, 2013).

In understanding principles governing the formulation of a research design, this treatise has adopted the research onion technique to serve as a guiding framework in the formulation of the research design. The constituent layers will now be examined and contextualised into this study.

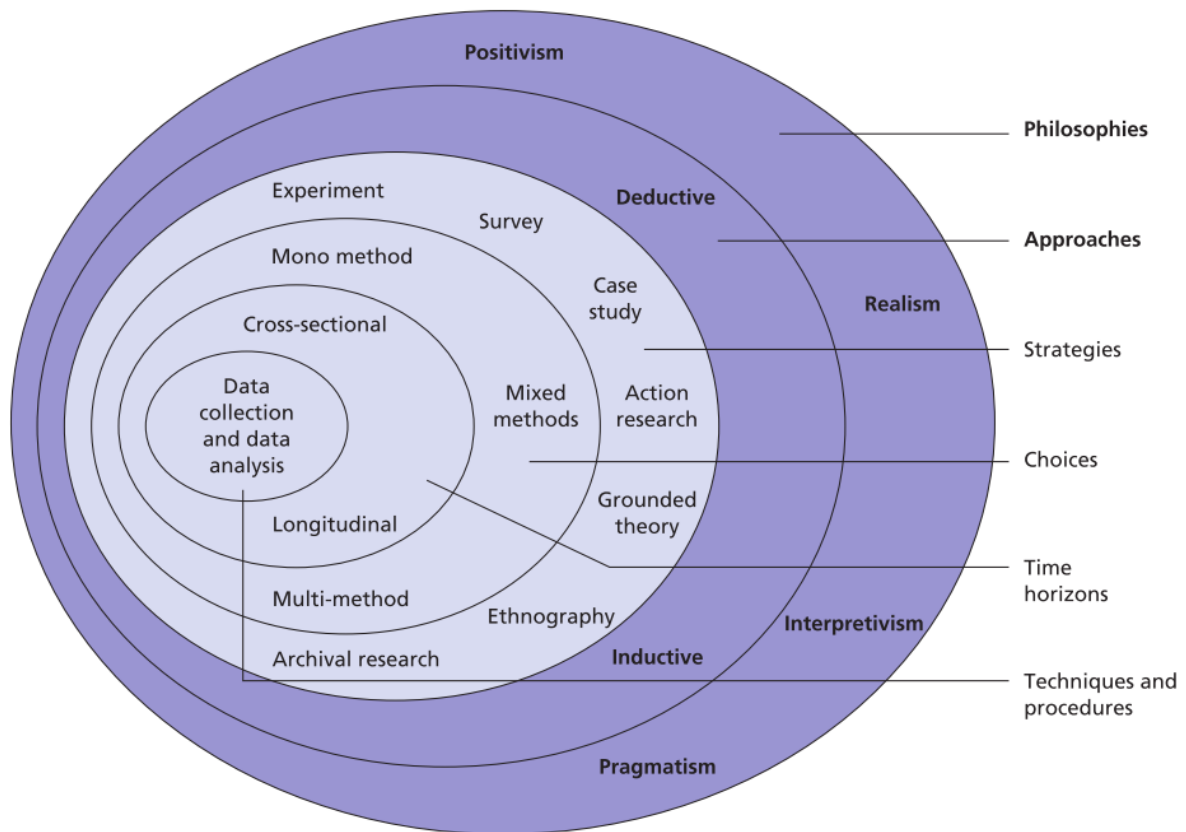


Figure 3.3-1: The research 'onion' (Saunders et al., 2008, p. 108)

3.3.1 Research Philosophy

Research philosophy relates to development of new knowledge in a particular field. The philosophy choice is driven by the research question to be answered and is influenced by practical considerations (Saunders et al., 2008:108). Central to the research philosophy are the assumptions on how the researcher views the world. The assumptions made from the basis of the foundation to the research strategy and research methodology (Saunders et al., 2008). This has a bearing on how the research study views the research question and is understood. That is, a research question concerned with observable phenomena in a given process will differ significantly from a question concerned on understanding the subjective meanings of the feelings and attitudes of people involved in the same process (Saunders & Tosey, 2013).

Four major ways of thinking are observed as research paradigms, these being Positivism, Realism, Interpretivism and Pragmatism. Each paradigm prescribes

the distinct research methods and approaches to conducting research. A short synopsis of each will now be examined concluding with this research study's paradigm selection.

3.3.1.1 Positivism

A researcher concerned with observing and predicting outcomes, generalising cause and effect, reflects the philosophy of positivism (Saunders & Tosey, 2013). Often referred to as an adoption of 'scientific method', the researcher tests or proposes theories with data which are structured, measurable and comparable and the research is not influenced by the researcher's bias or values (Saunders et al., 2008). This paradigm usually involves large samples of quantitative data and hypothesis testing (Saunders & Tosey, 2013). Positivism reflects a deterministic philosophy, wherein causes probably determine outcomes (Mackenzie & Knipe, 2006). Positivism makes the assumption that the social world can be observed in the same manner as the natural world, is value free and explanations to causes can be derived.

The positivistic paradigm is most used in business and management research. The researcher is more concerned with rational explanation as to why a particular organisational problem is occurring and developing a set of recommendations within the specific organisational or management structure (Saunders et al., 2008).

3.3.1.2 Realism

Realism, like positivism, is a philosophical position associated with a scientific enquiry. Broadly, realism considers the researcher's perceptions, world views and personal experiences. Realism exists in two forms, direct and critical (Saunders & Tosey, 2013). Where direct realism argues that the researcher's experiences through their senses constitute an accurate representation, critical realism argues that the researcher's initial experiences are subsequently processed subjectively by their mind. A critical realist approach would be to understand the immediate experiences, relationships and the subsequent subjective complexity (Saunders et al., 2008).

3.3.1.3 Interpretivism

The philosophical paradigm of interpretivism holds that the social world is too complex to be understood by a narrow set of defined models. Here the researcher is interested to gain new knowledge on rich insights into subjective meanings rather than wanting to be able to generalise or offer an element of predictability (Saunders & Tosey, 2013). This research approach focuses on the behavioural aspects of phenomena within a social system, seeking to understand the meaning of the people in their view rather than observing them as objects (Saunders & Tosey, 2013).

The interpretivist considers research as value bound, the area of research as being a function of a particular set of circumstances by individuals in a particular moment. Collection of data and analysis involves in-depth investigative techniques seeking to understand the 'why', be typically qualitative in nature and from smaller samples (Saunders & Tosey, 2013).

3.3.1.4 Pragmatism

The philosophical paradigm of pragmatism sees the researcher's importance focus on the research findings' practical consequences. A pragmatist viewpoint is that no single view can depict the whole scenario and therefore multiple realities probably exist (Saunders & Tosey, 2013). A pragmatists' research focuses on the 'what' and 'how' of the research problem and places the research problem as central and considers all philosophical paradigms and research approaches in understanding the problem (Mackenzie & Knipe, 2006). Data collection and methods are thus varied and situational dependent on the problem itself.

3.3.1.5 Research Philosophy Conclusion

As indicated earlier, the study intends to empirically assess determinants of value as perceived by South African SMEs, having implemented an ERP system successfully. By grounding the study in the theoretical frameworks of RBV and DOI based on prior research in the field of ERP, the study seeks to confirm and or highlight any significant variances of results. The study seeks to

observe and predict outcomes, generalising cause and effect in a scientific method. This research therefore follows the philosophical research paradigm of positivism.

3.3.2 Research Approach

Peeling back the onion to the second layer as per Figure 3.3-1, the research design considers the next facet for consideration, being the research approach. Whether the research is inductive or deductive in nature is largely predicated by the intent of the study (Saunders et al., 2008). This section examines the different approaches and concludes with the chosen approach of this study.

3.3.2.1 Deduction

A deductive approach grounds itself in the basis of theory development and setting out a research strategy to test the hypothesis through rigorous testing. A typical research philosophy associated with a deductive research approach is positivism, although other philosophies could be used (Saunders et al., 2008).

According to Robson (2002) a deductive research approach progresses through five sequential stages of research as illustrated in Figure 3.3-2. Deductive research features the following characteristics (Saunders et al., 2008):

- Explorative search in seeking to explain the causal relationships between concepts or variables;
- Develop a stated hypothesis as to the causal relationship;
- Collect data to test the hypothesis; typically quantitative in nature;
- Establish controls to allow the testing of the hypothesis;
- Utilisation of a highly structured methodology to facilitate replication and ensure reliability;
- Concepts require operationalisation in a manner that facts can be measured on a quantitative basis; and
- Generalisation through statistical means.

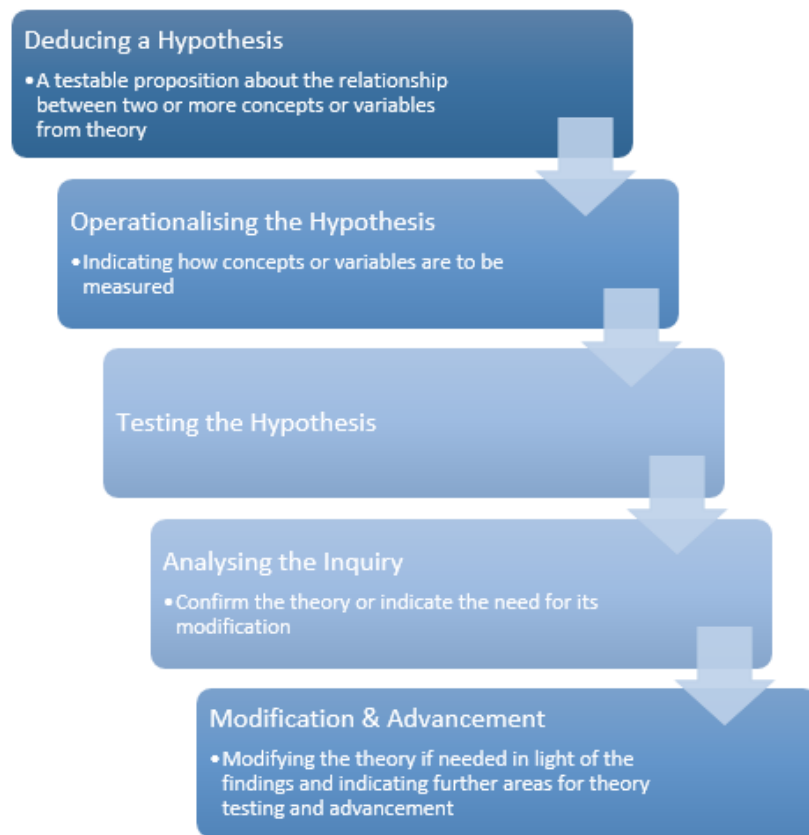


Figure 3.3-2: Sequential Progress of Deductive Research. Adapted from Robson (2002)

3.3.2.2 Induction

In contrast to deduction, an inductive approach grounds itself on the basis of collecting data first and thereafter building a theory as a result of the data analysis. A typical research philosophy associated with an inductive research approach is interpretivism, although other philosophies could be used (Saunders et al., 2008). Research based on an inductive approach is likely to be concerned with the context and reasoning in which events take place.

Data collection is typified by being qualitative in nature, the researcher has a close understanding to the research context and is therefore part of the research process, there is less need to generalise and a more flexible research structure is adopted in order to permit changes to the research as new knowledge is uncovered during the research process (Saunders et al., 2008).

3.3.2.3 Research Approach Conclusion

This study basis itself on scientific principles seeking to move from theory to data and analysing the causal relationships between theory-based variables. As the researcher is independent from the research study and wishes to generalise conclusions, a deductive research approach has been adopted for this study.

3.3.3 Research Strategy

In this sub-section, the onion metaphor as seen in Figure 3.3-1 is peeled back further in selecting the research strategy. Research strategies can be applied to explorative, descriptive and explanatory research, however, some strategies are more widely used in inductive or deductive approaches to research. Saunders et al. (2008) point out that selecting a strategy appropriate to your research is governed mostly by your research questions, objectives, availability of existing literature, time and resource availability as well as the researcher's philosophical orientation. Further, it is noted that no individual strategy is regarded as being superior or inferior, but the selection is based on the research situational factors (Saunders et al., 2008). The subsequent sub-sections briefly discuss each research strategy and the selection rational for this study is offered in the concluding summary.

3.3.3.1 Experiment

Experiment research emanated from natural sciences. Its purpose is to study causal links amongst variables and whether a change in one variable alters another. Simple experiments may be to establish a link amongst variables, where a complex may consider the size of change and relative importance of two or more independent variables (Saunders et al., 2008).

Experiment research finds greatest use in exploratory and explanatory research, interested in finding answers to the 'how' and 'why' questions. They may feature experiment and control groups to improve the internal validity of the results. Due to its random allocation of experimental conditions and introduction of planned interventions, this research strategy is generally not applied due to a multitude of reasons, not least ethics, to business research as laboratory

experimentation cannot be generalised across organisations (Saunders et al., 2008).

3.3.3.2 Survey

Typically a survey strategy is associated with a deductive research approach. It is both a common and popular strategy in business research as it allows for the answering of 'who, what, where, how' type research questions. A survey strategy standardises data, allowing for easy comparison, collects quantitative data which may be analysed to produce descriptive or inferential statistics (Saunders et al., 2008).

Numerous benefits such as a higher degree of control, lower costs, easier comparability, are associated with a survey strategy. When sampling is used, it is possible to generate results for the whole population provided the sample is representative and large enough (Saunders et al., 2008).

3.3.3.3 Case Study

A case study strategy involves empirical investigation of a particular phenomenon in a real life context using multiple sources of evidence (Robson, 2002). The case study strategy is most often used in explanatory and exploratory research, although it differs from a survey strategy in that the context is more rigid and the case study strategy allows for exploration of the context further (Saunders et al., 2008).

Numerous case study strategies such as single case, multiple case and holistic case versus an embedded case may be employed and sources of data typically are triangulated. Case study strategies are worthwhile when exploring existing theories, challenge their validity and pose new research questions (Saunders et al., 2008).

3.3.3.4 Action Research

An action research strategy concerns itself with the resolution of organisational issues such as dealing with change by those experiencing the issues. The researcher typically is involved with the members over an issue that is of

concern to the members. Action research additionally emphasises '*action*' and its iterative processes of diagnosis, planning, taking action and evaluating continue until the desired outcome is achieved (Saunders et al., 2008). This research strategy primarily deals with the aspect of change and can be utilised either for the formulation of a new theory or dealing with change management (Saunders et al., 2008).

3.3.3.5 Grounded Theory

Grounded theory emphasis is on developing and building theory as it is used in research to predict and explain behaviour. It is therefore often linked to an inductive approach to research. Data collection commences without the formulation of a theoretical framework (Saunders et al., 2008).

As the data leads to the generation of predictions to be tested against the observations, Collis and Hussey (2013) define grounded theory an inductive and deductive approach grounded in continual reference to data.

3.3.3.6 Ethnography

Ethnography is a pure inductive approach. The researchers are required to immerse themselves completely in the social world being researched. The purpose being to describe and explain the social world the research subjects inhabit in way that they would describe it themselves. This research strategy takes place over an extended period of time and is time consuming (Saunders et al., 2008).

3.3.3.7 Archival Research

Archival research strategy considers making use of administrative records and documents as the principle source of data. These records are inevitable secondary sources of data (Saunders et al., 2008).

3.3.3.8 Research Strategy Conclusion

This study intends to deduce causal relationships between theory-based variables. A survey strategy employing a questionnaire technique will be utilised in collecting quantitative data. In later sections the questionnaire and survey

design will be discussed in determining aspects such as reliability and validity. The researcher wishes to infer from the survey data analysis the larger population.

3.3.4 Research Choices

Research choices define the researcher's method for collecting and analysing data. The choices available are mono-method, multi-method and mixed-methods. Mono-method uses a single method for collecting and analysing data (Saunders et al., 2008).

Multi-method utilises more than one data collection and analysis technique, but is restricted to be either quantitative or qualitative. For example, conducting questionnaire and observations collecting quantitative data, would be classified as a multi-method quantitative study (Saunders et al., 2008).

A Mixed-method approach utilises both quantitative and qualitative techniques for data collection and analysis in its research design. Within a mixed-method approach, mixed method research uses both either in parallel or sequential but the analysis of the respective data is analysed with its corresponding analyses techniques. A mixed-model approach combines qualitative and quantitative data collection and analysis techniques. Other aspects to be considered within the research design decisions will need to take cognisance of this choice, for example, the use of inductive and or deductive analysis (Saunders et al., 2008). This treatise has selected to utilise a questionnaire within the survey method to collect quantitative data for the use of analysing descriptive and inferential statistics in answering the research questions and hypothesis formulated.

3.3.5 Time Horizons

This research study is particularly interested in the phenomena being studied at a point in time, that being the here and now. This is referred to as a cross-sectional study. Cross-sectional studies typically employ the survey method for data collection (Saunders et al., 2008). Cross-sectional studies contrast to longitudinal studies in that longitudinal studies observe to monitor change over a period of time (Saunders et al., 2008). Whilst this study is interested in

understanding how the maturity variable relates to the variable of value and benefits, it is not within the scope of this treatise to understand the impact of change of this variable over a period of time.

3.3.6 Research Methodology applied in this Study

This sub-section reviews the research design decisions in Section 3.3 and provides the rationale for the choices made in the context of this study. As reviewed in literature in Section 2.4..2.7, the independent variables that measure aspects of the theory of DOI in the use of ERP and the dependent variables that measure aspects of the theory of RBV in determining the value perception of ERP, form part of an objective reality capable of quantitative analysis utilising statistical techniques for both descriptive and inferential analysis. As the study aims to describe the relationships between these variables, this treatise is categorised as being descriptive in nature.

Further to this, the study seeks to answer the main research question **RQ_M** “What are the key benefits that ERP systems provide to SMEs?” in achieving **RO_M** – “To propose a model for ERP benefits for SMEs”. This main question and objective is only realised through an empirical analysis of relationships as detailed in the Table 2.7-1 “Summary of Hypothesis” and in testing the hypothesised model for ERP benefits argued in Section 2.7. Given this study’s aims and objectives and having utilised the “research onion” method in formulating the research design, the following research design has been adopted in this study and illustrated as Figure 3.3-3:

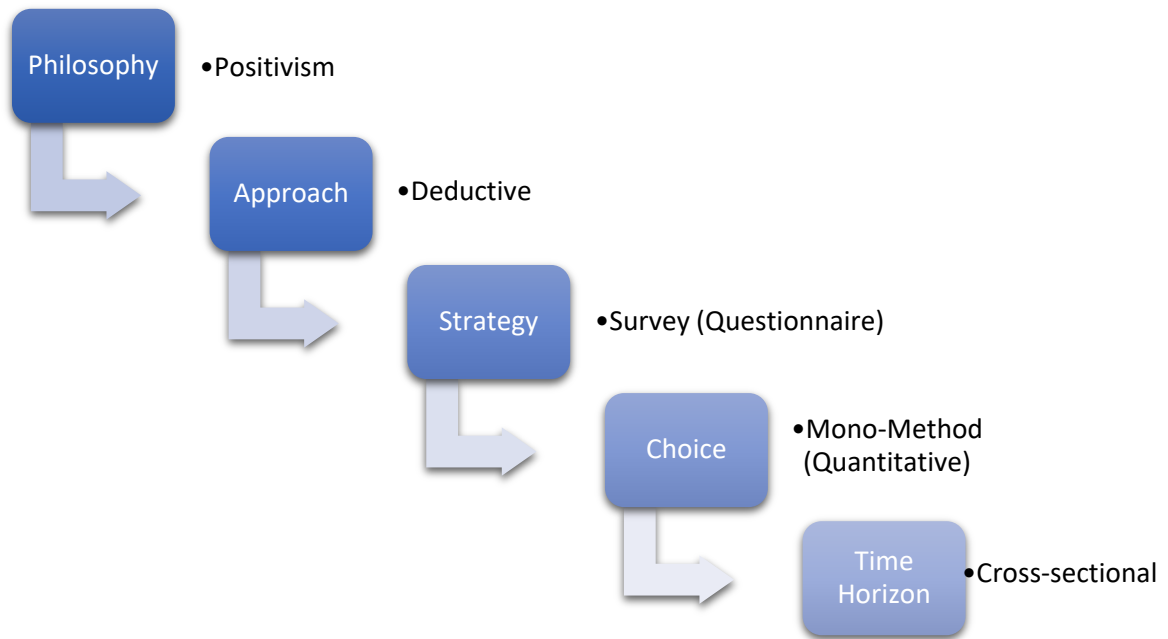


Figure 3.3-3 Research Design Hierarchy

A sample from SME ERP users has been chosen in order to address the research objectives. Quantitative data on the perceived value derived by ERP and use measurements were collected by means of an administered survey questionnaire sent to known organisations using ERP across South Africa and the identification of statistical significant relationships was identified.

3.4 Research Sampling Design

This sub-section explains the concepts of sampling, establishing the population, sample size, the differing sampling methods and the process of research sampling. The section concludes with the chosen research sampling design for this study answering **RQ₇** – “How can a detailed description of the research methodology be provided in order to understand and reproduce this research study in future?”. **RQ₇** will be addressed by achieving **RO₇** – “Identify and explain the research methodology used for this treatise enabling future reproducibility”. The final “onion layer” offered by Saunders et al. (2008) (see Figure 3.3-1) focuses on techniques and procedures for data collection and data analysis. This sub-section focuses on data collection aspects and data analysis is dealt with in subsequent sections.

3.4.1 Defining Sampling

Sampling depicts the process of selecting the target individuals, objects or events that represent the study or research matter (Sekaran, 2006). The basic premise is that by selecting elements of the population conclusions may be drawn about the entire population (Cooper & Schindler, 2014). The population is the term used for the listing of all population elements, that being each unit under study, from which the sample is drawn from (Cooper & Schindler, 2014). Many sampling techniques exist, but the choice of sampling technique often depends on the feasibility and practical consideration of collecting the data to answer the research questions in addressing the objectives against the population (Saunders et al., 2008).

3.4.2 Sampling Methods Reviewed

Sampling techniques fall into two major categories, probability or representative sampling and non-probability or judgemental sampling (Saunders et al., 2008). Saunders et al. (2008) provide a hierarchical view of sampling methods contained within each respective category, see Figure 3.4-1.

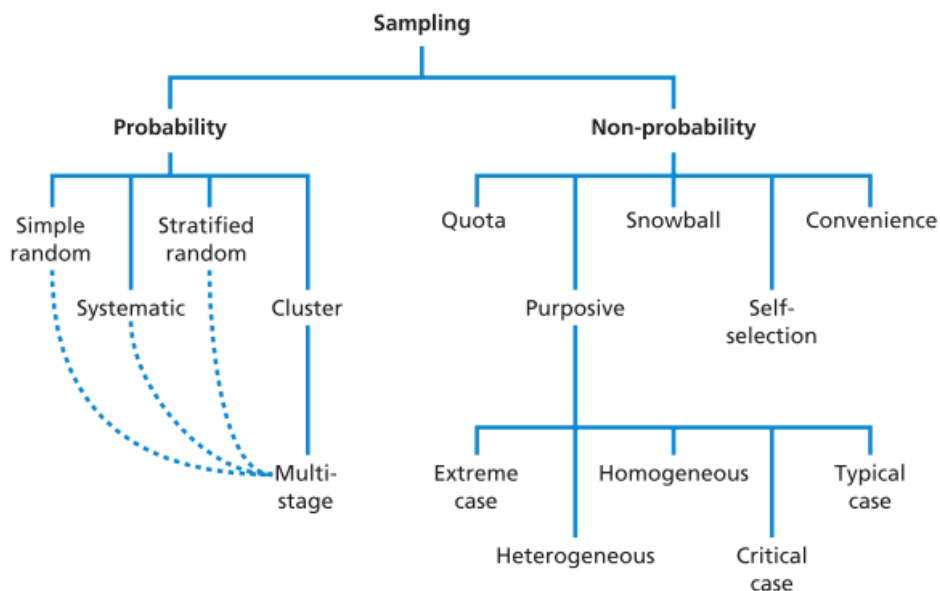


Figure 3.4-1 Sampling Techniques Hierarchy. Adapted from Saunders et al., (2008)

Probability sampling holds that the chance or probability of each unit under study, chosen from the population, is usually equal for all cases. Provided the sample size is significant enough, estimations of the analysis are possible against the whole population under the study within a given confidence level (Saunders et al., 2008). This sampling category achieves research objectives wishing to infer conclusions to the whole population.

Non-probability sampling holds that the probability of each case being selected from the whole population is not known and therefore precludes the researcher attempting to make inferential conclusions to the whole population (Saunders et al., 2008). Saunders et al. (2008) note that while you may not statistically infer the whole population, non-probability may still generalise conclusions to the population.

In selecting a sampling category, the researcher considered aspects against a population database. The database contains email addresses of all known ERP customers for SYSPRO in South Africa. The database was evaluated against the criteria of: Is the database information complete? Is the database information accurate? Is the database information current? (Saunders et al., 2008)

The SYSPRO customer database is both current and valid. Due to its on-going annual license renewal policy, the database is deemed as being complete, accurate and current. All South African customers were selected as the population of interest and contacted via email requesting their participation in completing the online survey questionnaire. Therefore, every unit of analysis was afforded an equal opportunity to participate, removing possible bias. This is a prerequisite for probability based sampling techniques (Saunders et al., 2008). As the sampling method is probability based, generalisations can be made to the population. Saunders et al. (2008) offers a decision tree for the selection of probability sampling methods. The invitation to participate in the online questionnaire was sent to the list of known customer email addresses, representing the whole population. The initial subjects were requested to send the questionnaire on to members within their organisation to elicit further

responses. This aspect of the questionnaire is regarded as snowballing, requesting the referral network of the cases initially contacted to in turn initiate contact with targeted respondents of interest for the study (Cooper & Schindler, 2014).

3.5 Sampling Data Collection

An explanation of data collection concepts and available methods is discussed in this sub-section. Thereafter data collection methods and measuring instruments utilised in this study are discussed.

3.5.1 The concept of Data Collection

Researchers are faced with the task of identifying the likely sources of data in order to answer their research questions. Data can be obtained from primary or secondary sources (Sekaran, 2006). Where secondary data sources utilise data already available, primary data collection refers to obtaining first-hand, new data (Sekaran, 2006).

Data may be collected utilising a variety of techniques and in different settings for example in the field or in a lab. Data collection methods include but are not limited to:

- Interviews – face-to-face, telephonic, computer-aided or electronic media;
- Questionnaires – personally administered, sent via mail, electronically administered;
- Observation – individuals, objects or events either electronically recorded or not; and
- Motivational techniques – projective testing (Sekaran, 2006).

Interviews, questionnaires and observation methods comprise the three main collection methods for survey research. The choice of data collection method ultimately must address the research questions of the study, but factors such as availability of resources or facilities, degree of required accuracy, researcher

preferences, the time span of the study and cost of collection play a role in the collection method selected (Sekaran, 2006).

It was previously noted that this research utilised the survey method. The researcher’s chosen approach to data collection in addressing the research questions, was the formulation of a questionnaire sent via email to be electronically administered and collected through the use of an online survey administering service, SurveyMonkey. Questionnaires are regarded as being the most useful data collection method when collecting data from large numbers of respondents dispersed across geographic areas (Sekaran, 2006).

3.5.2 Questionnaire Data Collection

A questionnaire is defined as a pre-formulated written set of questions, usually selection based with defined selections and alternative options, to which respondents record their answers (Sekaran, 2006). Questionnaires are the most widely used data collection techniques, due in part to the fact that all respondents respond to the same set of questions and the efficient manner of collecting responses from a large set of data in preparation to quantitative analysis (Saunders et al., 2008). Saunders et al. (2008) offer the following guidelines for characteristics associated with internet mediated questionnaires, see Table 3.5-1.

Attribute	Internet Mediated Questionnaires
Target population and suitability	Computer-literate individuals, able to be contactable via email or other internet means
Confidence the target audience has responded	Usually high if using email
Likelihood of distortion of respondent’s answers	Low
Size of sample	Large and geographic dispersed
Likely response rate	30% internal to organisation, 11% or lower external to organisation
Length of Questionnaire	Fewer screens as possible to increase completion rate likelihood
Types of Questions	Closed. Of interest to respondent
Time taken to complete collection	2-6 weeks
Role of interviewer	None
Data input errors (transposition)	None, automated

Table 3.5-1 Characteristics of Internet Mediated Questionnaires. Adapted from Saunders et al., (2008)

3.5.2.1 Questionnaire Design

Sekaran (2006) suggests that questionnaire design should consider the aspects of; principles of wording, planning of question variable issues such as categorisation, scaling and coding, and general questionnaire appearance. To minimise respondent bias and variable measurement error, all the principles have to be followed carefully.

Further, it is advised that certain demographic data such as age, gender, educational level, department, job level and number of tenure at the organisation are captured, even if the theoretical framework does not require it as it assists to describe the sample characteristics in the analysis sections of the study (Sekaran, 2006).

A questionnaire design map was planned and depicted in Figure 3.5-1. The questionnaire used in this study is attached as Appendix A.

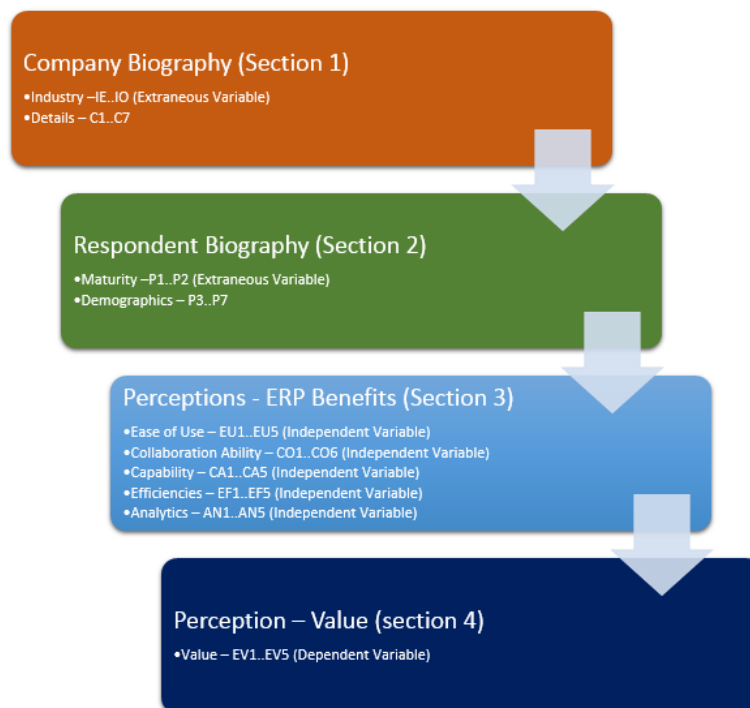


Figure 3.5-1 Questionnaire Design Map

3.5.3 Measuring Instruments used in this Study

Appropriate scales must be used depending on the type of data needed to be obtained (Sekaran, 2006), where possible, it is advised to make use of interval and ratio scales for measurements rather than nominal or ordinal scales (Cooper & Schindler, 2014). Further recommendations are to base measures to those used in similar studies so the researcher is able to draw comparisons (Saunders et al., 2008). Once data are obtained, the goodness of data is assessed through tests of validity and reliability. Validity establishes how well a technique, instrument, or process measures a particular concept, and reliability indicates how stably and consistently the instrument traps the variable (Cooper & Schindler, 2014).

3.5.4 Dependent and Independent Variables

Cooper et al. (2014) delineate variables to dependent, independent and extraneous. Dependent variables change in response to changes in other variables, independent variables cause changes in a dependent variable while extraneous variables might also cause changes in a dependent variable, offering an alternative explanation to the independent variables.

The Hypothesised Model for ERP Benefits for SMEs in Figure 2.7-3, depicts the measurement of relationships undertaken in this study. **H₁** to **H₅** in Table 2.7-1 were measured as independent to dependent variables by questionnaire items [EU1..EU5], [CO1..CO5], [CA1..CA5], [EF1..EF5], [AN1..AN5] and [EV1..EV5] respectively, see Appendix A. Further independent variables included in the Hypothesised model, **H₆**, **H₇**, were measured by questions [IE..IO] in the 'Nature of Industry' demographic section and question [P1] in the personal biography sections of the questionnaire, see Appendix A.

The following sub-section reviews the dependent and independent variable constructs with supporting literature support.

3.5.4.1 ERP Value – Dependent Variable

The variable has been constructed anchored on a 5 point Likert scale “*strongly disagree [1] to strongly agree [5]*” utilising measures of competitive advantage

(Porter, 1985) and organisation performance (Ruivo et al., 2012b). The constructed dependent variable “ERP Value” with corresponding literature support expressed as questionnaire indicators is defined in Table 3.5-2.

Construct	Indicators	Literature Support
[EV] ERP Business Value		
Competitive Advantage	[EV1] Profitability	(Porter, 1985)
	[EV2] Market Share	(Porter, 1985)
Organisation Performance	[EV3] Individual Productivity	(Ruivo et al., 2012b)
	[EV4] Customer Satisfaction	(Ruivo et al., 2012b)
	[EV5] Management Control	(Ruivo et al., 2012b)

Table 3.5-2 Dependent Variable [EV] ERP Business Value, Indicators and Literature Support

3.5.4.2 ERP Ease of Use – Independent Variable

The variable has been constructed anchored on a 5 point Likert scale “*strongly disagree [1] to strongly agree [5]*”, utilising both measures of complexity (Ruivo et al., 2012b) and ease of use for execution (Calisir & Calisir, 2004). The constructed independent variable “Ease of Use” with corresponding literature support expressed as questionnaire indicators is defined in Table 3.5-3.

Construct	Indicators	Literature Support
[EU] Ease of Use		
Complexity	[EU1] Easy to learn the system	(Ruivo et al., 2012b)
	[EU2] Intuitiveness of the system	(Ruivo et al., 2012b)
	[EU3] How comfortable you are using the system	(Ruivo et al., 2012b)
Execution	[EU4] Easy to get the system to do what I wanted it to do	(Calisir & Calisir, 2004)
	[EU5] Easy to Become skilful at using the system	(Calisir & Calisir, 2004)

Table 3.5-3 Independent Variable [EU] Ease of Use, Indicators and Literature Support

3.5.4.3 ERP Collaboration – Independent Variable

Collaboration measures researched by Ruivo et al. (2012a) and Wu and Chiu (2015) are thus combined to measure the collaboration construct anchored on a 5 point Likert scale “*strongly disagree [1] to strongly agree [5]*”. The constructed independent variable “Collaboration” with corresponding literature support expressed as questionnaire indicators is defined in Table 3.5-4.

Construct	Indicators	Literature Support
[CO] Collaboration		
Internal	[CO1] Improves collaboration with colleagues	(Ruivo et al., 2012a)
	[CO2] Improves collaboration with the system	(Ruivo et al., 2012a)
External	[CO3] Communicate with suppliers	(Ruivo et al., 2012a)
External	[CO4] Communicate with customers	(Ruivo et al., 2012a)
	[CO5] Improves transacting amongst members in my supply-chain	(Wu & Chiu, 2015)
Internal	[CO6] ERP promotes information flow amongst departments	*Self-construct (Yeh & Xu, 2013)

Table 3.5-4 Independent Variable [CO] Collaboration, Indicators and Literature Support

3.5.4.4 ERP Capabilities – Independent Variable

The capabilities construct is anchored on a 5 point Likert scale “strongly disagree [1] to strongly agree [5]”. The constructed independent variable “Capabilities” with corresponding literature support expressed as questionnaire indicators is defined in Table 3.5-5.

Construct	Indicators	Literature Support
[CA] Capabilities		
Best Practice	[CA1] System adaptability to business needs	(Ruivo et al., 2012b)
	[CA2] System capable of handling local requirements	(Ruivo et al., 2012b)
Organisational Integration	[CA3] Extent to which system allows interconnectivity between hierarchical levels in the organisation	(Uwizeyemungu & Raymond, 2012)
	[CA4] Extent to which system allows interconnection between various departments	(Uwizeyemungu & Raymond, 2012)
Functional Dependence	[CA5] Extent to which systems fulfils individual operational needs	*Self-construct (Uwizeyemungu & Raymond, 2012)

Table 3.5-5 Independent Variable [CA] Capabilities, Indicators and Literature Support

3.5.4.5 ERP Efficiencies – Independent Variable

The efficiencies construct is anchored on a 5 point Likert scale “strongly disagree [1] to strongly agree [5]”. The constructed independent variable “Efficiencies” with corresponding literature support expressed as questionnaire indicators is defined in Table 3.5-6.

Construct	Indicators	Literature Support
[EF] Efficiencies		
Individual Effectiveness	[EF1] Effectiveness in executing repetitive tasks	(Ruivo et al., 2012b)
	[EF2] Effectiveness of user interface	(Ruivo et al., 2012b)
Performance Enhancement	[EF3] System aids in performing operational functions	(Uwizeyemungu & Raymond, 2012)
	[EF4] System adjusts tasks and actions to trading conditions	*self-construct (Uwizeyemungu & Raymond, 2012)
	[EF5] System contributes to reduction in operational delays	*self-construct (Uwizeyemungu & Raymond, 2012)

Table 3.5-6 Independent Variable [EF] Efficiencies, Indicators and Literature Support

3.5.4.6 ERP Analytics – Independent Variable

The analytics construct is anchored on a 5 point Likert scale “*strongly disagree [1] to strongly agree [5]*”. The constructed independent variable “Efficiencies” with corresponding literature support expressed as questionnaire indicators is defined in Table 3.5-7.

Construct	Indicators	Literature Support
[AN] Analytics		
Standard Analytics	[AN1] Comprehensive reporting (KPI’s, dashboards etc.)	(Ruivo et al., 2012b)
	[AN2] Real-time access to information	(Ruivo et al., 2012b)
	[AN3] Data visibility across departments and operations	(Ruivo et al., 2012b)
Derived Analytics	[AN4] Ability to customise the information requirements	*self-construct (Madapusi & D’Souza, 2012)
	[AN5] Information is timeously available on demand	*self-construct (Madapusi & D’Souza, 2012)

Table 3.5-7 Independent Variable [AN] Analytics, Indicators and Literature Support

3.6 Data Analysis

3.6.1 The Relevance and Concept of Data Analysis

Wegner (2011) explains that statistics in management is a decision support tool, generating evidence based information through analysis of data. Quantitative studies, such as this treatise, concern themselves with measurements of the phenomena of interest. Importantly, in addition to the design and execution of the experiment, are the accurate evaluation and complete exploitation of the data obtained (Brandt, 2014). The process of data evaluation, or analysis, uses both logical reasoning and analytical techniques (Wegner, 2011), it summarises, examines patterns and statistically evaluates hypothesis (Cooper & Schindler, 2014). Data analysis is involved in achieving three objectives: gaining and understanding and having a feel for the data, testing the goodness of the data, and testing the hypotheses developed in the research study (Sekaran, 2006).

Quantitative studies concern themselves with descriptive and inferential data analysis. Descriptive statistics profiles the sample data and inferential statistics generalises sample data to a broader population to estimate values and confirm relationships. Statistical modelling explores and quantifies data relationships between variables for estimation or predictive purposes (Wegner, 2011).

Initial analysis explores data in the form of tables and diagrams. The choice to use tables or diagrams is driven by the research questions and objectives and the scale of measurement which the data was recorded with (Saunders et al., 2008). Examples of initial analysis tools are:

- Charts, histograms, pictograms comparing high and low values;
- Tables to show specific values;
- Line graphs to show trends;
- Pie or percentage charts to show proportions; and
- Box plots to show distribution of values (Saunders et al., 2008).

Subsequent analysis involves describing the data exploring relationships using statistical methods. The choice as to which statistical methods to use is driven

by the research questions and objectives and the scale of measurements which the data was recorded with (Saunders et al., 2008). Examples of subsequent analysis tools are:

- Central tendency of data using mean, median and mode;
- Inter-quartile range and standard deviation to describe dispersion;
- T-tests and ANOVA to test whether groups differ significantly;
- Correlation and regression to assess strength of relationships between variables; and
- Regression to predict values (Saunders et al., 2008).

3.6.2 Data Analysis Techniques Used

The purpose of this study is to support, or not to support, the hypothesised model by testing the relationships between variables captured via survey through statistical analysis. The quantitative data captured via the questionnaire were codified, cleaned, sorted, categorised by a statistician and thereafter analysed using a computer aided statistical package, SMART-PLS (“SmartPLS - Statistical Software For Structural Equation Modeling,” n.d.). Dependent on the variable under study, data were analysed using the following techniques as depicted in Table 3.6-1.

Stage	Quantitative Analysis	Tools Used
Initial - Descriptive	Comparative Value Analysis	Charts and Histograms
	Trends	Line Graphs
	Proportions	Pie Charts
Subsequent - Descriptive	Distributions	Standard Deviation, Box Plots, Inter-quartile analysis, central tendency measures
Subsequent – Statistical and Inferential	Inter-variable relationships	Partial Least Squares, Multiple Regression
	Differences in Groups Significance	ANOVA
	Strength of associations	Correlation Analysis

Table 3.6-1 Quantitative Analysis Techniques used in this Study

Dependent and independent variables as discussed in Sub-section 3.6.4 were codified using the acronyms and respective meanings in Table 3.6-2.

Acronym	Meaning
SD	[1] Strongly Disagree
D	[2] Disagree
N	[3] Neutral
A	[4] Agree
SA	[5] Strongly Agree

Table 3.6-2 Questionnaire Likert Scale Variable Acronyms and Meanings

Categorical independent variables included in the Hypothesised model, **H₆** and **H₇**, were measured by questions [IE..IO] "Nature of Industry" in the demographic section and questions P1 & P2 personal biography sections of the questionnaire respectively (See Appendix A).

This study utilises the industry classification methodology of the North American Classification SYSTEM (NAICS). In this system, revised in 2012 and developed with the purpose in offering a high level of comparability in business statistics, follows a hierarchical coding methodology for company classification based on the primary business activity for products made, distributed, retailed or services rendered (US Census Bureau Special Projects Staff, n.d.). Previous studies in ERP and SME classified industries broadly into manufacturing, distribution, services or financial services. This study has included the further delineation of sub-industries using the hierarchical NAICS classification system. The NAICS has interoperability with the International Industry Classification System (ISIC) and Statistical classification of economic activities in the European community (NACE Rev.2). NAICS was selected as the classification system due to its numerical nature of data and that SYSPRO utilises NAICS as its global classification system for existing customers.

The adoption of the NAICS hierarchical classification system allows this study to test the independent variable, 'Nature of Industry' as an alternative explanation to the relationship of change between the dependent and independent variable. This causal relationship between variables may be more significant at a higher hierarchical classification method or at a lower level within the industry classification system. Specific NAICS codes have been assigned to the

questionnaire at a 2-digit level hierarchy, that being industry sector and at a 3-digit level within the hierarchy, being industry sub-sectors.

The maturity variable is a further extraneous variable used in the hypothesised model, testing for the significance of ERP user perceptions based on their relative experience in utilising the system. Questions P1 and P2 in the questionnaire, see Appendix A, are codified in the following manner and depicted in Table 3.6-3.

Acronym	Meaning
L2	Less than 2 Years
M2L5	More than two years and less than 5 years
M5L10	More than 5 years and less than 10 years
M10	More than 10 years

Table 3.6-3 Questionnaire Maturity Measures Acronyms and Meanings

3.6.3 Data Validity

Once data are obtained, the “goodness of data” is assessed through tests of validity and reliability (Sekaran, 2006). Saunders et al. (2008) describe validity as being whether findings are really about what they appear to be about. The tests for validity are an important aspect to be factored as they establish the degree to which a technique or instrument measures a particular concept (Cooper & Schindler, 2014; Sekaran, 2006). Validity tests assist a researcher in solving the research problem (Cooper & Schindler, 2014).

Cooper and Schindler (2014) state that three forms of validity are used to evaluate particular measurement scales.

- *Content Validity* – The degree that a measure provides an adequate reflection of the topic under study. This typically is judgemental and intuitive in nature to the validities determination;
- *Criterion Validity* – The ability to predict some outcome or estimate an existence of a particular phenomenon; and

- *Construct Validity* – The degree that a measure conforms to predicted correlations of other theoretical propositions (Cooper & Schindler, 2014).

3.6.4 Data Reliability

If validity measures the context of the measure, reliability tests for data consistency. Reliability checks for the degree to which a measurement is free of random or stability errors (Cooper & Schindler, 2014). Reliability requires to stand up to the scrutiny of these basic questions (Saunders et al., 2008):

- Will the measures have the same results if tested on different occasions?
- Will observations made have similar results by other researchers?
- Was transparency offered in how sense was made from the raw data (Saunders et al., 2008)?

There are three forms of reliability testing methods, stability, equivalence and consistency. Stability operationalises on the principle that by re-testing the instrument twice on the same subjects and correlation methods are used, the instrument is deemed as being stable, if no differences are observed. Equivalence operationalises on the principle that parallel or alternate forms of testing on the same measure, produce similar results. The instrument is deemed as being consistent if no significant differences are observed. Internal consistency is the degree to which the instrument items are homogeneous and reflect the same underlying construct(s). Multi-item scales are generally tested against the Cronbach's alpha coefficient at the interval level of measurement (Cooper & Schindler, 2014).

The constructs used in this study are representative of previous studies of similar constructs. In ensuring this research checks and reports on reliability, the Cronbach's alpha coefficient will be tested as well as the Average Value Extracted (AVE). Table 3.6-4 outlines the reliability coefficient categories and the respective interpretation thereof. For new and explorative research, a α value between 0.50 and 0.69 is considered as having acceptable reliability (Collis & Hussey, 2013).

Reliability Coefficient	Interpretation
Cronbach Alpha (∞) ≥ 0.90	Highly Reliable
Cronbach Alpha (∞) ≥ 0.80	Moderately Reliable
Cronbach Alpha (∞) ≥ 0.70	Low Reliability
Cronbach Alpha (∞) < 0.70	Unacceptable Reliability

Table 3.6-4 Cronbach Alpha Coefficient. Adapted from Collis and Hussey, (2013)

3.6.5 Statistical Generalisability

According to Saunders et al. (2008), generalisability is sometimes referred to as external validity and it concerns itself with the research's ability to generalise findings to the population. Sekaran (2006) warns of common study problems associated with attempts to generalise to populations not represented by the sample. As noted in the limitations of this study, the sample obtained was from organisations using the SYSPRO ERP system only and thus generalisability can only be made to all SME using SYSPRO only and in South Africa. However, as this study basis its hypothesised model on previous studies, comparisons can be made in Chapter 4 to prior studies in observing if results are consistent across ERP systems and across different geographies.

3.7 Ethics in Research

A choice of research topic is governed by ethical considerations. Ethical issues in research design should not subject subjects under observation to embarrassment, harm, disadvantage or loss of privacy (Cooper & Schindler, 2014). Further, Cooper and Schindler (2014) note that consideration should be given to collecting data from subjects who have not given their express consent and to safeguard against these considerations, the researcher should follow the guidelines of:

- *Explain the study purpose and benefits* – The introductory letter to the questionnaire attached as Appendix D addresses the purpose and benefits of the questionnaire;

- *Participant rights and protection* – The introductory letter to the questionnaire, see Appendix D, explains the voluntary basis of participation and the observation of anonymity; and
- *Obtain informed consent* – This treatise is subject to the rigor of the NMMU research department where individual research requires to be lodged and ethics clearance obtained. The NMMU ethics clearance approval document is available as Appendix B.

3.8 Chapter Summary

Sub-section 3.1 briefly reviewed what was covered in Chapter 2 and confirmed that a literature review was conducted on ERP Benefits for SMEs. Aspects such as the role and importance of SMEs was discussed, SMEs were defined and contextualised to this study, an evaluation to the evolution of ERP was conducted and current trends noted, industry sectors using ERP was discussed which led to the formulation of **H₆** – “Industry sectors in SMEs has a mediating role as to the perception of benefits and value derived from ERP”, existing ERP SME benefit models were explored in literature and relationships deriving benefits thereof; ease of use, collaboration, capabilities, efficiencies and analytics was considered as benefits in contributing value to organisations through the use of ERP. A hypothesised model for ERP Benefits for SMEs was developed and corresponding hypothesis formulated. Sub-section 3.1 introduced the research question and objective to be covered in Chapter 3 namely ‘**RQ₇** – “How can a detailed description of the research methodology be provided in order to understand and reproduce this treatise in future?” in addressing **RO₇** – “Identify and explain the research methodology used for this treatise enabling future reproducibility”. An overview of Chapter 3 was provided in addressing the research question and objective.

Sub-section 3.2 defines the concept of research, explores its purpose and its context within business research. Research is understood as a systematic, process-based scientific enquiry, utilising tools, techniques and methods, pursuant with the purpose of finding answers or solutions to address a business problem for the reduction or risk to guide managerial decision-making.

Sub-section 3.3 explained the concepts of research design utilising the research onion metaphor to define and select; the research philosophy, paradigm, approach, strategy, choices and time horizons for this study. Guided by the research design considerations and the factoring of the research aims, questions and objectives, this sub-section established this research's design as being positivistic, deductive, adopting a survey strategy, mono-method quantitative and cross-sectional in approach. The study seeks to answer the main research question **RQ_M** "What are the key benefits that ERP systems provide to SMEs?" in achieving **RO_M** – "To propose a model for ERP benefits for SMEs". This main question and objective is only realised through an empirical analysis of relationships as detailed in the Table 2.7-1 "Summary of Hypothesis" and in testing the hypothesised model for ERP benefits argued in section 2.7. This scientific enquiry is only possible through quantitative data analysis through the means of statistical and numerical measures.

Sub-section 3.4 reviewed the concept of sampling design, the purpose of sampling, techniques used in sampling and identified the predominant sampling rationale used in this study. The sampling methods chosen for this study were identified as random sample. The population was identified as South African SME organisations using SYSPRO, an ERP provider. Geographically, these organisations are located across South Africa and a representative sample of 107 organisations responded to the questionnaire.

Sub-section 3.5 reviewed and described the concept of sampling data collection, considered aspects of data collection techniques as to their advantages and disadvantages and the survey questionnaire technique was selected for use in this study. Considerations to questionnaire design were evaluated such principles of wording, planning of question variable issues such as categorisation, scaling and coding, and general questionnaire appearance. A questionnaire map was depicted and a questionnaire designed to minimise respondent bias and variable measurement error. Measuring instruments was discussed, independent, dependent and extraneous variables reviewed in terms of the literature and transposed onto the questionnaire.

Sub-section 3.6 discussed the relevance and concept of data analysis, validity, reliability and generalisability. The data were collected via the means of an online survey, delivered with the use of SurveyMonkey. Data analysis techniques used in this study were critically discussed in aligning to the purpose of this study in supporting, or not supporting, the hypothesised model by testing the relationships between variables captured via survey using statistical analysis. The codifying process was generally discussed and the rationale behind the classification of industries in alignment to the NAICS system given. Specific quantitative analysis techniques, descriptive and inferential were discussed and indicated as being used in Chapter 4. As noted in the limitations of this study, the sample obtained was for organisations using the SYSPRO ERP system only and thus generalisability can only be made to all organisations using SYSPRO only. However, as this study basis its hypothesised model on previous studies, comparisons can be made in Chapter 4 to prior studies in observing if results are consistent across ERP systems.

Sub-section 3.7 considers the aspects of research ethics in considering the rights of the subjects being asked to participate. Appropriate actions as recommended in literature were adopted in providing a statement as to the study's purpose and the benefit that their participation will deliver. Additionally, subject anonymity was assured and the study has undergone a review by the ethics committee governing treatise research at the NMMU.

Chapter 4 analyses the primary data collected statistically in addressing the research aims, questions and objectives of this study. Chapter 4 addresses the research questions:

- **RQ₉**: What relationships between the independent and dependent variables of benefits, can be verified through empirical evaluation of the hypothesised model for ERP benefits for SMEs?
- **RQ₁₀**: Which independent variables in the hypothesised model for ERP benefits for SMEs have a significant relationship to benefits realised from ERP by SMEs?

- **RQ₁₁**: What is the significance of the difference in the relationship between the independent variables and the dependent variable in the hypothesised model for ERP benefits for SMEs?

In achieving the research objectives:

- **RO₉**: Empirically evaluate the hypothesised model of ERP benefits for SMEs in order to accept or reject the formulated hypotheses;
- **RO₁₀**: Establish which identified variables in the hypothesised model are significantly related to benefits derived from ERP systems by SMEs; and
- **RO₁₁**: Establish the significance of the difference in relationships of the independent variables to the dependent variable of value, in the hypothesised model.

Additionally, Chapter 4 tests the formulated hypotheses in testing the hypothesised model for ERP benefits for SMEs:

- **H₁** - Ease of Use is positively related to ERP value;
- **H₂** - Collaboration is positively related to ERP value;
- **H₃** - Capabilities are positively related to ERP value;
- **H₄** - Efficiencies are positively related to ERP value;
- **H₅** - Analytics are positively related to ERP value;
- **H₆** - Industry sectors in SMEs has a mediating role as to the perception of benefits and value derived from ERP; and
- **H₇** - The length of use on an ERP system has a mediating role on the perception of ERP value and benefits attained.

CHAPTER 4: Results and Analysis of SME ERP Benefits Survey

4.1 Introduction

Chapter 3 discussed the research methodology applied in this treatise through the definition of research and the research philosophy, approach, strategy and choices and methodologies applied to this treatise. Thereafter sampling design was discussed and the sample design used in this treatise was reviewed with the data collection methodologies used in this treatise and the rationale for their selection. The measuring instrument to be used in this study was discussed and the dependent and independent variables used in this treatise were explained. Chapter 3 addressed the research question **RQ₇** - *“How can a detailed description of the research methodology be provided in order to understand and reproduce this treatise in future?”* and in doing so satisfied the research objective **RO₈** - *“Empirically evaluate the hypothesised model for ERP benefits for SMEs in order to accept or reject the formulated hypotheses”*.

Chapter 4 introduces the data analysis and interpretation methods, the primary data is analysed and interpreted initially with descriptive statistics on the biographical organisational first, followed by personal biographic descriptive statistics and thereafter, descriptive statistics on the dependent and independent variables. After concluding the descriptive analysis of the data, multivariate analysis is performed on the hypothesised model constructs, confirming initially the reliability and validity of the data and thereafter setting out to address the following chapter research questions and objectives:

- **RQ₈**: What relationships between the independent and dependent variables of benefits, can be verified through empirical evaluation of the hypothesised model for ERP benefits for SMEs?
- **RQ₉**: Which independent variables in the hypothesised model for ERP benefits for SMEs have a significant relationship to benefits realised from ERP by SMEs?

- **RQ₁₀**: What is the significance of the difference in the relationship between the independent variables and the dependent variable in the hypothesised model for ERP benefits for SMEs?
- **RO₈**: Empirically evaluate the hypothesised model for ERP benefits for SMEs in order to accept or reject the formulated hypotheses;
- **RO₉**: Establish which identified variables in the hypothesised model are significantly related to benefits derived from ERP systems by SMEs; and
- **RO₁₀**: Establish the significance of the difference in relationships of the independent variables to the dependent variable of value, in the hypothesised model.

Delivery of the chapter objectives is achieved by the sub-sections covering the following topics:

- Sub-section 4.1 provides a summary of Chapter 3, introduces the research questions and objectives that Chapter 4 addresses, provides a chapter summary layout with the relevant sub-sections and topics addressed;
- Sub-section 4.2 provides a brief explanation of the analysis and interpretation methods utilised in this chapter and further information on the questionnaire and techniques utilised in analysing the information provided by the respondents;
- Sub-section 4.3 provides the univariate analysis and descriptive statistics for the organisational biographic data, personal biographic data, descriptive statistics on the independent variables of 'Ease of Use', 'Collaboration', 'Capabilities', 'Efficiencies', 'Analytics' and the dependent variable of 'Value';
- Sub-section 4.4 provides multivariate analysis and inferential statistics on the variables under study. Data validity and reliability is initially confirmed, thereafter relationships and significance is assessed in confirming the formulated hypotheses; and
- Sub-section 4.5 provides a chapter summary and discussed the most significant findings.

Figure 4.1-1 illustrates the chapter’s research questions and objectives addressed in the chapter and Figure 4.1-2 provides an illustration of the chapter’s structure.

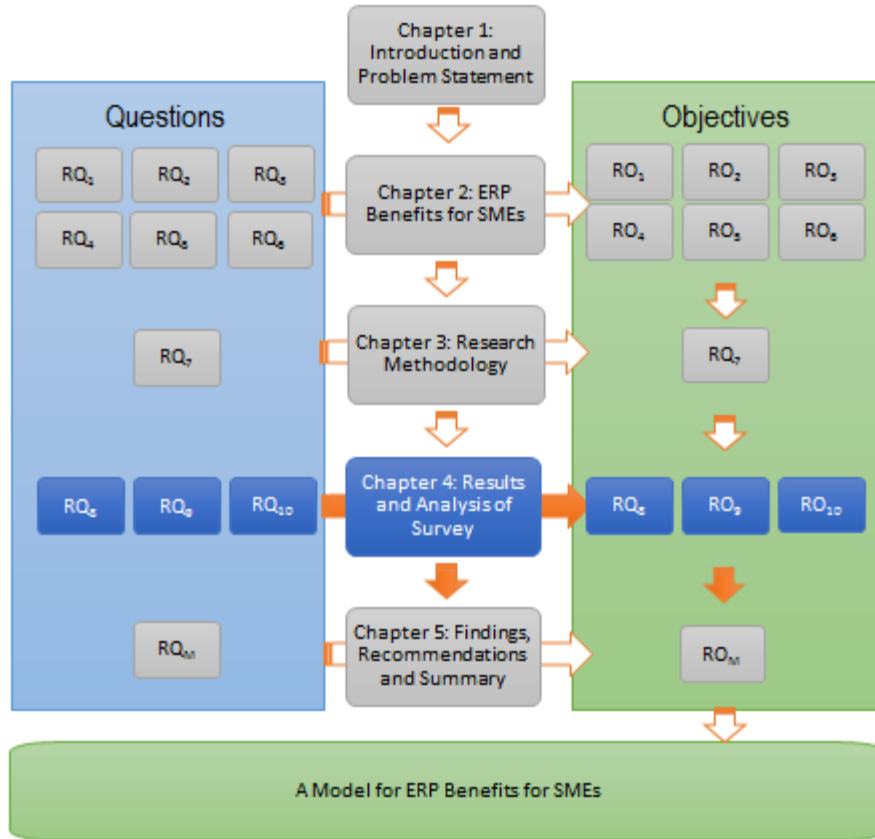


Figure 4.1-1 Chapter 4 Research Questions and Research Objectives

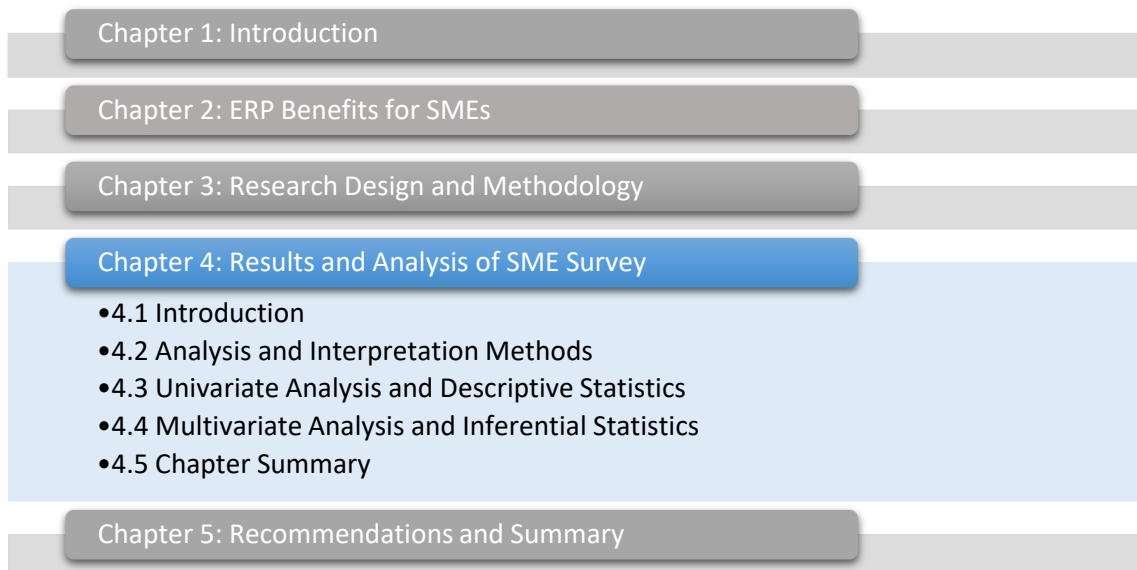


Figure 4.1-2 Chapter 4 Structural Overview

4.2 Analysis and Interpretation Methods

In this sub-section a brief review of the questionnaire (Appendix A) is provided. Variables used in this study are highlighted against the questionnaire and a review of the data analysis techniques for their analysis and interpretation are discussed. Respondents for this study are existing users of an ERP system within the geographic region of South Africa and work for an organisation classified as a SME.

The population selected is all SYSPRO ERP customers within South Africa. A total of 1,085 SYSPRO customers were emailed and requested to participate in this study by completing an online survey questionnaire. A two-week period was offered for questionnaire completion. The introductory invitation letter requested the recipient to complete the questionnaire and to forward the invitation to other members within their organisation as suggested by Hsu (2013a) to remove the potential of subjects providing socially appropriate answers that could lead to common error bias. A total of 98 unique organisations were recorded from 107 valid questionnaires, constituting 9% of the population. A total of five responses were recorded due to the snowballing request. The questionnaire is comprised of four parts (Appendix A); details with regard to the organisation's biographical information, the respondent's personal biographical information, the respondent's perception of ERP benefits represented as independent variables and the respondent's perception of ERP's overall value contribution to the organisation representing the dependent variable.

The organisational biographical information section collected data consisting of company industry sector, industry vertical, company name, length of years the company has been trading, number of fulltime employees, how many years an ERP system has been in use, whether a previous ERP system had been used and if so, which one, and the provinces the company has offices in. The independent variable of industry consists of the industry sector designated by the respondent and recorded as categorical data. Personal biographical information was collected consisting of the how many years the respondent had used an ERP system, how many years SYSPRO had been used, if other ERP

systems had been used and if so which ones, management designation and department they work in, gender, highest qualification attained and their computer proficiency. The maturity independent variable is captured by the length of years the respondent has used an ERP system. The independent variables of 'Ease of Use', 'Collaboration', 'Capabilities', 'Efficiencies' and 'Analytics' were captured using a 5-point Likert scale, questions [EU1..5], [CO1..6],[CA1..5],[EF1..5],[AN1..5] respectively. The dependent variable of 'ERP Value' was captured using a 5-point Likert scale, questions [EV1..5]. Responses were recorded electronically and codified into questions Q1 to Q59. The 5-point Likert scale ranged from strongly disagree[1] to strongly agree[5].

The primary data obtained from the survey questions were analysed utilising two statistical analysis techniques, univariate and multivariate analysis. Univariate analysis descriptive statistics, analyse individual variables without further investigation into their relationships with other variables. The statistical data are presented by categorical frequency tables, box-plots tables and figures and various graphing techniques. Multivariate analysis and inferential statistics are used for the analysis of the existence, strength and significance of relationships between two or more variables. Microsoft Excel is used in this study for the univariate analysis and SMART-PLS and ANOVA is used for multivariate analysis.

4.3 Univariate Analysis and Descriptive Statistics

4.3.1 Section 1: Organisational Biographical Data

4.3.1.1 Industry Classification

Data on the respondent's industry classification were collected by the respondent selecting and marking the nature of the industry their organisation is classified in. The classification categories depicted in Table 4.3-1 cover the 2012 NAICS hierarchical industry classification system to a two digit level of significance (US Census Bureau Special Projects Staff, n.d.).

Industry	Questionnaire Categories	NAICS Cross-Reference
Extractive	IE	11,21
Utilities	IU	22
Construction	IC	23
Manufacturing	IM	31-33
Wholesale Trade	IW	42
Retail Trade	IR	44-45
Transportation and Warehousing	IT	48-49
Information and Cultural	II	51
Services	IS	52-56,61-62,71-72,81,92

Table 4.3-1 Questionnaire Industry Categories

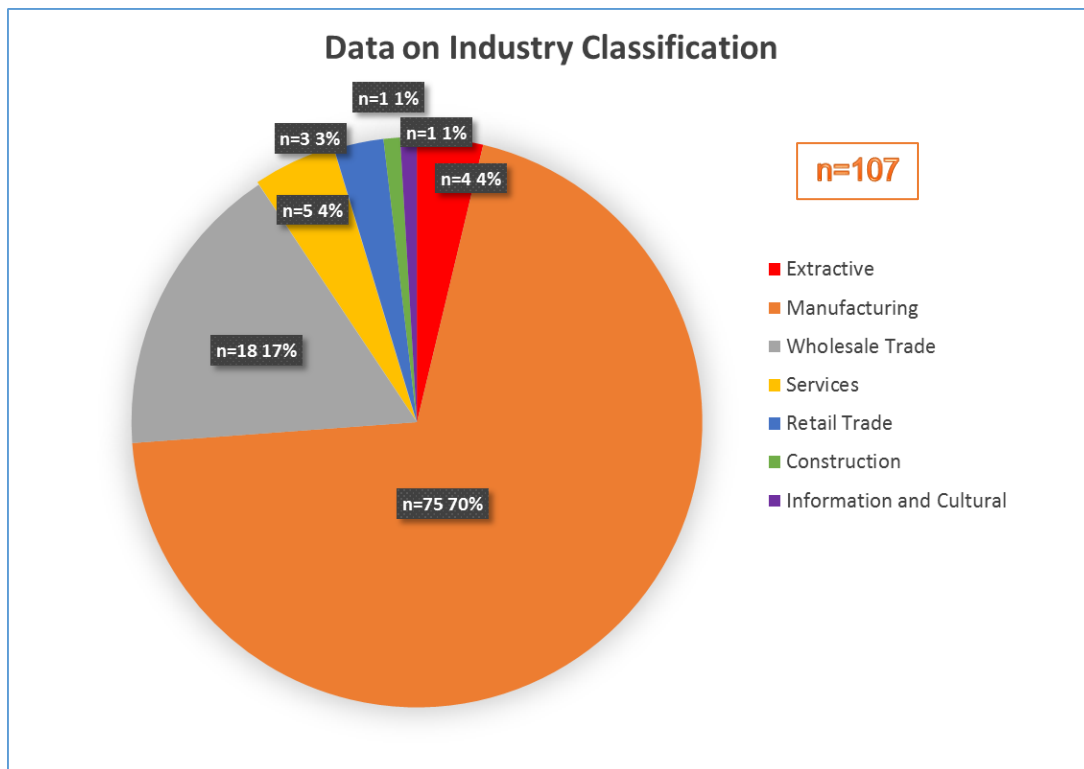


Figure 4.3-1 Data on Industry Classification

The results from the 107 respondents are illustrated in Figure 4.3-1. The results show that 70% (n=75) of the respondents are manufacturers, 17% (n=18) are wholesalers, 4% are extractive (n=5) and service (n=4) organisations respectively, 3% (n=3) are retailers and 1% (n=1) are in the construction and information industry respectively. No respondents were recorded in the

industries of transportation and warehousing or utilities. 87% of the respondents were made up of manufacturing and wholesale trade (n=93) supporting the product-centric nature of their industries and focus from where ERP systems evolved from. In comparison, the known SYSPRO South Africa customer database being the population, 62% of customers are manufacturers (n=556) and 22% are wholesale traders (n=192), comprising 84% of the population.

Compared to previous studies (Ruivo et al. 2015; Ruivo et al 2014; Ruivo et al. 2012), the respondent industry proportions of SMEs differ from this treatise as seen in Table 4.3-2. This could be explained due to the differences in the nature of SMEs between developed and developing economies or due to the differing capabilities of ERP systems under review. The studies conducted in Iberian and Scandinavian countries did not include respondents who utilised SYSPRO.

Study and Origin	Manufacturing	Wholesale Trade
South Africa (n=107) – Present Study	70%	17%
Spain and Portugal (n=558) (Ruivo et al., 2012b)	30.8%	29.6%
Denmark, Portugal, Spain, Sweden (n=883) (Ruivo et al., 2015)	25.1%	28.5%
Portugal (n=134) (Ruivo et al., 2014)	23.9%	28.4%

Table 4.3-2 Differences in Industry Proportions from Comparative ERP SME Studies

The largest proportion of the respondents' industries reside in the manufacturing sector, 70%. Further analysis into the industry verticals of the two largest industry groups, manufacturing and wholesale trade, reveal concentrations within industry verticals. Figure 4.3-2 illustrates that fabricated metal manufacturers represent 25% of the manufacturing respondents, followed by chemical manufacturers and machinery manufacturers recording 12% of the responses respectively. These three manufacturing sectors comprise almost half of all the manufacturing respondents. The further inclusion of electrical equipment manufacturers and food and beverage manufactures comprise 65% of all manufacturing responses.

17% of the total responses were in the wholesale trade industry, the second largest industry group. An analysis of this group’s verticals reveals that machinery equipment and supplies comprises 39% of the total responses. Followed by personal and household product wholesalers and building materials and supplies, 22% and 17% respectively. These three wholesale verticals comprise 79% of the total wholesale trade responses. Figure 4.3-3 illustrates the relative ranking and cumulative proportions of the wholesale trade vertical industry recorded from the responses.

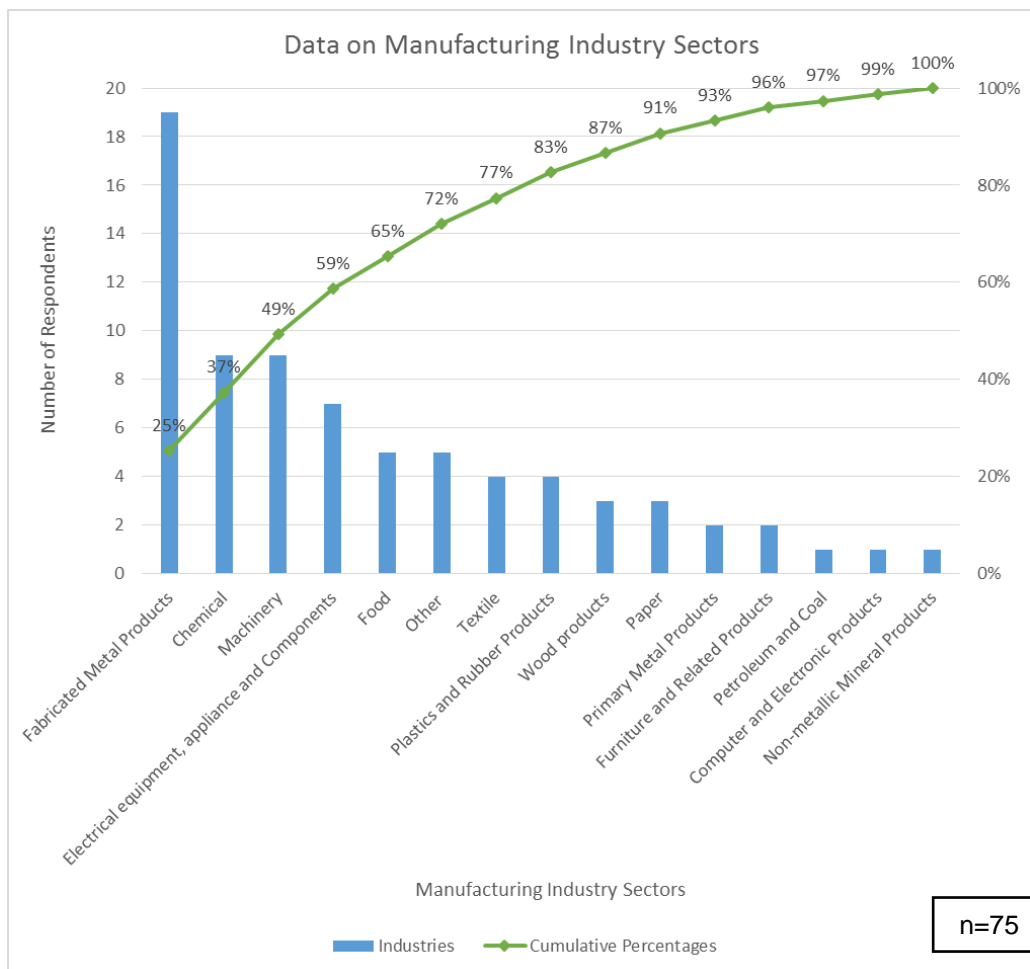


Figure 4.3-2 Data on Manufacturing Industry Sectors

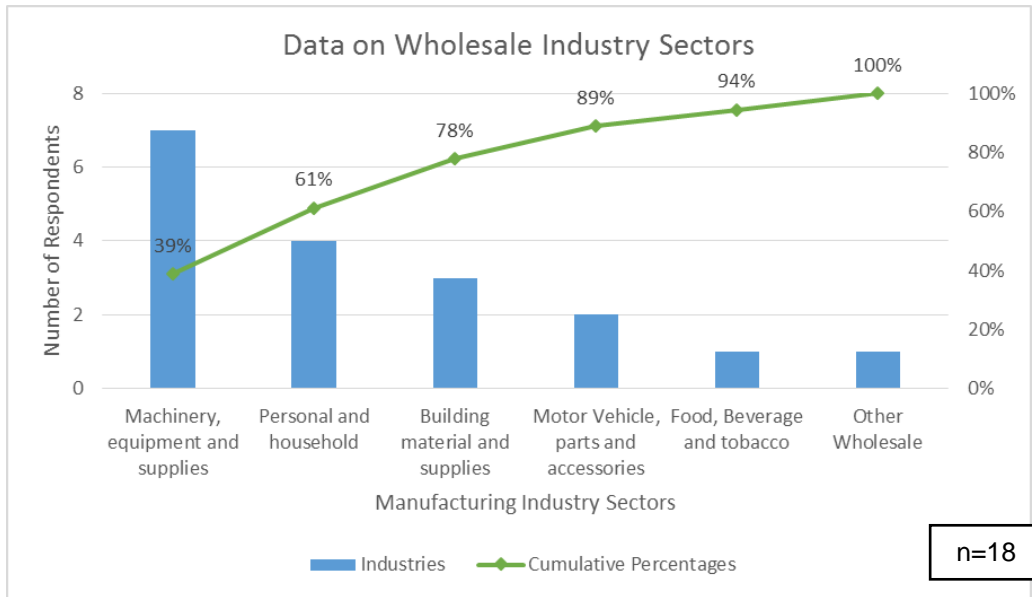


Figure 4.3-3 Data on Wholesale Industry Sectors

4.3.1.2 Trading Age

The length of years an SME has traded is an indication as to its resilience to survival (Lee et al., 2012). An analysis of the respondents organisation’s length of years trading reveals that the inter quartile range is twenty years, the median is 21 years, the lower quartile is 12 years and the upper quartile is 32 years. A box plot representing the distribution of the data is illustrated as Figure 4.3-4. In calculating outliers, respondents were recorded in organisations that had been trading from 66 years to 100 years. These are depicted on the box plot as red crosses, illustrating the range of outliers.

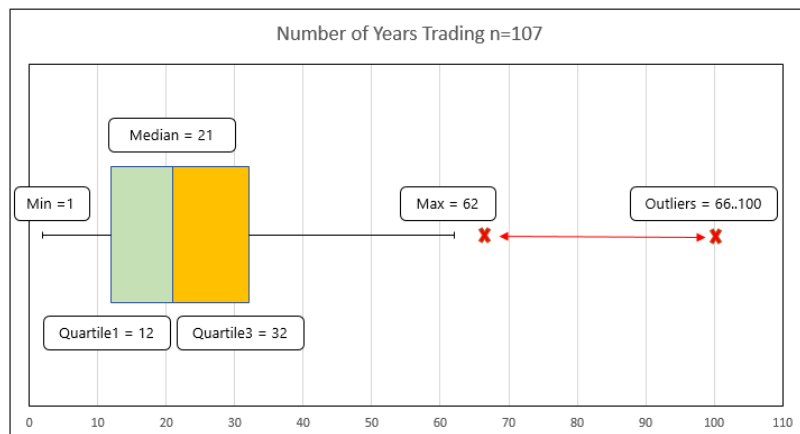


Figure 4.3-4 Number of Years Trading Box-Plot

The mean of the trading age is 28.06 years with a standard deviation of 23.1. The distribution is positively skewed (+1.54) and platykurtic, recording a kurtosis of 1.67.

4.3.1.3 Employee Size

Figure 4.3-5 illustrates the distribution of company size recorded as categorical data. Less than 10% of the organisations recorded had between one and 19 full time employees. 27% of the organisations were between one and 49 fulltime employees, the categorisation of a micro to small enterprise. 71% of the respondents were from organisations classified as being medium sized enterprises. Although the questionnaire requested only responses for organisations that fitted into the category of an SME (1 to 249 fulltime employees), two responses were recorded as having greater than 249 fulltime employees, that being considered a large enterprise. A greater number of respondents are employed by larger employee size category than smaller employee size categories. The category proportions for [1-19], [20-49], [50-99] and [100-249] fulltime employees are 9%, 18%, 28% and 43% respectively.

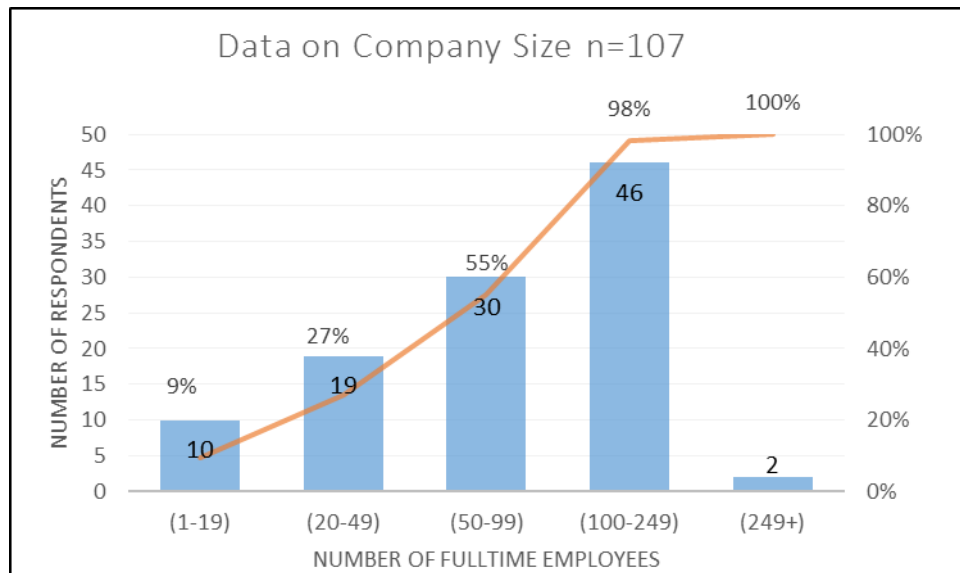


Figure 4.3-5 Data on Company Size

4.3.1.4 Number of Years an ERP System has been utilised

When ERP is viewed as a technological resource and the direct and moderating effects of technology resources is assessed as to its effects on knowledge,

technology resources are considered important to an organisation’s sustained competitiveness (Lee et al., 2012). An analysis of the respondents organisation’s length of use of ERP reveals that the inter quartile range twelve years, the median is eleven years, the lower quartile is five years and the upper quartile is seventeen years. A box plot representing the distribution of the data is illustrated as Figure 4.3-6. In calculating outliers, respondents were recorded in organisations having used ERP systems for 36 and 38 years. These are depicted on the box plot as red crosses, illustrating the range of outliers. The mean of ERP use is 12.37 years with a standard deviation of 8.6. The distribution is positively skewed (+0.774) and platykurtic, recording a kurtosis of 0.362.

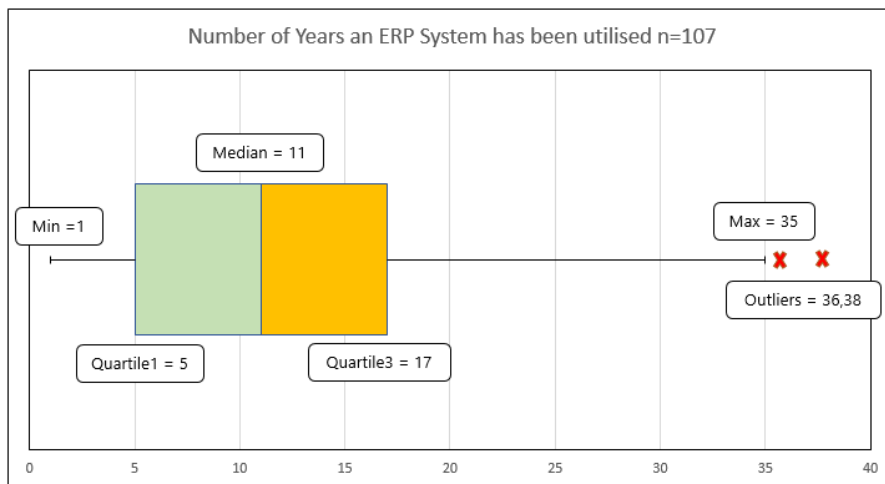


Figure 4.3-6 Number of Years ERP has been utilised

4.3.1.5 Number of Years SYSPRO has been in use in the Companies

An analysis of the respondents organisation’s length of use of SYSPRO reveals that the inter quartile range is ten years, the median is nine years, the lower quartile is four years and the upper quartile is fourteen years. A box plot representing the distribution of the data is illustrated as Figure 4.3-7. In calculating outliers, respondents were recorded in organisations having used ERP systems for 35 and 38 years. These are depicted on the box plot as red crosses, illustrating the range of outliers. The mean of SYSPRO use is 9.86 years with a standard deviation of 7.79. The distribution is positively skewed (+1.2) and platykurtic, recording a kurtosis of 1.4.

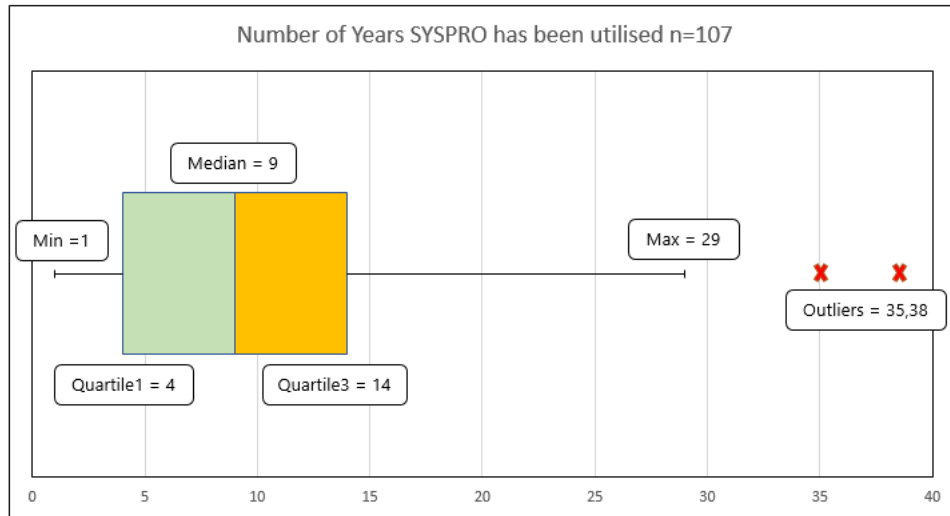


Figure 4.3-7 Number of Years SYSPRO has been utilised

4.3.1.6 Previous Use of other ERP systems in the Company

Of the 103 valid responses, only 39% of the companies had used other ERP systems besides SYSPRO as seen in Figure 4.3-8. This is an important finding as ERP systems are significant investments made by an organisation (Hsu, 2013a). Further, in comparing the average years ERP has been in use between the categories, companies who had not used ERP systems prior to SYSPRO recorded a mean of 8.7 years, while those that had, recorded an overall mean of 12.5 years and of those years, 10.9 has been usage in SYSPRO. Table 4.3-3 records the proportions and respective means of ERP usage.

Used Other Systems Prior to SYSPRO	Proportions (n=103)	Average SYSPRO Usage	Average Overall ERP Usage
yes	39%	10.86 Years	12.53 Years
no	61%	8.65 Years	-

Table 4.3-3 Proportions and Means of ERP usage

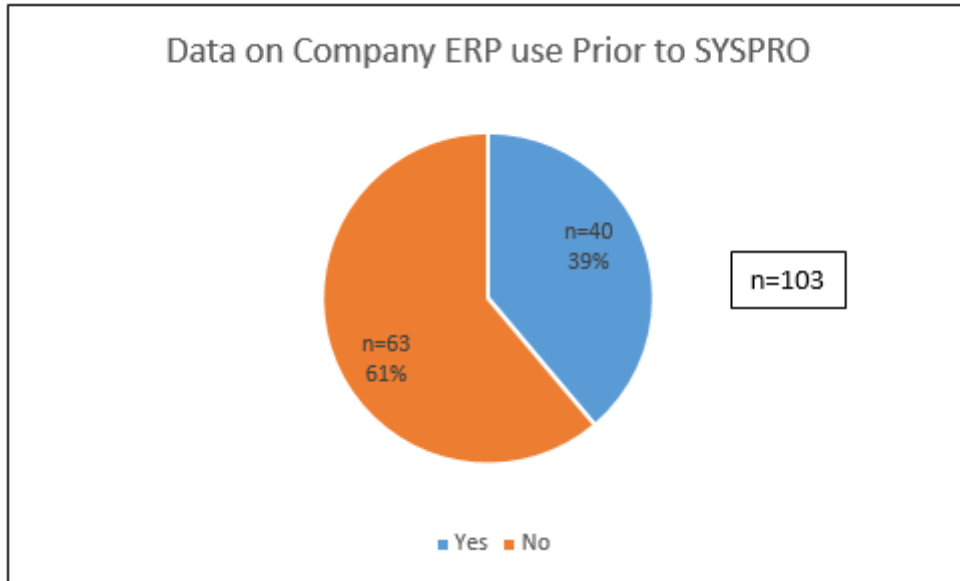


Figure 4.3-8 Data on Company ERP use Prior to SYSPRO

4.3.1.7 Company Locations Geographic Distribution

Respondents were asked to designate the geographic locations they operate in by selecting the provinces within South Africa. 61% of all the respondents operated from a single location, 75% from two locations and 89% from three locations. Figure 4.3-9 illustrates the number of responses per location and their proportional contribution to the number of responses.

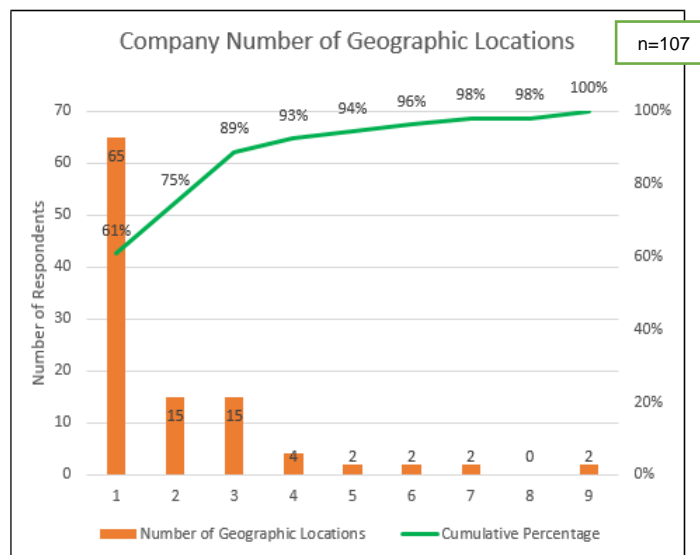


Figure 4.3-9 Company Number of Geographic Locations

Further analysis as to the density distribution of the geographic regions illustrated in Figure 4.3-10, indicates that Gauteng represents 34% of the geographic distribution followed by the Western Cape with 24%, Kwazulu Natal with 14% and the Eastern Cape with 13%. The top four geographic regions named above account for 85% of all the geographic locations recorded. This is consistent with the regional distribution of economic activity published by STATSSA in 2011 (*Regional Economic Growth, 2011*).

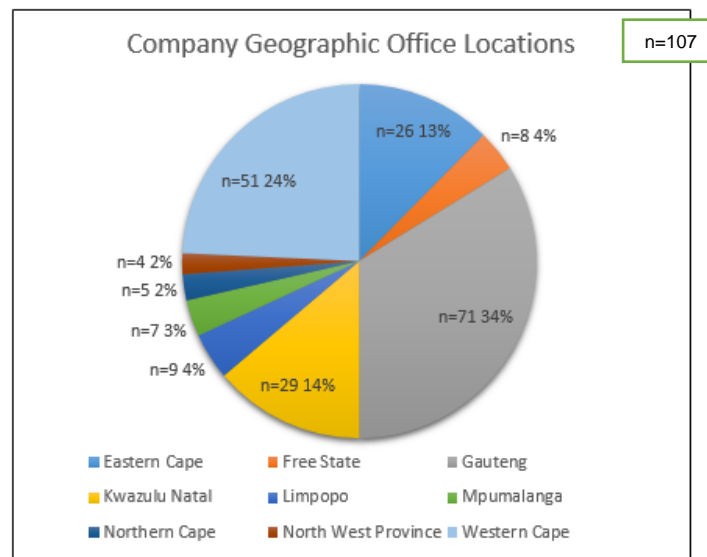


Figure 4.3-10 Company Geographic Office Locations

4.3.2 Section 2: Personal Biographical Data

4.3.2.1 Number of Years Respondents have used an ERP System

51% of all respondents have used an ERP system for more than ten years while only 27% of the respondents have used an ERP system up to 5 years. The experience categories and cumulative percentages are illustrated in Figure 4.3-11. Clearly ERP systems can be regarded as a mature technology with relatively a high degree of experience by its users. While SMEs are generally regarded as having a resource constraint, both in personnel and access to technology resources (Hwang, 2014), the evidence from the sample does not support these claims as indicated by the respondent's relative experience and maturity in ERP use.

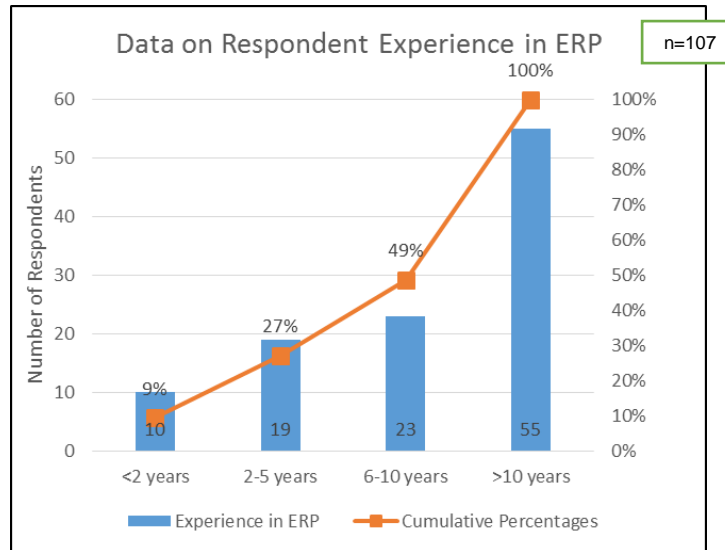


Figure 4.3-11 Data on Respondent Experience in ERP

4.3.2.2 Number of Years Respondents have used SYSPRO

In comparison to respondent overall experience in ERP systems, the highest experience in SYSPRO years usage being more than 10 years, is 33% comparing to overall ERP experience more than 10 years of 51%. However, respondents experience between 2 years and 10 years is significantly higher in comparison, 52% and 40% respectively. Respondent experience in SYSPRO is illustrated in Figure 4.3-12.

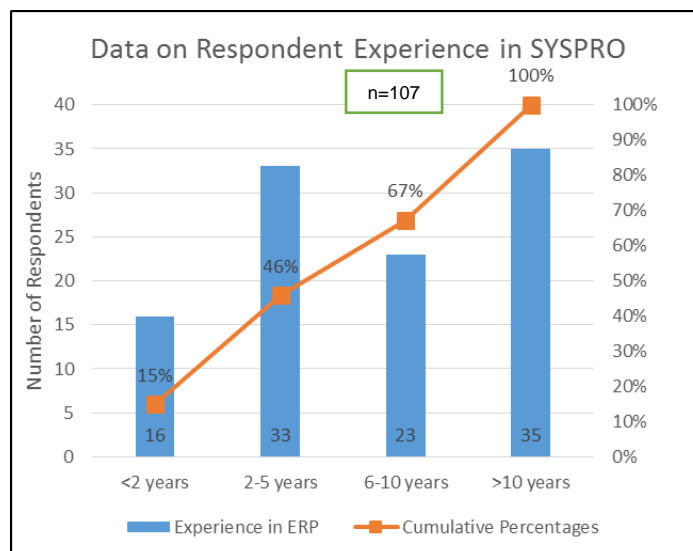


Figure 4.3-12 Data on Respondent Experience in SYSPRO

4.3.2.3 Other ERP Systems Used by Respondents

52% of the respondents have used other ERP systems prior to SYSPRO, while 48% of the respondents have experienced SYSPRO as their first ERP system. Relative proportions are illustrated in Figure 4.3-13.

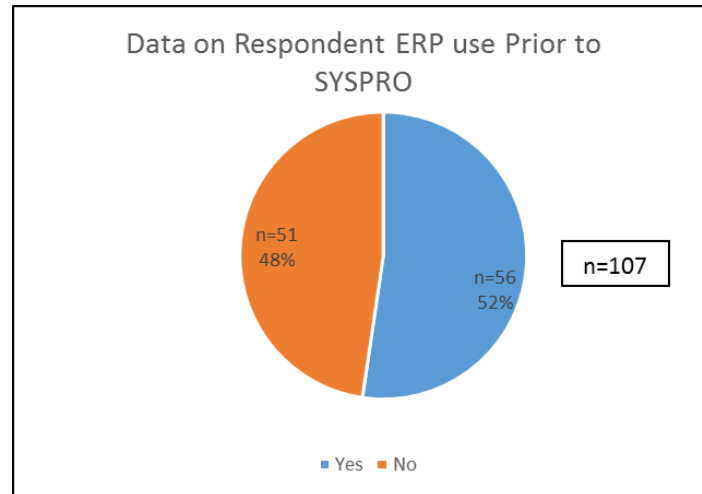


Figure 4.3-13 Data on Respondent ERP use Prior to SYSPRO

4.3.2.4 Respondents Management Designation

Respondents were asked to indicate their management designation. This is an important consideration as the perception of value and benefits derived from ERP would be better assessed if the respondent operated in a managerial capacity. 7% of the responses recorded were directly by the CEO or SME owner. A further 25% was recorded by a member designated in an executive capacity and 32% in a senior management role. 64% of all respondents are therefore in a senior management capacity. A frequency-count of the management categories and their proportional cumulative percentages are illustrated in Figure 4.3-14. 87% of total respondents are in a management capacity, responsible for operational functions, resources and considering their contribution to organisation performance.

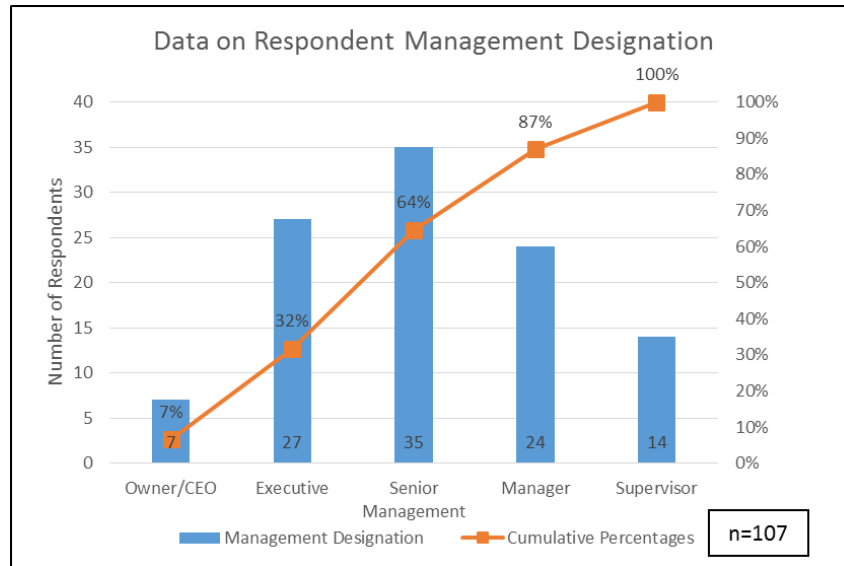


Figure 4.3-14 Data on Respondent Management Designation

4.3.2.5 Respondents Department Designation

Respondents were asked to indicate their departmental or operational role. 47% of the respondents were from the office of finance. The second largest department was operations at 37%. Together, these two departments make up 80% of the total respondents. This is not unexpected as ERP acts primarily as a system of record covering operational and financial transactions. Further, SMEs are generally regarded as having resource shortages when compared with larger organisations (Hwang, 2014), therefore it is probable that the ERP system in an SME is managed by the finance department and operations due to the lack of a dedicated information systems' department. This is an important finding as where an IS department is generally tasked in ensuring the technology systems provide operational and organisational fit in delivering value, having a specific department manage the ERP system may introduce bias as to the system's use, benefits and perceived value. This sentiment is echoed as a research limitation by Hwang (2014) encouraging future research in ERP to be representative by multiple respondents within the same organisation. Figure 4.3-15 illustrates the frequency of responses between departments and their cumulative proportional percentages.

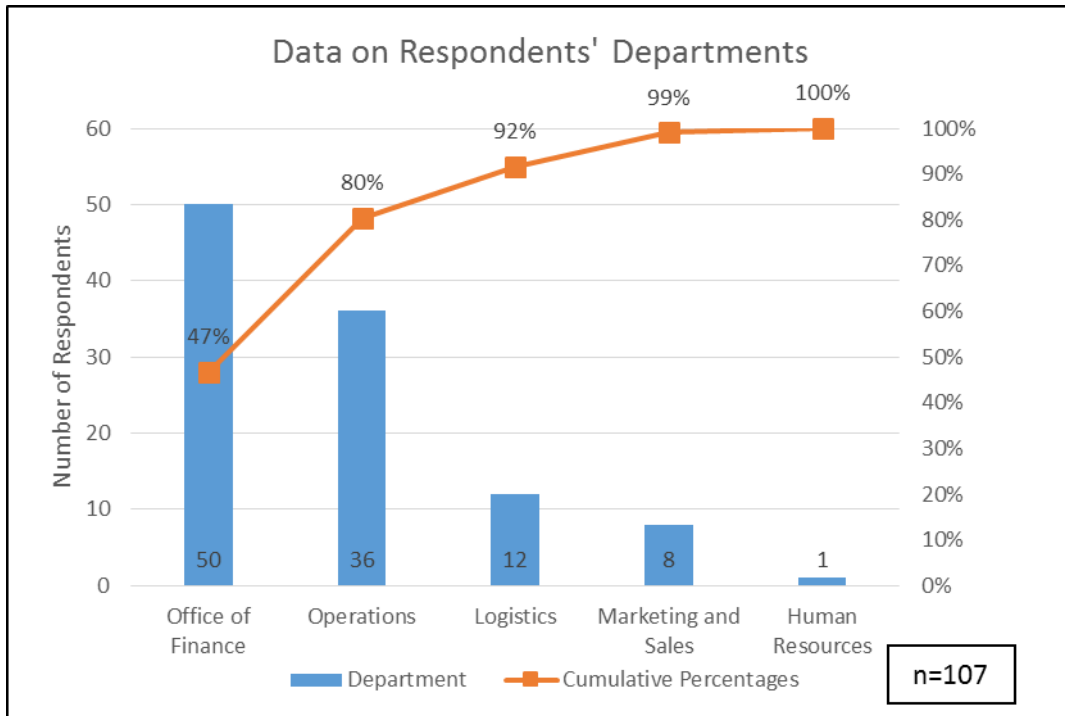


Figure 4.3-15 Data on Respondents' Departments

4.3.2.6 Respondents Gender

Proportionally, 65% of the respondents recorded were male versus 35% female. Two respondents did not disclose their gender. Figure 4.3-16 illustrates the relative proportions.

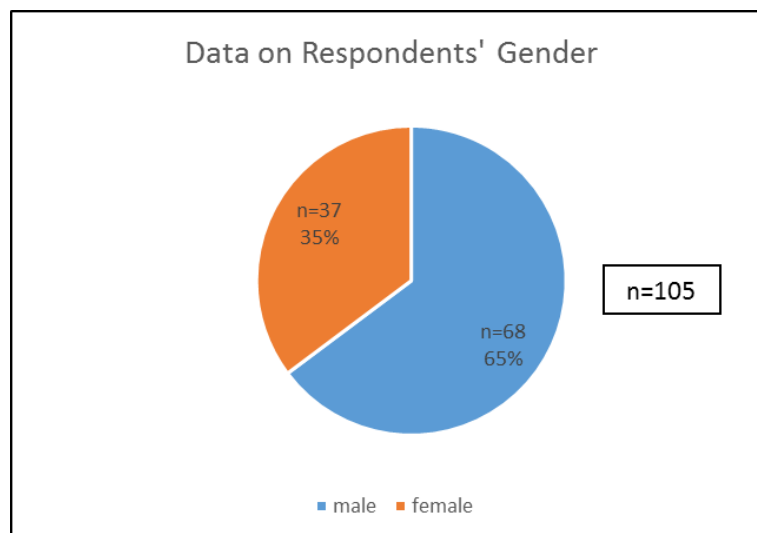


Figure 4.3-16 Data on Respondents' Gender

4.3.2.7 Respondents Qualification

The majority of the respondents (34%) have attained either a certificate or diploma, or a post-graduate level education as their highest qualification. Together this comprises 68% of the total respondents. Of interest is that 71% of the respondents that concluded graduate qualifications went on to complete post-graduate qualifications. A total of 57% of all respondents have an undergraduate or post-graduate qualification. The frequency of qualification responses and cumulative proportions is illustrated in Figure 4.3-17.

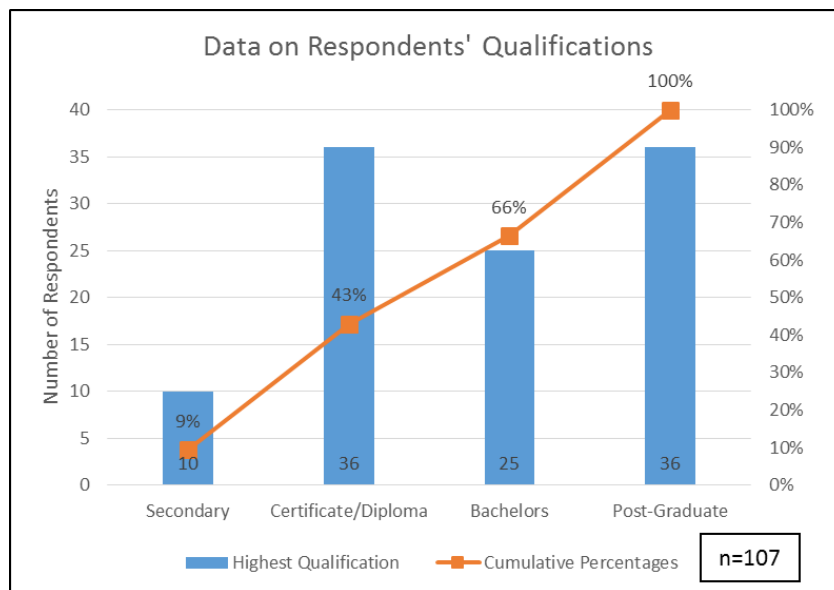


Figure 4.3-17 Data on Respondents' Qualifications

4.3.2.8 Respondents Computer Proficiency

Respondents were requested to assess their own computer proficiency and requested to indicate whether they classified themselves as having basic, intermediate, proficient or advanced proficiency. 7% of the respondents rated themselves as having basic proficiency only, while 41% rated themselves as being computer proficient, the highest category. 37% of the respondents considered themselves as having advanced computer proficiency. As ease of use is one of the independent variables measured in this treatise, a correlation between computer proficiency and ease of use is offered later in this report. The frequency of responses and cumulative proportions is illustrated in Figure 4.3-18.

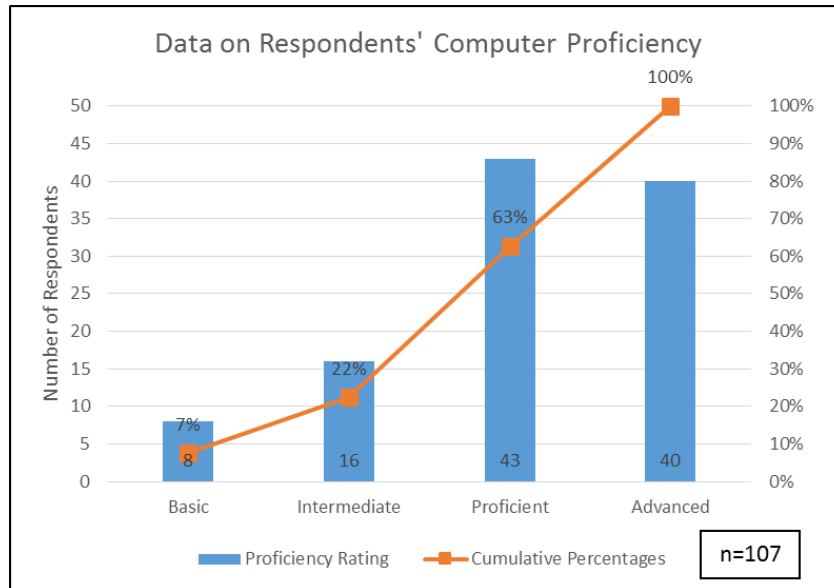


Figure 4.3-18 Data on Respondents' Computer Proficiency

4.3.3 Section 3: Benefits Derived from ERP use

4.3.3.1 Independent Variable: Ease of Use

The independent variable construct, “Ease of Use”, is measured using a 5 point Likert scale ranging from strongly disagree [1] to strongly agree [5]. The measurement indicators are established through a review of literature covered in sub-section 3.5.4. Frequency counts of the indicators and their proportional contribution are illustrated in 4.3-19. Visually, respondents mostly agreed or strongly agreed with the statements, with the highest levels of disagreement, disagree and strongly disagree, being recorded against the intuitiveness of ERP systems.

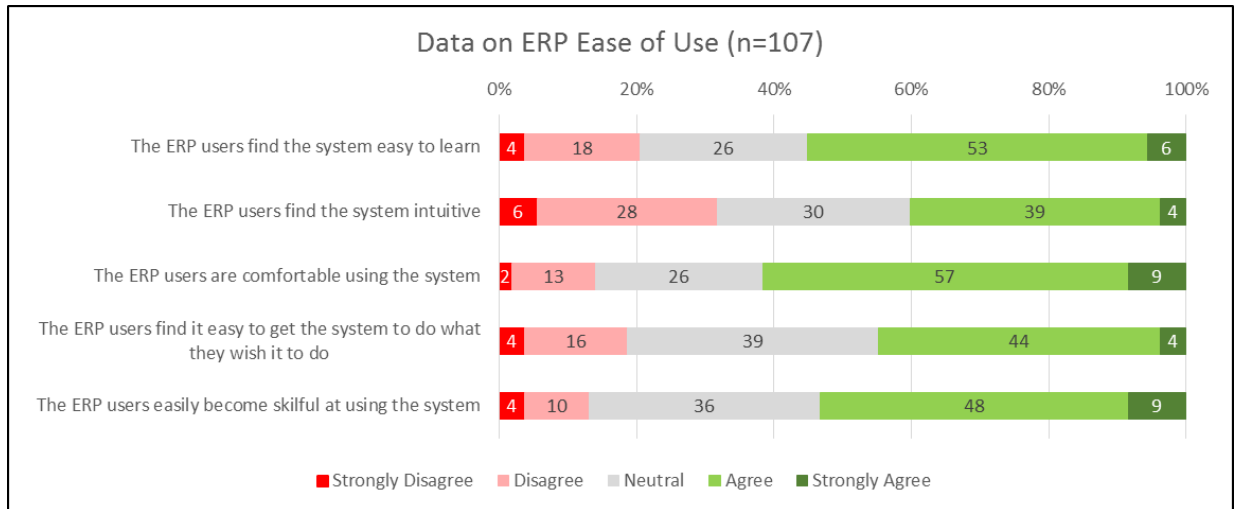


Figure 4.3-19 Data on ERP Ease of Use

The means, modes, standard deviation are recorded against individual construct indicators along with proportional and cumulative responses as illustrated in Table 4.3-4. The highest mean recorded, 3.54, was recorded against the indicator ‘The ERP users are comfortable using the system’, while the lowest was ‘The ERP users find the system intuitive; with a mean score of 3.07. All indicators recorded a mode of four (agree) to the Likert statements. 55% of the respondents agree or strongly agree that ERP users find the system easy to learn, 32% disagree or strongly disagree that users find ERP intuitive, 61.7% agree or strongly agree that users are comfortable using the system, 45% agree or strongly agree that users find it easy to get the system to do what they wish it to do and 53% agree or strongly agree that ERP users easily become skilful at using the system. Neutral responses for all indicators ranged between 24% and 36% of the responses.

Ease of Use	Mean	Mode	S Dev.	Likert Response Percentages Cumulative Percentages				
				SD	D	N	A	SA
The ERP users find the system easy to learn	3.36	4	0.96	3.7% 3.7%	16.8% 20.6%	24.3% 44.9%	49.5% 94.4%	5.6% 100.0%
The ERP users find the system intuitive	3.07	4	1.00	5.6% 5.6%	26.2% 31.8%	28.0% 59.8%	36.4% 96.3%	3.7% 100.0%
The ERP users are comfortable using the system	3.54	4	0.88	1.9% 1.9%	12.1% 14.0%	24.3% 38.3%	53.3% 91.6%	8.4% 100.0%
The ERP users find it easy to get the system to do what they wish it to do	3.26	4	0.89	3.7% 3.7%	15.0% 18.7%	36.4% 55.1%	41.1% 96.3%	3.7% 100.0%
The ERP users easily become skilful at using the system	3.45	4	0.91	3.7% 3.7%	9.3% 13.1%	33.6% 46.7%	44.9% 91.6%	8.4% 100.0%

Table 4.3-4 Ease of Use Descriptive Statistics

4.3.3.2 Independent Variable: Collaboration

The independent variable construct, 'Collaboration', is measured using a 5 point Likert scale ranging from strongly disagree [1] to strongly agree [5]. The measurement indicators are established through a review of literature covered in sub-section 3.5.4. Frequency counts of the indicators and their proportional contribution is illustrated in Figure 4.3-20. Over 60% of the recorded responses agree or strongly agree with their indicator measure except for the indicator measure 'ERP's collaboration improves my communication with suppliers' where 48% of the respondents agree or strongly agree. 'ERP's collaboration improves my communication with suppliers' recorded the highest neutral response (n=44) which is the same frequency count as agreeing to the statement.

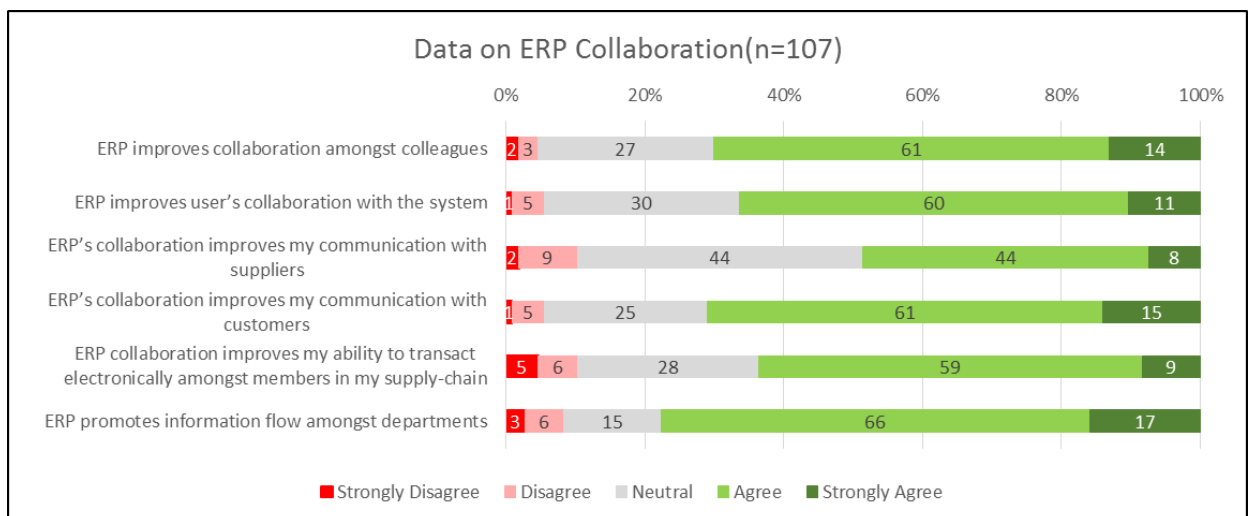


Figure 4.3-20 Data on Collaboration

The means, modes, standard deviation are recorded against individual construct indicators along with proportional and cumulative responses as illustrated in Table 4.3-5. The highest mean recorded, 3.8, was recorded against the indicator ‘ERP promotes information flow amongst departments’, while the lowest was ‘ERP’s collaboration improves my communication with suppliers’, with a mean score of 3.4. All indicators recorded a mode of 4 (agree), being an agreement to the Likert statements. 70.1% of the respondents agree or strongly agree that ERP improves collaboration amongst colleagues while 66.4% agree or strongly agree that ERP improves their own collaboration with the system.

49.6% agree or strongly agree that ERP’s collaboration improves communication with suppliers while 10.3% disagree or strongly disagree. 71% agree or strongly agree that ERP’s collaboration improves communication with customers while 5.6% disagree or strongly disagree. 63.6% agree or strongly agree that ERP collaboration improves their ability to transact electronically amongst members in their supply- while 10.3% disagree or strongly disagree and 77.6% agree or strongly agree that ERP promotes information flow amongst departments while 8.4% disagree or strongly disagree.

Collaboration	Mean	Mode	S Dev.	Likert Response Percentages				
				Cumulative Percentages				
				SD	D	N	A	SA
ERP improves collaboration amongst colleagues	3.77	4	0.78	1.9%	2.8%	25.2%	57.0%	13.1%
				1.9%	4.7%	29.9%	86.9%	100.0%
ERP improves user’s collaboration with the system	3.70	4	0.76	0.9%	4.7%	28.0%	56.1%	10.3%
				0.9%	5.6%	33.6%	89.7%	100.0%
ERP’s collaboration improves my communication with suppliers	3.44	4	0.83	1.9%	8.4%	41.1%	41.1%	7.5%
				1.9%	10.3%	51.4%	92.5%	100.0%
ERP’s collaboration improves my communication with customers	3.79	4	0.78	0.9%	4.7%	23.4%	57.0%	14.0%
				0.9%	5.6%	29.0%	86.0%	100.0%
ERP collaboration improves my ability to transact electronically amongst members in my supply-chain	3.57	4	0.90	4.7%	5.6%	26.2%	55.1%	8.4%
				4.7%	10.3%	36.4%	91.6%	100.0%
ERP promotes information flow amongst departments	3.82	4	0.87	2.8%	5.6%	14.0%	61.7%	15.9%
				2.8%	8.4%	22.4%	84.1%	100.0%

Table 4.3-5 Collaboration Descriptive Statistics

4.3.3.3 Independent Variable: Capabilities

The independent variable construct, “Capabilities”, is measured using a 5 point Likert scale ranging from strongly disagree [1] to strongly agree [5]. The

measurement indicators are established through a review of literature covered in sub-section 3.5.4. Frequency counts of the indicators and their proportional contribution is illustrated in Figure 4.3-21. Over 60% of all indicator responses either agree or strongly agree with the indicator statements.

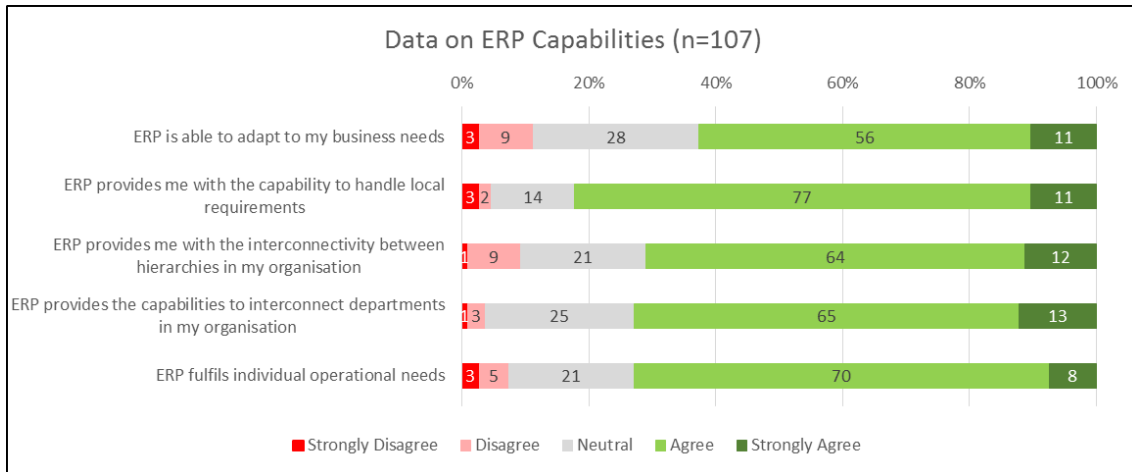


Figure 4.3-21 Data on ERP Capabilities

The means, modes, standard deviation are recorded against individual construct indicators along with proportional and cumulative responses as illustrated in Table 4.3-6. The highest mean recorded, 3.85, was recorded against the indicator ‘ERP provides me with the capability to handle local requirements’, indicating a high level of capability in dealing with the local market. The lowest mean was ‘ERP fulfils individual operational needs’, with a recorded mean score of 3.70. All indicators recorded a mode of 4, being an agreement to the Likert statements. 62.6% of the respondents agree or strongly agree that ‘ERP is able to adapt to their business needs’ while 82.2% agree or strongly agree that ‘ERP provides them with the capabilities to handle local requirements’. 71% agree or strongly agree that ‘ERP provides them with the interconnectivity between hierarchies in their organisation’, illustrating a strong agreement to vertical integration while 72.9% agree or strongly agree that ‘ERP provides the capabilities to interconnect departments within their organisation’, illustrating a high level of agreement to horizontal integration. 72.9% agree or strongly agree that ‘ERP fulfils an individual’s operational needs’.

Capabilities	Mean	Mode	S Dev.	Likert Response Percentages				
				Cumulative Percentages				
				SD	D	N	A	SA
ERP is able to adapt to my business needs	3.59	4	0.89	2.8% 2.8%	8.4% 11.2%	26.2% 37.4%	52.3% 89.7%	10.3% 100.0%
ERP provides me with the capability to handle local requirements	3.85	4	0.74	2.8% 2.8%	1.9% 4.7%	13.1% 17.8%	72.0% 89.7%	10.3% 100.0%
ERP provides me with the interconnectivity between hierarchies in my organisation	3.72	4	0.81	0.9% 0.9%	8.4% 9.3%	19.6% 29.0%	59.8% 88.8%	11.2% 100.0%
ERP provides the capabilities to interconnect departments in my organisation	3.80	4	0.72	0.9% 0.9%	2.8% 3.7%	23.4% 27.1%	60.7% 87.9%	12.1% 100.0%
ERP fulfils individual operational needs	3.70	4	0.79	2.8% 2.8%	4.7% 7.5%	19.6% 27.1%	65.4% 92.5%	7.5% 100.0%

Table 4.3-6 Capabilities Descriptive Statistics

4.3.3.4 Independent Variable: Efficiencies

The independent variable construct, ‘Efficiencies’, is measured using a 5 point Likert scale ranging from strongly disagree [1] to strongly agree [5]. The measurement indicators are established through a review of literature covered in sub-section 3.5.4. Frequency counts of the indicators and their proportional contribution are illustrated in Figure 4.3-22. Over 60% of all indicator responses agree or strongly agree with the indicator statements. The highest neutral response (n=31) is recorded against the indicator ‘ERP adjusts tasks and actions to trading conditions, improving efficiencies’.

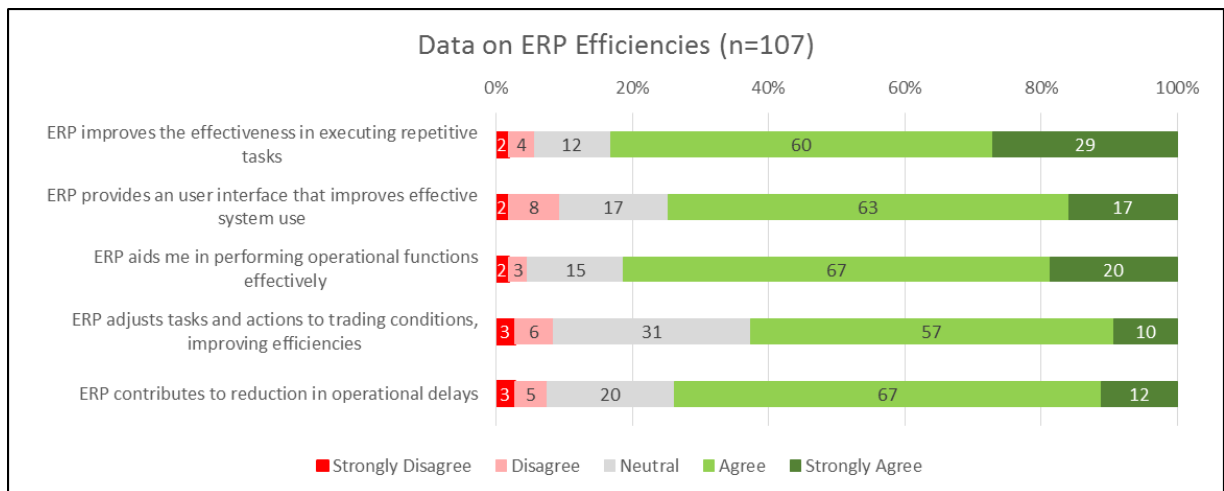


Figure 4.3-22 Data on ERP Efficiencies

The means, modes, standard deviation are recorded against individual construct indicators along with proportional and cumulative responses as illustrated in Table 4.3-7. The highest mean recorded, 4.03, was recorded

against the indicator ‘ERP improves the effectiveness in executing repetitive tasks’, indicating a high level of assistance in process automation. All indicators recorded a mode of 4 (agree) on the Likert statements. 83.2% of the responses agree or strongly agree that ‘ERP improves the effectiveness in executing repetitive tasks’, 74.8% of the respondents agree or strongly agree while 9.3% disagree or strongly disagree that ‘ERP provides an user interface that improves effective system use’. 81.3% agree or strongly agree that ‘ERP aids them in performing operational functions effectively’, 62.6% agree or strongly agree that ‘ERP adjusts tasks and actions to trading conditions, improving efficiencies’ and 73.8% agree or strongly agree that ‘ERP contributes to the reduction in operational days’, indicating resource improvement.

Efficiencies	Mean	Mode	S Dev.	Likert Response Percentages				
				Cumulative Percentages				
				SD	D	N	A	SA
ERP improves the effectiveness in executing repetitive tasks	4.03	4	0.84	1.9%	3.7%	11.2%	56.1%	27.1%
				1.9%	5.6%	16.8%	72.9%	100.0%
ERP provides an user interface that improves effective system use	3.79	4	0.87	1.9%	7.5%	15.9%	58.9%	15.9%
				1.9%	9.3%	25.2%	84.1%	100.0%
ERP aids me in performing operational functions effectively	3.93	4	0.78	1.9%	2.8%	14.0%	62.6%	18.7%
				1.9%	4.7%	18.7%	81.3%	100.0%
ERP adjusts tasks and actions to trading conditions, improving efficiencies	3.61	4	0.84	2.8%	5.6%	29.0%	53.3%	9.3%
				2.8%	8.4%	37.4%	90.7%	100.0%
ERP contributes to reduction in operational delays	3.75	4	0.83	2.8%	4.7%	18.7%	62.6%	11.2%
				2.8%	7.5%	26.2%	88.8%	100.0%

Table 4.3-7 Efficiencies Descriptive Statistics

4.3.3.5 Independent Variable: Analytics

The independent variable construct, ‘Analytics’, is measured using a 5 point Likert scale ranging from strongly disagree [1] to strongly agree [5]. The measurement indicators are established through a review of literature covered in Sub-section 3.5.4. Frequency counts of the indicators and their proportional contribution are illustrated in Figure 4.3-23. Over 70% of all indicator responses agree or strongly agree with the indicator statements except for the indicator ‘ERP provides comprehensive reporting’ where only 46.7% agree or strongly agree. The highest neutral response is recorded against the indicator ‘ERP provides comprehensive reporting’, recording 33 responses.

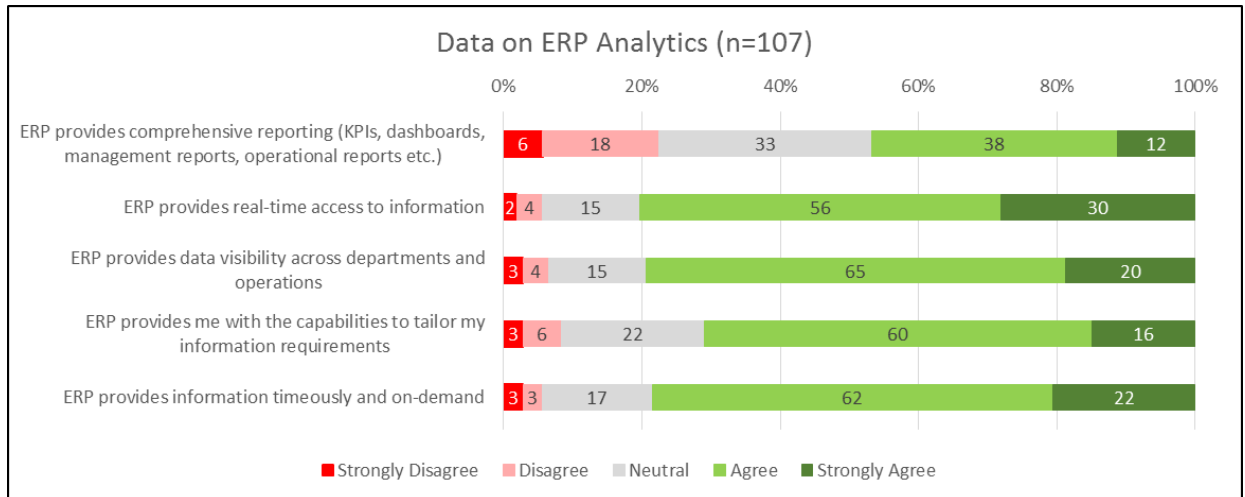


Figure 4.3-23 Data on ERP Analytics

The means, modes, standard deviation are recorded against individual construct indicators along with proportional and cumulative responses as illustrated in Table 4.3-8. The highest mean recorded, 4.01, was recorded against the indicator ‘ERP provides real-time access to information’, indicating a high level of on demand availability of information. All indicators recorded a mode of 4 (agree) on the Likert statements. 22.4% of the respondents disagree or strongly disagree with the statement that ‘ERP provides comprehensive reporting’ while 30.8% recorded a neutral response. 81.4% agree or strongly agree to the statement ‘ERP provides real-time access to information’, 79.4% agree or strongly agree that ‘ERP provides data visibility across departments and operations’, 71% agree or strongly agree that ‘ERP provides the capability to tailor their own personal information requirements’ and 79.5% agree or strongly agree that ‘ERP provides information timeously and on-demand’.

Analytics	Mean	Mode	S.Dev.	Likert Response Percentages				
				Cumulative Percentages				
				SD	D	N	A	SA
ERP provides comprehensive reporting (KPIs, dashboards, management reports, operational reports etc.)	3.30	4	1.06	5.6%	16.8%	30.8%	35.5%	11.2%
ERP provides real-time access to information	4.01	4	0.86	1.9%	3.7%	14.0%	52.3%	28.0%
ERP provides data visibility across departments and operations	3.89	4	0.85	2.8%	3.7%	14.0%	60.7%	18.7%
ERP provides me with the capabilities to tailor my information requirements	3.75	4	0.88	2.8%	5.6%	20.6%	56.1%	15.0%
ERP provides information timeously and on-demand	3.91	4	0.85	2.8%	2.8%	15.9%	57.9%	20.6%

Table 4.3-8 Analytics Descriptive Statistics

4.3.4 Section 4: Value Contributed to the Organisation through ERP

4.3.4.1 Dependent Variable: Value

The dependent variable construct, ‘Value’, is measured using a 5 point Likert scale ranging from strongly disagree[1] to strongly agree[5]. The measurement indicators are established through a review of literature covered in sub-section 3.5.4. Frequency counts of the indicators and their proportional contribution is illustrated in Figure 4.3-24. Over 60% of indicator responses agree or strongly agree with the indicator statements except for the indicator ‘ERP assists in increasing market share’ where just over 40% agree or strongly agree. The highest neutral response is recorded against the indicator ‘ERP assists in increasing market share’, n=46.

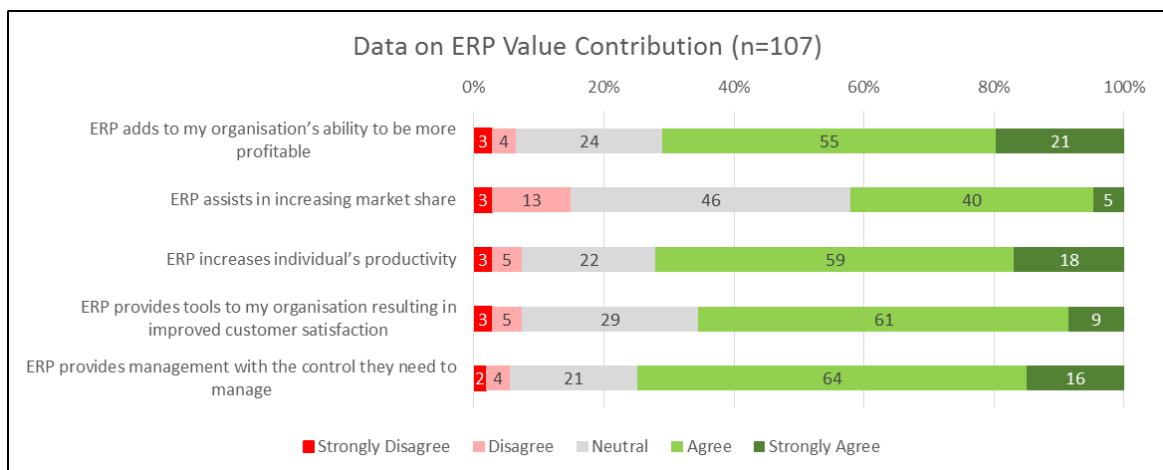


Figure 4.3-24 Data on ERP Value Contribution

The means, modes, standard deviation are recorded against individual construct indicators along with proportional and cumulative responses as illustrated in Table 4.3-9. The highest mean recorded, 3.82, was recorded against the indicator ‘ERP provides management with the control they need to manage’, with a standard deviation of 0.80. All indicators recorded a mode of 4 (Agree), except for the indicator that ‘ERP assists in increasing market share’ where the mode was 3 (Neutral). 71% of the respondents agree or strongly agree that ‘ERP adds to their organisation’s ability to be more profitable’, 17.8% disagree or strongly disagree that ‘ERP assists in increasing their market share’, 72% agree or strongly agree that ERP assists in increasing individual’s

productivity’ which indicates an improvement to resource utilisation, 65.4% agree or strongly agree that ‘ERP provides their organisation with tools that results in improved customer satisfaction’ and 74.8% agree or strongly agree that ‘ERP provides management with the control to effectively manage’.

Value	Mean	Mode	S.Dev.	Likert Response Percentages				
				Cumulative Percentages				
				SD	D	N	A	SA
ERP adds to my organisation’s ability to be more profitable	3.81	4	0.89	2.8% 2.8%	3.7% 6.5%	22.4% 29.0%	51.4% 80.4%	19.6% 100.0%
ERP assists in increasing market share	3.29	3	0.85	2.8% 2.8%	12.1% 15.0%	43.0% 57.9%	37.4% 95.3%	4.7% 100.0%
ERP increases individual’s productivity	3.79	4	0.88	2.8% 2.8%	4.7% 7.5%	20.6% 28.0%	55.1% 83.2%	16.8% 100.0%
ERP provides tools to my organisation resulting in improved customer satisfaction	3.64	4	0.82	2.8% 2.8%	4.7% 7.5%	27.1% 34.6%	57.0% 91.6%	8.4% 100.0%
ERP provides management with the control they need to manage	3.82	4	0.80	1.9% 1.9%	3.7% 5.6%	19.6% 25.2%	59.8% 85.0%	15.0% 100.0%

Table 4.3-9 Value Descriptive Statistics

4.4 Multivariate Analysis and Inferential Statistics

Partial Least Squares (PLS) is a component of Structural Equation Modelling (SEM) which makes no assumptions as to the data distribution (Vinzi, Chin, Henseler, & Wang, 2010). PLS-SEM is considered a good alternative to Covariance-based SEM (CB-SEM) when the following conditions are encountered (Wong, 2013):

- The sample size is small, as is the case in this treatise (n=107);
- Predictive accuracy is paramount, managerial recommendations require a high degree of accuracy; and
- Correct model specification cannot be ensured. As this treatise is explorative in nature, PLS is an appropriate multivariate analysis method to be utilised.

Wong (2013) notes that if there are limited respondents and the data distribution is skewed, as is the case in this treatise, collecting responses from a population limited to SMEs and using only the SYSPRO ERP system, PLS is useful in applied research. Further PLS-SEM has been utilised in many scientific fields of study such as behavioural sciences, marketing, organisational, management

information systems and business strategy (Chin, 2002; Hulland, 1999; Sarstedt, Ringle, Smith, Reams, & Hair, 2014).

Guidelines suggest that to determine the sample size, the maximum number of arrows pointing to any latent variable provide a guideline as seen in Table 4.4-1 (Marcoulides, Saunders, & Marcoulides, 2016). As the sample size in this treatise is 107, it satisfies the minimum requirements.

Minimum sample size required	Maximum # of arrows pointing at a latent variable in the model
52	2
59	3
65	4
70	5
75	6
80	7
84	8
88	9
91	10

Table 4.4-1 Minimum Sample Size Determination for PLS-SEM (Marcoulides et al., 2016)

4.4.1 Data Reliability and Validity

As discussed in Sub-section 3.6.4, reliability tests for data consistency. Reliability checks for the degree to which a measurement is free of random or stability errors (Cooper & Schindler, 2014). Utilising partial least squares for model fit, both construct indicators and the construct’s internal consistency can be tested. Indicator reliability is confirmed having outer loadings greater than 0.7, however for exploratory research a value of 0.4 or higher is acceptable (Hulland, 1999). Table 4.4-2, confirms all construct indicators as having values greater than 0.7 and therefore the indicators are reliable. The composite construct reliability is a measure of internal consistency reliability and having a value of 0.7 or greater is preferred and for exploratory research a value of 0.6 or higher is acceptable (Bagozzi & Yi, 1988).

Cronbach’s Alpha is usually used as a measure of internal consistency reliability and Table 4.4-2 illustrates the Cronbach’s Alpha results and their relative interpretation as per Table 3.6-4. However, there is a tendency for this measure to be conservative in PLS-SEM and the measure of composite reliability should be used as an alternative and the composite reliability should be a value greater

than 0.7 (Bagozzi & Yi, 1988; Hair, Ringle, & Sarstedt, 2012). Composite reliability measures are recorded against each construct in Table 4.4-2. As each construct has recorded a value greater than 0.7, all construct indicators are reliable and all constructs demonstrate internal consistency reliability.

As discussed in Sub-section 3.6.3, validity confirms whether findings are what they appear to be about (Saunders et al., 2008). Content validity is confirmed on the independent variable constructs ease of use (EU), collaboration (CO), capabilities (CA), efficiencies (EF), analytics (AN) and the dependent variable construct, value (EV) through a review of literature covered in Sub-section 3.5.4 and illustrated in Figure 2.7-3, the Hypothesised Model for ERP Benefits for SMEs.

To measure construct validity, convergent and discriminant validity is required. Convergent validity indicates that a construct is more strongly related to its own measures than with any other construct by examining the overlap in variance. Discriminant validity holds that a construct is more correlated to its own measures than another construct indicating that the underlying concepts being measured are distinct. Discriminant validity is tested by the comparison of the square root of the average variance extracted (AVE) to the correlations amongst constructs (Vinzi et al., 2010). Convergent validity of a construct requires the AVE to be greater than 0.5 (Fornell & Larcker, 1981). Table 4.4-2 confirms convergent validity for all constructs as having values greater than 0.5.

Variables	Means (S.D.)	Items	Factor loading (>0.7)	Cronbach's Alpha	Composite reliability (>0.7)	Average variance extracted (AVE) (>0.5)
Ease of Use	3.34 (0.82)	EU1	0.852	0.927 Highly Reliable	0.945	0.775
		EU2	0.865			
		EU3	0.908			
		EU4	0.859			
		EU5	0.915			
Collaboration	3.68 (0.68)	CO1	0.828	0.910 Highly Reliable	0.930	0.690
		CO2	0.877			
		CO3	0.811			
		CO4	0.789			
		CO5	0.801			
		CO6	0.762			
Capabilities	3.73 (0.66)	CA1	0.797	0.891 Moderately Reliable	0.920	0.699
		CA2	0.916			
		CA3	0.821			
		CA4	0.861			
		CA5	0.778			
Efficiencies	3.82 (0.69)	EF1	0.851	0.892 Moderately Reliable	0.920	0.697
		EF2	0.828			
		EF3	0.838			
		EF4	0.805			
		EF5	0.852			
Analytics	3.77 (0.75)	AN1	0.731	0.894 Moderately Reliable	0.922	0.704
		AN2	0.836			
		AN3	0.875			
		AN4	0.871			
		AN5	0.873			
ERP Value	3.67 (0.70)	EV1	0.848	0.888 Moderately Reliable	0.917	0.689
		EV2	0.705			
		EV3	0.849			
		EV4	0.855			
		EV5	0.879			

Table 4.4-2 Construct Descriptive Statistics, Reliability and Validity

The square root of the AVE for each variable can be used to establish discriminant validity. If the AVE of a construct is larger than correlation values between the construct and other variables, then discriminant variable validity is established (Fornell & Larcker, 1981). Table 4.4-3 illustrates the cross-variable correlations and the squares root of the AVE in bold for comparative purposes. All bold values (AVE) are greater than the correlations amongst other variables and therefore discriminant validity of the variables is established.

Variables	(AVE)	(EU)	(CO)	(CA)	(EF)	(AN)	(EV)
Ease of Use (EU)	0.775	0.880					
Collaboration (CO)	0.690	0.46	0.831				
Capabilities (CA)	0.699	0.61	0.71	0.836			
Efficiencies (EF)	0.697	0.61	0.68	0.77	0.835		
Analytics (AN)	0.704	0.57	0.68	0.70	0.75	0.839	
ERP Value (EV)	0.688	0.55	0.47	0.64	0.61	0.59	0.829

Table 4.4-3 Variable Discriminant Validity

4.4.2 Empirical Evaluation of the Hypothesised Model

The chapter objectives outlined in the Chapter introduction require the application of inferential statistical analysis to interpret the relationships and significance between variables as formulated in the hypotheses in support of the hypothesised model for ERP benefits for SMEs, see Sub-section 2.7.4.

4.4.2.1 Hypotheses Testing and Analysis

Table 4.4-4 lists the hypotheses requiring statistical testing. Partial least squares is used in this treatise to establish the path coefficients and significance between the independent variables and dependent variable for hypotheses H₁..H₅. ANOVA analysis is used to confirm or reject the categorical independent variables of industry and maturity on the dependent variable in support of the hypotheses H₆ and H₇.

Hypothesis	Literature Support
H ₁ - Ease of Use is positively related to ERP value	2.7.2.1
H ₂ - Collaboration is positively related to ERP value	2.7.2.2
H ₃ - Capabilities are positively related to ERP value	2.7.2.3
H ₄ - Efficiencies are positively related to ERP value	2.7.2.4
H ₅ - Analytics are positively related to ERP value	2.7.2.5
H ₆ - Industry sectors in SMEs has a positive mediating role as to the perception of benefits and value derived from ERP	2.7.3.1
H ₇ - The length of use on an ERP system has a positive mediating role on the perception of ERP value and benefits attained	2.7.3.2

Table 4.4-4 Formulated Hypotheses

Using a bootstrap to evaluate the significance to a 5% confidence level using a two-tailed test, the significance of the path coefficient is regarded as being a

significant relationship if the critical t-statistic is larger than 1.96. Figure 4.4-1 illustrates the model's path coefficients and t-statistics between the latent independent variables and latent dependent variable. The numerical values indicated in the relationship arrows, highlight the path coefficient between the variable and the respective t-value. Numbers indicated in red signify that the relationship is not significant. The relationship column indicates the significance and the confidence level. Table 4.4-5 summarises the results of the hypothesis testing for hypotheses $H_1..H_5$.

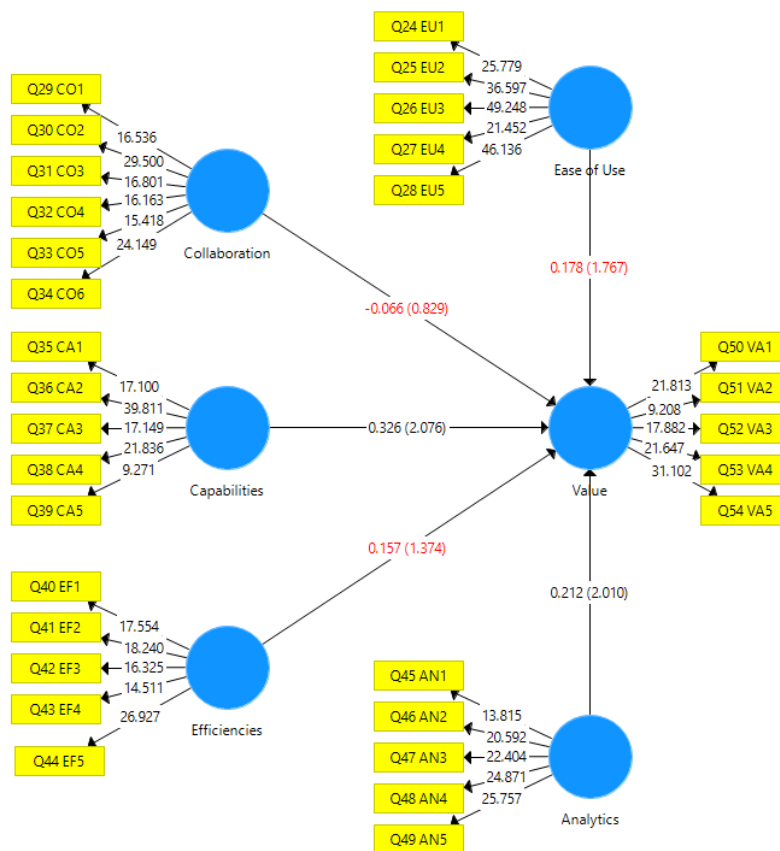


Figure 4.4-1 Model Path Coefficients and T-Values

Hypothesis	t-statistic Significant	p-value	Relationship	Hypothesis Accepted or Rejected
H ₁ - Ease of Use is positively related to ERP value	1.767	0.078	Significant 90% Confidence	Accepted
H ₂ - Collaboration is positively related to ERP value	0.829	0.408	Not significant	Rejected
H ₃ - Capabilities are positively related to ERP value	2.076	0.038	Significant 95% Confidence	Accepted
H ₄ - Efficiencies are positively related to ERP value	1.374	0.170	Not significant	Rejected
H ₅ - Analytics are positively related to ERP value	2.012	0.045	Significant 95% Confidence	Accepted

Table 4.4-5 Hypotheses Results H₁..H₅

Figure 4.4-1 additionally indicates the t-values for the indicators for each construct, reviewed as the outer model. All of the T-statistics are larger than 1.96, therefore the outer model loadings are highly significant.

Single factor ANOVAs were performed on the categorical data of industry and maturity as a test of comparing the means of value amongst different industries and the means of value amongst different maturities. To assess maturity, the length of time a respondent’s experience in using in ERP, question P1, was used. Industry analysis was conducted at the two-digit NAICS significance. Industries means of values when measure with a significance of 0.05, recorded a p-value of 0.302, which is greater than 0.05, see Table 4.4-6. Therefore, the hypothesis **H₆ - Industry sectors in SMEs has a positive mediating role as to the perception of benefits and value derived from ERP**, is rejected. Maturity’s value means when measured with a significance of 0.05, recorded a p-value of 0.147, which is greater than 0.05, see Table 4.4-7. Therefore, the hypothesis **H₇ - The length of use on an ERP system has a positive mediating role on the perception of ERP value and benefits attained**, is rejected.

Anova: Single Factor (Industries)

SUMMARY

Groups	Count	Sum	Average	Variance
Construction	1	4.6	4.6	
Extractive	4	14.6	3.65	0.063333
Information and Cultural	1	4	4	
Manufacturing	75	276.4	3.685333	0.483431
Retail Trade	3	11.2	3.733333	0.373333
Services	5	14.8	2.96	1.288
Wholesale Trade	18	67	3.722222	0.410065

ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	3.57458	6	0.595763	1.219985	0.302399	2.190601
Within Groups	48.83364	100	0.488336			
Total	52.40822	106				

Table 4.4-6 ANOVA Industries' Value Means

Anova: Single Factor (Maturity - Years used ERP)

SUMMARY

Groups	Count	Sum	Average	Variance
<2 Years	10	32.4	3.24	1.358222
2 - 5 Years	19	67.8	3.568421	0.814503
6 - 10 Years	23	87.6	3.808696	0.201739
> 10 Years	55	204.8	3.723636	0.341468

ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	2.645638	3	0.881879	1.825339	0.147187	2.692841
Within Groups	49.76259	103	0.483132			
Total	52.40822	106				

Table 4.4-7 ANOVA Maturities' Value Means

4.4.3 Significance of the Differences of Relationships in the Hypothesised Model

A further consideration is the path coefficients of the model in explaining the target endogenous variable variance, (Value). The AVE is 0.689 for the endogenous latent variable (Value). This means that the five latent independent variables (Ease of Use, Collaboration, Capabilities, Efficiencies and Analytics) moderately explain 68.9% of the variance in (Value). Further, (Capabilities and Analytics) explain 53.8% of the variance in (Value). Only the variables Capabilities and Analytics are significant to a 95% confidence level, however,

Ease of Use and Efficiencies are still significant, but not to a 95% confidence level. Ease of use is significant to a 90% confidence level. Only Collaboration is not statistically significant due to its path coefficient being lower than 0.1 (-0.066). Thus Capabilities, Analytics and Ease of Use are concluded as being moderately strong predictors of Value while Efficiencies are a moderately weaker predictor of Value and Collaboration does not predict Value directly. The R^2 of the dependent variable, Value, is 0.512. This is regarded as a high level according to Cohen (1988), indicating a superior explanation power of the research model. Figure 4.4-2 illustrates the model path coefficient sizes and significance.

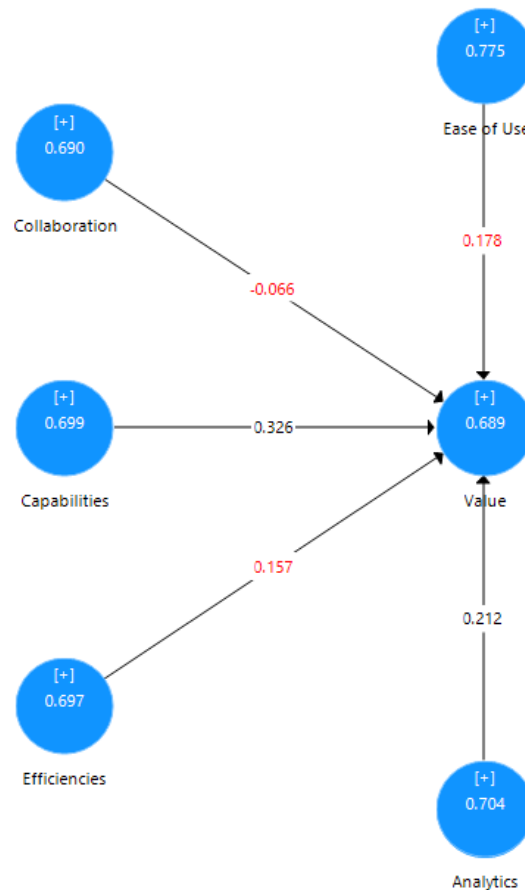


Figure 4.4-2 Model Path Coefficient Sizes and Significance

The result of the statistical analysis of the hypothesised model of ERP benefits for SMEs is illustrated in Figure 4.4-3.

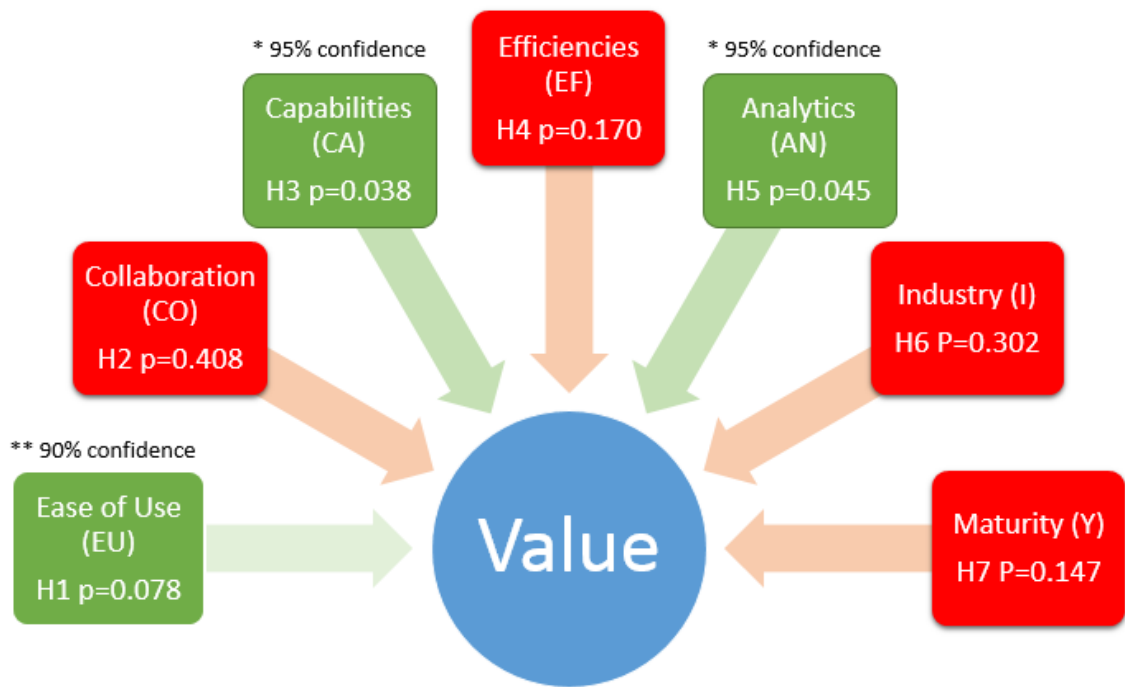


Figure 4.4-3 Results: Hypothesised Model for ERP Benefits for SMEs

4.5 Chapter Summary

Through an analysis and interpretation of the primary data collected, Chapter 4 addressed the following research questions:

- **RQ₈**: What relationships between the independent and dependent variables of benefits, can be verified through empirical evaluation of the hypothesised model for ERP benefits for SMEs?
- **RQ₉**: Which independent variables in the hypothesised model for ERP benefits for SMEs have a significant relationship to benefits realised from ERP by SMEs?
- **RQ₁₀**: What is the significance of the difference in the relationship between the independent variables and the dependent variable in the hypothesised model for ERP benefits for SMEs?

Chapter 4 addressed these research questions by achieving the research objectives:

- **RO₈**: Empirically evaluate the hypothesised model for ERP benefits for SMEs in order to accept or reject the formulated hypotheses;
- **RO₉**: Establish which identified variables in the hypothesised model are significantly related to benefits derived from ERP systems by SMEs;
- **RO₁₀**: Establish the significance of the difference in relationships of the independent variables to the dependent variable of value, in the hypothesised model.

These outcomes were achieved by achieving specific outcomes within the sub-sections outlined within the chapter. Sub-section 4.1 reviewed in brief Chapter 3 and outlined the research questions and objectives to be achieved in Chapter 4. Sub-section 4.2 dealt with data analysis and interpretation methods used in this treatise. Primary data was collected from survey questionnaires and were analysed using univariate and multivariate statistical analysis techniques. Sub-section 4.3 focused on univariate analysis, using descriptive statistics techniques on the questionnaire items in Appendix A. The data analysis was grouped into organisational biographical information, personal biographic information, data constituting the independent variables delivering benefits from ERP use and the dependent variable of value contribution to the organisation due to ERP.

The organisational biographic data revealed that 70% of the responses were from the manufacturing sector, the interquartile range of the length these organisations had been in operation was twenty years with a median of 21 years. These SMEs can be viewed as being mature and established SMEs as Survival rates of SMEs in South Africa are relatively low with less than half surviving the first five years (Brink, Cant, & Ligthelm, 2003). 43% of the organisations had between 100 and 249 fulltime employees, a classification of medium sized enterprises, while 55% are classified as small and micro sized organisations. Overall ERP had been in use in these organisations with a median of 11 years with an interquartile range of 12 years. The average length of years SYSPRO had been used was 10.86 years and 61% of the organisations had not used another ERP system prior to SYSPRO. Lastly, 61%

of the organisations operate only from a single location 85% of all locations were recorded in the top four geographic provinces of Gauteng, Western Cape, Kwazulu Natal and the Eastern Cape.

The personal biographic data indicated that the majority of the respondents, 51%, had more than ten years' experience in ERP systems, 73% had over five years' experience and only 9% had less than two years' experience in ERP. Specific experience in SYSPRO showed that 33% of the respondents had greater than ten years' experience. 56% of the respondents had used other ERP systems besides SYSPRO. The responses on management designation revealed that 64% of the respondents were from senior management, an important consideration due to the nature of the questionnaire requiring perspectives as to the value and benefits delivered to the organisation through ERP adoption. The majority of respondents, 80%, reside in the office of finance or in operations. This is another important aspect as ERP systems are systems of record and control the transactional operations of an organisation. Of the 105 complete responses on gender, 65% of the respondents are male and 57% of the responses have attained an under-graduate or post-graduate qualification. This percentage is higher than the figure of 40% reported by Sbp (2013). This is probably due to the fact that whilst Sbp and this treatise focus similarly on SMEs, the organisations in this treatise are skewed to the larger end of the SME size scale. Lastly, respondents were asked to rate their own computer proficiency and 41% rated themselves as being proficient with a further 37% rating themselves as advanced.

The univariate analysis and descriptive statistics on the independent variable Ease of Use's indicators, revealed that over sixty percent of the respondents were comfortable using the system while only just over half of the respondents felt that ERP users easily become skilful at using the system. ERP's intuitiveness recorded the highest mixed responses with forty percent finding it intuitive while thirty percent felt it wasn't intuitive. Over a third of the respondents had a neutral sentiment to whether they found it easy to get an ERP system to do what they needed it to do. These responses are probably

explained due to the large and complex nature of ERP systems, often containing more complexity than is needed due to the desire to address many industry needs. Ease of use is an important consideration as users tend to rate ERP systems as less useful when they find them difficult to use and therefore ERP providers need to focus attention on designing both useful and easy to use ERP systems (Calisir & Calisir, 2004).

The univariate analysis and descriptive statistics on the independent variable Collaboration's indicators, revealed that over seventy percent of the respondents believed that ERP promoted information flow amongst departments, improved collaboration amongst colleagues, improved collaboration with customers, but under fifty percent agreed that collaboration was improved with suppliers. Collaboration is an important aspect as realisation of the full potential of an integrated IT system cannot be achieved without it (Ruivo, Oliveira, Johansson, & Neto, 2013).

The univariate analysis and descriptive statistics on the independent variable Capabilities' indicators, revealed that over seventy percent of the respondents believed that ERP fulfils their individual operational needs, provides them with the capabilities to interconnect departments in executing value-chain activities, interconnects hierarchies within their organisations and that ERP handles local requirements. However, just over sixty percent of the respondents agreed that ERP is able to adapt to their business needs. The likely explanation for this is that ERP systems offer very diverse possibilities and results to companies having adopted them, even although the underlying ERP system could be provided from the same supplier owing to the configurable nature of the system (Uwizeyemungu & Raymond, 2012). But as noted by Uwizeyemungu and Raymond (2012), capabilities are crucial in determining the contribution of an ERP system to overall organisational performance, a measure of the RBV value contributable by ERP.

The univariate analysis and descriptive statistics on the independent variable Efficiencies' indicators, revealed that over eighty percent of the respondents believed that ERP improves effectiveness through its handling of repetitive

tasks and aids them in performing their functions effectively. Aberdeen Research, (2010) believes that only once business processes have been standardised, can efficiencies be realised. However, standardisation may limit flexibility as is seen in the respondent's lower agreement of just over sixty percent that ERP adjusts tasks and actions to changing trading conditions. Further, research into efficiencies and ERP have reported mixed results noting some companies have achieved operational efficiencies whilst others have not (Bradford & Florin, 2003; Nwankpa, 2015).

The univariate analysis and descriptive statistics on the independent variable Analytics' indicators reveal that overwhelmingly ERP provides real-time access to information and visibility across operations and departments and timeously on-demand. A lower level of agreement, agree and strongly agree, (47.7%) was recorded under the belief that ERP provides comprehensive reporting in the form of key performance indicators, management and operational reporting. It is likely that this is explained due to the transitioning requirements of ERP data to surfacing insights, in other words, while ERP provisions information on demand, it might not surface insights that drive business behaviour. Ruivo et al. (2015) are of the belief that analytics are the greatest differentiating factor to ERP value attainment.

The univariate analysis and descriptive statistics on the dependent variable Value's indicators reveal that over seventy percent of the respondents are of the belief that ERP provides management with the control they require to manage resources and that ERP adds to their organisation's ability to be more profitable and report an increase in their productivity. However, 43% were neutral on whether ERP aids them in capturing market share. Hsu (2013a) categorises business value of ERP into the three categories of intangible, operational and financial. The respondents are of the belief that value indicators relating to operational aspects, management and productivity, are higher than financial aspects of profitability and intangible aspects of customer satisfaction.

Sub-section 4.4 addressed multivariate analysis and inferential statistics in achieving **RO₈**, **RO₉** and **RO₁₀**. Data reliability and validity was established with

both Cronbach Alpha and AVE methods. Multi-regression was utilised with PLS in establishing the significance and strength of the relationships amongst the variables. It was determined that the independent variables of Capabilities and Analytics are significantly related to ERP value to a 95% confidence level ($p < 0.05$) and the independent variable Ease of Use is significantly related to ERP value to a 90% confidence level ($p < 0.10$). Efficiencies and Collaboration are not significantly related to ERP Value. Further, ANOVA was utilised to assess whether industry and maturity have a mediating role on the dependent variable of Value. No differences were noted amongst the categorical groups and therefore both Industry sector and Maturity are rejected. The above findings on Efficiencies and Collaboration differ from the existing literature reviewed and suggestions in the literature that industry and maturity have a mediating role on value have also been empirically established that they do not mediate value. Utilising PLS-SEM the model path coefficients was determined. It was identified that 68.9% of the variance of Value is explained by the independent variables of Ease of Use, Collaboration, Capabilities, Efficiencies and Analytics and that Capabilities and Analytics explain 53.8% of the variance in Analytics.

Chapter 5 will provide findings, recommendations, conclusions and opportunities for further research for this treatise.

CHAPTER 5: Findings, Recommendations and Conclusions

5.1 Introduction

ERP is a highly configurable, integrative system that spans across the entire enterprise, combining functions, operations and information within an organisation (Kumar & Hillegersberg, 2000). Annamalai and Ramayah (2011) deem ERP systems as a crucial component harmonising functions within an organisation and contributing significantly to a organisation's performance by improving efficiencies from operations (Benders et al., 2006), improving utilisation of resources (Hitt et al., 2002), improving on decision-making capabilities (Utecht et al., 2004), adding to an organisation's competitive and strategic advantage (Beard & Sumner, 2004; Uwizeyemungu & Raymond, 2012).

The applicability and the allure of ERP benefits is universal, irrespective of the organisation's size and therefore apply equally to MNEs and SMEs (Buonanno et al., 2005). Comparably however, SMEs face a scarcity of resources (Haddara & Elragal, 2013) and this factor strongly influences ERP adoption by SMEs (Buonanno et al., 2005). SMEs can ill afford failed implementations of ERP or not realise the expected benefits, due to the large requirement of investment and resources (Costa et al., 2016; Kanellou & Spathis, 2013; Momoh, Roy, & Shehab, 2010).

SMEs require a better understanding of how to extract value from technology adoption in order to remain competitive in an increasing competitive world (Ruivo et al., 2014). Esteves (2009) notes that an on-going problem is a lack of SMEs having an awareness of the benefits that an ERP system is capable of providing. The problem statement is therefore argued that "*SMEs do not understand the benefits derived from the adoption of an ERP system*". To address this problem, Chapter 2 conducted a literature review in understanding aspects around SMEs, their relative importance and contribution, how ERP has evolved over the decades, ERP's current trends as well as which industries ERP serves SMEs. Existing ERP SME benefit models were reviewed in the

literature in establishing the associations and relationships of benefit variables derived from ERP use, associated to value to contributed to the organisation through ERP. The literature suggested that benefit variables of ease of use, collaboration, capabilities, efficiencies and analytics were independently related to the dependent variable of value, attained from ERP, consistent with the theories of DOI and RBV. Further, in answering calls for further research in the literature with regard to SMEs and ERP, two further independent variables were incorporated into the hypothesised model for ERP benefits for SMEs, that being, whether the industry an SME is in mediates levels of value or whether the length of time having used an ERP, measured as maturity, realises different levels of value. Chapter 2 concluded with the incorporation of these variables in the creation of the hypothesised model for ERP benefits to SMEs. Chapter 3 identified the research methodology used in this treatise and in Chapter 4 the analysis and interpretation of data collected from the survey was conducted.

This chapter provides an overview of this chapter in Figure 5.1-1 and Figure 5.1-2 provides the chapter's research questions and objectives addressed. Research findings, recommendations and conclusions are covered in the sub-sections below:

- Sub-section 5.1 provides a brief introduction to the context within this treatise was conducted and outlines the remainder of the chapter's sub-sections;
- Sub-section 5.2 discusses the research questions of this treatise and whether the conducted research addresses the questions effectively;
- Sub-section 5.3 provides a summary of contributions made by the findings in this treatise;
- Sub-section 5.4 provides managerial recommendations for SMEs and ERP providers alike, based on the findings of this treatise;
- Sub-section 5.5 broadly discusses opportunities for further research;
- Sub-section 5.6 discusses limitations of this study that should be taken into consideration when considering the findings, recommendations and conclusions provided by this treatise; and

- Sub-section 5.7 concludes the chapter with a brief summary.

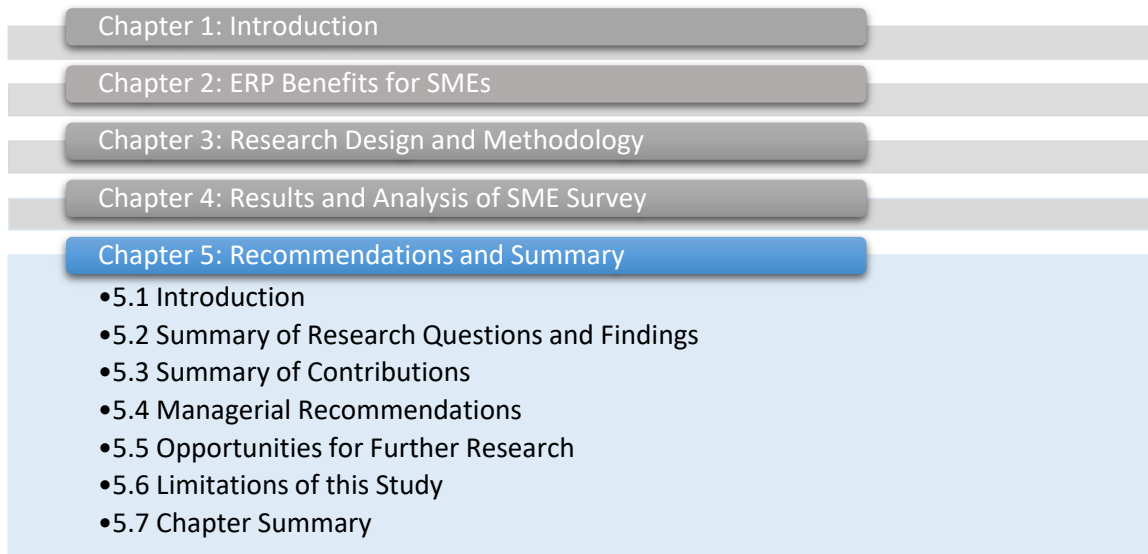


Figure 5.1-1 Chapter 5 Structural Overview

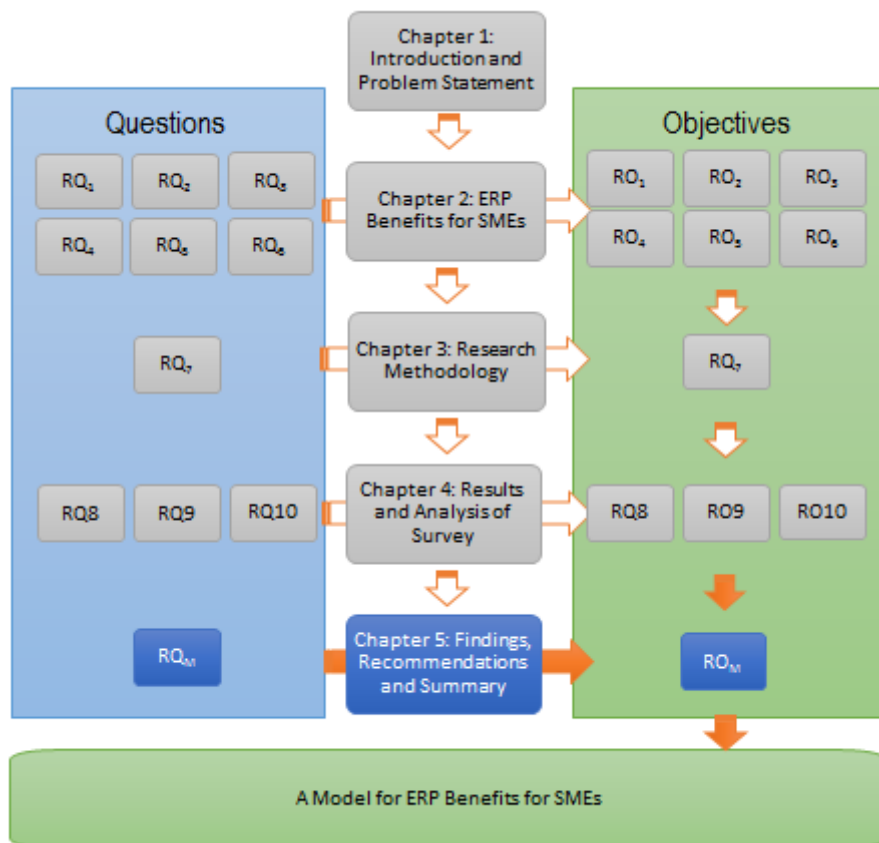


Figure 5.1-2 Chapter 5 Research Questions and Research Objectives

5.2 Summary of Research Questions and Findings

Ten research questions were identified and investigated in order to address the main research question (**RQ_M**) “What are the key benefits that ERP systems provide for SMEs?” This sub-section summarises the investigations into each research question.

5.2.1 Research Question RQ₁

The first research question was stated as “What constitutes an SME in South Africa?” In order to address this research question, the research objective (**RO₁**) defined SME’s classifications in South Africa. Sub-section 2.2, through a review of literature, found that there is no global or single SME classification in South Africa. The OECD and the Davis Tax Committee note that there is no single universal definition as to what constitutes and classifies a SME. This too is the case in South Africa. (Davis Tax Committee, 2014; Organisation for Economic Co-operation and Development, 2005; RSA, 1996). Dependent on the area of concern and consideration, agencies adopt classifications to suit their particular requirements, be it for, tax, grant or industry statistical analysis. The researcher has selected to adopt the OECD classification recommendation as defined in Figure 2.2-1, based on full-time employees at an organisation.

5.2.2 Research Question RQ₂

The second research question was stated as “Why are SMEs (a) important and (b) what is their contribution to the economy?” In order to address this research question, the research objective (**RO₂**) identified the importance of SMEs and their contribution to the economy. Sub-section 2.3, through a review of literature found that SMEs account for two-thirds of private sector employment amongst most economies (Organisation for Economic Co-operation and Development, 2005). They are generally regarded as the principal creator of jobs and are responsible for growth in economies, growing at a faster rate than large enterprises (Organisation for Economic Co-operation and Development, 2005; Sbp, 2013). The World Bank describes SMEs’ contribution as being relative to larger organisations, SMEs enhance competition, entrepreneurship, job growth and spur economy-wide efficiency, innovation, growth and poverty alleviation

(Ayyagari et al., 2011). Further, evidence exists that SME's contribution to growth is more pronounced in developing countries (Sbp, 2013). However, in South Africa, SMEs growth is slower than the economy (Stellenbosch University, 2016). This is an important finding as increasing an SME's competitiveness through the adoption of ERP would contribute to growth, profitability and job creation.

5.2.3 Research Question RQ₃

The third research question was stated as "What are the current trends in ERP?" In order to address the research question, the research objective (RO₃) reviewed the current trends and the evolution of ERP. Sub-section 2.4, through a review of literature found that ERP originated from manufacturing systems, initially, limited to inventory control, but thereafter expanded to the control of material requirements planning (MRP) and thereafter to manufacturing resource planning (MRP II) (Shehab et al., 2012). Due to larger enterprise ERP market becoming saturated, ERP providers have increasingly turned to targeting SMEs (Laukkanen et al., 2007). ERP providers have increasingly focused on downsizing their product offerings to increase their attractiveness to SMEs. ERP providers looked to simplify the inherent complexity of the overall offering, the system's architecture and the hardware platforms in provisioning for the SME market (Rashid et al., 2002). Recent trends look at deployment options embracing cloud technologies such as SaaS and Cloud-ERP with the express aim to lower costs, both IT and implementation related (Gartner Inc., n.d.; Panorama Consulting Solutions, 2015).

5.2.4 Research Question RQ₄

The fourth research question was stated as "What SME sectors use ERP?" In order to address the research question, the research objective (RO₄) endeavoured to identify SME industry sectors that use ERP. In reviewing the literature in sub-section 2.5, there appears to be a lack of previous studies specifically identifying SME industry sectors that utilise ERP. Numerous researchers have noted that different industries mediate the perceptions of benefits or value-derived from ERP (Calisir & Calisir, 2004; Hsu, 2013b; Huang

& Yasuda, 2016; Lee & Kim, 2016; Ruivo et al., 2012a; Schubert & Williams, 2011; Zach, 2012) and calls have been made for further research in this area, leading to the formation of the hypothesis; **H₆** - *Industry sectors in SMEs has a mediating role as to the perception of benefits and value derived from ERP.*

5.2.5 Research Question RQ₅

The fifth research question was stated as “What are the existing ERP SME benefit models?” In order to address the research question, the research objective (**RO₅**) identified existing ERP SME benefit models. A review of literature was conducted to identify ERP research models. ERP is an extensive application across the whole organisation and numerous factors determine its relative success across its lifecycle. Esteves and Pastor (1999) provided a framework for ERP research across its lifecycle. Research models and theories used within the models was categorised utilising this model and is presented as Table 2.6-1 “ERP Life-Cycle, Research Models and Frameworks”. Models featuring benefits in combination with SMEs was further scrutinised. Sub-section 2.6 concluded aspects from previous proposed models of ERP use and Value in SMEs are most applicable for this treatise (Rodrigues et al., 2014; Ruivo et al., 2012a; Ruivo et al., 2014, 2015).

5.2.6 Research Question RQ₆

The sixth research question was stated as “What are the related variables to benefits derived from ERP by SMEs?” In order to address the research question, the research objective (**RO₆**) developed a hypothesised model for ERP benefits for SMEs.

Section 2.7 answered the research question RQ₆: “What are the related variables to benefits derived from ERP by SMEs?” with the objective of achieving RO₆: “Develop a hypothesised model for ERP benefits for SMEs”. Sub-section 2.7 provides a review of literature that identifies the dependent variable of “Value” based on the theory of RBV. An ERP system is viewed as an organisation-specific resource that is a source of competitive advantage,

through its use, by leveraging resource differences amongst competitors. The variables contributing benefits from the use of ERP are grounded in the DOI theory. In the context of DOI, ERP systems, are classified as intra-organisational innovations with a locus of IT impact within an organisation providing administrative innovations of information, knowledge sharing and decision-making support (Wu & Chiu, 2015). The DOI variables of “Ease of Use”, “Collaboration”, “Capabilities”, “Efficiencies” and “Analytics” were identified and the rationale for their inclusion is addressed with literature support in Sub-section 2.7, leading to the formulation of the hypotheses:

- **H₁** - Ease of Use is positively related to ERP value;
- **H₂** - Collaboration is positively related to ERP value;
- **H₃** - Capabilities are positively related to ERP value;
- **H₄** - Efficiencies are positively related to ERP value; and
- **H₅** - Analytics are positively related to ERP value.

Further, Davenport et al. (2002) found that companies utilising ERP in their first year report that they attain lower benefits than organisations utilising ERP for a longer period of time. The study found that organisations reported greater realisation of benefits as usage increased over the years. Ruivo et al., (2015) also suggested that perhaps the number of year’s usage influence perceived ERP value and further research should be done in this area, leading to the last variable for inclusion, ‘Maturity’, in the hypothesised model for ERP benefits to SMEs and the formulation of the hypothesis; H₇ - The length of use on an ERP system has a positive mediating role on the perception of ERP value and benefits attained. Lastly, Figure 2.7-3 presents the Hypothesised Model of ERP Benefits to SMEs.

5.2.7 Research Question RQ₇

The seventh research question was stated as “How can a detailed description of the research methodology be provided in order to understand and reproduce this treatise in future?” In order to address the research question, the research objective (**RO₇**) to identified and explained the research methodology used for this treatise enabling future reproducibility. Chapter 3 addresses and achieves

the research question and research objective through the definition of research and research methodology, Sub-section 3.2 defines the concept of research, explores its purpose and its context within business research. Research is understood as a systematic, process-based scientific enquiry, utilising tools, techniques and methods, pursuant with the purpose of finding answers or solutions to address a business problem for the reduction or risk to guide managerial decision-making.

Sub-section 3.3 explained the concepts of research design. Guided by the research design considerations and the factoring of the research aims, questions and objectives, this sub-section established this research's design as being positivistic, deductive, adopting a survey strategy, mono-method quantitative and cross-sectional in approach. Sub-section 3.4 reviewed the concept of sampling design. The sampling methods chosen for this study were identified as probability sampling as everyone within the population had an equal chance of responding. The population of interest was identified as South African SME companies using SYSPRO, an ERP provider. Geographic disbursement of these companies is located across South Africa and a representative sample of 107 organisations responded to the questionnaire.

Sub-section 3.5 reviewed and described the concept of sampling data collection. Considerations to questionnaire design were evaluated and questionnaire map was depicted and a questionnaire designed to minimise respondent bias and variable measurement error. Measuring instruments was discussed, independent, dependent and extraneous variables reviewed in terms of the literature support and transposed onto the questionnaire. Sub-section 3.6 discussed the relevance and concept of data analysis, validity, reliability and generalisability. The data was collected via the means of an online survey, delivered with the use of SurveyMonkey. Data analysis techniques used in this study were critically discussed in aligning to the purpose of this study in supporting, or not supporting, the hypothesised model by testing the relationships between variables captured via survey using statistical analysis.

The codifying process was generally discussed and the rationale behind the classification of industries in alignment to the NAICS system given.

Sub-section 3.7 considers the aspects of research ethics in considering the rights of the subjects being asked to participate. Appropriate actions as recommended in literature were adopted in providing a statement as to the study's purpose and the benefit that their participation will deliver. Additionally, subject anonymity was assured and the study has undergone a review by the ethics committee governing treatise research at the NMMU.

5.2.8 Research Questions RQ₈ and RQ₉

The eighth research question was stated as “What relationships between the independent and dependent variables of benefits can be verified through empirical evaluation of the hypothesised model for ERP benefits for SMEs?” In order to address the research question, the research objective (**RO₈**) empirically evaluated the hypothesised model for ERP benefits for SMEs in order to accept or reject the formulated hypotheses. The ninth research question was stated as “Which independent variables in the hypothesised model for ERP benefits for SMEs have a significant relationship to benefits realised from ERP by SMEs?” In order to address the research question, the research objective (**RQ₉**) established which identified variables in the hypothesised model are significantly related to benefits derived from ERP systems by SMEs. Chapter 4 empirically evaluated the variables of interest through univariate descriptive statistical analysis and quantitatively through multivariate data analysis. First, demographic data captured via this treatise was empirically evaluated through the means of illustrations and discussions using univariate analysis.

The demographic data were sectioned into organisational and personal biographic sections. 70% of the responses were from the manufacturing sector and organisations had been in operation for an average of 28 years with a median of 21 years. 43% of the organisations had between 100 and 249 fulltime employees, a classification of medium sized enterprises, while 55% are classified as small and micro sized organisations. Overall ERP had been in use in these organisations with a median of 11 years with an interquartile range of

12 years. The average length of years SYSPRO had been used was 10.86 years and 61% of the organisations had not used another ERP system prior to SYSPRO. Lastly, 61% of the organisations operate only from a single location 85% of all locations were recorded in the top four geographic provinces of Gauteng, Western Cape, Kwazulu Natal and the Eastern Cape.

The personal biographic data indicated that the majority of the respondents, 51%, had more than 10 years' experience in ERP systems, 73% had over 5 years' experience and only 9% had less than 2 years' experience in ERP. Specific experience in SYSPRO showed that 33% of the respondents had greater than 10 years' experience. 56% of the respondents had used other ERP systems besides SYSPRO. The responses on management designation revealed that 64% of the respondents were from senior management, an important consideration due to the nature of the questionnaire requiring perspectives as to the value and benefits delivered to the organisation through ERP adoption. The majority of respondents, 80%, reside in the office of finance or in operations. This is another important aspect as ERP systems are systems of record and control the transactional operations of an organisation. 65% of the respondents are male and 57% of the responses have attained an undergraduate or post-graduate qualification. This percentage is higher than the figure of 40% reported by Sbp (2013). Lastly, respondents were asked to rate their own computer proficiency and 41% rated themselves as being proficient with a further 37% rating themselves as advanced.

The univariate analysis and descriptive statistics on the independent variable "Ease of Use's" indicators revealed that over sixty percent of the respondents were comfortable using the system by agreeing or strongly agreeing to the measurement statements. ERP's intuitiveness recorded the highest mixed responses with forty percent finding it intuitive while thirty percent felt it was not intuitive. Over a third of the respondents had a neutral sentiment to whether they found it easy to get an ERP system to do what they needed it to do. Calisir and Calisir (2004) note that Ease of Use is an important consideration as users tend to rate ERP systems as less useful when they find them difficult to use.

The univariate analysis and descriptive statistics on the independent variable Collaboration's indicators, revealed that over seventy percent of the respondents believed that ERP promoted information flow amongst departments, improved collaboration amongst colleagues and improved collaboration with customers. Lower responses were recorded on collaboration improving with suppliers, recording under 50%. Ruivo et al. (2013) believe that Collaboration is an important aspect in ensuring the full potential of ERP is realised.

The univariate analysis and descriptive statistics on the independent variable Capabilities' indicators, revealed that over seventy percent of the respondents believed that ERP fulfils their individual operational needs, provides them with the capabilities to interconnect departments in executing value-chain activities, interconnects hierarchies within their organisations and that ERP handles local requirements. A lower response of 60% was recorded where respondents agreed or strongly agreed that ERP is able to adapt to their business needs. This is probably owing to the fact that ERP systems offer very diverse possibilities and results to companies having adopted them, even although the underlying ERP system could be provided from the same supplier owing to the configurable nature of the system (Uwizeyemungu & Raymond, 2012). But as noted by Uwizeyemungu and Raymond (2012), capabilities are crucial in determining the contribution of an ERP system to overall organisational performance.

The univariate analysis and descriptive statistics on the independent variable Efficiencies' indicators showed that over eighty percent of the respondents believed that ERP improves effectiveness through its handling of repetitive tasks and aids them in performing their functions effectively. Jutras (2010) believes that only once business processes have been standardised, can efficiencies be realised. However, standardisation may limit flexibility as is seen in the respondent's lower agreement of just over sixty percent that ERP adjusts tasks and actions to changing trading conditions. Further, research into efficiencies and ERP have reported mixed results noting some companies have

achieved operational efficiencies whilst others have not (Bradford & Florin, 2003; Nwankpa, 2015).

The univariate analysis and descriptive statistics on the independent variable Analytics' indicators reveal that overwhelmingly ERP provides real-time access to information and visibility across operations and departments and timeously on-demand. In contrast only 47.7% believed that ERP provides comprehensive reporting in the form of key performance indicators, management and operational reporting. Ruivo et al. (2015) are of the belief that analytics is the greatest differentiating factor to ERP value attainment.

The univariate analysis and descriptive statistics on the dependent variable Value's indicators reveal that over seventy percent of the respondents are of the belief that ERP provides management with the control they require to manage resources and that ERP adds to their organisation's ability to be more profitable and report an increase in their productivity. As per Hsu's (2013a) categorisation of business value derived from ERP, the respondents are of the belief that value indicators relating to operational aspects, management and productivity, are higher than financial aspects of profitability and intangible aspects of customer satisfaction.

Sub-section 4.4 addressed multivariate analysis and inferential statistics in achieving **RO₈** and **RO₉**. Data reliability and validity were established with both Cronbach Alpha and AVE methods. Multi-regression was utilised with PLS in establishing the significance and strength of the relationships amongst the variables. It was determined that the independent variables of Capabilities and Analytics are significantly related to ERP value to a 95% confidence level ($p < 0.05$) and the independent variable Ease of Use is significantly related to ERP value to a 90% confidence level ($p < 0.10$). Efficiencies and Collaboration are not significantly related to ERP Value. ANOVA was utilised to assess whether industry and maturity have a mediating role on the dependent variable of Value. No differences were noted amongst the categorical groups and therefore both Industry sector and Maturity hypothesis are rejected. The above findings on Efficiencies and Collaboration differ from the existing literature reviewed and

suggestions in the literature that industry and maturity have a mediating role on value have also been empirically established that they do not mediate value.

Table 4.4-5 provides a summary of the results of the hypothesis testing between the independent constructs, Ease of Use, Collaboration, Capabilities, Efficiencies and Analytics on the dependent construct of Value. Table 4.4-6 provides the results on the variable Industry's relationship with Value through the statistical test of ANOVA. Table 4.4-7 provides the results on the variable Maturity's relationship with Value through the statistical test of ANOVA. Both ANOVA results did not find a difference in means amongst the variable categories resulting in the rejection of hypotheses H₆ and H₇. In doing so, RO₈ empirically evaluate the hypothesised model of ERP benefits for SMEs in order to accept or reject the formulated hypotheses is addressed.

The results of the multivariate analysis using inferential statistical methods provided by PLS multiple regression and ANOVA, identified that Ease of Use is significantly related to Value ($p < 0.10$) and Capabilities and Analytics is significantly related to Value ($p < 0.05$), therefore establishing which identified variables in the hypothesised model are significantly related to benefits derived from ERP systems by SMEs and addressing RO₉.

5.2.9 Research Question RQ₁₀

The tenth research question was stated as "What is the significance of the difference in the relationship between the independent variables and the dependent variable in the hypothesised model for ERP benefits for SMEs?" In order to address the research question, the research objective (RO₁₀) established the significance of the difference in relationships of the independent variables to the dependent variable of value, in the hypothesised model.

Utilising PLS-SEM the model path coefficients was determined. It was identified that 68.9% of the variance of Value is explained by the independent variables of Ease of Use, Collaboration, Capabilities, Efficiencies and Analytics and that Capabilities and Analytics explain 53.8% of the variance in Analytics. ERP

Capabilities is the strongest predictor of ERP business value with 32.6%, followed by Analytics 21.2%, Ease of Use 17.8% and Efficiencies on 15.7%.

This is the first study conducted on SMEs using the SYSPRO ERP system and the first to be conducted in South Africa. A Comparative study on the variables of Collaboration and Analytics against Value, conducted on other commercial packages on SMEs noted differences in results across the systems (Ruivo et al., 2015). As per Ruivo et al. (2015) this was the first empirical study to assess ERP value across four commercial ERPs amongst European SMEs. In particular, Collaboration and Analytics is supported across all four packages, SAP All-in-One, Dynamics NAV, Oracle JDE and Sage X3. With SYSPRO, only Analytics is supported. In Ruivo et al.'s study (2015), other independent constructs not used in this treatise were not measured, so further comparisons are limited. However, Ruivo et al. (2015) conclude that the antecedents of ERP value differ across products.

Through the analysis of the path coefficients provided by PLS-SEM, this treatise is able to determine the relative strength and importance between the independent variables and the dependent variable, thereby addressing RO₁₀ – establishing the significance of the difference in relationships of the independent variables to the dependent variable of value, in the hypothesised model.

5.2.10 Main Research Question RQM

The main research question was “What are the key benefits that ERP systems provide for SMEs?” In order to address this research question the research objective (**RO_M**) “To propose a model for ERP benefits for SMEs” was formulated. A hypothesised model for ERP benefits for SMEs was developed through a review of literature. Variables of interest were identified and tested through statistical acceptance. The results thereof are depicted in Figure 5.2-1 on the Results of the Hypothesised Model for ERP Benefits for SMEs, achieving the main research objective and answering the main research question.

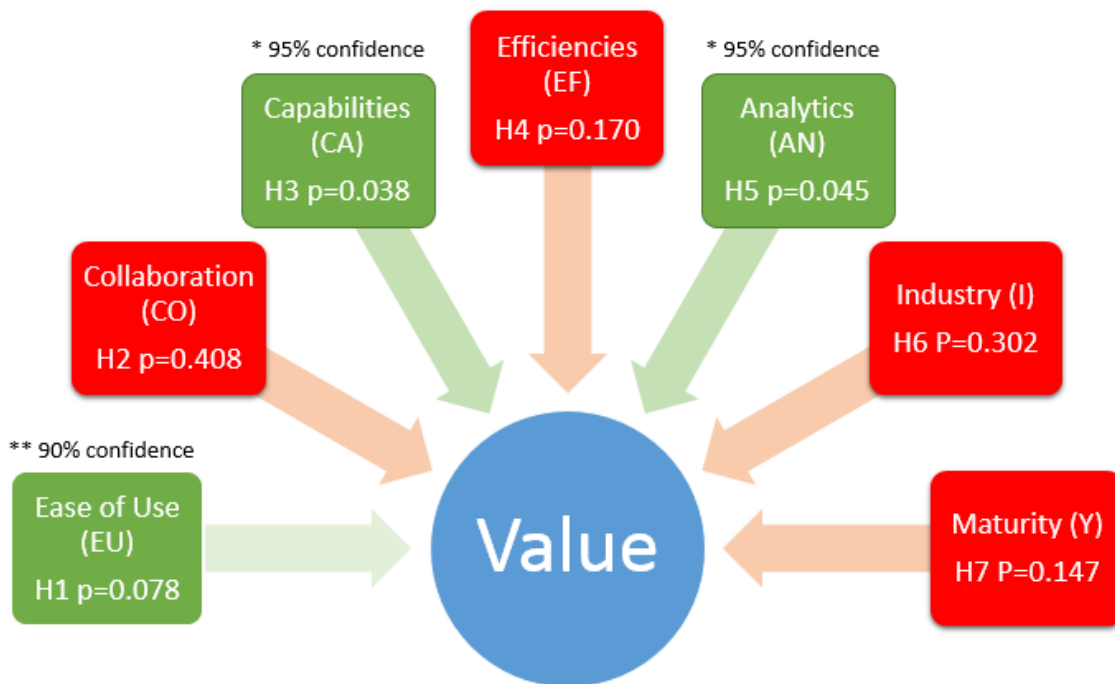


Figure 5.2-1 Results of the Hypothesised Model for ERP Benefits for SMEs

5.3 Summary of Contributions

This treatise makes the following contributions to the existing body of knowledge on the subject of ERP value and its antecedents:

- A new model for ERP benefits for SMEs has been developed, statistically confirmed and presented;
- This is the first ERP study examining ERP value for SMEs and benefits for the commercial ERP package SYSPRO;
- This is the first ERP study in regards to SMEs to be conducted in the developing country of South Africa;
- No relationships between ERP collaboration and ERP value were identified;
- ERP Capabilities is the strongest predictor of ERP value followed by Analytics with statistically significant relationships, while Ease of Use and Efficiencies have weaker relationships with ERP Value; and

- The developed model for ERP benefits for SMEs can be used by SMEs and ERP providers alike, to focus on the value-adding antecedent properties in maximising ERP Value to SMEs.

5.4 Managerial Recommendations

5.4.1 For Small to Medium Enterprises

This treatise proposes the following recommendations to SMEs due the established relationships between analytics, capabilities and ease of use benefits derived from ERP use that contribute to enhancing the value of the organisation due to ERP.

Firstly, this research shows that SMEs perceive analytics to be a valuable determinant of ERP business value contributing to the competitiveness of SMEs. The higher the focus on analytics, the greater is the enhancement to analytical-based decisions, aiding in a better decision-making process. In support of this recommendation, is the notion that analytics assists in organisations building organisation-specific capabilities, consistent with the theory of RBV where organisation-specific resources determine organisational performance (Ruivo et al., 2012a). In considering the ERP lifecycle (Esteves & Pastor, 1999), SMEs should dedicate a resources and focus across the ERP lifecycle to analytics, to enhance this particular aspect. This treatise supports the practical recommendations as defined by the Aberdeen Group's research on ERP in SMEs in which it states that SMEs continuously look to improve visibility into ERP data (Jutras, 2010).

Secondly, ERP capabilities are shown in this research to be perceived by SMEs as a significant antecedent to ERP value. According to Ruivo, et al. the ease by which organisations adapt their business needs and processes to the best-practices in-built into ERP systems, the greater the use and value is extracted from the ERP to the organisation (2014). However, the degree to which an organisation adapts to the in-built best practices is limited by the degree of functionality provided by a given ERP system; not all ERP systems are carved equally, as was found in the research by Ruivo et al. (2015).

Therefore, this treatise argues that SMEs should pay particular focus on the degree of operationalisation requirements that is capable of being adopted by the organisation as customisation of the ERP is costly. This is supported by Jutras, (2010) and; Uwizeyemungu and Raymond,(2012). Practically, SMEs should consider capability aspects during the ERP lifecycle phase and review capabilities on an on-going basis as business conditions change (Jutras, 2010).

Thirdly, this research shows that SMEs perceived ease of use to be an additional determinant of ERP value. The perception as to ease of use is measured by both perceived system complexity and perceived system execution ability. Organisation personnel utilising ERP must be comfortable utilising it. It improves their knowledge of the system, the business processes and improves their skills in manipulating the system in discovering effective ways to resolve problems (Ruivo et al., 2012a). SMEs should consider the inherent aspects of a given ERP system that support the adoption rate of their personnel to an ERP system. Practically, SMEs should assess the degree of system intuitiveness both during ERP selection and during the adoption lifecycle phases. Assess the user's comfort in using the system, the learnability aspects of the system and whether the ERP system is regarded as being easy to become skilful in its use and to get the system to do what the user's intended it to do. Improving on these aspects, improves on productivity and organisational performance as noted in Cooper and Zmud's research (1990).

5.4.2 For ERP Providers

Firstly, analytics has been found to be a significant antecedent to ERP business value for SMEs. This is both confirmed in this treatise and in previous research (Ruivo et al., 2012a; Ruivo et al., 2014; Ruivo et al., 2012b). Further, in examining the significance of analytics amongst different commercial ERP packages (Ruivo et al., 2015), this finding is consistent. SYSPRO as an ERP provider should consider analytics and the provision thereof, as central to its product offering and dedicate resources and focus in this area. ERP systems are essentially transaction-focused, but as Ruivo et al. (2015) note, SMEs using ERP analytics capabilities can easily and quickly use data for managerial

decision-making, through unique business insights. Therefore, SYSPRO should consider a product development strategy transition from a system-of-record to a system-of-insight.

Secondly, capabilities determine the degree to which functionality is provided by the ERP system to SMEs that they require in support of their value-chain operations. Capabilities is found in this treatise to be significantly related to ERP business value. SYSPRO as an ERP provider should consider enhancements to aspects of functionality requirements specific to SME requirements. This has the effect of increasing the adoption rate of the ERP system, realising benefits sooner and reducing customisation costs. Mukwasi and Seymour, (2014) in their research found that customisation and additional functionality requirements were major cost drivers to ERP projects in SMEs. Additionally, functionality compliance is seen as a factor that leads to an increase in users' intention to use an ERP system and leads to user satisfaction (Costa et al., 2016).

Thirdly, Ease of use was found in this treatise to be a significant antecedent to ERP business value. Calisir and Calisir (2004) found that perceived ease of use exerted an indirect effect on end-user satisfaction indicating that users tend to rate ERP systems as less useful if they find them difficult to use. Calisir and Calisir (2004), recommended that ERP providers focus attention on designing both useful and easy to use systems. This sentiment is further echoed in Gartner's recommendation to ERP leaders (Drobik & Rayner, 2015). In review of the individual indicators for the variable ease of use, SYSPRO customers perceived SYSPRO's intuitiveness and users getting the system to do what they needed it to do, as least favourable of the five indicators. SYSPRO should therefore consider these responses and allocate resources for the improvement of these aspects.

Fourthly, previous studies (Buonanno et al., 2005; Dwivedi et al., 2009; Eckartz et al., 2009; Marciniak et al., 2014; Ruivo et al., 2012a; Ruivo et al., 2014, 2015; Ruivo et al., 2012b; Uwizeyemungu & Raymond, 2012) confirm ERP's collaboration capabilities ability to create unique tactical and strategic opportunities amongst stakeholders, to increase ERP business value. This

treatise however rejected the relationship between collaboration and ERP business value which is probably explained by the population being limited to SYSPRO alone. As noted in Ruivo et al.'s (2015) research, different commercial ERP packages exert different relationships with ERP business value. SYSPRO should therefore consider this aspect and investigate the collaboration properties required by SMEs and garner an understanding as to the competitor's offerings, in order to institute a program to enhance its offering in this regard.

5.5 Opportunities for Further Research

This treatise provides a model for ERP benefits for SMEs. The population in this treatise is limited to SMEs in South and using SYSPRO only. The model explains 68.8% of the variance of business value through ERP. Some research opportunities to further the model are outlined below:

- Future research can be performed on the model through the extension of other commercial ERP packages in South Africa to establish comparability and the identification of differences;
- Future research to confirm this research which was explorative in nature, in order to further test the hypothesised model for ERP benefits for SMEs;
- Further research could focus on whether the same results are attained using SYSPRO across different countries;
- Further research could be conducted to identify the aspects as to why collaboration did not relate ERP business value with SYSPRO;
- Further research can be conducted to identify why no significant differences were found amongst different industries which the literature suggested there might be;
- Further research can be conducted to identify as to why no significant differences were found between the length an ERP system had been used for and ERP business value which the literature suggested there might be;

- Further research could be conducted in an attempt to understand the other factors, (31.2%), that explain the variance of ERP business value; and
- Finally, as noted by Calisir and Calisir (2004), it is essential to conduct a longitudinal study to confirm linkages among the study variables, a further opportunity for future research.

5.6 Limitations of the Study

The following have been identified as limitations in this treatise:

- The respondents are limited to SYSPRO ERP customers only. If the study were to be conducted with a different commercial ERP package, the results could differ;
- The sample was limited to SYSPRO customers in South Africa only. If the study were to be conducted in different countries, the results could differ;
- The field of ERP is constantly evolving as ERP providers seek new methods to serve the evolving market. Variables and measuring instruments included in this study may not accurately reflect the dynamic nature of changing SME consumer preferences;
- The review of literature identified many models based on different theories. The variables of ease of use, capabilities, collaboration, efficiencies, analytics, industry and maturity were the only variables included in this treatise. Many more variables were identified through the review of literature that share a relationship with ERP business value; and
- Quantitative techniques were limited to descriptive and inferential statistics using PLS and ANOVA only.

5.7 Chapter Summary

This treatise proposed a model for ERP benefits for SMEs, stated as the main research objective. To achieve this, the main research question stated “What are the key benefits that ERP systems provide to SMEs” required to be

answered. Further research questions and objectives were formulated to address the main research question.

The objectives to achieve this included:

- **RO₁**: Defining SME's classifications in South Africa;
- **RO₂**: Identifying the importance and contribution of SMEs to the economy;
- **RO₃**: Identifying the current trends in ERP evolution;
- **RO₄**: Identifying SME industry sectors that use ERP;
- **RO₅**: Identifying existing ERP SME benefit models;
- **RO₆**: Developing a hypothesised model for ERP benefits for SMEs;
- **RO₇**: Identifying and explaining the research methodology used for this treatise, enabling future reproducibility;
- **RO₈**: Empirically evaluating the hypothesised model of ERP benefits for SMEs in order to accept or reject the formulated hypotheses;
- **RO₉**: Establishing which identified variables in the hypothesised model are significantly related to benefits derived from ERP systems by SMEs;
- **RO₁₀**: Establishing the significance of the difference in relationships of the independent variables to the dependent variable of value, in the hypothesised model.

Through the achievement of the objectives covered in this treatise, the key benefits that ERP systems provide SMEs are noted as analytics, capabilities and ease of use, thereby answering the main research question. Together analytics and capabilities explain 53.8% of the variance in ERP business value. No statistical relationship was found for efficiencies, collaboration, industry or maturity. Therefore the suggestion by Calisir and Calisir (2004) that differences were probable across different industries cannot be supported.

The problem statement in this treatise was stated as "*SMEs do not understand the benefits derived from the adoption of an ERP system*". Esteves (2009) notes this problem as an on-going issue for SMEs as they lack the low-level awareness of the benefits ERP systems can provide them. This is further

supported by Ruivo et al. (2014) who states SMEs require a better understanding of how to extract value from technology adoption in order to remain competitive. A proposed model for ERP benefits for SMEs, as developed by this treatise, addresses this problem and is presented in Figure 5.7-1.

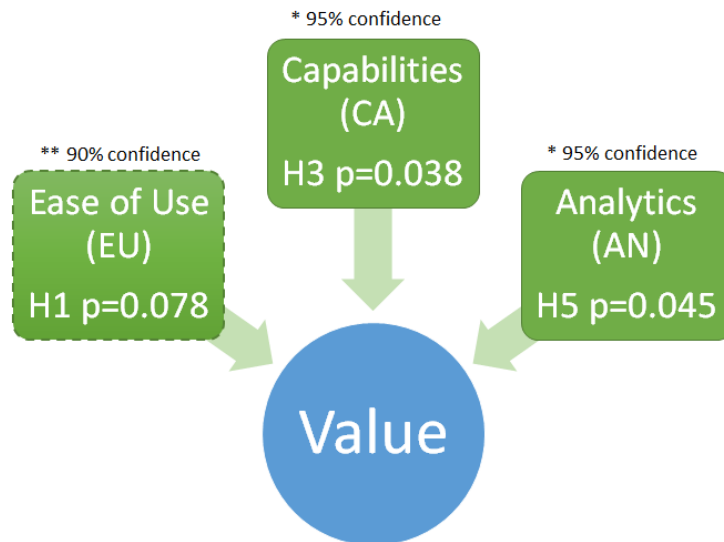


Figure 5.7-1 A Model for ERP Benefits for SMEs

In concluding this treatise, recommendations were made as to how this model could be improved upon, opportunities for further research were offered, limitations of this treatise were identified and managerial recommendations based on the findings of this treatise were made.

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APPENDIX A: QUESTIONNAIRE

Company Biography

Please indicate the industry you are in by marking an industry block with an 'X'. The industries are grouped into sectors. If you cannot locate the industry within your sector, please specify the industry you are in by completing the 'Other' within the sector. If the industry sector you are in is not specified, please specify the industry you are in in the 'Other Sector' section.

Nature of Industry:

Extractive (IE)

Agriculture	IE1
Forestry	IE2
Fishing & Hunting	IE3
Mining	IE4
Quarrying	IE5
Oil and Gas	IE6
Other Extractive (specify): IEO _____	IE7

Utilities (IU)

Electricity	IU1
Gas	IU2
Water	IU3
Sewage	IU4
Other Utilities (specify): IUO _____	IU5

Construction (IC)

Buildings	IC1
Civil Engineering	IC2
Trade Contractors	IC3
Other Construction (specify): ICO _____	IC4

Manufacturing (IM)

Food	IM1
Beverage	IM2
Textile	IM3
Wood products	IM4
Paper	IM5
Printing	IM6
Petroleum and Coal	IM7
Chemical	IM8
Plastics and Rubber Products	IM9
Leather and Allied products	IM10
Primary Metal Products	IM11
Fabricated Metal Products	IM12

Retail Trade (IR)

Motor Vehicles and Parts	IR1
Furniture and Home Furnishings	IR2
Electronics and Appliances	IR3
Building Material, Garden Equipment and Supplies	IR4
Food and Beverage	IR5
Health and Personal Care	IR6
Gasoline Stations	IR7
Clothing and Accessories	IR8
Sporting Goods, Hobbies, Books and Music	IR9
General Merchandise	IR10
Miscellaneous	IR11
Other Retail (specify): IRO _____	IR12

Transportation and Warehousing (IT)

Freight Transportation	IT1
Passenger Transportation	IT2
Scenic and Sightseeing Transportation	IT3
Couriers and Messengers	IT4
Warehousing and Storage	IT5
3rd Party Logistics Services	IT6
Other Transportation or Warehousing (specify): ITO _____	IT7

Information and Cultural (II)

Publishing Industries	II1
Motion Picture and Sound Recording	II2
Broadcasting	II3
Telecommunications	II4
Data Processing, hosting and related services	II5
Other Information and Cultural (specify): IIO _____	II6

Services (IS)

Professional, Scientific and Technical	IS1
Finance and Insurance	IS2
Real Estate and Rental Leasing	IS3

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Machinery	IM13	Companies Management	IS4
Computer and Electronic Products	IM14	Administrative and Support	IS5
Electrical equipment, appliance and Components	IM15	Waste Management and Remediation	IS6
Furniture and Related Products	IM16	Educational	IS7
Non-metallic Mineral Products	IM17	Health Care	IS8
Other Manufacturing (specify) :IMO____	IM18	Social Assistance	IS9
Wholesale Trade: (IW)		Performing Arts, sports and related industries	IS10
Farm produce	IW1	Heritage and Museum	IS11
Petroleum and petroleum products	IW2	Amusement, gambling and recreational	IS12
Food, Beverage and tobacco	IW3	Accommodation	IS13
Personal and household	IW4	Food and drinking establishments	IS14
Motor Vehicle, parts and accessories	IW5	Repair and maintenance	IS15
Building material and supplies	IW6	Personal and Laundry	IS16
Machinery, equipment and supplies	IW7	Religious & Civic	IS17
Other Wholesale (specify): IW9_____	IW8	Governmental	IS18
Other Sector: (IO)		Other Services (specify) ISO _____	IS19
Industry (specify): IOO_____	IO1		

Company Details

Company Name	C1				
How many years has your company been trading?	C2				
How many fulltime employees does your company have?	1-19 C3E1	20-49 C3E2	50-99 C3E3	100-249 C3E4	249+ C3E5
How many years has an ERP system been used in your company?	C4				
How many years has your company used SYSPRO?	C5				
Was any ERP system used before SYSPRO?	Yes C6P1		No C6P2		
▪ If 'Yes' please indicate which one	C6P3				

Geographic Area Please select which geographic areas you have offices in	C7G1	Eastern Cape	C7G6	Mpumalanga
	C7G2	Free State	C7G7	Northern Cape
	C7G3	Gauteng	C7G8	North West Province
	C7G4	Kwazulu Natal	C7G9	Western Cape
	C7G5	Limpopo		

Personal Biography

Personal Details

How many years have you used an ERP system?	< 2 P1E1	2-5 P1E2	6-10 P1E3	>10 P1E4
How many years have you used SYSPRO?	< 2 P2S1	2-5 P2S2	6-10 P2S3	>10 P2S4
Have you used any other ERP systems?	Yes P3O1		No P3O2	
<ul style="list-style-type: none"> If 'Yes' Please indicate which ones 	P3O3			

What is your management designation?	Owner / CEO P4M1	Executive P4M2	Senior Manager P4M3	Manager P4M4	Supervisor P4M5
Which department do you primarily function in?	Office of Finance P5D1	Operations P5D2	Logistics P5D3	Marketing and Sales P5D4	Human Resources P5D5

Please indicate your gender?		Male P6G1	Female P6G2	
What is the highest qualification you have Attained?	Secondary P6Q1	Certificate / Diploma P6Q2	Bachelors P6Q3	Post- Graduate P6Q4
How would you describe your computer proficiency?	Basic P7P1	Intermediate P7P2	Proficient P7P3	Advanced P7P4

ERP Benefits

ERP's Ease of Use

Please indicate the extent which you agree with the following statements on ERP's Ease of Use by circling a single option:	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
[EU1] The ERP users find the system easy to learn	1	2	3	4	5
[EU2] The ERP users find the system intuitive	1	2	3	4	5
[EU3] The ERP users are comfortable using the system	1	2	3	4	5
[EU4] The ERP users find it easy to get the system to do what they wish it to do	1	2	3	4	5
[EU5] The ERP users easily become skilful at using the system	1	2	3	4	5

ERP's Collaboration Ability

Please indicate the extent to you which you agree with the following statements **on ERP's Collaboration Ability** by circling a single option:

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
[CO1] ERP improves collaboration amongst colleagues	1	2	3	4	5
[CO2] ERP improves user's collaboration with the system	1	2	3	4	5
[CO3] ERP's collaboration improves my communication with suppliers	1	2	3	4	5
[CO4] ERP's collaboration improves my communication with customers	1	2	3	4	5
[CO5] ERP collaboration improves my ability to transact electronically amongst members in my supply-chain	1	2	3	4	5
[CO6] ERP promotes information flow amongst departments	1	2	3	4	5

ERP's Capabilities

Please indicate the extent to you which you agree with the following statements **on ERP's Capabilities** by circling a single option:

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
[CA1] ERP is able to adapt to my business needs	1	2	3	4	5
[CA2] ERP provides me with the capability to handle local requirements	1	2	3	4	5
[CA3] ERP provides me with the interconnectivity between hierarchies in my organisation	1	2	3	4	5
[CA4] ERP provides the capabilities to interconnect departments in my organisation	1	2	3	4	5
[CA5] ERP fulfils individual operational needs	1	2	3	4	5

ERP's Efficiencies

Please indicate the extent to you which you agree with the following statements **on ERP's Efficiencies** by circling a single option:

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
[EF1] ERP improves the effectiveness in executing repetitive tasks	1	2	3	4	5
[EF2] ERP provides an user interface that improves effective system use	1	2	3	4	5
[EF3] ERP aids me in performing operational functions effectively	1	2	3	4	5
[EF4] ERP adjusts tasks and actions to trading conditions, improving efficiencies	1	2	3	4	5
[EF5] ERP contributes to reduction in operational delays	1	2	3	4	5

ERP's Analytics and Information Delivery					
Please indicate the extent to you which you agree with the following statements on ERP's Analytics and Information Delivery by circling a single option:	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
[AN1] ERP provides comprehensive reporting (KPIs, dashboards, management reports, operational reports etc.)	1	2	3	4	5
[AN2] ERP provides real-time access to information	1	2	3	4	5
[AN3] ERP provides data visibility across departments and operations	1	2	3	4	5
[AN4] ERP provides me with the capabilities to tailor my information requirements	1	2	3	4	5
[AN5] ERP provides information timeously and on-demand	1	2	3	4	5

ERP's Ability to add Value to your Organisation					
Please indicate the extent to you which you agree with the following statements on ERP's Ability to add Value to your Organisation by circling a single option:	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
[EV1] ERP adds to my organisation's ability to be more profitable	1	2	3	4	5
[EV2] ERP assists in increasing market share	1	2	3	4	5
[EV3] ERP increases individual's productivity	1	2	3	4	5
[EV4] ERP provides tools to my organisation resulting in improved customer satisfaction	1	2	3	4	5
[EV5] ERP provides management with the control they need to manage	1	2	3	4	5

Thank you for completing the survey.

APPENDIX B: ETHICS CLEARANCE



FORM E

ETHICS CLEARANCE FOR TREATISES/DISSERTATIONS/THESES

Please type or complete in black ink

FACULTY: Business & Economics Science

SCHOOL/DEPARTMENT: Business School

I, (surname and initials of supervisor) **Professor Margaret Cullen**

the supervisor for (surname and initials of candidate) **de Matos, P.S.D.S.**

(student number) **214 258 513**

a candidate for the degree of **Masters in Business Administration**

with a treatise/dissertation/thesis entitled (full title of treatise/dissertation/thesis):

A MODEL FOR ERP BENEFITS FOR SMEs


considered the following ethics criteria (*please tick the appropriate block*):

	YES	NO
1. Is there any risk of harm, embarrassment of offence, however slight or temporary, to the participant, third parties or to the communities at large?		√
2. Is the study based on a research population defined as 'vulnerable' in terms of age, physical characteristics and/or disease status?		√
2.1 Are subjects/participants/respondents of your study:		
(a) Children under the age of 18?		√
(b) NMMU staff?		√
(c) NMMU students?		√
(d) The elderly/persons over the age of 60?		√
(e) A sample from an institution (e.g. hospital/school)?		√
(f) Handicapped (e.g. mentally or physically)?		√
3. Does the data that will be collected require consent of an institutional authority for this study? (An institutional authority refers to an organisation that is established by government to protect vulnerable		√

people)		
3.1 Are you intending to access participant data from an existing, stored repository (e.g. school, institutional or university records)?		√
4. Will the participant's privacy, anonymity or confidentiality be compromised?		√
4.1 Are you administering a questionnaire/survey that:		
(a) Collects sensitive/identifiable data from participants?		√
(b) Does not guarantee the anonymity of the participant?		√
(c) Does not guarantee the confidentiality of the participant and the data?		√
(d) Will offer an incentive to respondents to participate, i.e. a lucky draw or any other prize?		√
(e) Will create doubt whether sample control measures are in place?		√
(f) Will be distributed electronically via email (and requesting an email response)?		
Note:		
• If your questionnaire DOES NOT request respondents' identification, is distributed electronically and you request respondents to return it <i>manually</i> (print out and deliver/mail); AND respondent anonymity can be guaranteed, your answer will be NO.		
• If your questionnaire DOES NOT request respondents' identification, is <i>distributed via an email link and works through a web response system (e.g. the university survey system)</i> ; AND respondent anonymity can be guaranteed, your answer will be NO.		

Please note that if ANY of the questions above have been answered in the affirmative (YES) the student will need to complete the full ethics clearance form (REC-H application) and submit it with the relevant documentation to the Faculty RECH (Ethics) representative.

and hereby certify that the student has given his/her research ethical consideration and full ethics approval is not required.



 SUPERVISOR(S)

11/10/16


 DATE



 HEAD OF DEPARTMENT

11/10/2016

 DATE



 STUDENT(S)

24/07/2016

 DATE

Please ensure that the research methodology section from the proposal is attached to this form.

Please note that by following this Proforma ethics route, the study will NOT be allocated an ethics clearance number.

APPENDIX C: TURNITIN REPORT

Document Viewer

Turnitin Originality Report

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<1% match (publications) Industrial Management & Data Systems, Volume 112, Issue 7 (2012-08-18)
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<1% match (Internet from 15-Dec-2013) http://uir.unisa.ac.za
<1% match (Internet from 17-Jan-2014) http://www.sbp.org.za
<1% match (Internet from 30-Jul-2012) http://shamim.szabist-isb.edu.pk
<1% match (publications) Calisir, F.. "The relation of interface usability characteristics, perceived usefulness, and perceived ease of use to end-user satisfaction with enterprise resource planning (ERP) systems", Computers in Human Behavior, 200407
<1% match (publications) Oh, K.-Y.. "The adoption of e-trade innovations by Korean small and medium sized firms", Technovation, 200902
<1% match (publications) Journal of Enterprise Information Management, Volume 20, Issue 4 (2007-10-21)
<1% match (student papers from 23-Apr-2014) Submitted to Buckinghamshire Chilterns University College on 2014-04-23
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<1% match (publications) Amaro, Suzanne, and Paulo Duarte. "An integrative model of consumers' intentions to purchase travel online", Tourism Management, 2015.

APPENDIX D: QUESTIONNAIRE INTRODUCTORY LETTER

Dear SYSPRO user,

My name is Paulo de Matos and I am completing a research study through the Nelson Mandela Metropolitan University (NMMU) in partial requirement in concluding a Master's in Business Administration (MBA).

You are invited to participate in a research study relating to benefits derived from ERP use. This study will require you to complete the questionnaire with regards to your personal perceptions of benefits gained or realised through the use of your current ERP system. Your participation is entirely voluntary and your responses will be anonymous and never linked to you personally.

The questionnaire should take no more than 10 minutes to complete and there will be no additional cost in time or participation requirement. It is requested for this study if you are able to complete this questionnaire within the next two weeks. The data collected will be analysed and assist the researcher in proposing a Model for ERP Benefits for SMEs. Your input will assist in providing suggestions for focal areas to improve benefits derived from your ERP system. If you so wish, the results of this study will be made available to you on request.

Should you have any queries in this regards, you may contact this research supervisor, Professor Margaret Cullen of the NMMU Business School, via email correspondence on Margaret.cullen@nmmu.ac.za.

I thank you for taking the time to participate and for completing the survey and request that you forward this questionnaire to any other person within your organisation in a management capacity that utilises SYSPRO.

The questionnaire is online at the following web address: <https://www.surveymonkey.com/r/6LQTTQB>

Kind Regards,

Paulo de Matos

Chief Product Officer | SYSPRO - Corporate

Phone: +27 (0) 21 552 2220 | Fax: +27 (0) 21 552 2506

Paulo.DeMatos@syspro.com

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