UNIVERSITY OF KWAZULU-NATAL

# An Investigation of Problem Factors in ERP Selection in KwaZulu-Natal Organizations

By

QING YU

Student Number: 205504846

A dissertation submitted in partial fulfilment of the requirements for the

degree of

MASTER OF BUSINESS ADMINISTRATION

Graduate School of Business

Supervisor: Professor Manoj Maharaj (School of IS&T)

July, 2007

# DECLARATION

This research has not previously been accepted for any degree and is not currently being considered for any other degree at any other university. I declare that this dissertation contains my own work, except where specifically acknowledged.

Qing Yu

Student Number: 205504846

Signed...............................................

Date.............04/03/2008.............

# ACKNOWLEDGEMENTS

No undertaking of a project as intense as this study is possible without the contribution of many people. It is not possible to single out all those who offered support and encouragement during what, at times, seemed a 'never ending journey'. However, there are individuals without whom this project would not have been completed and to them go my special thanks and acknowledgement of their contribution:

- To my supervisor, Professor Manoj Maharaj, for his patience, confidence, leadership, valuable advice and, most importantly, for believing in me.

- To my parents and my brother for their support and perseverance. Without their unconditional support, this study would have not been completed.

- And finally, to the lecturers and staffs at the Graduate School of Business, University of KwaZulu-Natal, for their dedication and encouragement and for regularly reminding me to carry on and complete the tasks.

Qing Yu
Graduate School of Business @ University of KwaZulu-Natal

# ABSTRACT

The aim of this study was to investigate the current ERP selection processes that are used by KwaZulu-Natal organizations, in order to determine what problem factors were evidenced during the selection process.

In order to obtain a KwaZulu-Natal organizations' perspective of the ERP selection process, two stages were used to gather survey data. The first stage consisted of an electronic mail and fax survey; the second stage was a door to door survey done in business parks and industrial parks/zones in the Greater Durban region – this was for purposes of remedying the low · response rate obtain during the first stage.

Sixty-three respondents from a wide range of industrial sectors in KwaZulu-Natal responded to the research questionnaire. In terms of response information:

- more than 55% of respondents had recently acquired an ERP solution and their ERP systems were fully integrated
- 12.7% of respondents had bought ERP software, but it was not fully implemented
- 6.3% of respondents were at the ERP selection stage, they were without an ERP system but had already commenced the selection process
- 23.8% of respondents did not have ERP nor did they intend to obtain ERP in the future
- 1.6% of respondents did not have ERP but indicated that they may have such a system in the future.

Respondents were randomly chosen from medium sized and large sized organizations in KwaZulu-Natal. They are determined as large in turnover, total asset and number of employees by South African standards and are

mostly hierarchical and centralized organisations with a divisional/functional structure.

The study revealed that although ERP selection was considered to be making a significant contribution to organizations' IT/IS strategy, the ERP selection process was not paid enough attention in practice in KwaZulu-Natal organizations due to a number of obstacles deduced from this study. Therefore, this study can be of benefit to organizations in identifying these obstacles and in recommending strategies that could be employed to overcome them.

Qing Yu
Graduate School of Business @ University of KwaZulu-Natal

# TABLE OF CONTENTS

Qing Yu
Graduate School of Business @, University of KwaZulu-Natal

Qing Yu
Graduate School of Business @ University of KwaZulu-Natal

# LIST OF FIGURES AND TABLES

x

# ABBREVIATIONS

AHP – Analytic Hierarchy Process

ASP – Advanced Scheduling and Planning

BSC – Balanced Scorecard

CRM – Customer Relationship Management

DCF – Discounted Cash Flow

ERP – Enterprise Resource Planning

GSB – Graduate School of Business

HRM – Human Resource Management

IRR – Internal Rate of Return

IS – Information System

IS&T – Information Systems and Technology

IT – Information Technology

JSE – Johannesburg Securities Exchange

KZN – KwaZulu-Natal

MBA – Master in Business Administration

MCDM – Multi-Criteria Decision-Making

MIS – Management Information System

MRP – Material Requirement Planning

MRP II – Manufacturing Resource Planning

NPV – Net Present Value

ROI – Return on Investment

SA – South Africa

SCM – Supply Chain Management

SME – Small and Medium Enterprise

SPSS – Statistical Program for Social Research

SRM – Supplier Relationship Management

UKZN – University of KwaZulu-Natal

# CHAPTER ONE
# INTRODUCTION AND ORIENTATION

---

## 1.1 INTRODUCTION

The strategic and operational importance of *management information systems* (MIS) in business is no longer questioned. Today, most organizations in all sectors of industry, commerce and government are fundamentally dependent on their *information systems* (IS). *Information technology* (IT) has become significantly important in all types of business. With the emergence of the Internet, the use of IT/IS has become an accepted, and moreover an expected, way of conducting business. Consequently, organizations are looking more and more to additional applications provided by IT/IS. This is not only to underpin existing business operations, but also to create new opportunities that will provide a new source of competitive advantage. Nowadays, organizations worldwide who are intent on transforming themselves into global business competitors consider doing so by making major investments in MIS and other IT/IS initiatives.

In order to revamp and improve vital business processes in the entire enterprise, companies started to use IT in the early 1990s, developing a more integrated and enterprise-wide MIS that crossed the boundaries of traditional business in areas such as product design, information warehousing, material planning, capacity planning, communication systems, human resources, finance and project management (Umble, 2003). These organizations viewed cross-functional MIS as a strategic way to use IT to share *information resources and improve the efficiency and effectiveness of* business processes as a whole. These integrated cross-functional enterprise MIS are commonly known as *enterprise resource planning* (ERP) systems.

O'Brien (2005) defined ERP as a kind of business technology solution that is 'driven by an integrated suite of software modules that supports the basic

internal business processes of a company'. ERP has evolved substantially in recent years: whilst the basic concept has stayed the same, the technicalities and design have improved to ensure suitability not only for internal company use, but extending the ability for use beyond the boundary of an enterprise. This has been achieved through the birth of internet-enabled ERP systems, which allows companies to extend their business applications to external suppliers and to customers. These types of Internet-enabled ERP systems are referred to as extended ERP, or ERP II systems.

There has been an increase in the number of companies that have adopted ERP systems worldwide. According to a study conducted by Verville and Halingten (2003), from the early to mid 1990s until 2001, the ERP software market was one of the fastest growing segments within the IT discipline. These researchers estimated that growth rates were 30% to 40% per year worldwide. Having estimated that worldwide sales of ERP software would exceed US$22 billion by the year 2001, the researchers further surmised that by the year 2002, packaged ERP software would represent a significant portion of most IT portfolios. Due to the high cost of ERP systems (often running into millions of dollars) capital budgets of organizations contain significantly funding allocations for ERP packaged software. As there is very little literature available on more recent ERP market related studies, one can only assume that the ERP market in *South Africa* (SA) has followed the same trend as that revealed by the research of Verville and Halingten (2003).

It could be concluded, therefore, that 'the management of investment in the capabilities of IT networks, people, data and software may be one of the most important decisions taken by senior management regarding expenditure' (Irani, 2002). ERP expenditure already represents a significant portion of ongoing capital expenditure for many organizations and this will more than likely continue to increase. In light of this, there is a strong need for business managers and professionals to be fully aware of what

Qing Yu
Graduate School of Business @ University of KwaZulu-Natal

expenditure is going towards ERP, and more importantly, what processes the organization has gone through, or is about to go through, to select an adequate ERP system. Indeed, what are the selection processes that organizations use and what are the characteristics of those processes?

The aim of this research, therefore, is firstly to investigate the current ERP selection processes that are used by *KwaZulu-Natal* (KZN) organizations. Secondly, to attempt to determine what problem factors these organizations encountered during the selection process. In making organisations aware of the selection process and the problems associated with the process this research also aims to make organisations more aware of suitable criteria and techniques that could be used within their own organizations to select and control their ERP software more efficiently and effectively. In doing so, this study anticipates that it will provide support for a more learned approach to the acquisition of ERP systems in KZN. In terms of applicability beyond KZN, this researcher considers that whilst the study focused on a very small, confined geographical region (being the KZN province of SA) it may be that certain information revealed by the study would be applicable to organisation based in other areas of the country and indeed around the world. These would perhaps be the 'human' issues that could be expected to evidence in any given group of employees in similar organisations anywhere in the world. Obviously applicability would, conversely, be limited in terms of certain other respects and one aspect that immediately springs to mind is the issue relating to head offices and satellite or branch offices. A natural assumption could perhaps be that influences would vary at head office and at branch office level and that there would also be differences in terms of influence.

The problem that this research attempts to answer is addressed in this first chapter. The objective and the critical research questions are clearly defined and presented in the following paragraphs. The chapter also includes a brief overview of each subsequent chapter contained in this dissertation.

3

## 1.2 BACKGROUND AND CONTEXT

### 1.2.1 Why ERP?

'Companies today face the challenge of increasing competition, expanding markets and rising customer expectations. This increases the pressure on business management to lower total operational costs in the entire supply chain, shorten throughput times, drastically minimize inventories, expand product range, provide more reliable delivery and better customer service, improve product or service quality, and efficiently coordinate global demand, supply and production' (Umble, 2003)..

With worldwide globalization a reality it is imperative that managers improve overall business practices and procedures in order to remain competitive. Organisations are also subject to the growing expectation from customers, suppliers and other relevant parties that a company must share relevant information with them. Similarly, within the internal workings of the company, there is now a growing need to upgrade the capability of the company to receive and deliver accurate information between different functional departments on time. In order to accomplish these goals, companies are beginning to recognise the need to adopt an ERP system.

Holsapple and Sena (2005) believed that the focus of ERP systems and their use thereof should not only be one dimensional, but that they should rather include both the improvement of transaction handling through the standardization of business processes and integration of operation and data, as well as the need to support sound and timely decision making. Providing more detail, Holsapple and Sena (2005) cited Lonzinsky's (1998) work, listing seven general objectives that companies seek to accomplish by installing ERP:

1. Drastically reduce the size and cost of a company's information sector;

2. Decentralize information processing by making data available in real time without dependence on the MIS department;

3. Provide technology tools that permit simplification of accounting, finance and administrative functions, as well as the generation of management reports to maintain processes of control and business management;

4. Create a base to support growth with reduced proportional internal support costs;

5. Achieve a better balance between decentralization and control of functions to avoid duplication, ensure synergy, and management performance indicators;

6. Electronically exchange information and orders with major clients to decrease costs;

7. Employ new technologies to keep pace with or surpass competitors.

Umble (2003) furthermore observed two major advantages in having an integrated MIS, or ERP. The first being that although it increases the requirement and extent of company interdepartmental cooperation and coordination by increasing information flows and transactions, it allows an all-encompassing view to all functions within and between all departments of the enterprise. In doing so, it allows the company to achieve the objectives of increased communication and responsiveness to all stakeholders. The second is that in an integrated MIS, or ERP, the database has all the business transactions entered, recorded, processed, monitored and reported. These two influential benefits, which do not exist in a non-integrated MIS, strongly support the adoption of ERP systems.

Having defined some of the advantages of ERP, there is no doubt that there are advantages for companies that opt to adopt ERP. However, in order to be fully aware of the business impact of ERP, it is necessary to begin with the brief history of ERP.

5

## 1.2.2 Brief History of ERP

According to Umble (2003), having begun in the early 1960s, the development of ERP has so far spanned the course of more than forty years. The following brief history of ERP is primarily based on the study conducted by Umble (2003).

The idea of ERP was born in the early 1960s as a direct result of the need for companies to keep a 'just-in-case' inventory in order to control actual as well as assumed inventory levels. This task was necessary to fully satisfy customer demand as well as the need to stay competitive at the same time. With the aim of helping companies control their inventory more successfully, several packaged software solutions were invented and designed at that time. The software that was developed was based on traditional inventory concepts of the day.

During the 1970s, the need for inventory control increased. In order to maintain levels of competitiveness, companies needed to minimize their total production costs as much as possible by keeping inventory levels as low as possible. This thought naturally led to the introduction of *material requirement planning* (MRP) systems. 'MRP represented a huge step forward in the materials planning process. For the first time, using a master production schedule, supported by the bill of material files that identified the specific materials needed to produce each finished item, a computer could be used to calculate gross material requirements' (Umble, 2003).

Soon after the introduction of MRP in the manufacturing industry, additional functions - such as sales or production operations, which included production planning, master production scheduling, and capacity requirement planning - were included in the basic MRP systems. Scheduling techniques for the factory floor and supply scheduling were also incorporated. As the MRP systems included more functions and became more useful and powerful, managers began to consider MRP systems as

6

important company-wide systems. These developments resulted in the next evolutionary stage that became known as closed-loop MRP.

In the 1980s, the expansion of the MRP system to include other portions of productive systems was a natural development and to be expected. One of the first modules to be included was the purchasing function. At the same time, there was a more detailed inclusion of the production system itself – on the shop floor, in dispatching and in the detailed scheduling control. MRP had already included work centre capacity limitations, so it was no longer adequate to describe the expanded system. 'Empowered by the new affordability of available technology and coupled with the movement of inventory with the coincident financial activity, *manufacturing resource planning* (MRP II) evolved to incorporate the financial accounting system and the financial management system along with the manufacturing and materials management systems. This allowed companies to have a more integrated business system that derived the material and capacity requirement associated with a desired operations plan, allowed input regarding detailed activities and translated all this to financial statement' (Umble, 2003).

By the early 1990s, continued improvements in technology allowed MRP II to expand to include all resource planning for the entire enterprise. Functions such as manufacture, financial accounting, financial management, *supply chain management* (SCM), *human resource management* (HRM), purchasing, marketing, product design and life cycle management, could now all be included in the plan. The term, ERP, was coined during that period to refer to the comprehensive systems and to distinguish between the MRP systems.

The section above briefly shows how ERP systems evolved in the late 20th century. Their emergence, expansion and recent development and changes can be aligned with the information revolution. Companies are now using

7

and taking advantage of ERP systems. Special attention should be paid to the fact that even today ERP systems are dynamic, still growing and transforming: they are not static systems that cannot be changed. Instead, their evolution over the last three decades indicates that future evolution and development of ERP systems can still be expected for some time.

The next section of this chapter will reveal the future trends that may be expected with ERP systems.

### 1.2.3 Current Trends for ERP

Whilst erstwhile ERP systems are used to integrate and optimize an organization's internal manufacturing, financial, distribution, and human resource functions, the improved ERP system, commonly known as ERP II, addresses the integration of business processes that extend across an enterprise and its trading partners. ERP II thus forms the basis of Internet-enabled e-business and collaborative commerce.

The main reason why ERP II came into existence was because of the need to look at a way to give access to customers, suppliers and other partners to scheduling, delivery, inventory, manufacturing, invoicing and planning information. Over the last decade, solutions like *Customer Relationship Management* (CRM) and *Supplier Relationship Management* (SRM) have used the Internet as leverage to support these processes. ERP II incorporates all of these in a single package. To be globally competent, the resources of an organization need to be opened up and delivered to its collaborative partners. ERP II enables businesses to remain competitive by providing information online, thus adding real value to businesses of all types and sizes.

Many researchers suggest that, in the future, the trend for ERP could be expected to be for more Internet-based interfaces and object-oriented databases. Similarly, a stronger move to *Advanced Scheduling and Planning*

(ASP) is foreseen. Another trend foreseen for ERP is that it will become more widely used in *Small and Medium Enterprises* (SME), which of course means that ERP will not be restricted to large organizations. Moreover, with further improvements and mature industrial standardizations in the software, ERP projects will take less time to implement in the future.

Currently ERP products are available that address all business functions. Yet, more often than not, customers do not need all of these functions at any one time. This has led to a new trend, that of component-based solutions being made available by ERP vendors. One company may decide to buy only sales and finance components at first. Later it may then decide to add materials control, production planning and HRM, according to its later needs. In this way budgetary constraints are satisfied and customers only have to pay for what they require at the time. Because of this, the ERP evaluation and selection models will be of far greater importance in the future and companies will be able to justify their investments effectively.

### 1.2.4 The Term "ERP"

After reading an account of the history of ERP, it is obvious that it was initially targeted at manufacturing companies as an updated MRP II. But, being a framework of integrated application suites that unite major business processes, the use of the term ERP expanded.

The key idea of ERP is to use IT to achieve the capability to plan and integrate enterprise wide resources. 'It has a software architecture that facilitates the flow of information among all functions within an enterprise' (Kumar, 2003). ERP integration goes beyond physical computer integration and system integration: it is more about business integration, which not only requires achieving enterprise integration, but also coordinating and integrating management and operation mechanisms, such as standardization of work processes, norms, skills and output, and supervision structure.

Qing Yu
Graduate School of Business @ University of KwaZulu-Natal

Today, ERP is broadly defined as an integrated, customized, packaged, software-based enterprise-wide MIS that processes the majority of business system requirements in all functional areas and which can be used across any organization in any industry.

## 1.3 STATEMENT OF PROBLEM

Although the significant strategic importance of ERP systems to business is widely recognized, managers and business professionals are facing a very high rate of failure of ERP adoption. Botta-Genoulaz (2003) quoted the study on ERP implementation in China conducted by Zhang 'where the implementation success rate is significantly lower than in western countries', 10% as opposed to 33% according to the authors (Botta-Genoulaz, 2005). Zhang's study highlighted that even in the developed or industrialized countries the ERP implementation success rate is only about 33%. This percentage implies that more than two thirds of ERP adoption projects failed globally at the implementation stage, which has resulted in a massive investment failure in the ERP practice. (Failure is determined as the high attrition rate of ERP adoption therefore raises the universal question relating to 'value for IT money').

Previous literature on ERP research has explored how ERP contributes value to an organization and the risks involved in the high value of IT expenditure. 'In spite of the hopeful nature of ERP investments, many companies have ended up in litigation over ERP implementation issues and even bankruptcy' (Beard & Sumner, 2004). Farbey (1999) pointed out that the ERP or IT/IS investment failure is cause by incorrect selection: ''value for IT money' has been an issue for a number of years and is linked to the 'productivity paradox' ... poor evaluation practices have resulted in incorrect selection and management of projects, resulting in poor returns'.

Unlike other forms of investment, as 'there is a substantial human and organization interface' (Irani, 2006), ERP investment decision making

depends on high levels of intangibility, and it is this that makes ERP investments difficult to access or to be quantified. Chou (2006) identified three major reasons why ERP investment evaluation is difficult, namely:

- High cost: For many organizations, implementing ERP implies substantial financial cost. Computer and telecommunications investments, especially in respect of an ERP project, amounts to at least half of most large organisations' annual capital expenditure;.

- Uncertainty of return: Chou cited the research conducted by Strassmann (1997), Willcocks (1992), and Hochstrasser and Griffiths (1991), and suggested that 'IT/IS investment produces negligible benefits and there is no linear relationship between IT/IS expenditure and business success; 30-40% of IT projects do not realize any net business benefits and that at least 20% of IT/IS expenditure is wasted'. In addition, 'over 25% of the managers in the organizations they studied did not know if IT/IS investments were better or worse than non-IT/IS investments'.

- A control and management mechanism: 'evaluation can provide basic feedback to managers and can form a fundamental component of the organizational learning process. This can be seen as essential for problem diagnosis, planning, reduction of uncertainty, comparing projects, ranking projects in terms of organizational priorities, and as a control mechanism'. As such, it makes a valuable contribution to the evaluation process.

Qing Yu
Graduate School of Business @ University of KwaZulu-Natal

Figure 1: Number of articles in a given set of publishers from 1996 to 2004
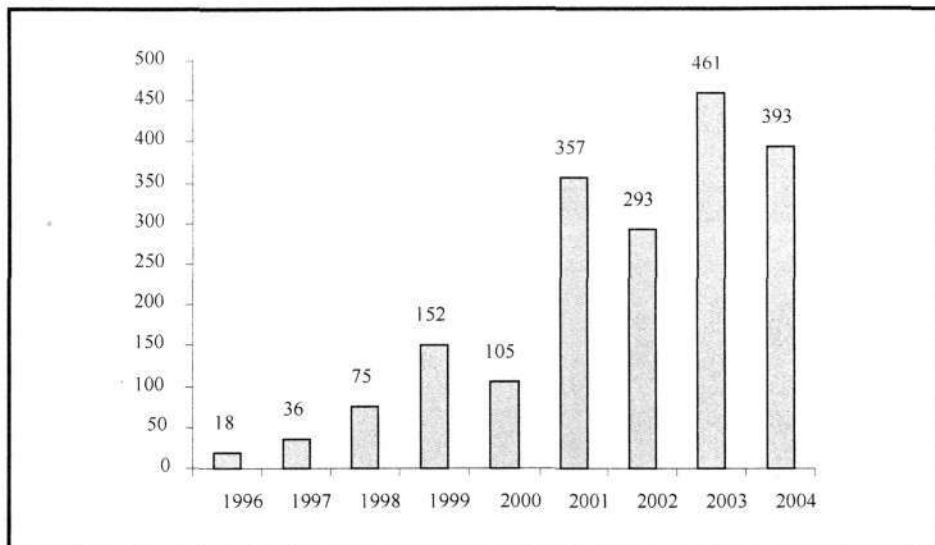


Source: Botta-Genoulaz, Millet and Grabot (2005)

Over the last few decades, emphasis on the field of MIS, and more specifically the area of ERP, has increased world wide due to the growth of ERP industrial applications. A survey conducted by Botta-Genoulaz (2005) on research activities conducted on ERP systems between the years 1996 and 2004 showed that a constant increase in the number of articles, special issues of journals or dedicated sessions at international conferences could be observed. Figure 1 shows the results of Botta-Genoulaz's (2005) 'quick search of articles having the word 'ERP' either in their title, summary or keywords within a selection of the major active publishers of science, management and applied sociology'.

Although the volume of research on ERP has increased dramatically, 'while much attention is directed to implementation, post-implementation and other organization issues, the acquisition process for ERP systems is for the most part being ignored' (Verville, 2003). Verville (2003) state furthermore that 'while many conceptual models of the ERP selection-and-evaluation have been developed ... there has been a lack of research to extend and test these models'.

However, previous industrial practices show that the 'many types of problems and issues that arise from the implementation of ERP systems range from specific issues and problems that can come up during the installation of ERP' (Verville, 2003) to the 'poor planning ... cited as a major reason why ERP implementation' fails (Hosapple & Sena, 2005).

In addition, there are many debates advocating different methodologies, approaches and frameworks for conducting effective ERP selection and evaluation. Some of these methods were developed during the early stages of theory development and these methods therefore only provide general categories of constructs. They are expected to influence organizational ERP investment selection and evaluation, but fail to capture all of the concepts, variables and relationships involved. Moreover, 'as ERP systems have become more complex and interconnected, the need for evaluation processes that allow for the true contribution of an IS to be recognized has increased' (Stockdale & Standing, 2006). In short, the practice of ERP system selection and evaluation has become an increasingly complex and difficult task for corporate management.

In summary, it is necessary to provide managers with an easy to use ERP selection and evaluation tool because the 'high rate of IT/IS failure is partly attributable to a lack of solid, but easy to use, management tools for evaluating, prioritizing, monitoring and controlling IT/IS investment'(Chou, 2006).

## 1.4 SIGNIFICANCE OF THE STUDY

ERP software, as one of the most important elements of IT/IS systems, is now gaining universal attention from enterprises. ERP investment has been viewed as a competitive advantage rather than a costly exercise, and is sometimes even seen as critical to business success. The new SA was established in 1994, following isolation from the rest of the world for more than three decades and it has effectively turned into a link in the global

economic cycle and is playing an important role in the world economy. Since rejoining the world market, SA's economy has grown rapidly but nevertheless also faces growing pressures and challenges from other countries. Many South African countries consider ERP adoption to be a key factor in maintaining competitive advantage and one that has significantly influenced their success in the global market.

Whilst ERP adoption can certainly bring many benefits to organizations, it was more importantly the idea of ERP that was initially established in developed and industrialized countries. With the point of departure being their economic practices, a mature ERP system contains advanced business management and operation theories: when a company adopts ERP, the integration of corporate resources and the standardization of operational processes are not the only advantages gained, but moreover the learning that is gained from advanced business management and operational theories and mechanisms that are contained in the ERP system. As a result, the adoption of ERP could greatly enhance and improve the progress of advancement of business management in KZN and therefore the vital importance of this study on ERP in KZN and presumably the rest of SA if we assume that companies of KZN are representative of the country as a whole.

This study will focus on the ERP selection stage and attempt to investigate problem factors in ERP selection within organizations in KZN in the hope that it could be used to assist at least local companies – and hopefully those outside of the immediate area of study – to build up a solid knowledge of ERP selection and evaluation.

## 1.5 RESEARCH OBJECTIVES AND QUESTIONS

This study will underline some of the most appropriate existing ERP selection frameworks and approaches from prior studies, and then compare them with current ERP practices within organizations in KZN. An attempt will be made to determine what problem factors have occurred in these local

organizations and in doing so will hopefully make these organisations aware of the intricacies of the selection process and the problems that it involves.

This study attempts to answer the following questions:

- What types of organizations have adopted ERP systems in KZN recently?

- What criteria and methodologies do companies in KZN use to evaluate and select appropriate ERP software packages?

- What are the major problems that occur when KZN companies select ERP systems in?

- Are the measurement criteria and selection processes different in SME and large size organizations in KZN? If the answer is positive, what is the possible reason for explaining the difference?

- How do organizations in KZN attempt to simplify the ERP project evaluation-and-selection techniques and select ERP software packages in an easy, cost-effective and collective manner?

## 1.6 DISSERTATION OVERVIEW

This dissertation looks at ERP selection and is focussed on the impact of ERP selection within organizations in KZN. The dissertation is divided into five chapters, including the background to the research, a literature review, the research methodology, analysis of survey results and a conclusion. The following provides a brief review of the theme and content of each chapter.

### 1.6.1 Chapter One

This chapter examines the background to the research questions. The motivation, background knowledge, problem statement, research objectives, key questions and the importance of the research are presented. Readers should gain a clear idea of the purpose and direction of the paper after reading Chapter One.

### 1.6.2 Chapter Two

This chapter reviews the literature and provides background information on ERP evaluation and selection studies. It presents a review of ERP evaluation-and-selection decision-making frameworks and approaches, describes the evaluation and selection measurement criteria, the stakeholders and the limitations of most ERP selection approaches or frameworks.

### 1.6.3 Chapter Three

This chapter explains the methodology adopted in this paper. It examines different research methodologies and places emphasis on the research process. The different steps in the research are also discussed. The application of the survey strategy will be explained and the methods used to collect data from the respondents will be outlined. In addition, the process used to gain access to organisations in order to distribute the questionnaire and the sample collection process will be discussed.

### 1.6.4 Chapter Four

This chapter analyzes and compares the data received from the respondents with the theory obtained from the literature review. Research limitations are acknowledged and recommendations for future research are made. Company profiles of the respondents are analyzed for purposes of establishing trends and correlating information.

### 1.6.5 Chapter Five

This chapter answers the research questions and poses limitations to the study. The major part of the discussion in this chapter will revolve around attempting to solve the research questions regarding ERP selection and application status in KZN. Final recommendations are made on how to evaluate and select ERP products efficiently and effectively.

## 1.7 CONCLUSION

The adoption of ERP has become increasingly popular worldwide and research conducted on the topic of ERP has also grown substantially. However, compared with research conducted elsewhere, such like North America, Europe, and South-eastern Asia, it is clear that ERP studies conducted in KZN thus far have not been sufficient and there is still a lot of room for improvement and many areas awaiting business and academic research within this topic. This study is a basic research that focuses mainly on a survey of ERP application status in KZN and an investigation of ERP selection problem factors within KZN organizations. In particular, the study attempts to build up fundamental knowledge of ERP evaluation-and-selection within local businesses.

Chapter Two follows with an exploration of the literature concerning the research problem. It establishes the theory behind the background to the study.

# CHAPTER TWO

# LITERATURE REVIEW

## 2.1 INTRODUCTION

Farbey (1999) observed that 'the term 'IT evaluation' is often used imprecisely. Sometimes it is referred to as an event taking place at the commencement of a project in order to decide whether the project should go ahead. At another times this decision point is called 'appraisal', reserving 'evaluation' for a post-implementation review of achieved benefits. However, in both theory and practice the concept is much broader'. His research clearly shows that the proposal stage represents an important part of ERP evaluation and selection literature and this literature is therefore necessary for purposes of this study.

According to the survey conducted by Botta-Genoulaz (2005), the problems associated with ERP and IT/IS selections are not new. Even so, not much attention seems to have been paid to the ERP selection phase in the existing literature, which is seen in the number of recent studies that 'address the problem of choice of an adequate ERP system' (Botta-Genoulaz, 2005). Detail study of existing ERP literature reveals the following summarized reasons that have been highlighted as to why ERP evaluation and selection decision-making has become more difficult and complex:

1. The large number of ERP software packages and vendors in the market makes it difficult for adequate comparison as it means more effort and time is needed by management to compare packages and to decide on which package to select, and which vendor is the most suitable partner for the company's acquisition outlay (Wei, 2005; Verville & Halingten, 2003);

2. Ongoing improvements to IT/IS, especially the proliferation and upgrade of numerous ERP systems, make it difficult to put a monetary value on the potential benefit of ERP software. Therefore

18

it is hard for managers to justify the cost of the acquisition (Irani, 2006);

3. Different stakeholders in ERP acquisition projects means multiple aims and sometimes conflicting objectives within a single ERP project, which creates difficulty in establishing the right criteria for selecting the ERP software (Stockdale & Standing, 2006; Chou, 2006);

4. The increasing number of decision makers in organizations in diverse sectors means that some of those involved in the selection process do not have sufficient knowledge of ERP and consequently the selection of a suitable ERP system is hampered. Moreover, there is no real surety as to whether or not a company's existing operational problems were caused by the lack of an ERP system or not (Kumar, 2003);

5. Certain organizations cannot afford the capital investment needed for the required or most suitable ERP software (Yusuf, 2006);

6. Problems often arise through a lack of top management involvement in the selection process, as well as a lack of cooperation and coordination between departments (Yusuf, 2006).

The reasons for ERP systems failure highlighted above have led many researchers to attempt to combine different theories and techniques in order to develop a broader or more suitable approach or a more comprehensive framework to aid ERP evaluation – and selection decision-making. Unfortunately, there is still no common agreement within academia or industry with regard to an ERP evaluation and selection framework, nor could such an approach be found in the literature reviewed for this study.

Stockdale and Standing (2006) pointed out that the major challenge for ERP evaluation and selection is 'to develop a framework that is sufficiently generic to be applicable to a wide range of applications but also sufficiently detailed to provide effective guidance'. In order to do this, an understanding

is required of why the ERP evaluation is being conducted, who is conducting the evaluation, what the evaluation is measuring and who the audience is. 'Recognition of the intended outcomes of the evaluation also requires explanation if effectiveness is to be achieved' (Stockdale & Standing, 2006).

The ERP evaluation and selection literature review for this study will therefore be classified into three main areas: the ERP measurement content, the ERP evaluation and selection stakeholders, and the ERP evaluation and selection process.

In this section of Chapter two, the study will briefly summarize previous ERP systems evaluation and selection decision-making frameworks and approaches, describe the evaluation and selection measurement criteria and stakeholders, and then discuss the limitations of the most appropriate ERP selection frameworks and approaches.

## 2.2 ERP MEASUREMENT CONTENT

The criteria for selecting ERP systems are important because of the obvious influence on the selection result. Irani (2006) argued that ERP or IT/IS 'investments differ in nature from other capital investments as there is a substantial human and organizational interface'. Clearly, the crucial factor in any evaluation and selection study is an understanding of what is being measured. Recent literature on ERP evaluation and selection advocate a shift away from straightforward measures such as the financial and ratio quantification of cost, to including such measures as intangible benefits, risks and opportunities presented by ERP systems. A review of recent studies on ERP evaluation and selection reveals that most of the literature considers intangible benefits and costs when dealing with ERP project evaluation or selection issues and researchers therefore intend to develop a set of criteria to measure those benefits, costs, risks and opportunities.

Table 1: IT/IS investment criteria

| IT/IS investment criteria: | | |
| --- | --- | --- |
| External criteria: | 1. Apply with partner<br>2. Commit to government requirement<br>3. React to or compete with other competitors | |
| Internal criteria: | 1. Organization learning<br>2. Users' requirements<br>3. Compatibility or integration ability with existing IT/IS portfolio<br>4. Organizational re-structure | |
| Risk criteria: | 1. Probability of completion:<br><br>2. Probability of benefit achievement | a. Manpower<br>b. Skill of IT staff<br>c. Maturity of new technology |
| Cost criteria | 1. Hardware costs<br>2. Software costs<br>3. Implementation costs (including change of management)<br>4. Maintenance costs<br>5. Consultant costs (including training time and learning curve) | |
| Benefit criteria | 1. Assist in achieving corporate goal<br>2. Assist planning and control<br>3. Assist in making a management decision<br>4. Improve competitive advantage<br>5. Reduce or avoid operation "S"<br>6. Improve information quality<br>7. Improve users' satisfaction<br>8. System flexibility<br>9. Security protection | |

Source: Adapted from Chou, Chou & Tzeng, 2006

In the study of MRP II benefit/cost analysis, Irani (2002) analyzed the benefits and costs of MRP II and then addressed three main sets of benefits, namely: strategic, tactical and operational benefits. This was compared with two main types of cost: indirect human costs and indirect organizational costs. The study conducted by Shang and Seddon (2000) was cited by Murphy and Simon (2002), who identified five main dimensions of ERP benefits, namely: operational, managerial, strategic, IT infrastructure and organizational. Chou (2006) suggest a hierarchical IT/IS investment criteria list, including not only internal ERP or IT/IS evaluation criteria, but also considering external environments. By generalising recent ERP criteria in studies he divided IT/IS investment criteria into five different sectors, namely: benefit, cost, risk, internal and external criteria. These are detailed in Table 1 above.

The research conducted by Wei (2005) creatively proposed a hierarchical structure that separated ERP evaluation and selection criteria into detailed means. Table 2 and Table 3 below are samples adapted from Wei's study (2005) that show how ERP evaluation and selection means can be split into

21

product factors (system software factors) and non-product factors (vendor factors).

Wei's study (2005) has expanded on previous studies of ERP selection criteria and in doing so has provided extensive groundwork for researchers to conduct future studies on the topic of ERP selection.

Table 2: ERP product factors

| Attributes | Evaluation items | Means |
|---|---|---|
| Total costs | 1. Price<br>2. Maintenance costs<br>3. Consultant expenses<br>4. Infrastructure costs | 1. Limited project budget<br>2. Limited annual maintenance budget<br>3. Limited infrastructure budget |
| Implementation time | | 1. Designed to minimize implementation time |
| Functionality | 1. Module completion<br>2. Function fitness<br>3. Security | 1. Having complete functionality<br>2. Operating process improvement<br>3. Operating system independency<br>4. Security features |
| User friendliness | 1. Ease of operation<br><br>2. Ease of learning | 1. Ease of installation<br><br>2. Consistency with interface and user-friendly operations<br>3. Easily understood and well designed business decision-making support for IS<br>4. Accessibility and quality of product support |
| Flexibility | 1. Ability to be upgraded<br>2. Ease of integration<br>3. Ease of in-house development | 1. Adaptability and flexibility of software<br>2. Compatibility with existing hardware<br>3. Compatibility with existing operation software<br><br>4. Customization |
| Reliability | 1. Overall performance<br>2. Stability and recovery ability | 1. Overall performance<br>2. Overall reliability (stability and recovery ability) |

Source: Adapted from Wei, Chien & Wang, 2005

Table 3: ERP non-product factors

| Attributes | Evaluation items | Means |
|---|---|---|
| Objective fit | 1. Acquisition strategies | 1. Improved innovation capabilities |
| | | 2. Increased organizational flexibility |
| | 2. Requirements | 3. Customer and supplier needs |
| | | 4. Increased customer satisfaction |
| Reputation | 1. Vendor | 1. Market position of vendor |
| | | 2. Good reputation of the provider |
| | | 3. A satisfactory reference site visit |
| | | 4. Quality of the vendor's proposal |
| | | 5. The contact person from the vendor seems to be trustful and reliable |
| | 2. Marketplace | 1. Internationality of software |
| | | 2. Recommendation by a well-known company |
| | 3. Deliverable | 1. Good understanding of the requirements, constraints and concerns of the customer |
| | | 2. Success experienced in delivering solutions to similar companies |
| Finance | 1. Financial advantage | 1. Good value relative to cost |
| | | 2. It is cheaper for the same modules than for different ERP |
| | | 3. Lower upgrade cost |
| | | 4. Vendor offers monthly rental or installment option and not just a lump-sum payment option |
| Service | 1. Technical capability | 1. Minimum implementation time |
| | | 2. Ownership of the source-code |
| | 2. Training | 1. Good end-user training program |
| | 3. Data transition | 1. Provide data extract and data import service |

Source: Adapted from Wei, Chien & Wang, 2005

## 2.3 ERP EVALUATION AND SELECTION STAKEHOLDERS

'For the evaluation process and result to be successful, it is not only important to understand the criteria, but the stakeholders who do the evaluation must also be considered' (Chou, 2006) because 'the complexity of an interpretive approach to evaluation owes much to the different perceptions and beliefs of the different stakeholders involved' (Stockdale & Standing, 2006). There is a strong need for different stakeholder groups to be able to make sense of and understand ERP evaluation and selection in order that they are able to make an informed decision. Milis and Mercken (2004) recognized five parties involved in IS investments, each with their own set of objectives and expectations. Table 4 below provides an overview of Milis and Mercken's study on different stakeholders and their expectations of IT/IS investments.

Table 4: IT/IS investment stakeholders

| Stakeholders | Objectives and expectations |
|---|---|
| Management (key users) | 1. Interested in the gains (financial/and other) generated by the investment<br>2. Seek to ensure that the project is implemented on time, within budget and to user requirements |
| End users | 1. Technology should meet their requirements whilst integrating flexibility to adapt to the changing requirement of users/customers |
| Project team (implementers) | 1. Focus on short-term criteria set by sponsors (used to judge their performance) |
| Supporters (sub-contractors) | 1. Focus on short-term criteria |
| Others (stakeholders who do not benefit from or influence the investment) | 1. Consists of many groups, each with its own goals and objectives<br>2. Might support or oppose the investment - possible covert resistance |

Source: Adapted from Milis & Mercken, 2004

The study by Milis and Mercken suggested that the roles played by each group of stakeholders is different. Their argument is thus that an understanding of who is conducting the ERP evaluation process could explain to a certain degree why the intended outcome of the evaluation could be recognised, as well as helping to explain whether or not the evaluation and selection process had been effective. Therefore, it is of obvious importance to consider the different positions and interests of different stakeholders and stakeholder groups when considering an ERP system selection.

As explained in the previous chapter, the nature and aim of this study focuses on the key users of ERP systems, namely management, who invest in ERP systems and make use of them when faced with important business decisions. The end user group – the employees who actually work on the ERP system with daily actions affecting the outcome of the ERP system – will not be main focus of this study as a whole because they are not usually able to influence ERP selection decision-making. Similarly, the project team and supporters (sub-contractors) are not an important part of this study as their influence on the decision-maker for ERP investments is also limited. Obviously, all external stakeholder groups will not be considered in this study and they can perhaps be considered for a further broader study on the topic of ERP.

24

## 2.4 ERP EVALUATION AND SELECTION PROCESS

Prior literature has already developed a variety of methods and frameworks for ERP selection or other IT/IS selection. This literature review is restricted to prior ERP or IT/IS evaluation and selection applications and coverage of different methodologies and frameworks is certainly not exhaustive. However, it does demonstrate the diversity of decision making in ERP evaluation and selection applications. Table 5 below summarizes ERP or IT/IS evaluation-and-selection methodologies or frameworks that this study has reviewed in literature published by previous researchers.

Table 5: A summary of the major literatures reviewed by this study on the topic of ERP or IT/IS evaluation-and-selection

| Author | Selection item | Methods/Framework |
| --- | --- | --- |
| (Martinsons, 1999) | IS | Balanced scorecard |
| (Ravarini, 2000) | ERP | Business process reengineering |
| (Zahir Irani, 2002) | IT/IS | Fuzzy cognitive mapping |
| (Murphy & Simon, 2002) | ERP | Financial and ratio approach |
| (Kumar, 2003) | ERP | Multi criteria approach |
| (Verville & Halingten, 2003) | ERP | ERP acquisition process model |
| (Holsapple & Sena, 2005) | ERP | Multi criteria approach |
| (Wei, 2005) | ERP | AHP |
| (Bernroider & Stix, 2006) | IS | Multi criteria approach |
| (Chou, 2006) | IT/IS | Fuzzy multi criteria approach |
| (Mykkanen &Tuomainen, 2007) | IS standards | Multi criteria approach and AHP |
| (Stockdale & Standing, 2006) | IS | Content context process |
| (Wang & Yang, 2006) | IS | AHP and multi criteria approach |
| (Lin, 2007) | Data warehouse | Fuzzy multi criteria approach |

Renkema and Berghout (1997) and Bernroider and Stix (2006) all proposed that the methodologies of IT/IS investment evaluation can be classified into four common approaches, namely:

- The financial approach;
- The multi-criteria approach;
- The ratio approach;
- The portfolio approach.

The above IS investment evaluation methodology classification can also be applied to an ERP study.

Due to the fact that there are many citations that overlap in terms of the financial approach and the ratio approach, these two approaches can be

25

merged to avoid confusion amongst readers. However, the portfolio approach is often misleading, although Renkema and Berghout (1997) only used it to address some kind of well developed set of evaluation methods. The researcher considers then that instead of the portfolio approach, a hierarchical process would be a more suitable method and that it would represent a type of evaluation or selection approach. Therefore, the ERP evaluation and selection approaches taken in this research can be divided into three main categories, namely: the financial and ratio approach, the multi-criteria approach and the hierarchical process approach. The following section provides a brief overview of these three approaches.

### 2.4.1 Financial and Ratio Approach

The financial approach is the approach usually applied with corporate investment evaluation and selection proposals. 'These methods focus on the incoming and outgoing cash flows as a result of the investment made' (Renkema & Berghout, 1997).

Unlike the financial approach, 'the ratio approach pays special attention to the possibility of comparing organizational effectiveness by means of ratios ... Ratios do not necessarily take only financial figures into account. ERP expenditures can, for instance, be related to the total number of employees or to some output measures' (Renkema & Berghout, 1997).

*2.4.1.1 The often used Financial and Ratio Methods*

The often used financial and ratio methods are:

*Payback period*

It is common practice to talk of the payback on a proposed investment. 'The payback period is the amount of time required for an investment to generate cash flows to recover its initial cost' (Firer, 2004). Organizations decide on a time period by which the initial investment must be recovered by income

cash flow. If the planned time period is less than the calculated payback period then a decision may be taken to invest in the proposed ERP project.

*Net present value*

The *net present value* (NPV) is 'the difference between an investment's market value and its cost' (Firer, 2004). The starting point in the net present value equation is the opportunity cost of capital. If an ERP project NPV value is larger than zero, then it would be advantageous to the organisation to proceed with the investment.

*The internal rate of return*

The *internal rate of return* (IRR) is the 'discount rate that makes the net present value of an investment zero' (Firer, 2004). If this rate exceeds the opportunity cost of capital, then it is worthwhile to launch the ERP project.

The latter two methods (often referred to as *discounted cash flow* (DCF) methods) are commonly used financial methods for corporate investment evaluation. The DCF methods take into account the time value for money, and calculate the net present value of a future cash flow to determine an investment's value today. This means that if the time period of receipt of cash flow is becoming longer, the current value of the cash flow will be less. It is advisable that when a decision maker uses the above financial methods to evaluate an ERP investment, they should not only be concerned about the DCF value, but should also consider the risk involved.

Other methods, including discount rate sensitivity, *return on investment* (ROI), adjusted cost/benefit analysis and adjusted interpretation analysis, are also commonly used financial and ratio methods for corporate investment decision-making. In the particular literature reviewed, these techniques have been developed to suit the special needs of ERP or IT/IS investment.

*The options model*

In the options model approach, ERP investment projects are perceived as a 'bet' that might result in revenues in the future. Options models are common in the valuation of complex financial transactions such as stock trading, currency arbitrage and pricing of currency futures. 'This financial method tracks, stores and analyzes not only what happened with the current bet, but also what could have happened if the method had made a bet on an option. The method can then dynamically adjust its structure and coefficients to improve its chances next time the computer recommends making another bet' (Milis & Mercken, 2004).

*Information economics*

An additional technique is that referred to as information economics. The reason for using an information economics method is because it gives a financial evaluation of a proposed ERP or IT/IS investment. This is called the enhanced ROI. 'The ROI not only looks at cash flows arising from cost reduction and cost avoidance, but also provides some additional techniques to estimate incoming cash flows' (Renkema & Berghout, 1997):

- Value linking: additional cash flows that accrue to other departments;
- Value acceleration: additional cash flows due to a reduced time scale for operations;
- Value restructuring: additional cash flows through restructuring work and improved job productivity;
- Innovation valuation: additional cash flows arising from the innovating aspects of the investment (e.g. competitive advantage).

Renkema and Berghout (1997) classified this method as a multi-criteria approach, but it is obvious that information economics has more of a focus on the financial evaluation of an investment project; even though there are some additional non-financial techniques applied by this approach, the final outcome determinant is still cash flow. Thus, this study re-classifies

information economics as a financial and ratio approach for ERP evaluation and selection.

### 2.4.1.2 Brief summary of the Financial and Ratio Approach

Although financial and ratio methods are the most common evaluation and selection techniques used by business management in investment decision-making, there is an emerging debate regarding the ability of these techniques to:

- Measure the 'softer' benefits of IT/IS and the difficulty in quantifying those 'softer' elements in financial terms for decision-makers;

- Identify 'hidden' or seldom-considered costs and benefits and organizational problems.

An additional problem is that these techniques 'treat the evaluation process in isolation from its human and organizational components and place excessive emphasis on the technological and accounting/financial aspects ... (and they therefore) do not consider the influence of social, political, or behavioural factors' (Chou, 2006). This is the reason why a multi-criteria approach and hierarchical process approach has been developed for ERP selection and evaluation.

### 2.4.2 Multi-Criteria Approach

Apart from the obvious financial consequences, an ERP investment project also has non-financial consequences. These positive or negative consequences of an ERP project are difficult to transform into monetary terms because 'it is difficult to compare the different consequences on an equal basis because of the differences between financial and non-financial consequences. This, however, is a prerequisite for an IS (or ERP) investment proposal and the prioritization of different proposals ... (and the use of methods) from the multi-criteria approach solves this problem by

29

creating one single measure for each investment" (Renkema & Berghout, 1997).

Multi-criteria decision theory is a decision analysis that looks at the way in which an individual decision-maker (or decision-maker group) contemplates a choice of action in an uncertain environment. This decision-making theory helps the decision-maker identify the alternative with the highest expected value (probability of obtaining a possible value). The decision analysis is designed to help the decision-maker make a choice from among a set of pre-specified alternatives. The multi-criteria decision making process relies on information about the alternatives. Therefore, the type of information required in this decision-making approach is dependant on the target problem, and it could range from scientifically-derived hard data to subjective interpretations, from certainty about decision outcomes (deterministic information) to uncertain outcomes represented by probabilities and fuzzy numbers.

It is safe to say, therefore, that the diversity in type and quality of information about a decision problem calls for multi-criteria methods and techniques that can assist in decision-making.

When using a multi-criteria method to evaluate an ERP project, a number of goals or decision criteria have to be set at the beginning of the process. Scores or ranks then have to be assigned to each criterion for each alternative considered in the ERP project. The relative importance of each alternative should be weighted. The final score of an alternative is mathematically and optimally calculated by multiplying the scores on the different decision criteria with the assigned weights.

## 2.4.2.1 Balance Scorecard

The *balanced scorecard* (BSC) is a widely used multi-criteria method of evaluation. Martinsons (1999) suggested that ERP selection and evaluation

methods that 'rely on financial measures are not well-suited for newer generations of IT applications ... computer-based IS typically seek to provide a wide range of benefits, including many that are intangible in nature' (Martinsons, 1999). Hence, these authors presented a BSC approach to select, measure and evaluate IT related investments. Their idea of a BSC approach was developed as a means to evaluate corporate performance from four different perspectives, namely:

- The financial perspective;
- The internal business process perspective;
- The customer perspective;
- The learning and growth perspective.

By using these perspectives, the BSC concept can be applied to select, measure, evaluate and guide activities that take place in specific functional areas of a business, such as ERP selection. A BSC framework with four perspectives that can be adapted to ERP project selection is shown in Table 6 below.

Qing Yu
Graduate School of Business @ University of KwaZulu-Natal

Table 6: The four perspectives in a balanced ERP project scorecard

| User orientation perspective (end-user's view) | Business value perspective (management's view) |
|---|---|
| Mission: Deliver value-adding ERP solution to end-users Key question: Is the ERP project fulfilling the need of our end-users?  Objectives: 1. Establish and maintain a good image and reputation with end-users 2. Exploit ERP opportunities 3. Establish a good relationship with end-users and satisfy end-user requirements | Mission: Contribute to the value of the business Key question Is the ERP project accomplishing our goals and contributing value to the organization as a whole?  Objectives: 1. Establish and maintain a good image and reputation with management 2. Ensure that the ERP project provides business value 3. Control ERP project costs |
| Internal process perspective (operations-based view) Mission: Deliver ERP solution in an efficient and effective manner Key question. Will the ERP project create, deliver and maintain support to our product and service in an efficient manner?  Objectives: 1. Anticipate and influence requests from end-users and management 2. Be efficient in planning and delivering an ERP solution 3 Be efficient in acquiring and testing hardware and software 4. Provide cost-effective training that satisfies end-users 5. Effectively manage ERP-related problems that arise | Future readiness perspective (innovation and learning view) Mission· Deliver continuous improvement and prepare for future challenges Key question: Is the ERP project improving products and services and preparing for potential change and challenges  Objectives: 1. Anticipate and prepare for ERP-related problems that could arise 2. Continuously upgrade ERP skills and knowledge through training and development 3. Regularly upgrade ERP and related IT portfolio 4. Conduct cost-effective research into emerging technologies and their suitability for business |

Source: Adapted from Martinsons, Davison & Tse, 1999

## 2.4.2.2 Brief summary of Multi-Criteria Approach

The applicability of multi-criteria approaches is 'often weakened by sophisticated mathematic models or limited attributes to carry out in a real-world ERP system selection decision. especially when some attributes are not readily quantifiable. as well as (being) not too easy for managers to understand ... Moreover. these methodologies focus too much on quantifiable calculations and look down upon the comprehensive selection framework of ERP systems and the strategic considerations of a company' (Wei, 2005). These methodologies 'did not explain how to construct a specific objective structure relating to the company's strategies and how to extract the proper criteria for evaluating the fulfilment of the company's requirements' (Wei. 2005). If we follow this argument. the hierarchical approach is therefore one that should be considered useful for purposes of

business management when embarking on a process of selecting an ERP system.

### 2.4.3 Hierarchical Process Approach

The hierarchical process approach to decision making is one that involves structuring multiple choice criteria into a hierarchy, assessing the relative importance of each of these criteria, comparing alternatives for each criterion, and then determining an overall ranking of the alternatives (Milis & Mercken, 2004).

According to Milis and Mercken (2004), the hierarchical process is based on a top-down decision-making strategy; in such an approach, an overview of the decision-making criteria system is first formulated. It specifies but does not detail any first-level criteria. Each criterion is then refined in yet greater detail, sometimes using many additional criteria levels, until the entire specification is reduced to base elements. Due to the large number of ERP products available in the market and the high time and cost implication of examining these ERP products, business management needs to reduce the number of ERP products that have to be examined in order to narrow their ERP product target. The hierarchical process can provide an objective top-down decision-making structure that can be used by a company in order to select an ERP system: a structure that provides for inclusion of all related elements, from the top business strategy objective down through the basic ERP application objectives. This process can be beneficial in speeding up the ERP selection decisions that might otherwise be difficult to make and is also in tune with the intangible benefits associated with the adoption of ERP.

Such a process may therefore be the most beneficial for ensuring the successful adoption of ERP in organizations.

*2.4.3.1 The often used Hierarchical Process Methods*

Commonly used hierarchical process methods are the following:

*Strategic fit*

The strategic fit approach expressly 'addresses the strategic dimensions of the competitive advantage perspective on management' (Milis & Mercken, 2004). This approach requires that ERP investments be evaluated primarily in line with the function of their contribution to a firm's competitive advantage.

According to Milis and Mercken (2004), the basic tool for understanding the role of ERP or IT/IS in competitive advantage is the value chain. This helps to align ERP projects to corporate goals and this alignment between corporate goals and IT/IS should demonstrate a positive relationship, expressed by accepted measures of ERP performance.

But 'the down side to strategy fit approach is that it does not give explicit attention to financial analysis. As such, this method provides guidelines to select between investments of a different kind, but it is not helpful when a company needs to choose between two mutually exclusive projects, both serving the same purpose' (Milis & Mercken, 2004).

*Multi-layer evaluation process*

According to Milis and Mercken (2004), a multi-layer evaluation process uses different evaluation techniques, which are more or less ordered in a hierarchical manner. Often, a combination of strategic fit and an adjusted financial or ratio evaluation technique is suggested. Milis and Mercken (2004) argue that there is a widespread belief that ERP project appraisal can only be effective if the appraisal process is embedded in strategic level business processes. Conversely, financial or ratio evaluation techniques are not completely abandoned since these techniques offer some unmistakable advantages.

When applying the multi-layer process technique to ERP selection, all ERP projects that do not contribute to the strategic or business aims of the company will be rejected at the first stage. During the second stage, a selection is made between the remaining ERP projects, based on one or more adjusted financial and ratio evaluation techniques.

*Analytical hierarchy process*

The basic idea to the approach of the *analytic hierarchy process* (AHP) is to convert subjective assessments of relative importance to a set of overall scores or weights. AHP is one of the most widely applied multi-attribute decision making methods. Its strength lies in that it 'directs how to determine the priority of a set of alternatives and the relative importance of attributes in a multiple criteria decision-making problem' (Wei, 2005).

Unlike multi-layer evaluation processes, AHP does not apply adjusted financial and ratio evaluation techniques to select an ERP product. By organizing and assessing alternatives against a hierarchy of multi-faceted objectives, AHP simplifies the process by providing a proven effective means to deal with complex decision making. Indeed, AHP allows a better, easier, and more efficient identification of selection criteria, their weighting and analysis. Thus, AHP reduces the decision making cycle drastically.

*2.4.3.2 Brief summary of the Hierarchy Process Approach*

In comparison to the financial and ratio methods and the multi-criteria methods, a hierarchical process helps to capture both subjective and objective evaluation measures. It provides a useful mechanism for checking the consistency of the ERP evaluation and selection measures and potential alternatives, thus reducing bias and time in decision making. A hierarchical process allows organizations to minimize some of the common pitfalls of the decision making process, such as lack of focus, planning, participation

or ownership – which ultimately prove costly distractions that can prevent project teams from making the right choice.

A hierarchical process is very useful when facing a complex decision-making process – an unstructured ERP project for instance. When the decision cycle involves taking into account a variety of multiple criteria with ratings based on a multiple-value choice, a hierarchical process splits the overall problem into multiple evaluations of lesser importance that require solutions, whilst at the same time retaining their part in the global decision.

While the hierarchical process approach does have advantages for ERP selection processes, there are still some problems associated with its use in ERP selection practices. One of these problems would be where a company has failed to identify or does not recognize the principal ERP evaluation and selection goal and therefore makes a wrong choice in terms of the evaluation and selection criteria. This then leads to a final selection result that is far from the initial expectation. Another problem would be the unnecessary involvement of stakeholders in the evaluation and selection process. As different stakeholders hold different expectations of achievement by the ERP system, wrongly considering stakeholders could lead to an unexpected selection outcome.

Chou (2006) also identified certain limitations with regard to the application of traditional AHP. However, due to the fact that his study focussed on the application of fuzzy mathematic evaluation techniques, some of the limitations do not relate to this study, and therefore only the following two limitations have been chosen and will be addressed in order to sum up the limitations determined after a study of the AHP method:

- AHP uses crisp values to score alternatives and is thus highly dependant on an expert's opinion;

Qing Yu
Graduate School of Business @ University of KwaZulu-Natal

- Some criteria are qualitative and cannot have a crisp value assigned to them.

## 2.5 CONCLUSION

The literature on ERP evaluation and selection explores many frameworks and approaches that managers are able to practically implement in the real business environment. However, the question of which one will prove to be more efficient and/or effective for companies remains a debatable matter.

Due to the massive capital investment requirement, an ERP project may be a strictly once-off practise for any particular company. Any individual company will probably not have the luxury of a 2$^{nd}$ chance to run a second ERP project – except perhaps should the first ERP project be completely aborted. Once an ERP system has been deployed, it is extremely difficult for a company to disengage from the system even if there are many problems associated with the currently operating system. The caveat is then that direct and indirect finical loss will occur if the ERP was wrongly selected.

Business managers are, therefore, engaged in a critical mission when they commence an ERP project and there is no leeway allowed for any mistakes. Practically, although the published literature purposes many ERP evaluation and selection measurement content and processes, from the point of view of the different ERP selection stakeholders, it still rather difficult for business managers to determine a specific solution for their particular problems.

This study was an attempt to determine a relationship between ERP measurement content, ERP selection stakeholders and the ERP evaluation and selection processes. It may have failed at last in determining such a relationship because the diversified business environment is far richer than the content, stakeholders and technical processes considered as simple or simply related elements – they are, in fact, incredibly complex and complicated, interwoven and through-woven in sometimes confoundingly

37

elusive ways. This is also the reason why there is so much ongoing debate regarding the literature which attempts to provide a universal solution for ERP or IT/IS selection. Hence, the study objective returns again to: overlooking current ERP practices in organizations within KZN in an attempt to determine how KZN companies make their ERP selection; what problem factors have occurred in these organizations; and in so doing make them aware of the selection process and the problems involved.

Chapter Three explains how this research was conducted and the steps used in the survey study. It also explains the research methodologies and the sample selection for this study.

# CHAPTER THREE

## RESEARCH METHODOLOGY

## 3.1 INTRODUCTION

When conducting this research, methodologies from previous researches were taken into account and an attempt was made to mitigate some of the shortcomings reported by past researchers' experiences. These are considered below.

This research aims firstly at establishing the type of companies that adopt ERP systems; the type of ERP software that has been deployed in KZN; and the selection process used by companies that undertook an ERP project. Secondly, the research attempts to investigate the problem factors that occur during the selection stage of an ERP project. Thirdly, it investigates the impact of the identified problem factors on the ERP implementation and usage stage. This research is limited to companies within the KZN province in SA.

In this chapter, the research design, negotiation process regarding access, ethics, sample selection procedure, data collection and data analysis process are portrayed and discussed. The application of the survey strategy will be explained and the methods used to collect data from the respondents will be outlined. The process used to gain access to organisations for purposes of distributing the questionnaire to the sample will be discussed as well.

## 3.2 RESEARCH DESIGN

Appropriate research strategy is a vital part in any study because it directly influences the result of the research. According to Cooper and Schindler (2005), the 'research design is the blueprint for fulfilling objectives and answering questions. Selecting a design may be complicated by the

availability of a large variety of methods, techniques, procedures, protocols and sampling plans'.

'When the researcher designs the research method, the source and the variety of the available information and the statistics are taken into account'. In addition, 'special attention must be paid to the internal relationship between the study's variables when the researcher plans the research framework' (Cooper & Schindler, 2005).

For purposes of this paper, the research design was based on the questionnaires.

### 3.2.1 Survey Strategy

Two widely used methods in academic research are qualitative studies and quantitative studies. These two different research approaches have their respective advantages and disadvantages, and it is obvious that studies that are qualitative focus on understanding matters of quality whilst quantitative studies rely on studies of quantity, namely numbers. Each method has a part to play in research, evidencing particular strengths and weaknesses and being more or less suitable for particular research studies. A particular strength of qualitative research would, for instance, be that it provides "an understanding of a phenomenon from the participants' perspectives (providing information relating to) the meaning people derive from a situation or understanding a process" (Merriam, 2002).

A decision must be made as to the most appropriate methodology to investigate the particular questions posed. This means that the researcher must first be clear about what kind of information he is seeking and then analyze the positive and negative aspects of each method of research. This analysis and comparison will enable the researcher to better decide on the most appropriate methodology for the envisaged research. Neither methodology can be considered to be absolutely positive and the other

40

absolutely negative, with both methodologies providing benefits and drawbacks. The outcome the researcher is seeking will provide guidance as to which method is the more appropriate one to use.

Given the objectives and drawbacks of this research, the methodology determined to be the most suitable is a quantitative study, with a survey being conducted. A questionnaire was designed and distributed in order to provide for the collection of first-hand data from respondents who would be able to assist with the study by answering the research questions. This method ensures the collection of primary data, being data that is being collected first-hand and which has not been previously collected and made available to others in a published form.

The researcher's reason for choosing the primary data collection approach of a questionnaire survey is because of its versatility as a primary data collecting approach. It does not require that there be a visual or other objective perception of the information sought by the researcher and it allows for abstract information of all types to be gathered by questioning others (Cooper & Schindler, 2005).

A further reason for determining a questionnaire survey as the data collection methodology is it really 'quite simple in design' when reduced to its basic elements (Leedy & Ormrod, 2005).

An additional consideration in a survey research is that a survey provides self-reported data with people telling the researcher what they believe to be true – or perhaps what they think the researcher wants to hear (Leedy & Ormrod, 2005). This aspect of a survey is one of the greatest drawbacks to this particular method of data collection. Other limitations relate to: misinterpretation of questions, lack of opportunity to explain items or respond to queries.

41

Since both time and the financial budget for this research was limited, a survey that uses the telephone, mail and especially the internet as the medium of communication provided a mechanism for expanding geographic coverage at a fraction of the cost and time required by the observation method. The observation method of research was also discounted on the basis of it being a laborious process not at all suited to obtaining answers to the questions posed by this research.

Hence, a survey research strategy was considered efficient and economical for this topic of study.

In order to conduct the survey, a questionnaire was developed. It comprises quantitative questions that can be coded and analyzed using statistical methods.

### 3.2.2 Negotiating Access and Research Ethics

As in any other questionnaire survey, the major problem encountered in this research was related to physical access or entry. The topic of this study required respondents to be familiar with both their company's capital investment decision making processes and to have knowledge of ERP system selection. This requirement restricted the number of possible respondents to the survey severely. The ideal respondents to this questionnaire are the executives of an organization, the head of IT or a related functional department, or the key personnel who may be involved or who may have been involved in an ERP project.

Obviously, such people are difficult to get in touch with and it is even more difficult to obtain their time for a non-commercial academic research project with strict deadlines. Such a situation obviously increases the difficulty of the research and provides additional drawbacks relating to the validity of the results, e.g. respondents not setting aside sufficient time to respond to the survey comprehensively, misunderstanding or misreading questions.

Another problem in gaining access for research purposes is that many organizations and individuals are not prepared to engage in extra and voluntary activities because they have neither the time nor the resources required.

According to Saunders (2003), a number of problems commonly occur when a researcher accesses information from organizations or individuals, namely:

- A lack of perceived value in relation to the work of the organization or individual;
- Potential sensitivity in terms of the nature of the topic;
- Concerns about the confidentiality of the information that is required;
- Perceptions about the credibility of the research;
- Competence of the researcher.

When conducting this research, several of the problems listed above occurred and a low response rate was received. Factors contributing to this situation include: the time of the year when the research was conducted. The perceived sensitivity of the information sought as this type of information is considered to provide an organisation with a competitive advantage. The ERP investment decision-making process is a strategically important decision making process for all type of organizations, and even though some organizations do not have an ERP system, their business investment decision procedures and IS structures are also content sensitive.

Given the above, the research response rate was understandably and expectedly low.

Potential respondents were identified from business chambers in the KZN province in SA, the Johannesburg Securities Exchange (JSE) website, online directories such as Braby's and the online Yellowpages.

An e-mail, which outlined the purpose of the research and requested assistance in completing the survey questionnaire, was sent to the target companies. The research questionnaire was sent under cover of a letter, which provided information as to: possible reasons why respondents should answer the questionnaire; how long it would take to complete the questionnaire; how the questionnaire should be completed; and information on how it should be returned after completion. The questionnaire also included details of both the researcher's and the supervisor's names and contact details to ensure the legitimacy of the research.

The ethical concerns that emerged during several phases of the research, included: the planning of the research, seeking access to organizations and to individuals, collecting, analyzing and reporting the data.

Saunders (2003) refers ethics as being 'the appropriateness of the researcher's behaviour in relation to the rights of those who become the subject of the research'.

Methods were found to address ethical issues that were taken into account when preparing the research instrument for this study. One method was by ensuring that only the signature of participants was required and no other identifying information was requested regarding either the respondent or the respondent's employer. An informed consent form was provided to participants to ensure that all participants were aware that their participation was voluntary by nature and that all had the right to withdraw partially or completely from the research process at any stage. The participants were assured that their responses would be kept confidential and that neither their nor their employer's information would be revealed to anyone. For purposes

of obtaining certainty that the research would adhere to the research code of ethics, both the research methodology and the research proposal were submitted to the University of KZN's Research Ethics Committee. The committee approved the research instrument and provided the researcher with an Ethics Clearance letter for this study.

The additional ethical issues that arise during the analysis and reporting stages called for 'maintaining objectivity during the analysis stage to make sure that the researcher did not deliberately misrepresent the data collected' (Saunders, 2003). Therefore, all the data collected was used 'as is' without any alteration or implied interpretation.

### 3.2.3 Sample Selection

According to Cooper and Schindler (2005), before deciding on how large the sample should be, the most logical starting point for a primary research study would be to define the population of the research. Ideally a study of an entire population or universe under investigation would give provide weight and accuracy to research findings. However, it is not always possible to study an entire population, given the problems regarding access, cost, time. Thus a research subset or sample of the population is used and results and findings to the entire population of which the sample is considered a representative group.

The population for this research was the large and medium sized companies within the KZN province in SA. Due to time constraints, the sample area was determined as being the Greater Durban region of the KZN province in SA. Contact information for these companies was obtained from the business chambers in KZN, downloaded from internet websites such as Braby's and the online Yellowpages, and the JSE.

According to the *KwaZulu-Natal Economic Review 2005*, published by the KwaZulu-Natal Department of Economic Development, 'the economic

activity in KZN is geographically concentrated in the urban district municipality of eThekwini (Greater Durban region) which generates almost two-thirds (61.2%) of the GDP in the province ... The other areas of concentrated economic activity in the province include the port of Richards Bay and its immediate surrounds, Pietermaritzburg and the cities of Ladysmith and Newcastle near the border of the province with the Free State and Mpumalanga.' *The Economic Review* reported that it anticipated that 'the economic activity in KZN will become even more spatially concentrated around the coastal centres of Durban and Richards Bay, which currently generates 70% of the provincial GDP' (Muller, 2005). Given the above and the limitations on time and budget, the study was restricted to the Greater Durban region. The study was conducted with the hope that the sample selected could be regarded as representative of KZN organizations.

As ERP projects require massive capital investment, small sized business obviously cannot afford and will have no intention of adopting an ERP system. Therefore, the research population for this study was determined as being limited to large and medium sized organizations in KZN province. Company classification was performed using data on number of employees, turnover, and total assets as per the definition proposed by the Department of Trade and Industry (*National Small Business Act, 1996*). According to the Durban Chamber of Commerce, they boasted over two thousand members at the time of the study, but most of their members did not qualify as being large or medium sized organizations when the above classification of size of business was applied. The Durban Chamber of Commerce suggested almost two hundred companies should be included in this study. In addition to the KZN companies listed on the JSE, they suggested that other specific business chambers be approached, such as the Muslim and Afrikaans business chambers. It was suggested that the entire population for this study would be over two hundred but that it would not exceed three hundred organizations.

Consequently, a minimum fifty samples were determined as being required for this study.

The sampling method used in the study is random sampling: each sample unit in the entire population has an equal, non-zero probability of being chosen for inclusion in the actual sample. The method of random sampling used in this study is discussed in the following section.

### 3.2.4 Data Collection

Data collection by way of a questionnaire was conducted in two phases. The first phase consisted of an email and fax survey. Respondents were required to complete the questionnaire and then email or fax it back to researcher.

The second phase of the data collection process consisted of semi-structured interviews. Past experience gained with previous research conducted by the Graduate School of Business, University of KZN indicated that the response rate for an email survey is low. In addition, the nature of the questionnaire research required that only certain individuals from organizations would be able to respond to it, which obviously increased the problem of difficulty with completion. Therefore, in order to obtain additional responses the researcher searched out major business parks and industrial parks/zones in the Greater Durban region and undertook an actual door to door survey.

In total, over two hundred large and medium sized companies were contacted and provided with questionnaires. Fifty nine companies responded. Of these, two companies have three divisions, each using different ERP systems and these divisions were treated as separate individual research units for purposes of this study. Thus, the total sample size increased to 63.

The survey questionnaire used in this research was designed in terms of the following five parts:

47

- Part 1 – obtaining permission from the respondent, which allows the researcher to use the responses for purposes of academic research.

- Part 2 – company information. The questions in this section included the firm's business activities, employee numbers, annual turnover, total assets, managerial and organizational structure, company ERP status.

- Part 3 – company ERP information, including responses to the following:. What sort of ERP systems are companies using? Who are the personnel involved in ERP selection and how important is their contribution to the selection decision-making procedure?

- Part 4 – ERP selection process within the company. The questions in this section were aimed at determining how companies gather information on ERP software, how they rate the product and non-product factors of an ERP system, and what evaluation tools companies use to evaluate and select ERP software.

- Part 5 – the utilizing experience of ERP. The questions in this section relate to the company's experiences with their utilized ERP system. The respondents were given 13 problem factors and asked to rate the frequency of each factor.

Before the questionnaire was distributed, it was submitted to the research supervisor and pilot tested with three ERP related personnel who were given the questionnaires to review and complete. Two of these are SAP consultants and one is an industrial IT manager.

The purpose of the pilot test was to determine:
- The time it took to complete the questionnaire;
- The clarity of the instructions;
- The difficulty of answering the questionnaire;
- The clarity and attractiveness of the topic layout;
- Any other opinions.

48

The feedback on the pilot test was successful and both SAP consultants and IT managers believed that the questionnaire would be workable. Their comments were also used for purposes of adjusting the questionnaire.

### 3.2.5 Data Analysis

The primary purpose of conducting a survey is to produce data to help answer the research questions. The data and observations gathered were summarized, analyzed, compared, interrogated and interpreted so as to reflect the general perception of the population and to either support or reject the objectives of this research.

The data extracted from the completed research questionnaire was coded and entered into the statistical package for quantitative research studies, known as SPSS (*Statistical Program for Social Science*) programming software. The results are presented in two distinct parts, namely descriptive statistics and inferential statistics.

The analysis approach for the questions from each part of the questionnaire was as follows:

1. Use central tendency statistics to describe the general opinion of each question from responding organizations. Mean, median, minimum value, maximum value and standard deviation is discussed.

2. Use T-tests or ANOVA-tests to compare the opinions from organisations of different sizes and from different industrial sectors in order to identify the significantly important differences between different respondent groups.

3. Use comparison dispersion statistics, for instance, cross tabulation analysis, to discover the difference between different respondent groups and thereafter to explain the possible reasons resulting in the difference.

### 3.2.6 Limitations of the Study

All survey studies have certain methodological limitations in common. Researchers may be unable to conduct a 'perfect' survey, but they are expected to have a broad understanding of the limitations of their research and to make a reasonable arrangement regarding the time and resources they have spent on the research (Leedy & Ormrod, 2005).

The limitations of this study, as discussed in the preceding sections, may affect the interpretation and results of this study in the following manner:

- To what extent was the study subject to sampling error?
- To what extent was the sampling frame representative of the population, and what are the potential impacts of any errors?
- What, if anything, is known about the non-respondents?
- Which questions are more sensitive to possible bias than others?

As previously pointed out, this study was limited to organisations in the KZN province of SA due to the constraints on research resources (budget and time).

### 3.3 CONCLUSION

The answers required by the research questionnaire was limited to the options provided, being scales ranging from 'disagree' to 'agree', and from 'unimportant' to 'important'. This could lead to a certain degree of misinterpretation since peoples' understanding of a question might be quite different. This problem is a shortcoming of this research and it is suggested that qualitative study could be used in future work on the same topic to obtain further results for research analysis

In the previous chapter, the literature review and the importance of conducting research were discussed. The forthcoming chapter will explore the data collection process and the manner and method of analysis in further

50

detail. The findings of Chapter Four will form the basis for the Recommendation and Conclusion that follows.

Qing Yu
Graduate School of Business @ University of KwaZulu-Natal

# CHAPTER FOUR
# DATA ANALYSIS AND FINDINGS

## 4.1 RESPONDENTS BACKGROUND

The questionnaire survey research was conducted during April and May in 2007, over two hundred large and medium sized companies in KZN province were provided with questionnaire and a total of 63 valid responses were returned eventually a response rate of over 30%. This response rate belies the preferred by Lin and Pervan (2003) that 'the survey has often been plagued by low response rate'. According to these researchers, their survey study yielded only a 7% response rate – which came as no surprise to the researchers. Lin and Pervan (2003) cited several survey researchers conducted by different authors in different geographic areas that also experienced a low response rate and they determined the average survey response rate to be approximately 14%.

This research topic obviously required that only personnel involved with company strategic decision-making should respond to the questionnaire. Unfortunately, many of these people simply do not have either sufficient time or the interest to complete and return a survey questionnaire. These two factors could also explain the very low response rate to the email survey which comprised the first stage of this research. The response rate improved significantly when the research strategy moved to the second stage, namely door to door canvassing for participants to the survey across business parks and industrial parks/zones in the Greater Durban region. Subsequent to the door to door canvassing by the researcher, the final outcome improved noticeably.

Most of the information presented below is based on descriptive statistics with comparisons between different respondent groups made using T-tests and ANOVA tests in order to obtain the detailed opinions.

Table 7: Profile of the respondent organizations

| Range | Percentage (%) |
|---|---|
| **(1) Industry sectors** | |
| Manufacturing | 20.6 |
| Finance and Business Services | 15.9 |
| Transport, Storage and Communications | 14.3 |
| Wholesale Trade, Commercial Agents and Allied Services | 11.1 |
| Construction | 9.5 |
| Other | 28.6 |
| **(2) Company size** | |
| Large | 57.1 |
| Small and medium | 42.9 |
| **(3) Annual turnover (million Rand)** | |
| >50 | 52.4 |
| 20-50 | 12.7 |
| <20 | 14.3 |
| Don't know or don't want to answer | 20.6 |
| **(4) Total gross assets (million Rand) (Fixed property excluded)** | |
| >18 | 34.9 |
| 5-18 | 15.9 |
| <5 | 12.7 |
| Don't know or don't want to answer | 36.5 |
| **(5) Number of employees** | |
| >200 | 41.3 |
| 100-199 | 9.5 |
| 50-99 | 14.3 |
| <50 | 34.9 |
| **(6) Respondents' background** | |
| (a) By managerial rank | |
| Senior management level | 39.7 |
| Middle management level | 42.9 |
| Skill level | 17.5 |
| (a) By professional field | |
| Business operation | 57.1 |
| IT related | 25.4 |
| Business support | 17.5 |
| **(7) Organizational structure** | |
| (a) Hierarchical | 55.6 |
| Flat | 30.1 |
| Not answered | 14.3 |
| (b) Centralized | 63.5 |
| Decentralized | 14.3 |
| Not answered | 22.2 |
| (c) Divisional/functional | 50.8 |
| Cross-functional | 34.9 |
| Not answered | 14.3 |
| **(8) ERP application status** | |
| Using ERP and it is fully integrated | 55.6 |
| Bought ERP, but it is not fully implemented | 12.7 |
| At ERP selection stage | 6.3 |
| Don't have ERP, but might have one in the future | 1.6 |
| Don't have ERP and have no intention of buying one | 23.8 |

A wide range of industry sectors was represented by companies that responded to this research. In Table 7 above it can be seen that most responses came from industries such as manufacturing, financial and business services, transport, storage, communications and construction and that these businesses are large in turnover, total assets and number of

employees – by South African standards (National Small Business Act, 1996, Department of Trade and Industry, South Africa)

The majority of the respondents came from the business operation field: 57.1%. 82.6% of respondents are at the middle management level or above: 42.9% at middle management level and 39.7% at senior management level. Table 7 also reveals that the organizations that participated in the study were mostly hierarchical and centralized with a divisional/functional structure.

ERP application distribution is shown in Table 7: more than 55% of respondents had already obtained an ERP system and their ERP systems are fully integrated. An additional 12.7% of respondents had bought ERP software, but it was not fully implemented. Furthermore, 6.3% of respondents were at the ERP software selection stage, having embarked on the selection process but they hadn't as yet obtained an ERP system. Other respondents indicated that they did not have an ERP system and were not involved in selecting ERP software. Within this last group of respondents, a small portion (1.6% of the entire sample) indicated that they might obtain an ERP system in the future; the remaining respondents (23.8% of the entire sample) had no intention of buying ERP software in the future.

The above discussion relates to the entire sample of this research, and provides a global picture of companies surveyed by this study.

Because of the design of the questionnaire, companies that had no ERP system and who had not recently embarked on a project in terms of ERP acquisition (16 companies) were only required to answer part of the questionnaire, namely the basic information regarding the organization and its ERP application status. These respondents were not required to provide opinion or comment on the topic of this research. Therefore, the remaining data analysis discussion refers only to the group of respondents that chose option 1, 2, or 3 at question P1.6 (Annexure 3). Sixteen of the 63 companies

only answered part one of the questionnaire as they had no ERP system and had no intention of buying one. Only one company within this group said that they might have an interest in obtaining an ERP system in the future; the remainder had no intention of buying an ERP system in the future. This respondent group's distribution by company size and industrial sector is shown in Table 8 below.

Forty three of the 63 companies answered the questionnaire in its entirety, including 35 companies that already had an ERP system that was integrated and eight companies that had an ERP system that was not fully implemented. Four of the 63 companies recently ran an ERP selection project, didn't as yet have an ERP system but had already commenced the ERP selection process. These companies responded to part one and part three of the questionnaire.

Table 8: Cross tabulation analysis for respondents that had no ERP system

|  |  | Don't have ERP, but might have one in future (N of company) | Don't have ERP and have no intention of buying (N of company) |
|---|---|---|---|
| Company size | Large organization | 1 | 4 |
|  | SME |  | 11 |
| Industrial sector | Manufacturing |  | 2 |
|  | Wholesale Trade, Commercial Agents and Allied Services |  | 3 |
|  | Transport, Storage and Communications |  | 1 |
|  | Finance and Business Services |  | 4 |
|  | Construction |  | 1 |
|  | Other | 1 | 4 |

The information provided in Table 8, above does not provide exact and conclusive reasons why companies do not intend to adopt an ERP system and the research was not designed to obtain further information on this subject.

Table 8 does reveal a comparative descriptive result of ERP application status (the portion of respondents that had no ERP system and had no recent intention of acquiring one) dispersion per company size and industrial sector. An explanation could be that SMEs are more likely not to intend adopting ERP than large organizations, probably because of financial capability and business management and operation complications.

Qing Yu
Graduate School of Business @ University of KwaZulu-Natal

## 4.2 ERP SYSTEM APPLICATION STATUS

Cross tabulation analysis on ERP application by company size and industrial sector is shown in Table 9 below. It indicates that: large organizations are the major ERP software consumers; in terms of industrial sectors, the manufacturing industry is the biggest user of ERP systems, followed by the transport, storage and communication industries, and then the finance and business service industry.

Table 9: ERP distribution comparison by company size and industrial sector

| Range | | Percentage (%) |
|---|---|---|
| Company size | Large organization | 69.8 |
| | SME | 30.2 |
| Industrial sector | Manufacturing | 23.3 |
| | Wholesale Trade, Commercial Agents and Allied Services | 9.3 |
| | Transport, Storage and Communications | 14.0 |
| | Finance and Business Services | 14.0 |
| | Construction | 9.3 |
| | Other | 30.2 |

Table 10 below provides a tabulated depiction of brand distribution. The ERP systems adopted by KZN organizations are widely representative of well-known and commonly used brands as well as unique brands. These ERP systems are developed by either local providers or international providers. Respondents reported more than 14 ERP brands to have been deployed in their organizations, with the most commonly applied ERP brand being SAP: 25.6% of market share. The second most applied ERP brands is JD Edwards: 11.6% of market share. Numerous other ERP brands each showed only a 2.3% share of market in KZN, including brands such as Optimus/Prism, Proman, Goldmine e-ngauge, Afsys, Quicktrav, X-Alt and Switd.

## Table 10: ERP brand distribution

| Range | Percentage (%) |
|---|---|
| SAP | **25.6** |
| JD Edwards | **11.6** |
| Pastel Evolution | **9.3** |
| Oracle | **7.0** |
| Syspro | 7.0 |
| Microsoft Dynamics NAV (formerly Microsoft Navision) | 4.7 |
| AccPac | **2.3** |
| Optimus/Prism | **2.3** |
| Proman | **2.3** |
| Goldmine e-ngauge | **2.3** |
| Afsys | **2.3** |
| Quicktrav | **2.3** |
| X-Alt | **2.3** |
| Switd | **2.3** |
| Other | 16.3 |

Further cross tabulation analysis on ERP brand by company size is shown in Table 11 below.

## Table 11: ERP brand comparison by company size

| | Large size organization | SME | Total |
|---|---|---|---|
| AccPac | 2.3% | | 2.3% |
| JD Edwards | 11.6% | | 11.6% |
| Microsoft Dynamics NAV (formerly Microsoft Navision) | 2.3% | 2.3% | 4.7% |
| Oracle | 7.0% | | 7.0% |
| Pastel Evolution | 2.3% | 7.0% | 9.3% |
| SAP | 25.6% | | 25.6% |
| Other | 9.3% | 7.0% | 16.3% |
| Syspro | 4.7% | 2.3% | 7.0% |
| Optimus/Prism | 2.3% | | 2.3% |
| Proman | | 2.3% | 2.3% |
| Goldmine e-ngauge | | 2.3% | 2.3% |
| Afsys | | 2.3% | 2.3% |
| Quicktrav | | 2.3% | 2.3% |
| X-Alt | 2.3% | | 2.3% |
| Switd | | 2.3% | 2.3% |
| Total | 69.8% | 30.2% | 100.0% |

The table reveals that:

- AccPac, JD Edwards, Oracle, SAP, Optimus/Prism and X-Alt are applied by large size organizations;

- Proman, Goldmine e-ngauge, Afsys, Quicktrav and Switd are applied by SMEs;

- The remaining ERP brands, including Microsoft Dynamics NAV, Pastel Evolution and Syspro are applied by both large organizations and SMEs.

58

The cross tabulation analysis on ERP brand by industrial sector shows no significant finding. The more commonly used and well-known ERP brands have wider industrial application and the unique and more specialized ERP brands have narrow industrial applications.

## 4.3 SELECTION COMMITTEE STRUCTURE

'The process of selecting an ERP system needs also to be staffed correctly to ensure the inclusion of diverse stake-holders within the organization' (Bernroider & Koch, 2001). Usually, in practice, an organization nominates an ERP selection project committee or team to undertake the task. Obviously, the committee size and inclusion of functional departments or personnel will influence the outcome of the final ERP selection.

In this research, the respondents were asked to indicate the number of personnel involved in selecting ERP within their organization (Annexure 3, question P2.8) and to also rate the importance of the personnel who were involved or the functional department's contribution to the ERP selection (Annexure 3, question P2.9.1-P2.9.14). In terms of question P2.8, comparison by company size responses are shown in Table 12 below, which indicates that large organizations are characterised by bigger ERP selection committees. SME ERP selection teams are obviously then characteristically smaller.

Table 12: ERP selection committee size comparison by company size

| | | B1:Company size | | |
| | | Large organization | SME | Total |
| --- | --- | --- | --- | --- |
| P2.8: Number of personnel involved in selecting ERP | ? | 11.6% | 2.3% | 13.9% |
| | <6 | 11.6% | 23.3% | 34.9% |
| | 6-10 | 23.4% | 4.6% | 28.0% |
| | 11-25 | 9.2% | | 9.2% |
| | >25 | 14.0% | | 14.0% |
| Total | | 69.8% | 30.2% | 100.0% |

Table 13 below provides an analysis of questions P2.91-P2.9.14 (Annexure 3) by central tendency statistics. It shows that the P2.9.1 (executive) study

59

variable has a mean value of 6.00: respondents to the research articulated that average perception is 'extremely important' regarding the previously mentioned study variable. In other words, executives play a very important role when organizations run ERP selection projects, their opinions have a direct effect on ERP selection decision making: an opinion generally voiced by all responding organizations that have ERP system.

Table 13: Central tendency statistics for questions P2.9.1-P2.9.14

| | P2.9.1: Executives | P2.9.2: Admin | P2.9.3: Engineering | P2.9.4: Finance | P2.9.5: HR |
|---|---|---|---|---|---|
| N Valid | 42 | 42 | 42 | 42 | 42 |
| Missing | 1 | 1 | 1 | 1 | 1 |
| Mean | 6.00 | 3.00 | 2.00 | 5.00 | 3.00 |
| Median | 6.00 | 4.00 | 1.00 | 5.00 | 1.00 |
| Standard Deviation | 1.131 | 2.026 | 1.754 | 1.794 | 1.999 |
| Variance | 1.280 | 4.105 | 3.076 | 3.217 | 3.998 |
| Minimum | 1 | 1 | 1 | 1 | 1 |
| Maximum | 6 | 6 | 6 | 6 | 6 |

| | P2.9.6: IT | P2.9.7: Legal | P2.9.8: Merchandiser | P2.9.9: Marketing | P2.9.10: Operation |
|---|---|---|---|---|---|
| N Valid | 42 | 42 | 42 | 42 | 42 |
| Missing | 1 | 1 | 1 | 1 | 1 |
| Mean | 5.00 | 2.00 | 2.00 | 3.00 | 4.00 |
| Median | 5.00 | 1.00 | 1.00 | 2.00 | 4.00 |
| Standard Deviation | 1.979 | 1.605 | 1.828 | 2.047 | 2.198 |
| Variance | 3.915 | 2.576 | 3.343 | 4.191 | 4.832 |
| Minimum | 1 | 1 | 1 | 1 | 1 |
| Maximum | 6 | 6 | 6 | 6 | 6 |

| | P2.9.11: R&D | P2.9.12: SCM | P2.9.13: Distribution | P2.9.14: External consultants |
|---|---|---|---|---|
| N Valid | 42 | 42 | 42 | 42 |
| Missing | 1 | 1 | 1 | 1 |
| Mean | 3.00 | 3.00 | 3.00 | 3.00 |
| Median | 1.50 | 3.50 | 3.00 | 4.00 |
| Standard Deviation | 1.991 | 2.187 | 2.200 | 2.115 |
| Variance | 3.963 | 4.783 | 4.839 | 4.472 |
| Minimum | 1 | 1 | 1 | 1 |
| Maximum | 6 | 6 | 6 | 6 |

Note:
1 – Was not involved in ERP selection
2 – Not at all important
3 – Somewhat important
4 – Moderately important
5 – Important
6 – Extremely Important

Similarly, P2.9.4 (finance) and P2.9.6 (IT) has a mean value of 5.00, which gives an average perception as 'important'. P2.9.10 (operation) has a mean value of 4.00, which gives average perception as 'moderately important'. Therefore, the finance, IT and operation departments also played an important role in organizational selection of ERP software and their contributions are important to the final decision making – a generally voiced opinion from all responding organizations that were already using an ERP system.

P2.9.2 (admin), P2.9.5 (HR), P2.9.9 (marketing), P2.9.11 (R&D), P2.9.12 (SCM), P2.9.13 (distribution) and P2.9.14 (external consultants) have a mean value of 3.00, which indicates the average perception as being 'somewhat important'. Obviously, these departments have some influence and power in the ERP selection process, but their contribution to the ERP selection decision making process is somewhat important. In other words, their opinion will be considered and evaluated by the final decision maker, but by and large they cannot determine the outcome individually. This is an opinion that can be generalised to all responding organizations that reported the existence of ERP systems.

P2.9.3 (engineering), P2.9.7 (legal) and P2.9.8 (merchandiser) have a mean value of 2.00. This relates to an average perception of 'not at all important'. In terms of these three functional departments or personnel, the general opinion from all responding organizations was that they are not important to the ERP selection decision making process, but that they do have a voice in the project under certain circumstances.

No personnel or functional departments have a mean value of 1, which relates to the representing perception 'was not involved in ERP selection'. In other words, no departments or personnel were rated as 'was not involved in ERP selection' – a general opinion offered by all responding organizations that already have ERP systems.

Continuing the analysis of the data in Table 13, it can be seen that:

- Median values of P2.9.1 (executive), P2.9.4 (finance), P2.9.6 (IT), P2.9.10 (operation) and P2.9.13 (distribution) are equal to the mean value, which reveals that the mean values are representative of the majority of respondents' perception;

- The remaining personnel or functional departments have a different median value compared to the mean value, which reveals that perceptions of respondents are not convergent.

When looking at the standard deviation and variance in Table 13, it can be seen that is provides support for the assumption made above.

For all variables in Table 13, the minimum value is 1, and the maximum value 6. This indicates the variables differences in respondents' perceptions and that respondents have expressed a range of opinions in response to the research questions: the articulated minimum perception is 'was not involved in ERP selection'; the articulated maximum perception is 'extremely important'.

In order to obtain detailed opinions for questions P2.9.1-P2.9.14, this study has undertaken comparison statistics analysis by company size and industrial sector in order to reveal the differences in perception between respondent groups. In addition, T-tests and ANOVA tests were used to identify the significant differences between respondent groups in order to aid the researcher in narrow the comparison workload and focus on the valuable comparison statistics data.

### 4.3.1 Comparison by Company Size

Table 14 below provides the T-tests for question P2.9.1-P2.9.14 compared by company size. The table reveals the p significance values are 0.013, 0.002, 0.001, 0.004, 0.018, 0.035, 0.004, 0.001, 0.034 for question P2.9.4

(finance), P2.9.5 (HR), P2.9.6 (IT), P2.9.7 (legal), P2.9.8 (merchandiser), P2.9.9 (marketing), 2.9.12 (SCM), P2.9.13 (distribution), P2.9.14 (external consultants) and that they are below 0.05. It reveals a statistical significance in difference between different company size group respondents' perceptions regarding these study questions. This indicates that respondents from large organizations and those from SMEs hold different perceptions of the contribution made during ERP selection of the functional departments or personnel listed above. These differences in opinion are quite large.

In order to obtained a detailed picture to show the differences identified in Table 14, cross tabulation analysis was done using comparison dispersion statistics for questions P2.9.4 (finance), P2.9.5 (HR), P2.9.6 (IT), P2.9.7 (legal), P2.9.8 (merchandiser), P2.9.9 (marketing), 2.9.12 (SCM), P2.9.13 (distribution) and P2.9.14 (external consultants). These comparison tables are shown in Table 15 below.

The data provided in Table 15 indicates that the ERP selection involvement of finance (P2.9.4) and IT (P2.9.6) departments is lower in SMEs than the same functional departments in the large organizations. This could be explained by the fact that SMEs usually have a smaller ERP selection committee and this committee sometimes only including the executives.

## Table 14: Question P2.9.1-P2.9.14 T-tests comparison by company size

| | | T-test | | | | T-test | | |
| | | t | df | Sig. (2-tailed) | | T | df | Sig. (2-tailed) |
|---|---|---|---|---|---|---|---|---|
| P2.9.1 | Equal Variance assumed | 1.128 | 40 | .266 | P2.9.2 | Equal Variance assumed | -.233 | 40 | .817 |
| | Equal Variance not assumed | .977 | 17.240 | .342 | | Equal variance not assumed | -.227 | 21.827 | .823 |
| P2.9.3 | Equal variance assumed | 1.814 | 40 | .073 | P2.9.4 | Equal variance assumed | 2.592 | 40 | .013 |
| | Equal variance not assumed | 2.082 | 31.523 | .045 | | Equal variance not assumed | 2.130 | 15.766 | .049 |
| P2.9.5 | Equal variance assumed | 3.372 | 40 | .002 | P2.9.6 | Equal variance assumed | 3.530 | 40 | .001 |
| | Equal variance not assumed | 4.494 | 39.781 | .000 | | Equal variance not assumed | 2.893 | 15.693 | .011 |
| P2.9.7 | Equal variance assumed | 3.012 | 40 | .004 | P2.9.8 | Equal variance assumed | 2.476 | 40 | .018 |
| | Equal variance not assumed | 4.430 | 31.018 | .000 | | Equal variance not assumed | 3.273 | 39.933 | .002 |
| P2.9.9 | Equal variance assumed | 2.187 | 40 | .035 | P2.9.10 | Equal variance assumed | 1.642 | 40 | .108 |
| | Equal variance not assumed | 2.371 | 28.328 | .025 | | Equal variance not assumed | 1.585 | 21.388 | .128 |
| P2.9.11 | Equal variance assumed | 1.448 | 40 | .155 | P2.9.12 | Equal variance assumed | 3.087 | 40 | .004 |
| | Equal variance not assumed | 1.454 | 23.381 | .159 | | Equal variance not assumed | 3.327 | 27.873 | .002 |
| P2.9.13 | Equal variance assumed | 3.526 | 40 | .001 | P2.9.14 | Equal variance assumed | 2.201 | 40 | .034 |
| | Equal variance not assumed | 4.065 | 33.053 | .000 | | Equal variance not assumed | 2.110 | 21.059 | .047 |

Note:
1 – If $p \leq 0.05$, statistically there is significant difference between comparison groups' opinions.
2 – If $p > 0.05$, statistically there is NO significant difference between comparison groups' opinions.

Table 15: Selected question P2.9.1-P2.9.14 comparison dispersion statistics by company size

| | | Large organisation | SME | | | Large organisation | SME |
|---|---|---|---|---|---|---|---|
| P2.9.4 Finance | Was not involved in ERP selection | 6.9% | 38.4% | P2.9.5 HR | Was not involved in ERP selection | 34.5% | 92.2% |
| | Not at all important | | | | Not at all important | 10.3% | |
| | Somewhat important | 3.4% | 7.9% | | Somewhat important | 10.3% | |
| | Moderately important | 3.4% | | | Moderately important | 10.3% | 7.8% |
| | Important | 41.4% | 23.0% | | Important | 10.3% | |
| | Extremely important | 44.9% | 30.7% | | Extremely important | 24.3% | |
| Total | | 100% | 100% | Total | | 100% | 100% |
| P2.9.6 IT | Was not involved in ERP selection | 6.9% | 53.7% | P2.9.7 Legal | Was not involved in ERP selection | 48.2% | 92.2% |
| | Not at all important | | | | Not at all important | 6.9% | 7.8% |
| | Somewhat important | 3.4% | | | Somewhat important | 6.9% | |
| | Moderately important | 6.9% | 7.7% | | Moderately important | 24.2% | |
| | Important | 27.5% | 7.7% | | Important | 6.9% | |
| | Extremely important | 55.3% | 30.9% | | Extremely important | 6.9% | |
| Total | | 100% | 100% | Total | | 100% | 100% |
| P2.9.8 Merchandiser | Was not involved in ERP selection | 48.2% | 92.2% | P2.9.9 Marketing | Was not involved in ERP selection | 34.5% | 76.8% |
| | Not at all important | 10.3% | | | Not at all important | 10.3% | |
| | Somewhat important | 10.3% | | | Somewhat important | 7.0% | |
| | Moderately important | 7.0% | 7.8% | | Moderately important | 13.7% | 15.5% |
| | Important | 7.0% | | | Important | 10.3% | |
| | Extremely important | 17.2% | | | Extremely important | 24.2% | 7.7% |
| Total | | 100% | 100% | Total | | 100% | 100% |
| P2.9.12 SCM | Was not involved in ERP selection | 27.5% | 76.6% | P2.9.13 Distribution | Was not involved in ERP selection | 31.0% | 84.6% |
| | Not at all important | 3.5% | | | Not at all important | | |
| | Somewhat important | 3.5% | 7.8% | | Somewhat important | 3.5% | 7.7% |
| | Moderately important | 20.5% | | | Moderately important | 24.2% | |
| | Important | 7.0% | 7.8% | | Important | 3.5% | |

Qing Yu
Graduate School of Business @ University of KwaZulu-Natal

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Extremely important | 38.0% | 7.8% | | Extremely important | 37.8% | 7.7% |
| Total | | 100% | 100% | Total | | 100% | 100% |
| P2.9.14 External consultants | Was not involved in ERP selection | 27.5% | 69.1% | | | | |
| | Not at all important | 3.5% | | | | | |
| | Somewhat important | | 7.9% | | | | |
| | Moderately important | 20.7% | | | | | |
| | Important | 27.6% | | | | | |
| | Extremely important | 20.7% | 23.0% | | | | |
| Total | | 100% | 100% | | | | |

In SMEs, the human resource (P2.9.5), legal (P2.9.7), merchandiser (P2.9.8), marketing (P2.9.9), SCM (P2.9.12), distribution (P2.9.13) and external consultants (P2.9.14) departments or personnel have very low involvement in ERP selection projects compared with large organizations. This difference could be explained in terms of the following assumptions:

1. Compared to large organizations, SMEs generally have a small ERP selection committee which often includes only a few executives and heads of departments. Thus, the remaining departments have a lower involvement rate in ERP selection.

2. The company management structure and operation processes of SMEs are obviously simpler than in large organizations - generally due to the nature of business. SMEs do not reveal the structure and therefore as many functional departments as do large organizations do, ergo if some departments do not exist within respondents' organizations, they would have responded to the question with a mark at the option 'was not involved in ERP selection'.

3. Often SMEs do not purchase full modules of ERP software. Some of the ERP modules (HRM, SCM, SRM, CRM.) are often optional, depending on the nature of an SME, which could lead to low involvement of such departments with the selection of ERP.

Qing Yu
Graduate School of Business @ University of KwaZulu-Natal

### 4.3.2 Comparison by Industrial Sector

Table 16 below provides the ANOVA-tests for questions P2.9.1-P2.9.14 compared by industrial sector. The table reveals the p significance values are 0.035, 0.035, 0.027, 0.011 for question P2.9.3 (engineering), P2.9.6 (IT), P2.9.8 (merchandiser), P2.9.14 (external consultants) and that they are below 0.05. It reveals that statistically there is a significant difference between different industrial sector group respondents' perceptions towards these study questions. This means respondents from different industrial sectors hold different perceptions of the above functional departments' contributions during the ERP selection process, and that the differences in opinion are large.

In order to obtain a detailed picture of the difference identified in Table 16 cross tabulation analysis was done by using comparison dispersion statistics for questions P2.9.3 (engineering), P2.9.6 (IT), P2.9.8 (merchandiser), and P2.9.14 (external consultants). The comparison results are shown in Table 17 below.

According to the information in Table 17, there is a large difference between the engineering (P2.9.3) department's involvement at the ERP selection project in the manufacturing industry and in other industries. Only 29.8% of respondents from the manufacturing industry indicated that their engineering department was not involved in the ERP selection project, however, most respondents from other industries indicated that their engineering departments were not involved in the ERP selection project. This is understandable as the manufacturing industry has a high demand for input from the engineering department when dealing with an ERP selection issue – they are more concerned with the MRP module when selecting ERP software and this requires a high level of contribution from the engineering department.

Qing Yu
Graduate School of Business @ University of KwaZulu-Natal

Table 16: Question P2.9.1-P2.9.14 ANOVA-tests comparison by industrial sector

| | | Sum of squares | df | Mean square | Significance |
|---|---|---|---|---|---|
| P2.9.1 | Between groups | 4.743 | 5 | .949 | .616 |
| | Within groups | 47.733 | 36 | 1.326 | |
| | Total | 52.476 | 41 | | |
| P2.9.2 | Between groups | 21.536 | 5 | 4.307 | .400 |
| | Within groups | 146.750 | 36 | 4.076 | |
| | Total | 168.286 | 41 | | |
| P2.9.3 | Between groups | 34.552 | 5 | 6.910 | .035 |
| | Within groups | 91.567 | 36 | 2.544 | |
| | Total | 126.119 | 41 | | |
| P2.9.4 | Between groups | 24.171 | 5 | 4.834 | .181 |
| | Within groups | 107.733 | 36 | 2.993 | |
| | Total | 131.905 | 41 | | |
| P2.9.5 | Between groups | 30.505 | 5 | 6.101 | .173 |
| | Within groups | 133.400 | 36 | 3.706 | |
| | Total | 163.905 | 41 | | |
| P2.9.6 | Between groups | 44.017 | 5 | 8.803 | .035 |
| | Within groups | 116.483 | 36 | 3.236 | |
| | Total | 160.500 | 41 | | |
| P2.9.7 | Between groups | 17.636 | 5 | 3.527 | .233 |
| | Within groups | 87.983 | 36 | 2.444 | |
| | Total | 105.619 | 41 | | |
| P2.9.8 | Between groups | 39.305 | 5 | 7.861 | .027 |
| | Within groups | 97.767 | 36 | 2.716 | |
| | Total | 137.071 | 41 | | |
| P2.9.9 | Between groups | 14.350 | 5 | 2.870 | .659 |
| | Within groups | 157.483 | 36 | 4.375 | |
| | Total | 171.833 | 41 | | |
| P2.9.10 | Between groups | 37.219 | 5 | 7.444 | .168 |
| | Within groups | 160.900 | 36 | 4.469 | |
| | Total | 198.119 | 41 | | |
| P2.9.11 | Between groups | 6.493 | 5 | 1.299 | .910 |
| | Within groups | 155.983 | 36 | 4.333 | |
| | Total | 162.476 | 41 | | |
| P2.9.12 | Between groups | 39.119 | 5 | 7.824 | .139 |
| | Within groups | 157.000 | 36 | 4.361 | |
| | Total | 196.119 | 41 | | |
| P2.9.13 | Between groups | 28.921 | 5 | 5.784 | .316 |
| | Within groups | 169.483 | 36 | 4.708 | |
| | Total | 198.405 | 41 | | |
| P2.9.14 | Between groups | 59.733 | 5 | 11.947 | .011 |
| | Within groups | 123.600 | 36 | 3.433 | |
| | Total | 183.333 | 41 | | |

Note:
1 – If p≤ 0.05, statistically there is a significant difference between comparison groups' opinions.
2 – If p>0.05, statistically there is NO significant difference between comparison groups' opinions.

## Table 17: Selected question P2.9.1-P2.9.14 comparison dispersion statistics by industrial sector

| | | A (%) | B (%) | C (%) | D (%) | E (%) | F (%) |
|---|---|---|---|---|---|---|---|
| P2.9.3 | Was not involved in ERP selection | 29.8% | 100.0% | 83.2% | 83.2% | 75.0% | 41.6% |
| | Not at all important | 10.1% | | | 16.8% | | |
| | Somewhat important | 10.1% | | 16.8% | | | 8.4% |
| | Moderately important | 20.2% | | | | | 41.6% |
| | Important | | | | | | 8.4% |
| | Extremely important | 29.8% | | | | 25.0% | |
| **Total** | | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| P2.9.6 | Was not involved in ERP selection | | | 16.8% | 66.6% | | 33.3% |
| | Not at all important | | | | | | |
| | Somewhat important | | | 16.8% | | | |
| | Moderately important | 10.0% | | | | 25.0% | 8.5% |
| | Important | 20.0% | 50.0% | | | 25.0% | 33.3% |
| | Extremely important | 70.0% | 50.0% | 66.4% | 33.4% | 50.0% | 24.9% |
| **Total** | | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| P2.9.8 | Was not involved in ERP selection | 50.0% | 50.0% | 83.2% | 83.2% | 25.0% | 66.6% |
| | Not at all important | | 50.0% | | 16.8% | | |
| | Somewhat important | | | | | | 24.9% |
| | Moderately important | 10.0% | | | | 25.0% | 8.5% |
| | Important | 10.0% | | 16.8% | | | |
| | Extremely important | 30.0% | | | | 50.0% | |
| **Total** | | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| P2.9.14 | Was not involved in ERP selection | 50.0% | 75.0% | 49.9% | 66.6% | 25.0% | 50.0% |
| | Not at all important | | 25.0% | | | | |
| | Somewhat important | | | | | 25.0% | |
| | Moderately important | 20.0% | | 16.7% | 16.7% | 25.0% | 8.5% |
| | Important | 40.0% | | 16.7% | | | 25.0% |
| | Extremely important | 40.0% | | 16.7% | 16.7% | 25.0% | 16.5% |
| **Total** | | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |

Note:
A – Manufacturing
B – Wholesale Trade, Commercial Agents and Allied Services
C – Transport, Storage and Communications
D – Finance and Business Services
E – Construction
F – Other

Qing Yu
Graduate School of Business at University of KwaZulu-Natal

The biggest difference regarding question 2.9.6 (IT) is that 66.6% of respondents from the finance and business service industry indicated that the IT department was not involved with the ERP selection project. Without further research to gather more information on this question, it is difficult to explain this situation as the IT department's involvement in all other industrial sectors and organizations of varying sizes is generally high. An assumption could be made that the ERP packages being considered are particularly designed for this particular industry and have to meet a high security requirement. In addition, the software packages have to be highly integrated and less flexible and therefore the ERP product options available to the finance and business service industry are limited and the need for customization decline. This means that it may not be necessary to involve the IT department in the selection committee.

The major difference relating to question P2.9.8 (merchandiser) is that more than half of the respondents from all industries except the construction industry indicated that their merchandiser department was not involved with the ERP selection project: only 25% of respondents from construction industry held the same opinion. Without further research, this cannot be easily understood. Again, without further research information on this question, it would be difficult to explain this statistic.

Similarly, at question P2.9.14 (external consultants), 75% of respondents from the wholesale trade, commercial agents and allied services industry indicated that external consultants were not involved with the ERP selection project; Although the remainder of the respondents from the same industry confirmed the involvement of external consultants, they rated this contribution as being 'not at all important'. This result shows a bigger difference between wholesale trade, commercial agents and allied services industry and the other industries. Again, without further research information, this difference cannot be explained from an informed point of view. However, one possible reason that springs to mind is that the

difference may have been caused by the small sample size when the total sample is split into industrial sectors.

### 4.3.3 Brief Summary

In this section, the personnel or functional departments involved in the ERP selection were analyzed and it is therefore possible to draw some conclusions from the above analysis. These possible conclusions follow.

1. A high percentage of respondents from all types of companies indicated that top management (executives) were involved in the organisation's ERP selection process and that they played a very important role.

2. The finance and IT departments are the most involved functions with companies dealing with ERP selection issues for companies of varying sizes and across all industrial sectors. However, these two departments are more important in SME ERP selection: their contribution plus that of their executives dominate the final ERP selection decision making process. One possible reason could be either reducing costs or a lack of know-how in other departments: typically, IT and finance would be the cornerstones of an SME and would therefore generally include the most skilled, experienced or senior personnel, with certain other 'softer' support functions, such as HR, not being considered as critical a function and this being reflected in the staff in such departments.

3. The ERP selection committee size shows significant difference between large organizations and SMEs. More functional departments and personnel are engaged in ERP selection process within large organisations: this could be the result of a different ERP selection decision making process.

71

## 4.4 INFORMATION GATHERING

The method of gathering ERP information as a basis for selection decision making was asked in question P3.13. The results are shown in Table 18 below.

Table 18: ERP information gathering

| Range | Percentage (%) |
|---|---|
| (1) No. of information gathering methods used | |
| 1 | 51.1 |
| 2 | 14.9 |
| 3 | 8.5 |
| 4 | 8.5 |
| 5 | 2.1 |
| 6 | 2.1 |
| Missing | 12.8 |
| (2) Information gathering method frequency | |
| P3.13.1: Purchase ERP studies | 2.1 |
| P3.13.2: Employ consultants to examine ERP products | 27.7 |
| P3.13.3: Establish project team to examine ERP market | 36.2 |
| P3.13.4: Submit requirements catalogue to ERP vendors | 12.8 |
| P3.13.5: ERP presentations by bidders | 29.8 |
| P3.13.6: Feedback regarding competitors' ERP practice | 12.8 |
| P3.13.7: Feedback from well-known companies | 40.4 |
| P3.13.8: Other | 4.3 |

The comparison between companies shows no significant finding on this question. However, the analysis of comparison of company size shows that most of the information gathering methods were used by both large organizations and SMEs, but that they were all preferred to use one or two information gathering methods when selecting ERP software. The most applied information gathering methods are:

- Feedback from well-known companies (40.4%)
- Establishing a project team to examine the ERP market (29.8%)
- Employing consultants to examine ERP products (27.7%)

Although the information gathering method applications were similar in the different sized companies, the comparison analysis still indicates that some information gathering methods were used extensively only by large organizations, namely:

- Purchasing ERP studies
- Submitting a requirements catalogue to ERP vendors

One could assume from this information that large organizations have more finance and knowledge resources and know-how when they involve themselves in an ERP selection project.

## 4.5 ERP SELECTION PROBLEMS

The diverse problems associated with ERP selection have been reported in previously published literature and this research listed 10 major problems in the questionnaire for respondents to verify. Table 19 below provides an analysis of the responses to questions P3.16.1-P3.16.10 by central tendency statistics. It shows that the study variable has a mean value is 2.00 in terms of: P3.16.1 (cannot decide which vendor and payment methods), P3.16.3 (no established criteria to select ERP), P3.16.8 (capital investment required for ERP is not affordable), P3.16.9 (top management not committed). This reveals that respondents who participated in this research articulated an average perception of 'disagree' towards the above mentioned study variable. In other words, the respondents do not agree that the problems detailed above affect their ERP selection decision making.

Similarly, a mean value of 3.00 is shown for the rest of the questions: P3.16.2 (difficult to value ERP benefit/cost), P3.16.4 (takes lots of management time to compare ERP software), P3.16.5 (lack of knowledge of ERP and its selection), P3.16.6 (large number of ERP products make comparison difficult), P3.16.7 (not sure whether the existing operation problems were caused by a lack of ERP), P3.16.10 (other ERP selection problems). It reveals that the average perception is 'neutral' and that this is the general opinion of the responding organizations that have already embarked on an ERP selection project.

In Table 19 below, median values are shown as being equal to the mean value, except with P3.16.4 (mean value 3.00; median value 4.00). This reveals that the mean value is representative of the majority of respondents' perceptions; but the perceptions of respondents are not convergent at question P3.16.4. From this we can infer that not all companies in the KZN province ensure sufficient management time and effort to compare and decide on the appropriate ERP software, namely, a large portion of companies situated in the KZN province did not ensure a proper process to

select an ERP system. The reason might be related to limited ERP product availability in the local market. The standard deviation and variance revealed in Table 13 supports this assumption.

All variables in Table 19 below have a minimum value of 1 and a maximum value of either 4 or 5. This indicates that these variables show differences in respondents' perceptions and that respondents have expressed different opinions on the research question: the articulated minimum perception is 'strongly disagree'; the articulated maximum perception is 'agree' or 'strongly agree'.

Table 19: Central tendency statistics for questions P3.16.1-P3.16.10

|  | | P3.16.1 | P3.16.2 | P3.16.3 | P3.16.4 | P3.16.5 |
|---|---|---|---|---|---|---|
| N | Valid | 35 | 38 | 37 | 38 | 39 |
|  | Missing | 12 | 9 | 10 | 9 | 8 |
| Mean | | 2.00 | 3.00 | 2.00 | 3.00 | 3.00 |
| Median | | 2.00 | 3.00 | 2.00 | 4.00 | 2.00 |
| Standard Deviation | | 1.033 | 1.318 | 1.146 | 1.249 | 1.334 |
| Variance | | 1.067 | 1.738 | 1.314 | 1.560 | 1.779 |
| Minimum | | 1 | 1 | 1 | 1 | 1 |
| Maximum | | 4 | 5 | 5 | 5 | 5 |

|  | | P3.16.6 | P3.16.7 | P3.16.8 | P3.16.9 | P3.16.10 |
|---|---|---|---|---|---|---|
| N | Valid | 38 | 37 | 37 | 37 | 23 |
|  | Missing | 9 | 10 | 10 | 10 | 24 |
| Mean | | 3.00 | 3.00 | 2.00 | 2.00 | 3.00 |
| Median | | 3.00 | 3.00 | 3.00 | 2.00 | 3.00 |
| Standard Deviation | | 1.021 | 1.096 | 1.068 | 1.076 | .953 |
| Variance | | 1.042 | 1.201 | 1.141 | 1.158 | .909 |
| Minimum | | 1 | 1 | 1 | 1 | 1 |
| Maximum | | 5 | 4 | 4 | 5 | 5 |

Note:
1 – Strongly disagree
2 – Disagree
3 – Neutral
4 – Agree
5 – Strongly Agree

Although the central tendency statistics show a high consistency in respondents' answers, there are still a number of variances between respondents. In order to obtain detail on the opinions of respondents on questions P3.16.1-P3.16.10, this study has done a comparison statistics

75

analysis by company size, industrial sector and organizational structure. This will show the perception differences between respondent groups. In addition, T-tests and ANOVA tests were used to identify the significant differences between respondent groups and this will help the researcher to narrow the comparison workload and focus on the valuable comparison statistics data.

### 4.5.1 Comparison by Company Size

Table 20 below reveals the T-tests data for questions P3.16.1-P3.16.10 compared by company size. According to the data contained in this table, the p significance values are 0.018, 0.037 for questions P3.16.1, P3.16.9 and that they are below 0.05. It reveals that statistically there is a significant difference between different company size group respondents' perceptions regarding these study questions. This means that respondents from large organizations and SMEs hold different types of perceptions of the above ERP selection problems and that the differences in opinion are large. The perceptions held by SME are the same with more confidence reflected in ERP system selection. The detailed analysis follows.

Table 20: Question P3.16.1-P3.16.10 T-tests comparison by company size

| | | T-test | | | | | T-test | | |
| | | t | Df | Sig. (2-tailed) | | | t | df | Sig. (2-tailed) |
|---|---|---|---|---|---|---|---|---|---|
| P3.16.1 | Equal Variance assumed | 2.494 | 33 | .018 | P3.16.2 | Equal Variance assumed | .843 | 36 | .405 |
| | Equal Variance not assumed | 2.406 | 22.628 | .025 | | Equal variance not assumed | .744 | 17.773 | .466 |
| P3.16.3 | Equal variance assumed | 1.057 | 35 | .298 | P3.16.4 | Equal variance assumed | .928 | 36 | .360 |
| | Equal variance not assumed | 1.023 | 22.534 | .317 | | Equal variance not assumed | .903 | 22.696 | .376 |
| P3.16.5 | Equal variance assumed | -1.288 | 37 | .206 | P3.16.6 | Equal variance assumed | 1.765 | 36 | .086 |
| | Equal variance not assumed | -1.139 | 19.067 | .269 | | Equal variance not assumed | 1.708 | 24.699 | .100 |
| P3.16.7 | Equal variance assumed | -1.160 | 35 | .254 | P3.16.8 | Equal variance assumed | 1.874 | 35 | .069 |
| | Equal variance not assumed | -1.124 | 22.579 | .273 | | Equal variance not assumed | 1.669 | 18.034 | .112 |
| P3.16.9 | Equal variance assumed | 2.171 | 35 | .037 | P3.16.10 | Equal variance assumed | .948 | 21 | .354 |
| | Equal variance not assumed | 2.164 | 24.505 | .040 | | Equal variance not assumed | .744 | 7.467 | .479 |

Note:
1 – If p ≤ 0.05, statistically there is significance difference between compare groups opinions.
2 – If p > 0.05, statistically there is NO significance difference between compare groups opinions.

In order to obtain a detailed picture so as to show the differences identified in Table 20, cross tabulation analysis was done by using comparison dispersion statistics for questions P3.16.1 and P3.16.9. The comparisons results are provided in Table 21 below.

According to Table 21: 77.1% of respondents from SMEs disagree that the ERP vendor selection and payment methods are difficult for them to decide on; only 45.4% of respondents from large organizations are of the same opinion. 76.9% of respondents from SMEs disagree that top management commitment is a problem in their ERP selection process; only 54% of

77

respondents from large organizations noted the same comments. The degree of perception difference between the two respondent size groups shows a large difference: 69.3% of respondents from SMEs chose 'strongly disagree' as their response to question P3.16.1; only 18.3% of respondents from large organizations selected the same option. In response to question P3.16.9: 61.5% of respondents from SMEs chose 'strongly disagree'; only 16.6% of respondents from large organizations indicated the same opinion.

This perception difference on question P3.16.1 could be explained if SME and large organisations are targeting different ERP products. Since the management and operation needs within SMEs are simpler than in large organizations and the financial capability less, target ERP products are limited for SMEs, which means less confusion when engaged in an ERP selection project.

An explanation for the differences revealed in terms of question P3.16.9 are obvious: executives from SMEs are more involved with company projects, thus, the top management commitment in SMEs does not pose a problem. Conversely, in large organizations, sufficient attention from top management is difficult to obtain for certain projects. This reasoning would explain the apparent differences in perception in organisations representing the different sized company groups.

Table 21: Selected questions P3.16.1-P3.16.10 comparison dispersion statistics by company size

| | | Large organisation | SME | | | Large organisation | SME |
|---|---|---|---|---|---|---|---|
| P3.16.1 | Strongly disagree | 18.2% | 69.3% | P3.16.9 | Strongly disagree | 16.6% | 61.5% |
| | Disagree | 27.2% | 7.8% | | Disagree | 37.4% | 15.4% |
| | Neutral | 45.5% | 15.1% | | Neutral | 33.4% | 15.4% |
| | Agree | 9.1% | 7.8% | | Agree | 8.4% | 7.7% |
| | Strongly agree | | | | Strongly agree | 4.2% | |
| Total | | 100% | 100% | Total | | 100% | 100% |

## 4.5.2 Comparison by Industrial Sector

This research included ANOVA-tests for questions P3.16.1-P3.16.10 compared by industrial sector. According to the tests, there is no any p significant value below or equal to 0.05. This indicates that statistically there is no significant difference between different industrial sector group respondents' perceptions regarding these study questions. This means that respondents from different industrial sectors have almost the same perceptions regarding the above ERP selection problems and that the differences in opinion are not large.

## 4.5.3 Comparison by Organizational Structure

Table 22 below provides the T-tests for questions P3.16.1-P3.16.10 compared by organizational structure (questions P1.5.1-P1.5.3). According to this table:

- the p significant values are 0.050 and 0.039 for questions P3.16.8 and P3.16.9 respectively and equal to or below 0.05 when compared with question P1.5.1;

- the p significant values are 0.039 and 0.007 for questions P3.16.6 and P3.16.7 respectively and that they are below 0.05 when compared with question P1.5.2;

- the p significant value is 0.044 for question P3.16.5 and that it is below 0.05 when compared with question P1.5.3.

It reveals a statistically significant difference between perceptions towards these study questions held by respondents from the different managerial structure groups. This means that respondents from different managerial structure organizations hold different perceptions regarding the above ERP selection problems and that the differences in opinion are large.

Qing Yu
Graduate School of Business @ University of KwaZulu-Natal

Table 22: Questions P3.16.1-P3.16.10 T-tests comparison by organizational structure

| Compare by P1.5.1 | | | |
|---|---|---|---|
| | T-test | | |
| | t | df | Significance (2-tailed) |
| P3.16.8 Equal variance assumed | 2.047 | 29 | .050 |
| Equal variance not assumed | 1.912 | 15.133 | .075 |

| | T-test | | |
|---|---|---|---|
| | t | df | Significance (2-tailed) |
| P3.16.9 Equal variance assumed | 2.162 | 30 | .039 |
| Equal variance not assumed | 2.123 | 16.760 | .049 |

| Compare by P1.5.2 | | | |
|---|---|---|---|
| | T-test | | |
| | t | df | Significance (2-tailed) |
| P3.16.6 Equal variance assumed | -2.171 | 28 | .039 |
| Equal variance not assumed | -2.452 | 12.308 | .030 |

| | T-test | | |
|---|---|---|---|
| | t | df | Significance (2-tailed) |
| P3.16.7 Equal variance assumed | 2.933 | 28 | .007 |
| Equal variance not assumed | 2.892 | 9.751 | .016 |

| Compare by P1.5.3 | | | |
|---|---|---|---|
| | T-test | | |
| | t | df | Significance (2-tailed) |
| P3.16.5 Equal variance assumed | -2.099 | 30 | .044 |
| Equal variance not assumed | -1.712 | 11.702 | .113 |

Note:
1 - If p≤ 0.05, statistically there is a significant difference between comparison groups' opinions.
2 - If p>0.05, statistically there is NO significant difference between comparison groups' opinions.

Qing Yu
Graduate School of Business @ University of KwaZulu-Natal

In order to obtain a detailed picture to show the difference between responses to the identified questions in Table 22, cross tabulation analysis was done by using comparison dispersion statistics for these questions. The comparisons tables are shown in Table 23 below. The results show that

- respondents from organisations with a flat structure hold a more positive opinions regarding the ERP selection problems described in P3.16.8 (capital investment required for ERP is not affordable) and P3.16.9 (top management not committed) when compared with respondents from organisations that are hierarchically structured;

- respondents from organisations with a decentralized structure show a more negative opinion on the ERP selection problem P3.16.6 (large number of ERP products make comparison difficult) than do respondents from organisations with a centralized structure;

- respondents from organisations with a decentralized structure hold more positive opinions on the ERP selection problem P3.16.7 (not sure whether the existing operation problems were caused by a lack of ERP) than do respondents from organisations with a centralized structure;

- respondents from organisations with a divisional structure reveal more positive opinions on ERP selection problem P3.16.5 (lack of knowledge of ERP and its selection) than do respondents from organisations with a cross-functional structure.

Qing Yu
Graduate School of Business @ University of KwaZulu-Natal

Table 23: Selected questions P3.16.1-P3.16.10 comparison dispersion statistics by organizational structure

| | | Hierarchical (%) | Flat (%) |
|---|---|---|---|
| P3.16.8 | Strongly disagree | 14.3 | 50.0 |
| | Disagree | 19.0 | 20.0 |
| | Neutral | 52.4 | 20.0 |
| | Agree | 14.3 | 10.0 |
| | Strongly agree | | |
| Total | | 100.0 | 100.0 |
| P3.16.9 | Strongly disagree | 13.7 | 60.0 |
| | Disagree | 36.4 | 20.0 |
| | Neutral | 36.4 | 10.0 |
| | Agree | 9.0 | 10.0 |
| | Strongly agree | 4.5 | |
| Total | | 100.0 | 100.0 |

| | | Centralized (%) | Decentralized (%) |
|---|---|---|---|
| P3.16.6 | Strongly disagree | 17.4 | |
| | Disagree | 34.8 | 14.4 |
| | Neutral | 34.8 | 42.8 |
| | Agree | 13.0 | 42.8 |
| | Strongly agree | | |
| Total | | 100.0 | 100.0 |
| P3.16.7 | Strongly disagree | 13.0 | 71.5 |
| | Disagree | 17.4 | |
| | Neutral | 47.9 | 28.5 |
| | Agree | 21.7 | |
| | Strongly agree | | |
| Total | | 100.0 | 100.0 |

| | | Divisional/functional (%) | Cross-functional (%) |
|---|---|---|---|
| P3.16.5 | Strongly disagree | 27.3 | 30.0 |
| | Disagree | 40.8 | |
| | Neutral | 22.7 | 30.0 |
| | Agree | 9.2 | 10.0 |
| | Strongly agree | | 30.0 |
| Total | | 100.0 | 100.0 |

## 4.5.4 Brief Summary

In sections 4.5.1.-to 4.5.3 the problems encountered during the ERP selection process were analyzed and a short conclusion can therefore be drawn from this analysis, as follows:

1. The problems that occurred during ERP selection process show no significant difference between companies from different industrial sectors. However, certain organizational characteristics do have a certain impact on the ERP selection process and therefore result in particular problems. These characteristics include company size and organizational structure.

2. The research has shown that hierarchically structured organizations have certain disadvantages in terms of ERP selection: top

management commitment was not as good as in organisations with a flat structure. This issue is also reflected in the problems that occur by company size.

3. No distinct evidence supports whether centralized or decentralized organizational structures will provide more benefit in terms of ERP selection: both structures reveal certain advantages and disadvantages during the ERP selection process. A pertinent examples would include be that centralized organizational structures are good at comparison decision making when a company has to evaluate a large number of ERP products; it is harder, however, for the decision-maker to obtain detail on the problems from the frontline personnel as decision making is done at the head office. Decentralized organizations show the contrary situation.

## 4.6 SELECTION CRITERIA

The section dealing with ERP selection criteria was provided in the questionnaire from question P3.17.1 to 3.17.15, and from question P3.18.1 to P3.18.21. The section differentiated between product factors and non-product factors relating to ERP selection and respondents were asked to rate the importance of those factors. The average perception held by all respondents in terms of these questions is presented in a central tendency statistic shown in Table 24 and Table 25 below.

According to Table 24, all product factors (P3.17.1-P3.17.15) have a mean value of either 4.00 or 5.00. This indicates that the respondents who participated in this research have articulated an average perception of 'important' or 'extremely important' regarding this study variable. In other words, respondents from all companies give high importance to those particular product factors. This is the general opinion held by responding organizations that have not embarked on an ERP system selection project.

The results of factors P3.18.1-P3.18.21 are similar except in relation to factors P3.18.11 (internationality of ERP software), P3.18.12 (recommendation by a well-known company), P3.18.19 (monthly rental or instalments option instead of a lump-sum payment) and P3.18.21 (cheaper for the same modules/functions than other ERP). Table 25 shows that the remaining non-product factors all have a mean value 4.00. This indicates that the respondents who participated in this research have articulated and average perception of 'important' regarding this particular study variable. Surprisingly, different opinions were expressed on factors P3.18.11, P3.18.12, P3.18.19 and P3.18.21: the factors show a mean value of 3.00. This indicates that the respondents who participated in this research have articulated an average perception of 'moderately important' with regard to this particular study variable. This is a general opinion held by responding organizations that had not engaged in an ERP systems selection project.

The median values are all equal to the mean value provided in both Table 24 and Table 25. This suggests that the mean value is representative of the perception of the majority of respondents and that the perceptions of respondents are convergent. The standard deviation and variance from these tables support this assumption.

Table 24: Central tendency statistics for questions P3.17.1-P3.17.15

|  | | P3.17.1 | P3.17.2 | P3.17.3 | P3.17.4 | P3.17.5 |
|---|---|---|---|---|---|---|
| N | Valid | 43 | 42 | 42 | 42 | 42 |
|  | Missing | 4 | 5 | 5 | 5 | 5 |
| Mean | | 5.00 | 5.00 | 4.00 | 4.00 | 4.00 |
| Median | | 5.00 | 5.00 | 4.00 | 4.00 | 4.00 |
| Standard Deviation | | .545 | .593 | .618 | 1.000 | 1.234 |
| Variance | | .297 | .351 | 382 | 999 | 1.522 |
| Minimum | | 3 | 3 | 3 | 1 | 1 |
| Maximum | | 5 | 5 | 5 | 5 | 5 |

|  | | P3.17.6 | P3.17.7 | P3.17.8 | P3.17.9 | P3.17.10 |
|---|---|---|---|---|---|---|
| N | Valid | 42 | 43 | 40 | 40 | 41 |
|  | Missing | 5 | 4 | 7 | 7 | 6 |
| Mean | | 4.00 | 4.00 | 4.00 | 4.00 | 5.00 |
| Median | | 5.00 | 4.00 | 4.00 | 4.00 | 4.00 |
| Standard Deviation | | 1.019 | .947 | .888 | .687 | .506 |
| Variance | | 1.038 | .896 | .789 | .472 | .256 |
| Minimum | | 1 | 1 | 2 | 3 | 4 |
| Maximum | | 5 | 5 | 5 | 5 | 5 |

|  | | P3.17.11 | P3.17.12 | P3.17.13 | P3.17.14 | P3.17.15 |
|---|---|---|---|---|---|---|
| N | Valid | 41 | 40 | 42 | 42 | 42 |
|  | Missing | 6 | 7 | 5 | 5 | 5 |
| Mean | | 4.00 | 4.00 | 5.00 | 5.00 | 5.00 |
| Median | | 4.00 | 4.00 | 5.00 | 5.00 | 5.00 |
| Standard Deviation | | .756 | .932 | .772 | .526 | .497 |
| Variance | | .572 | .869 | .595 | .276 | .247 |
| Minimum | | 2 | 1 | 2 | 3 | 3 |
| Maximum | | 5 | 5 | 5 | 5 | 5 |

Note:
1 – Not at all important
2 – Somewhat important
3 – Moderately important
4 – Important
5 – Extremely important

All variables in Table 24 and Table 25 have a minimum value of 1 and a maximum value of 5. This indicates that a difference in respondents' perceptions on these variables and that respondents have expressed a variety of opinions on the research questions. The articulated minimum perception is 'not at all important'; and the articulated maximum perception is 'extremely important'.

Table 25: Central tendency statistics for questions P3.18.1-P3.18.21

| | P3.18.1 | P3.18.2 | P3.18.3 | P3.18.4 | P3.18.5 |
|---|---|---|---|---|---|
| N Valid | 39 | 39 | 37 | 39 | 39 |
| Missing | 8 | 8 | 10 | 8 | 8 |
| Mean | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 |
| Median | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 |
| Standard Deviation | .995 | .811 | .681 | .857 | .701 |
| Variance | .989 | .657 | .464 | .734 | .491 |
| Minimum | 1 | 1 | 3 | 2 | 2 |
| Maximum | 5 | 5 | 5 | 5 | 5 |

| | P3.18.6 | P3.18.7 | P3.18.8 | P3.18.9 | P3.18.10 |
|---|---|---|---|---|---|
| N Valid | 40 | 39 | 39 | 37 | 39 |
| Missing | 7 | 8 | 8 | 10 | 8 |
| Mean | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 |
| Median | 4.00 | 4.00 | 4.00 | 5.00 | 4.00 |
| Standard Deviation | .632 | .628 | .627 | .828 | .929 |
| Variance | .400 | .394 | .393 | .686 | .862 |
| Minimum | 3 | 3 | 3 | 3 | 1 |
| Maximum | 5 | 5 | 5 | 5 | 5 |

| | P3.18.11 | P3.18.12 | P3.18.13 | P3.18.14 | P3.18.15 |
|---|---|---|---|---|---|
| N Valid | 39 | 39 | 39 | 39 | 39 |
| Missing | 8 | 8 | 8 | 8 | 8 |
| Mean | 3.00 | 3.00 | 4.00 | 4.00 | 4.00 |
| Median | 3.00 | 3.00 | 4.00 | 4.00 | 4.00 |
| Standard Deviation | 1.177 | 1.004 | .873 | .756 | .929 |
| Variance | 1.386 | 1.008 | .762 | .571 | .862 |
| Minimum | 1 | 1 | 2 | 2 | 2 |
| Maximum | 5 | 5 | 5 | 5 | 5 |

| | P3.18.16 | P3.18.17 | P3.18.18 | P3.18.19 | P3.18.20 | P3.18.21 |
|---|---|---|---|---|---|---|
| N Valid | 39 | 38 | 38 | 38 | 39 | 39 |
| Missing | 8 | 9 | 9 | 9 | 8 | 8 |
| Mean | 4.00 | 4.00 | 4.00 | 3.00 | 4.00 | 3.00 |
| Median | 4.00 | 4.00 | 4.00 | 3.00 | 4.00 | 3.00 |
| Standard Deviation | .857 | .831 | 1.058 | 1.194 | .946 | 1.012 |
| Variance | .734 | .691 | 1.119 | 1.426 | .895 | 1.024 |
| Minimum | 2 | 2 | 1 | 1 | 1 | 1 |
| Maximum | 5 | 5 | 5 | 5 | 5 | 5 |

Note:
1 – Not at all important
2 – Somewhat important
3 – Moderately important
4 – Important
5 – Extremely important

In order to obtain more detail regarding the opinions held by respondents on factors P3.17.1-P3.17.15 and P3.18.1-P3.18.21, a comparison statistics analysis by company size and industrial sector was done in order to show

86

the perception difference between respondent groups. In addition, T-tests and ANOVA tests were used to identify the significant differences between respondent groups and this will help the researcher to narrow the comparison workload and focus on the valuable comparison statistics data.

### 4.6.1 Comparison by Company Size

T-tests for factors P3.17.1-P3.17.15 were done and compared by company size. The tests reveal no p significant values below or equal to 0.05. They reveal that statistically there is no significant difference between different company size group respondents' perceptions in terms of these study questions. This means that respondents from the different company sizes have almost the same perceptions of these ERP selection product factors and that the differences in opinion are not large.

Table 26 below provides the T-tests results for factors P3.18.1-P3.18.21 compared by company size. According to this table, the p significant values are 0.026, 0.005, and 0.001 for factors P3.18.1, P3.18.11, P3.18.17 respective and are below 0.05. It reveals that statistically there is a significant difference between different company size group respondents' perceptions in terms of these specific study questions. This means that respondents from large organizations and from SMEs hold different perceptions regarding these specific ERP non-product factors and that the differences in opinion are large.

## Table 26: Factors P3.18.1-P3.18.21 T-tests comparison by company size

| | | T-test | | | | | T-test | | |
|---|---|---|---|---|---|---|---|---|---|
| | | t | df | Significance (2-tailed) | | | T | df | Significance (2-tailed) |
| P3.18.1 | Equal Variance assumed | 2.238 | 37 | .026 | P3.18.2 | Equal Variance assumed | -.809 | 37 | .424 |
| | Equal Variance not assumed | 2.036 | 18.552 | .056 | | Equal variance not assumed | -.944 | 18.552 | .351 |
| P3.18.3 | Equal variance assumed | -1.054 | 35 | .299 | P3.18.4 | Equal variance assumed | -.130 | 37 | .897 |
| | Equal variance not assumed | -1.068 | 25.713 | .295 | | Equal variance not assumed | -.113 | 17.166 | .911 |
| P3.18.5 | Equal variance assumed | -.319 | 37 | .751 | P3.18.6 | Equal variance assumed | -.422 | 38 | .675 |
| | Equal variance not assumed | -.285 | 18.259 | .779 | | Equal variance not assumed | -.415 | 22.782 | .682 |
| P3.18.7 | Equal variance assumed | -1.273 | 37 | .211 | P3.18.8 | Equal variance assumed | -.537 | 37 | .595 |
| | Equal variance not assumed | -1.385 | 30.136 | .176 | | Equal variance not assumed | -.538 | 24.219 | .596 |
| P3.18.9 | Equal variance assumed | .648 | 35 | .521 | P3.18.10 | Equal variance assumed | .362 | 37 | .720 |
| | Equal variance not assumed | .635 | 20.757 | .532 | | Equal variance not assumed | .311 | 16.839 | .760 |
| P3.18.11 | Equal variance assumed | 2.954 | 37 | .005 | P3.18.12 | Equal variance assumed | -.334 | 37 | .740 |
| | Equal variance not assumed | 2.705 | 19.345 | .014 | | Equal variance not assumed | -.296 | 17.967 | .770 |
| P3.18.13 | Equal variance assumed | -1.038 | 37 | 306 | P3.18.14 | Equal variance assumed | 1.364 | 37 | .181 |
| | Equal variance not assumed | -1.023 | 23.156 | .317 | | Equal variance not assumed | 1.268 | 20.057 | .219 |
| P3.18.15 | Equal variance assumed | .727 | 37 | .472 | P3.18.16 | Equal variance assumed | .524 | 37 | .604 |
| | Equal variance not assumed | .768 | 27.958 | .449 | | Equal variance not assumed | .429 | 15.341 | .674 |
| | | T-test | | | | | T-test | | |
| | | t | df | Significance (2-tailed) | | | t | df | Significance (2-tailed) |

88

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| P3.18.17 | Equal variance assumed | -3.614 | 36 | .001 | P3.18.18 | Equal variance assumed | -1.243 | 36 | .222 |
| | Equal variance not assumed | -4.234 | 35.301 | .000 | | Equal variance not assumed | -1.152 | 19.970 | .263 |
| P3.18.19 | Equal variance assumed | .575 | 36 | .569 | P3.18.20 | Equal variance assumed | -1.080 | 37 | .287 |
| | Equal variance not assumed | .490 | 16.432 | .631 | | Equal variance not assumed | -.998 | 19.756 | .331 |
| P3.18.21 | Equal variance assumed | .666 | 37 | .509 | | | | | |
| | Equal variance not assumed | .593 | 18.149 | .560 | | | | | |

Note:
1 – If $p \leq 0.05$, statistically there is a significant difference between comparison groups' opinions.
2 – If $p > 0.05$, statistically there is NO significance difference between comparison groups' opinions.

In order to derive a detailed picture of the differences identified in Table 26, cross tabulation analysis has been done using comparison dispersion statistics for factors P3.18.1 (satisfactory reference site visit), P3.18.11 (internationality of ERP software) and P3.18.17 (the contact person in the software company seems trustful and reliable). The comparison results are shown in Table 27 below.

According to Table 27:

- 36% of respondents from large organizations rated factor P3.18.1 as important or extremely important; compare this with SMEs, where only 14.2% of respondents were of the same opinion;

- No respondents from large organizations rated factor P3.18.1 as 'not at all important'; 14.2% of respondents from SMEs did so.

In terms of factor P3.18.11:

- The majority of respondents from SMEs rated it as a non-important factor; only 23.1% of respondents from SMEs rating it as important or extremely important;

- Large organizations considered this factor to be important or extremely important (61.5% of respondents); only 7.8% of respondents rated it as a non-important factor.

Large differences were also revealed on factor P3.18.21:

- 69.3% of respondents from SMEs considered this factor as extremely important; the remainder of the respondents from SMEs saw it as an important factor;

- Respondents from large organizations were of a different opinion, 12% of respondents chose the option 'extremely important'; another 12% indicated this factor to be 'somewhat important'; 8.1% of respondents considered it a moderately important factor.

Table 27: Selected factors P3.18.1-P3.18.21 comparison dispersion statistics by company size

| | | Large organisation (%) | SME (%) |
|---|---|---|---|
| P3.18.1 | Not at all important | | 14.2 |
| | Somewhat important | | |
| | Moderately important | 20.0 | 28.7 |
| | Important | 44.0 | 42.9 |
| | Extremely important | 36.0 | 14.2 |
| Total | | 100.0 | 100.0 |
| P3.18.11 | Not at all important | 3.9 | 23.0 |
| | Somewhat important | 3.9 | 23.0 |
| | Moderately important | 30.7 | 30.9 |
| | Important | 42.3 | 15.3 |
| | Extremely important | 19.2 | 7.8 |
| Total | | 100.0 | 100.0 |
| P3.18.17 | Not at all important | | |
| | Somewhat important | 12.0 | |
| | Moderately important | 8.1 | |
| | Important | 67.9 | 30.7 |
| | Extremely important | 12.0 | 69.3 |
| Total | | 100.0 | 100.0 |

The different opinions on factors P3.18.1. P3.18.11 and P3.18.21 can perhaps be explained by the fact that large organizations have more resources when considering ERP selection and are therefore able to give more important weightings to some ERP factors in order to extend the pre-selected ERP software range, e.g. P3.8.1. Another issue may be that ERP accessibility required by suppliers and customers is higher in large organizations and therefore the internationality of ERP software (P3.18.11)

is highly valued in large organization because of the issue of sharing data warehouse and other related functions/modules. In terms of the ERP potential consumer, the contact person from the ERP software company is usually the sales representative or technical consultant and, given the limitations of SMEs information gathering capabilities, they (the contact person from the ERP software company) were given a more important weighting.

### 4.6.2 Comparison by Industrial Sector

ANOVA-tests were done for factors P3.17.1-P3.17.15 compared by industrial sectors. The tests are shown in Table 28 below and it can be seen that these reveal a p significant value of 0.036 for factor P3.17.7 and that it is below 0.05. The table reveals that statistically there is a significant difference between the perceptions regarding this particular study question held by respondent groups from different industrial sectors. This means that respondents from different industrial sectors hold different perceptions regarding these particular ERP selection product factors and that the differences in opinion are large.

The ANOVA-tests for factors P3.18.1-P3.18.21 compared by industrial sector reveal no p significance values equal to or below 0.05. The table reveals that statistically there is no significant difference between the perceptions held regarding these specific study questions by respondent groups from different industrial sectors. This means that respondents from different industrial sectors do not have vastly different perceptions regarding these specific ERP non-product factors and that the differences in opinion are not large.

In order to obtain a detailed picture of the differences identified in Table 28, cross tabulation analysis was done using comparison dispersion statistics for factor P3.17.7 (designed to minimize implementation time). The comparison results are shown in Table 29 below.

The main difference revealed in Table 29 that the in the finance and business service industry, 19.8% of respondents rated the factor P3.17.7 as 'not at all important'. Unfortunately, without further research information on this question, it is not easy to explain such a result. The researcher would suggest that it may be caused by the small sample size when the survey sample is separated by industrial sector.

## Table 28: Question P3.17.1-P3.17.15 ANOVA-tests comparison by industrial sectors

| | | Sum of squares | df | Mean square | Significance |
|---|---|---|---|---|---|
| P3.17.1 | Between groups | 1.234 | 5 | .247 | .548 |
| | Within groups | 11.231 | 37 | .304 | |
| | Total | 12.465 | 42 | | |
| P3.17.2 | Between groups | 2.074 | 5 | .415 | .324 |
| | Within groups | 12.331 | 36 | .343 | |
| | Total | 14.405 | 41 | | |
| P3.17.3 | Between groups | .706 | 5 | .141 | .885 |
| | Within groups | 14.937 | 36 | .415 | |
| | Total | 15.643 | 41 | | |
| P3.17.4 | Between groups | 6.226 | 5 | 1.245 | .290 |
| | Within groups | 34.750 | 36 | .965 | |
| | Total | 40.976 | 41 | | |
| P3.17.5 | Between groups | 4.838 | 5 | .968 | .696 |
| | Within groups | 57.567 | 36 | 1.599 | |
| | Total | 62.405 | 41 | | |
| P3.17.6 | Between groups | 5.171 | 5 | 1.034 | .434 |
| | Within groups | 37.400 | 36 | 1.039 | |
| | Total | 42.571 | 41 | | |
| P3.17.7 | Between groups | 10.033 | 5 | 2.007 | .036 |
| | Within groups | 27.595 | 37 | .746 | |
| | Total | 37.628 | 42 | | |
| P3.17.8 | Between groups | 3.483 | 5 | .697 | .513 |
| | Within groups | 27.292 | 34 | .803 | |
| | Total | 30.775 | 39 | | |
| P3.17.9 | Between groups | 2.721 | 5 | .544 | .339 |
| | Within groups | 15.679 | 34 | .461 | |
| | Total | 18.400 | 39 | | |
| P3.17.10 | Between groups | .517 | 5 | .103 | .865 |
| | Within groups | 9.727 | 35 | .278 | |
| | Total | 10.244 | 40 | | |
| P3.17.11 | Between groups | 2.483 | 5 | .497 | .523 |
| | Within groups | 20.395 | 35 | .583 | |
| | Total | 22.878 | 40 | | |
| P3.17.12 | Between groups | 1.817 | 5 | .363 | .856 |
| | Within groups | 32.083 | 34 | .944 | |
| | Total | 33.900 | 39 | | |
| P3.17.13 | Between groups | 1.645 | 5 | .329 | 759 |
| | Within groups | 22.760 | 36 | .632 | |
| | Total | 24.405 | 41 | | |
| P3.17.14 | Between groups | .583 | 5 | .117 | 852 |
| | Within groups | 10.751 | 36 | .299 | |
| | Total | 11.333 | 41 | | |
| P3.17.15 | Between groups | 1.045 | 5 | .209 | 537 |
| | Within groups | 9.074 | 36 | .252 | |
| | Total | 10.119 | 41 | | |

Note.
1 – If p≤ 0.05, statistically there is a significant difference between comparison groups' opinions.
2 – If p>0.05, statistically there is NO significant difference between comparison groups' opinions.

Qing Yu
Graduate School of Business @ University of KwaZulu-Natal

Table 29: Selected questions P3.17.1-P3.17.15 comparison dispersion statistics by industrial sector

| P3.17.7 | | | | | | |
| --- | --- | --- | --- | --- | --- | --- |
| | Not at all important | Somewhat important | Moderately important | Important | Extremely important | Total |
| Manufacturing | | 10.0% | 10.0% | 80.0% | | 100.0% |
| Wholesale trade, Commercial Agents and Allied Services | | | | 24.7% | 75.3% | 100.0% |
| Transport, Storage and Communications | | | 28.8% | 14.1% | 57.1% | 100.0% |
| Finance and Business Services | 19.8% | | 19.8% | 19.8% | 40.6% | 100.0% |
| Construction | | | 59.4% | 40.6% | | 100.0% |
| Other | | | 8.2% | 25.1% | 66.7% | 100.0% |

## 4.6.3 Brief Summary

The criteria for selecting ERP systems is important because it has an obvious influence on the selection result. This research was designed to discover the common ERP selection criteria framework within KZN organizations. The survey and analysis results shown above reveal that the common ERP selection criteria framework was well defined and used by KZN organizations. Generally, the ERP characteristics were harmonious and contained a balance of product factors and non-product factors. Respondents reported consistent perceptions on all ERP selection criteria, such as total cost, implementation time, user friendliness, flexibility, reliability, vendor objective fit and reputation. No theoretical difference was found between SMEs and large organizations and no theoretical difference was found between organizations from different industrial sectors. Although a few differences were found in terms of the ERP selection criteria, these were due to company size and financial ability and there were no innate principle differences in practices revealed by SMEs and large organizations.

## 4.7 METHODS USED IN DECISION PROCESS

The methods used in ERP selection process were examined by this research; the differences relating to company size are revealed in this section. The overall ERP evaluation and selection methods application status is shown in Table 30 below.

Table 30: ERP evaluation –and selection methods

| Range | Percentage (%) |
|---|---|
| (1) No. of methods used | |
| Missing | 17.0 |
| 1 | 21.3 |
| 2 | 14.9 |
| 3 | 19.1 |
| 4 | 21.3 |
| 5 | 2.1 |
| 7 | 4.3 |
| (2) Methods used frequency | |
| P3.19.1  Adjusted cost/benefit analysis | 36.2 |
| P3.19.2  Adjusted interpretation process | 29.8 |
| P3.19.3  Balanced scorecard | 10.6 |
| P3.19.4  Discount rate sensitivity | 4.3 |
| P3.19.5  Information economics | 12.8 |
| P3.19.6  Internal rate of return | 10.6 |
| P3.19.7  Multi-layer evaluation process | 10.6 |
| P3.19.8  Net present value | 29.8 |
| P3.19.9  Payback period | 21.3 |
| P3.19.10 Return on investment | 27.7 |
| P3.19.11 Strategic fit | 23.4 |
| P3.19.12 The options model | 14.9 |
| P3.19.13 Other | 2.1 |

According to Table 30:

- Financial and ratio methods were the most widely applied methods used by KZN organizations. It can be seen that some of the cash flow methods (discount rate sensitivity and internal rate of return) were less popular than the formal accounting balance methods;

- The complex financial and ratio methods (information economics and the options model) were not often applied by KZN organizations;

- Except for strategic fit, the multi-criteria methods and hierarchical process methods were not often adopted by KZN organizations;

- Companies in KZN usually applied between one and four methods during an ERP project evaluation and selection process.

Table 31 below shows the T-tests for methods P3.19.1-P3.19.13 compared by company size. According to this table, the p significance value is 0.047

for method P3.19.11 and that it is below 0.05. The table reveals that statistically there is no significant difference between the perceptions held by respondent groups from different company sizes regarding these specific study questions. This means that respondents from large organizations and SMEs hold different perceptions of the above ERP evaluation and selection methods and that the differences in opinion are large.

Table 31: Methods P3.19.1-P3.19.13 T-tests comparison by company size

| | | T-test | | | | | T-test | | |
| | | t | df | Significance (2-tailed) | | | t | df | Significance (2-tailed) |
|---|---|---|---|---|---|---|---|---|---|
| P3.19.1 | Equal variances assumed | -.495 | 45 | .623 | P3.19.8 | Equal variances assumed | .154 | 45 | .878 |
| | Equal variances not assumed | -.500 | 31.358 | .620 | | Equal variances not assumed | .152 | 29.448 | .880 |
| P3.19.2 | Equal variances assumed | .154 | 45 | .878 | P3.19.9 | Equal variances assumed | -1.046 | 45 | .301 |
| | Equal variances not assumed | .152 | 29.448 | .880 | | Equal variances not assumed | -1.138 | 38.140 | .262 |
| P3.19.3 | Equal variances assumed | .291 | 45 | .772 | P3.19.10 | Equal variances assumed | .387 | 45 | .700 |
| | Equal variances not assumed | .279 | 27.210 | .782 | | Equal variances not assumed | .378 | 28.515 | .708 |
| P3.19.4 | Equal variances assumed | .477 | 45 | .635 | P3.19.11 | Equal variances assumed | -2.041 | 45 | .047 |
| | Equal variances not assumed | .430 | 23.232 | .671 | | Equal variances not assumed | -2.459 | 44.950 | .018 |
| P3.19.5 | Equal variances assumed | .871 | 45 | .388 | P3.19.12 | Equal variances assumed | .524 | 45 | .603 |
| | Equal variances not assumed | .794 | 23.859 | .435 | | Equal variances not assumed | .496 | 26.316 | .624 |
| P3.19.6 | Equal variances assumed | 1.291 | 45 | .203 | P3.19.13 | Equal variances assumed | -.715 | 45 | .479 |
| | Equal variances not assumed | 1.115 | 21.117 | .277 | | Equal variances not assumed | -1.000 | 30.000 | .325 |
| P3.19.7 | Equal variances assumed | -.690 | 45 | .494 | | | | | |
| | Equal variances not assumed | -.761 | 39.433 | .451 | | | | | |

Qing Yu
Graduate School of Business @ University of KwaZulu-Natal

In order to obtain a detailed picture of the differences identified in Table 31, cross tabulation analysis was done by using comparison dispersion statistics for method P3.19.11 (strategic fit). The comparison results are shown in Table 32 below.

Table 32: Selected methods P3.19.1-P3.19.13 comparison dispersion statistics by company size

| | | Large organisation (%) | SME (%) |
|---|---|---|---|
| P3.19.11 | Yes | 32.3 | 6.2 |
| | No | 67.7 | 93.8 |
| Total | | 100.0 | 100.0 |

Table 32 shows that although the strategic fit method has a relative high usage application in KZN organisation, it is not commonly used by SMEs and is normally only applied by large organizations.

A short conclusion relating to this section analysis is that:

1. Overall, there are no significant differences between large size organizations and SMEs in the use of financial and ratio methods.

2. Financial and ratio methods are the major methods applied in KZN organizations' ERP selection practices.

3. The multi-criteria methods and hierarchical process methods were applied less often in KZN organizations, although strategic fit proves an exception SMEs do not use these as their preferred methods and large organizations more prefer to employ more complex methods. This indicates that SMEs prefer to use less complex and less expensive evaluation – and selection methods for purposes of ERP selection.

4. The research shows that KZN organizations have less of an interest in the cash flow methods. If this assumption is combined with the previous ERP selection criteria section, wherein respondents showed less concern regarding ERP payment terms, a further assumption

that can be made is that KZN organizations were likely to treat their ERP system as a cost oriented asset rather than a profit oriented asset in their business.

## 4.8 ERP IMPLEMENTATION OR USAGE PROBLEMS

In order to obtain opinions on the problems that occurred after ERP system implemented, this research designed included a fourth part to the questionnaire, which detailed a list of problems against which respondents could indicate their perceptions. The key questions in part four are the set of questions numbered P4.20.1-P4.20.13. Questions P4.20.1-P4.20.11 detail problems that often occur; questions P4.20.12-P4.20.13 were intended to obtain general feelings from respondents.

Table 33 below provides the results of an analysis of questions P4.20.1-P4.20.13 using central tendency statistics. It shows all study variables to have a mean value of 3.00, except in the case of: P4.20.2 (the ERP does not function as promised), which has a mean value of 2.00; and P4.20.12 (overall satisfied with the ERP system) and P4.20.13 (overall ERP improved business efficiency), which have a mean value of 4.00. This reveals that the respondents who participated in this research articulated an average perception of 'neutral' regarding the mentioned study variable, except in the case of P4.20.2, P4.20.12 and P4.20.13. In other words, respondents generally disagree that these problems occurred after ERP implementation in their organizations, however, their opinions were not very strong. Problems P4.20.2, P4.20.12 and P4.20.13 all received positive responses and, in general, the average response was 'tend to disagree' that the ERP system does not function as promised. Overall, the average response was 'tend to agree' in terms of satisfaction with ERP system; the average response was 'tend to agree' in relation to ERP system has improved business efficiency.

In Table 33, median values are all equal to or close to the mean value, indicating that the mean values are representative of the majority of respondents' perceptions.

For all variables in Table 33: questions P4.20.1-P4.20.11 have a minimum value of 1 and a maximum value of 5; questions P4.20.12-P4.20.13 have a minimum value of 2 and a maximum value of 5. This indicates a difference in respondents' perceptions on these variable and that respondents have expressed differing opinions regarding the research questions. The articulated minimum perception is 'strongly disagree' for questions P4.20.1-P4.20.11 and 'disagree' for questions P4.20.12-P4.20.13. The articulated maximum perception is 'strongly agree' for all variables in Table 33.

Table 33: Central tendency statistics for questions P4.20-P4.20.13

| | | P4.20.1 | P4.20.2 | P4.20.3 | P4.20.4 | P4.20.5 |
|---|---|---|---|---|---|---|
| N | Valid | 38 | 38 | 38 | 39 | 38 |
| | Missing | 5 | 5 | 5 | 4 | 5 |
| Mean | | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 |
| Median | | 3.00 | 3.00 | 3.00 | 3.00 | 2.00 |
| Standard Deviation | | 1.226 | 1.252 | 1.197 | 1.188 | 1.104 |
| Variance | | 1.502 | 1.568 | 1.434 | 1.410 | 1.218 |
| Minimum | | 1 | 1 | 1 | 1 | 1 |
| Maximum | | 5 | 5 | 5 | 5 | 5 |

| | | P4.20.6 | P4.20.7 | P4.20.8 | P4.20.9 | P4.20.10 |
|---|---|---|---|---|---|---|
| N | Valid | 38 | 38 | 38 | 38 | 38 |
| | Missing | 5 | 5 | 5 | 5 | 5 |
| Mean | | 3.00 | 2.00 | 3.00 | 3.00 | 3.00 |
| Median | | 2.00 | 2.00 | 2.00 | 2.00 | 4.00 |
| Standard Deviation | | 1.006 | 1.132 | 1.109 | 1.033 | 1.345 |
| Variance | | 1.013 | 1.281 | 1.230 | 1.067 | 1.810 |
| Minimum | | 1 | 1 | 1 | 1 | 1 |
| Maximum | | 4 | 5 | 5 | 4 | 5 |

| | | P4.20.11 | P4.20.12 | P4.20.13 |
|---|---|---|---|---|
| N | Valid | 38 | 39 | 40 |
| | Missing | 5 | 4 | 3 |
| Mean | | 3.00 | 4.00 | 4.00 |
| Median | | 2.00 | 4.00 | 4.00 |
| Standard Deviation | | 1.179 | .793 | .862 |
| Variance | | 1.391 | .629 | .743 |
| Minimum | | 1 | 2 | 2 |
| Maximum | | 5 | 5 | 5 |

Note:
1 – Strongly disagree
2 – Disagree
3 – Neutral
4 – Agree
5 – Strongly Agree

Qing Yu
Graduate School of Business @ University of KwaZulu-Natal

Although the central tendency statistics show a high consistency in answers from respondents, there are still obvious variances between respondents. In order to obtain the detailed opinions held by respondents regarding questions P4.20.1-P4.20.13 comparison statistics analysis was done by company size to show the perception differences held by respondent groups. In addition, T-tests were used to identify the significant differences between respondent groups in order to help the researcher narrow the comparison workload and focus on the valuable comparison statistics data.

### 4.8.1 Comparison by Company Size

Table 34 provides the T-tests for questions P4.20.1-P4.20.13 compared by company size. The table shows the p significant values are 0.011 and 0.025 for questions P4.20.5 and P4.20.10 respectively and that they are below 0.05. It reveals that statistically there is a significance difference between the perceptions regarding the specific study questions held by the different company size group respondents. This means that respondents from large organizations and SMEs hold different perceptions of these particular ERP selection problems and that the differences in opinion are large.

In order to obtain a detailed picture of the differences identified in Table 34 cross tabulation analysis was done using comparison dispersion statistics for question P4.20.5 (software interface not intuitive, difficult to use) and P4.20.10 (employee resistance to use ERP). The comparison details are shown in Table 35 below.

The table indicates that 45.7% of respondents from SMEs strongly disagree that their ERP interface is not intuitive and employees are resistance to use ERP; the response from large organizations is weaker on these two problems than the response of SMEs. This reveals perhaps that the ERP selection process was not paid enough attention by employees in large organizations and that the problem surfaced after implementation. When this item is combined with the previous section, regarding ERP system

friendliness characteristics, there were no significant differences in opinions provided by SMEs and large organizations. Strangely enough, however, the outcome after implementation is different. The assumption that could be made is that the complex managerial structure and large number of employees in large organizations allowed for the attitudes of employees to be easily ignored by the ERP selection committee. The result is perhaps that the finally selected ERP software often only meets the needs of management and fails to accommodate that of employees. Further evidence of this situation is the lower involvement of the HR department and personnel in the ERP selection committee in large organizations: more than 50% of respondents from large organizations reported that their HR department or personnel was not involved (34.5%) or was not an important participant (20.6%) in their ERP selection process. This is lower than the average involvement of other departments. Thus, the lower involvement of the HR department results in not associating the ERP training program with any other normal or regular HR program. Consequently, employees show resistance to using the ERP system.

The above analysis does not mean that SMEs did well in terms of HR issues when selecting an ERP system. In fact, this research provides no evidence in support of this assumption and the actual involvement of the HR function in SMEs was also low. However, because of the simple managerial structure within SMEs and the smaller number of employees, top management is usually more aware of their employees and the HR issues than are executives in large organizations. Another assumption in this regard is that SMEs usually require that their staffs are multi-skilled, whereas large organizations are more inclined to a specialized team of staff. It may be that when these different staff teams become involved in the ERP environment, the staffs at the SMEs perhaps have an advantage in reducing resistance to the use of an ERP system.

Qing Yu
Graduate School of Business @ University of KwaZulu-Natal

## Table 34: Questions P4.20.1-P4.20.13 T-tests comparison by company size

| | | T-test | | | | T-test | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | | t | df | Significance (2-tailed) | | t | Df | Significance (2-tailed) |
| P4.20.1 | Equal Variance assumed | .532 | 36 | .598 | P4.20.2 | 1.762 | 36 | .087 |
| | Equal Variance not assumed | .488 | 15.721 | .632 | | 1.766 | 18.703 | .094 |
| P4.20.3 | Equal variance assumed | 1.605 | 36 | .117 | P4.20.4 | -.942 | 37 | .352 |
| | Equal variance not assumed | 1.731 | 22.084 | .097 | | .767 | 14.263 | .456 |
| P4.20.5 | Equal variance assumed | 2.681 | 36 | .011 | P4.20.6 | .782 | 36 | .440 |
| | Equal variance not assumed | 2.646 | 18.106 | .016 | | .673 | 14.184 | .512 |
| P4.20.7 | Equal variance assumed | 1.940 | 36 | .060 | P4.20.8 | 1.474 | 36 | .149 |
| | Equal variance not assumed | 1.809 | 16.212 | .089 | | 1.268 | 14.158 | .225 |
| P4.20.9 | Equal variance assumed | .614 | 36 | .543 | P4.20.10 | 2.332 | 36 | .025 |
| | Equal variance not assumed | .560 | 15.563 | 583 | | 2.25 | 17.293 | .038 |
| P4.20.11 | Equal variance assumed | .537 | 36 | .594 | P4.20.12 | -.166 | 37 | .869 |
| | Equal variance not assumed | .462 | 14.143 | .651 | | -.146 | 16.121 | .886 |
| P4.20.13 | Equal variance assumed | .515 | 38 | .609 | | | | |
| | Equal variance not assumed | .449 | 15.923 | 660 | | | | |

Note:
1 – If p≤ 0.05, statistically there is a significant difference between comparison groups' opinions.
2 – If p>0.05, statistically there is NO significant difference between comparison groups' opinions.

Qing Yu
Graduate School of Business @, University of KwaZulu-Natal

Table 35: Selected questions P4.20.1-P4.20.13 comparison dispersion statistics by company size

| | | Large organisation | SME | | | Large organisation | SME |
|---|---|---|---|---|---|---|---|
| P4.20.5 | Strongly disagree | 3.7% | 45.7% | P4.20.10 | Strongly disagree | 14.8% | 45.7% |
| | Disagree | 40.6% | 27.0% | | Disagree | 11.0% | 9.0% |
| | Neutral | 22.3% | 18.3% | | Neutral | 7.5% | 18.3% |
| | Agree | 29.7% | 9.0% | | Agree | 59.2% | 27.0% |
| | Strongly agree | 3.7% | | | Strongly agree | 7.5% | |
| Total | | 100% | 100% | Total | | 100% | 100% |

## 4.8.2 Brief Summary

This research has resulted in a surprise outcome on questions P4.20.1-P4.20.13: respondents reported positive perceptions regarding the possible post-implementation ERP problems listed in the research questionnaire. When compared by company size, no significant issues emerged, except for the matter of the ERP interface and user resistance issues within large organizations (already discussed in this section).

## 4.10 RELIABILITY STATISTICS

As the data was collected via a survey research, the data gathered from the survey respondents must raise a question regarding reliability ("R"). In order to provide confidence in using the results from this study, a Cronbach's Alpha test was done on the five major sets of questions contained in the research questionnaire, the continuous study variables from questions: P2.9.1-P2.9.14; P3.16.1-P3.16.10; P3.17.1-P3.17.15; P3.18.1-P3.18.21; P4.20.1-P4.20.13.Table 36 provides the reliability analysis of this questionnaire on the continuous study variables from sections P2.9, P3.16, P3.17 and P3.18, P4.20. It reveals Cronbach's Alpha values are 0.911, 0.869 and 0.785 respectively. It therefore indicates that the research instrument's (questionnaire) continuous study variables (sections P2.9, P3.16, P3.17, P3.18, P4.20) all have adequate internal consistency and reliability.

## Table 36: Cronbach's Alpha tests for sections P2.9, P3.16, P3.17, P3.18 and P4.20

| P2.9.1-P2.9.14 | | N | % |
|---|---|---|---|
| Case | Valid | 42 | 97.7 |
| | Excluded | 1 | 2.3 |
| | Total | 43 | 100.0 |

| Cronbach's Alpha | N of Items |
|---|---|
| .911 | 14 |

| P3.16.1-P3.16.10 P3.17.1-P3.17.15 P3.18.1-P3.18.21 | | N | % |
|---|---|---|---|
| Case | Valid | 19 | 40.4 |
| | Excluded | 28 | 59.6 |
| | Total | 47 | 100.0 |

| Cronbach's Alpha | N of Items |
|---|---|
| .869 | 46 |

| P4.20.1-P4.20.13 | | N | % |
|---|---|---|---|
| Case | Valid | 38 | 88.4 |
| | Excluded | 5 | 11.6 |
| | Total | 43 | 100.0 |

| Cronbach's Alpha | N of Items |
|---|---|
| .785 | 13 |

Qing Yu
Graduate School of Business @ University of KwaZulu-Natal

# CHAPTER FIVE

# RECOMMENDATIONS AND CONCLUSION

---

## 5.1 INTRODUCTION

The purpose of this chapter is to answer the research questions posed by this study in chapter one. The data analysis and findings of the ERP selection process will be further discussed and used to interpret the findings in order to make considered recommendations regarding the ERP selection process based on the data provided by responses to the research questions. The recommendations focus on the importance of the ERP selection process to organizations and including it as an integral part of the organisation's IT/IS strategy. It also deals with the operational fit with strategy that forms an integral part of ensuring ERP selection is a success.

Conclusions will then be drawn from the recommendations in order to fulfil the objective of this study (determining ERP problem factors experienced by organisations in KZN in SA) while adding to the body of knowledge that already exists on this subject.

This study investigated the ERP selection processes used by organizations in KZN in order to determine and establish the basic features of their ERP selection activities and to identify some of the key problem factors involved. The study proposed in this paper will be of benefit to both large organizations and SMEs in KZN (and perhaps even further afield) when they embark on an ERP selection process.

The following recommendations that are provided were deduced from the findings and an analysis of the findings in this research. These recommendations provide possible answers to the research questions set out in Chapter 1 which were not answered in Chapter 4, namely how do organizations in KZN province attempt to simplify ERP project evaluation and selection techniques and select ERP software in an easy, cost-effective,

and collective manner? They also contribute further findings that are not strictly a part of this study but provide some rather interesting observations.

## 5.2 RECOMMENDATIONS

This research conducted by the researcher was at an exploratory level of ERP selection in KZN province, SA and related research proved virtually impossible to find in terms of the specific region under study, namely KZN, SA. While the nature of this research therefore precludes it from producing any generalizable result, the selection of a reasonably representative sample provides valuable insight into ERP selection processes and documents important selection issues.

According to the analysis of the data provided by this research, although organizations in KZN for the most employed feasible ERP selection processes, certain shortcomings in terms of these processes did emerge and the following areas should be considered by similar KZN organizations conducting ERP selection process in the future:

1. Include an employee representative in the ERP selection committee. The research results showed that ERP selection committees in KZN organizations lacked real involvement by employees and that this could result in resistance to an ERP system by employees. Problems of this nature were more commonly reported by the large organizations. Organizations should take cognisance of the fact that ERP selection requires not only strategy and operation fit required by management's needs, but also the development of employee skills and experience/qualifications. ERP investment has a substantial human and organizational interface and the decision making relating to the selection of ERP systems therefore has to take various parties into account to ensure the universal acceptance within the organisation of the chosen system, thereby reducing resistance on the part of employees.

2.  An appropriately framed ERP selection and evaluation approach or method that is based on the organization's strategic and operational objectives and needs should guide the ERP selection criteria to arrive at the final determination of both product and non-product factors. The research survey results reveal that the majority of responding organizations assigned almost equal importance to all ERP selection factors, both product and non-product factors. The research revealed that organisations in KZN, SA. Neglected individual needs and objectives when involved in ERP adoption. This could also indicate that these organizations lack the practical expertise in terms of ERP selection and evaluation approaches and methods. It suggests that they depend on the use of evaluation approaches and methods, with different priorities, weightings and scores assigned to the selected ERP factors in order to suit the unique needs and objectives of ERP adoption. The equally weighted or semi-equally weighted criteria do not provide organizations with an advantage in overcoming the ERP selection conundrum.

3.  The ERP selection and evaluation approaches and methods have to efficiently and effectively support the ERP selection decision making. According to the research result, the ERP selection and evaluation approaches and methods adopted by KZN organisations were poorly applied in KZN organizations. The research shows that the majority of applied ERP selection approaches and methods were those that were low cost and less complex and that cross sector approaches and methods portfolio was not well structured and applied. Theoretically, a single ERP selection approach or method could bias the decision maker, but the well considered ERP selection approaches and methods portfolio could result in an improved final outcome and provide the decision-maker with a comprehensive view of the ERP candidate software.

4.  ERP information gathering and system requirements drafting are important to the selection outcome, hence the system requirement

109

drafting needs to be based on the ERP information gathered and the strategic goals identified by the organization. The research results show that ERP system requirements drafting was not commonly used by participating organizations with 'submit requirements catalogue to ERP vendors' exclusively used by large organizations. This indicates that SMEs in KZN are hampered by a lack of expertise in selecting ERP systems. This is clearly a disadvantage to SMEs engaged in ERP selection and a more successful decision may require the allocation of additional resources and thorough investigation (ERP system requirements drafting).

5. ERP selection and adoption is evolving in such a way as to change the way organizations conduct business using technology. However, the design has to take cognisance of the need to support the organization's strategy and vision. Decisions regarding selection have to be forward looking; Both the organization and its ERP selection committee have to consider the future beyond the immediate satisfaction of pressing goals to those that may not necessarily be important in the present business environment, but which could well be looming and become of great importance in the future.

An ERP system can be considered the information backbone of an organization as it supports and underpins all the business functions and links in the organizational value chain. Thus, an organization's long term strategy will underlie the introduction of an ERP system selection process.

In practice, the actual ERP selection process is never the same for any two organizations. Internal conditions unique to an organisation are what ultimately determine exactly what needs to be done. A good ERP selection project support team will be a combination of many elements, including: clear defined strategic and operational objectives and goals; wider involvement of departments and specialist individuals as part of the

selection committee; a comprehensive information gathering system; a well structured criteria set (including both product and non-product factors); an optimised and designed cross-sector selection approach and methods portfolio.

Combining, applying and balancing these elements will depend on each individual organization and their needs of ERP adoption.

However, based on this research certain guidelines can be provided that provide common steps and approaches that any organization and its selection committee could follow. These are summarized as follows:

1. ERP selection committee has to be a cross-functional team that includes the best and the brightest personnel from each functional department of the company. These personnel should understand the inner working processes within the organisation and who the potential ERP end-users in the respective departments will be. As the ERP selection process moves forward, they should be able to fairly and accurately represent and communicate the needs of their own functional departments regarding the ERP system's configuration. These personnel also need to understand the importance of information sharing and integration. The selection team or committee should be led by a member of the company's executive who reports directly to CEO, alternatively by the CEO himself/herself.

2. The ERP selection committee members need to establish the reasons and conditions that exist in their organizations that have to led to a decision to identify a potential ERP system. They need to define the organization's core requirements for meeting strategic goals as well as the limitations, the problems and the barriers to current business processes. The committee must be able to identify the core competencies that provide the organization with a distinct advantage over its competitors and then identify the requirements for ERP

system implementation, including: features, functionality, vendor service, future human resource portfolio required to suit the ERP system and what training programs will be required in future.

3. The company's full resources need to be identified and assessed in order to evaluate the areas most critical to the organization's ongoing growth. The following resources must be included in those assessed:

- Human resources – determines how the organization presently uses its human resources, defines the organization's strengths and identifies key areas that are in need of improvement.

- IT/IS – understands what the business's current MIS infrastructure is and how the current IT/IS may be limiting the organization's growth. This department also identifies the key business areas where potential enhancements can be used to good affect in the business, thereby facilitating the desired growth. They are also required to outline the current IT/IS infrastructure and list what has to be changed in future in order to integrate this with the proposed ERP system.

- Workflow – required to analyze the critical business processes and workflow issues. This enables the identification of critical operational decisions that are made on a daily or ongoing basis. This is of importance as consideration needs to be given not only as to how these business processes and workflows actually work today, but also how they should work in the future to support the organization's growth.

- Performance measurements – these define the measures of business performance. After establishing a set of performance measurements they can be used not only for purposes of measuring business performance, but also to define the organization's potential growth and they thereby

Qing Yu
Graduate School of Business @ University of KwaZulu-Natal

> help indicate the path that needs to be followed to achieve the desired growth of the organisation.

4. Identify the specified needs of the organization and the critical ERP system functionality requirements as well as, and most importantly, establish a financial plan and budget for the ERP project.

5. Research and gathering product information on potentially suitable ERP software. This is followed by the elimination of selected ERP software that does not meet the organisation's specified needs and financial requirements. The process of elimination will help with the creation of a manageable list of vendors whose product offering should be reviewed and whose client references should be checked.

6. Choose the appropriate ERP selection and evaluation methods and approaches and then decide on the required ERP product factors and non-product factors and at the same time determining relevant priority, weighting or score by considering the selection methods or approaches.

7. Finally, select the ERP package and the vendor that provides the best fit in terms of an organization's future growth and stability.

## 5.3 LIMITATIONS

The main limitations of this study relate to the sample size and to geographic restrictions. The limited time and budget available to conduct this research proscribed that the survey's geographic coverage had to be limited to a very small area within South Africa, like KZN and, more specifically, the Greater Durban area. The sample size was also unfortunately not big enough for a proper industrial sector analysis. When the survey sample was divided into industrial sectors, some perceptions were obviously predominantly held by certain individual responding organizations, which may have provided a certain extent of confusion with the research results.

A suggestion for future research on this subject is that consideration should be given to enlarging the sample size and to extending the geographic coverage of the sample. By doing so, the research result, especially as it relates to an industrial sector analysis, could be more meaningful and perhaps provide additional constructive ideas regarding the ERP selection process.

## 5.4 CONCLUSION

Although the study explore many ERP selection and evaluation methods and approaches, it is difficult to select one particular method that would be most appropriate for use by any organization. A successful ERP selection and adoption project depends on the actual business circumstances, not only in terms of the alignment of the ERP selection criteria, approaches and methods, and the stakeholders, but also in relation to various external environments, including; country or regional economy conditions; government policies and regulations; local IT/IS infrastructure; business competition; financial market development.

As a complex, systematic decision making process, there is no single easy measurement or standard by which to judge the ERP selection outcome because theoretical evaluations and third party perceptions does not provide the final judgment on an ERP selection outcome: the only measurements of ERP selection success should be the market and time. An excellent ERP acquisition will show in the success of the business in the long run and reflex on the return of investment eventually.

# BIBLIOGRAPHY

Beard, J.W. and Sumner M. (2004) Seeking strategic advantage in the post-net era: viewing ERP systems from the resource-based perspective. *Journal of Strategic Information Systems,* 13: 129-150.

Bernroider, E. and Koch, S. (2001) ERP selection process in midsize and large organizations. *Business Process Management,* Vol. 7 No. 3 : 251-257.

Bernroider, E. and Stix, V. (2006) Profile distance method - a multi-attribute decision making approach for information system investments. *Decision Support Systems,* 42 : 988-998.

Botta-Genoulaz, V., Millet, P.A. and Grabot, B. (2005) A survey on the recent research literature on ERP systems. *Computers in Industry,* 56 : 510-522.

Chou, T., Chou, S.T. and Tzeng, G. (2006) Evaluating IT/IS investments: A fuzzy multi-criteria decision model approach. *European Journal of Operational Research,* 173 : 1026-1046.

Cooper, D.R. and Schindler, P.S. (2005) *Business research methods,* McGraw-Hill.

Farbey, B., Land, F. and Targett, D. (1999) Moving IS evaluation forward: learning themes and research issues. *Journal of Strategic Information Systems,* 8 : 189-207

Firer, C., Ross, S.A., Westerfielf, R.W. and Jordan, B.D. (2004) *Fundamentals of Corporate Finance,* (3rd South African edition), McGraw-Hill.

Holsapple, C.W. and Sena, M.P. (2005) ERP plans and decision-support benefits. *Decision Support Systems,* 38 : 575-590.

Irani, Z. Sharif, A., Love, P.E.D. and Kahraman, C. (2002) Applying concepts of fuzzy cognitive mapping to model: The IT/IS investment evaluation process. *International Journal of Production Economics,* 75 : 199-211.

Irani, Z., Ghoneim, A. and Love, P.E.D. (2006) Evaluating cost taxonomies for information systems management. *European Journal of Operational Research,* 173 : 1103-1122.

# LIST OF APPENDICES

Appendix 1: Letter of Introduction

Appendix 2: Respondents' Permission

Appendix 3: Coded Questionnaire

Appendix 4: Ethical Clearance

Appendix 5: Definition of Company Size

Appendix 6: Data Analysis Tables

# APPENDIX ONE
# LETTER OF INTRODUCTION

---

Dear Sir/Madam,

I am conducting research for a dissertation on 'ERP (Enterprise Resource Planning) Software Selection' as a final requirement for an MBA through the University of KwaZulu-Natal. In this survey, companies within KwaZulu-Natal will be asked to complete a questionnaire about the process the company has gone through, or is about to go through, to select an ERP system. It will take approximately 10-20 minutes to complete the questionnaire. The questionnaire consists of three main parts: Information about your company, information about the selection process and information about your company's experience with the software after purchase.

It is very important to me to obtain your opinions and respondent companies will be entitled to a copy of the completed research report. Your survey responses will be kept strictly confidential and the information will be coded and also remain confidential. Any data presented in the thesis will be in aggregate form and it will not be possible for anyone to identify any company individually.

If you have questions at any time about the survey or about the procedures involved, please contact Qing Yu (Gene) at +27 82 8816788 or by email at gene.yuqing@gmail.com. Alternatively you may contact my supervisor, Professor Manoj Maharaj, by email at maharajms@ukzn.ac.za.

How to complete the questionnaire:
Indicate your response to each question by making a tick or a cross, or encircling the appropriate item with a PEN (not a pencil), or by filling in the

required words or numbers. If the question does not provide for multiple responses, please select only one option per question.

Thank you very much for completing this questionnaire.

Qing Yu (Gene)

# APPENDIX TWO

# RESPONDENTS' PERMISSION

I hereby confirm that I understand the contents of this document and the nature of the research project, and that I consent to participating in the research project if our company and my identity are not revealed in the published records regarding the research.

I understand that participation is voluntary and that I am at liberty to withdraw from the project at any time, should I so desire.

Initials and surname _____

Company name _____

Position at the company _____

Contact details @ work: Tel _____

Email _____

Signature _____ Date _____

# APPENDIX THREE

# CODED QUESTIONNAIRE

---

## PART 1: INFORMATION ABOUT THE COMPANY

1. What is your company's primary business activity in South Africa? (Code: P1.1)
o Agriculture
o Mining and Quarrying
o Manufacturing
o Electricity, Gas and Water
o Construction
o Retail and Motor Trade and Repair Services
o Wholesale Trade, Commercial Agents and Allied Services
o Catering, Accommodation and other Trade
o Transport, Storage and Communications
o Finance and Business Services
o Community, Social and Personal Services
o Other

2. How many full-time paid employees are employed in your company? (Code: P1.2)
o More than 200
o 100~199
o 50~99
o Less than 50
o Don't know/Don't want to answer

3. What was your company's total turnover value (ZAR million) last year? (Code: P1.3)
o >50
o 41~50
o 31~40
o 26~30
o 21~25
o 11~20
o <10
o Don't know/Don't want to answer

4. What was your company's total gross asset value (ZAR million) at the end of last year? (NB: fixed property excluded) (Code: P1.4)
o >18
o 15~18
o 8~14
o 5~7

○ <5

○ Don't know/Don't want to answer

5. What is your company's organizational structure? (Please select applicable option)

○ Hierarchical or ○ Flat (Code: P1.5.1)

○ Centralized or ○ Decentralized (Code: P1.5.2)

○ Divisional/functional or ○ Cross-functional (Code: P1.5.3)

6. Is your company currently using/selecting an ERP system? (Code: P1.6)

○ Yes, we are using one, and it is fully integrated into our company's operation system

○ Yes, we have bought one, but it is not fully implemented

○ We are involved in such an acquisition and are at the software selection stage

○ No, we don't have one but might have one in the future

○ No, we don't have one and have no intention of buying one in the future

## PART 2: ONLY FOR THOSE COMPANIES THAT HAVE ALREADY PURCHASED AN ERP SYSTEM

7. If your company has purchased an ERP system, what is the name of the ERP system that your company selected? (Code: P2.7)
o AccPac
o JD Edwards
o Microsoft Dynamics NAV (formerly Microsoft Navision)
o Oracle
o Pastel Evolution
o PeopleSoft
o SAP
o Other, please specify software name: _____

8. Approximately, how many personnel were actively involved in selecting the ERP software? (Code: P2.8)
Your answer: _____ (the answer should be a number)

9. Which department or personnel were actively involved in selecting the ERP software at your company? And if these departments or personnel were involved in the selection process, please rate their contribution in terms of importance to the decision-making process of ERP purchasing: (please select only one option per department, which best represents your opinion)

| | Was not involved in ERP selection | Not at all important | Somewhat unimportant | Moderately important | Important | Extremely important |
|---|---|---|---|---|---|---|
| Executives (Code: P2.9.1) | O | O | O | O | O | O |
| Administrative department (Code: P2.9.2) | O | O | O | O | O | O |
| Engineering department (Code. P2.9.3) | O | O | O | O | O | O |
| Finance/Accounting department (Code: P2.9.4) | O | O | O | O | O | O |
| Human Resource department (Code: P2.9.5) | O | O | O | O | O | O |
| IT department (Code: P2.9.6) | O | O | O | O | O | O |
| Legal department (Code P2.9.7) | O | O | O | O | O | O |
| Merchandiser department (Code. P2.9.8) | O | O | O | O | O | O |
| Marketing department (Code P2.9.9) | O | O | O | O | O | O |
| Operation department (Code. P2.9.10) | O | O | O | O | O | O |
| Research & Development department (Code: P2.9.11) | O | O | O | O | O | O |

| | Was not involved in ERP selection | Not at all important | Somewhat unimportant | Moderately important | Important | Extremely important |
|---|---|---|---|---|---|---|
| Executives (Code: P2.9.11) | O | O | O | O | O | O |
| Supply Chain department (Code: P2.9.12) | O | O | O | O | O | O |
| Distribution and Warehouse department (Code: P2.9.13) | O | O | O | O | O | O |
| External consultants (Code: P2.9.14) | O | O | O | O | O | O |

10. Approximately, how many months did your company take to make the buying decision? (Code: P2.10)

Your answer: _____ (the answer should be a number)

11. If your company has bought ERP software but hasn't fully utilized it, what is the reason that has stopped your company from using it? (Code: P2.11)

o We found that our ERP software is not suitable for our company's business strategy and procedures

o We feel that our ERP software is unreliable and we are still not confident enough to transform all business activities into it

o Our ERP software relevant IT/IS infrastructure has not been completed

o Some of the modules in our ERP system are redundant

o The support of the ERP provider and vendor is poor and we are not confident of using it

o Our key ERP project personnel have left the company and the project has stopped /slowed down while we are looking for replacement personnel

## PART 3: FOR THOSE COMPANIES THAT HAVE ALREADY PURCHASED AN ERP SYSTEM AS WELL ASFOR COMPANIES THAT ARE CURRENTLY SELECTING ERP SOFTWARE

12. How many software providers did/are your company investigate/investigating? (Code: P3.12)
Your answer: _____ (the answer should be a number)

13. How did/does your company gather information for ERP software selection? (Please select where applicable)
o Purchase relevant ERP studies (Code: P3.13.1)
o Employ external consultants to examine the market for available ERP products (Code: P3.13.2)
o Establish internal project team/committee to search and examine the market for available ERP products (Code: P3.13.3)
o Submit requirements catalogue in the form of a questionnaire to ERP vendors (Code: P3.13.4)
o ERP software presentations by the bidders (Code: P3.13.5)
o Feedback regarding business competitor's ERP system practice (Code: P3.13.6)
o Feedback regarding any other well-known company that has an ERP system (Code: P3.13.7)
o Other, please specify: (Code: P3.13.8)

_____

_____

14. Does your company have a budget for the ERP software? (Code: P3.14)
o Yes, the budget is approximately ZAR_____ for this year (the answer should be a number)
(NB: if your company has an ERP budget, but you don't want give the exact amount, please mark above and leave the ZAR value empty)
o No

15. Did your company established the basic requirements catalogue of the ERP system before selecting the ERP software? (Code: P3.15)
o No, we haven't established any basic requirements catalogue in respect of the ERP system needed
o We are still in the process of establishing the basic requirements catalogue for the ERP system needed
o We have some criteria on the ERP system, but it is not clear
o Yes, we do have a basic requirement catalogue for the ERP system needed

16. During the ERP software selection process, what problems has your company encountered? (Please select only one option per problem, which best represents your opinion)

| | Strongly Disagree | Tend to Disagree | Not Sure/Not applicable | Tend to Agree | Strongly Agree |
|---|---|---|---|---|---|
| • Cannot decide which vendor and payment method (instalments or lump-sum) to use (Code: P3.16.1) | O | O | O | O | O |
| • Difficult to put a monetary value on the potential benefit of the ERP software to justify the cost (Code: P3.16.2) | O | O | O | O | O |
| • Don't have established criteria for selection of an ERP system (Code: P3.16.3) | O | O | O | O | O |
| • It is taking a lot of management time and effort to compare and decide on the appropriate software (Code: P3.16.4) | O | O | O | O | O |
| • Lack of knowledge about ERP systems and their selection (Code: P3.16.5) | O | O | O | O | O |
| • Large number of ERP software products available in the market leads to difficulty of comparison (Code: P3.16.6) | O | O | O | O | O |
| • Not sure whether our existing operation problems were caused by a lack of an ERP system (Code: P3.16.7) | O | O | O | O | O |
| • The capital investment required for the desired software is not affordable (Code: P3.16.8) | O | O | O | O | O |
| • Top management is not committed (Code: P3.16.9) | O | O | O | O | O |
| • Any other problems (Code: P3.16.10) | O | O | O | O | O |

If you indicate there are other problems involved besides those specified, please describe the problem briefly:

_____

_____

_____

17. How important were/are the following product characteristics to your company in the selection of an ERP system? (Please select only one option per characteristic, which best represents your opinion)

| | Not at all important | Somewhat unimportant | Moderately important | Important | Extremely important |
|---|---|---|---|---|---|
| • Accessibility and quality of product support (Code: P3.17.1) | O | O | O | O | O |
| • Adaptability and flexibility of software (Code: P3.17.2) | O | O | O | O | O |
| • Customization (Code: P3.17.3) | O | O | O | O | O |
| • Compatibility with existing hardware (Code: P3.17.4) | O | O | O | O | O |
| • Compatibility with existing operation software (Code: P3.17.5) | O | O | O | O | O |
| • Consistency with interface and user-friendly operations (Code: P3.17.6) | O | O | O | O | O |
| • Designed to minimize implementation time (Code: P3.17.7) | O | O | O | O | O |
| • Ease of installation (Code: P3.17.8) | O | O | O | O | O |
| • Easily understood and well designed business decision-making support information system (Code: P3.17.9) | O | O | O | O | O |

Qing Yu
Graduate School of Business @ University of KwaZulu-Natal

| | | | | | |
|---|---|---|---|---|---|
| • Having complete functionality (Code: P3.17.10) | O | O | O | O | O |
| • Operating process improvement (Code: P3.17.11) | O | O | O | O | O |
| • Operating system independency (Code: P3.17.12) | O | O | O | O | O |
| • Security features (Code: P3.17.13) | O | O | O | O | O |
| • Overall performance (Code: P3.17.14) | O | O | O | O | O |
| • Overall reliability (stability and recovery ability) (Code: P3.17.15) | O | O | O | O | O |

18. How important were/are the following Non-Product Factors to your company in the selection of an ERP system? (Please select only one option per factor, which best represents your opinion)

| | Not at all important | Somewhat unimportant | Moderately important | Important | Extremely important |
|---|---|---|---|---|---|
| • A satisfactory reference site visit (Code: P3.18.1) | O | O | O | O | O |
| • Customer and supplier needs (Code: P3.18.2) | O | O | O | O | O |
| • Demonstrated an understanding of our requirements, constraints and concerns (Code: P3.18.3) | O | O | O | O | O |
| • Success in delivering solutions to companies of a similar size, complexity and geographic scope (Code: P3.18.4) | O | O | O | O | O |
| • Good reputation of the provider (Code: P3.18.5) | O | O | O | O | O |
| • Good end-user training program (Code: P3.18.6) | O | O | O | O | O |
| • Good value relative to cost (Code: P3.18.7) | O | O | O | O | O |
| • Improved innovation capabilities (Code: P3.18.8) | O | O | O | O | O |
| • Increased customer satisfaction (Code: P3.18.9) | O | O | O | O | O |
| • Increased organizational flexibility (Code: P3.18.10) | O | O | O | O | O |
| • Internationality of software (Code: P3.18.11) | O | O | O | O | O |
| • It was recommended by a well-known company (Code: P3.18.12) | O | O | O | O | O |
| • Lower upgrade cost (Code: P3.18.13) | O | O | O | O | O |
| • Market position of vendor (Code: P3.18.14) | O | O | O | O | O |
| • Minimum implementation time (Code: P3.18.15) | O | O | O | O | O |
| • Quality of the vendor's proposal (Code: P3.18.16) | O | O | O | O | O |
| • The contact person in this software company seems to be trustful and reliable (Code: P3.18.17) | O | O | O | O | O |
| • The ownership of the source-code of the software belongs to the buyer, not the software provider (Code: P3.18.18) | O | O | O | O | O |

| | | | | | |
|---|---|---|---|---|---|
| • The software provider offered a monthly rental or instalment option rather than just a lump-sum payment (Code: P3.18.19) | O | O | O | O | O |
| • The software provider provides a data extract and data import service (Code: P3.18.20) | O | O | O | O | O |
| • The software is cheaper for the same modules/functions than other ERP system (Code: P3.18.21) | O | O | O | O | O |

19. Which evaluation methods/techniques has/is your company adopted/adopting to select ERP software? (Please select where applicable)
o Payback period (Code: P3.19.1)
o Return on investment (Code: P3.19.2)
o Internal rate of return (Code: P3.19.3)
o Net present value (Code: P3.19.4)
o Adjusted cost/benefit analysis (Code: P3.19.5)
o Discount rate sensitivity (Code: P3.19.6)
o Adjusted interpretation process (Code: P3.19.7)
o Strategic fit (Code: P3.19.8)
o Information economics (Code: P3.19.9)
o The options model (Code: P3.19.10)
o Multi-layer evaluation process (Code: P3.19.11)
o Balanced scorecard (Code: P3.19.12)
o Other, please specify: (Code: P3.19.13)

_____

_____

## PART 4: ONLY FOR THOSE COMPANIES THAT HAVE PURCHASED AN ERP SYSTEM
— Your company's experience with the ERP system

20. Please select the problems that your company encountered when implementing or using the ERP system: (please select only one option per problem, which best represents your opinion)

| | Strongly disagree | Tend to disagree | Not Sure/Not applicable | Tend to agree | Strongly agree |
|---|---|---|---|---|---|
| • A lot of bugs in the software (Code: P4.20.1) | O | O | O | O | O |
| • It took a long time to gain the confidence for the system to go live (Code: P4.20.2) | O | O | O | O | O |
| • It took a long time to import data into the ERP system (Code: P4.20.3) | O | O | O | O | O |
| • Some modules bought were never utilized within the company (Code: P4.20 4) | O | O | O | O | O |
| • The software interface is not intuitive and very difficult for non-computer literate people to use (Code: P4 20.5) | O | O | O | O | O |
| • The software provider is not responsive to problems that have occurred. Poor level of support (Code: P4.20.6) | O | O | O | O | O |
| • The system does not function to the expectations as promised by the software vendor (Code: P4.20.7) | O | O | O | O | O |
| • The system is difficult to maintain or upgrade (Code: P3.20 8) | O | O | O | O | O |
| • The training program is long and complex and was not cost effective (Code: P4.20.9) | O | O | O | O | O |
| • There was great resistance from employees to the new software (Code: P4.20.10) | O | O | O | O | O |
| • We did not have effective project management when implementing the software (Code: P4.20 11) | O | O | O | O | O |
| • Overall, we are satisfied with this software (Code: P4.20.12) | O | O | O | O | O |
| • Overall, the software has improved our business efficiency (Code: P4.20.13) | O | O | O | O | O |

21. Approximately, how many months did the implementation of the software actually take - from training to going live? (Code: P4.21)
Your answer: _____ (the answer should be a number)

22. Approximately, how many months did your company expect that the implementation of the software would take in the first place? (Code: P4.22)
Your answer: _____ (the answer should be a number)

NB: the following are optional questions and respondent may choose not to answer these.

23. Approximately, how much had your company pay for the software package, including training costs? (Code: P4.23)

Qing Yu
Graduate School of Business @ University of KwaZulu-Natal

Your answer in ZAR_____ (the answer should be a number)


24. Approximately, how much was your company expecting to pay for the software package, including training, before the selection process? (Code: P4.24)
Your answer in ZAR_____ (the answer should be a number)


Thank you once again for helping me with this survey!

# APPENDIX FOUR

# ETHICAL CLEARANCE

---

RESEARCH OFFICE (GOVAN MBEKI CENTRE)
WESTVILLE CAMPUS
TELEPHONE NO.: 031 – 2603587
EMAIL : ximbap@ukzn.ac.za

**UNIVERSITY OF**
**KWAZULU-NATAL**

16  APRIL 2007

MR. Q YU  (205504846)
GRADUATE SCHOOL OF BUSINESS

Dear Mr. Yu

ETHICAL CLEARANCE APPROVAL NUMBER:  HSS/0175/07M

I wish to confirm that ethical clearance has been granted for the following project:

"An investigation of problem factors in ERP selection from KwaZulu-Natal Organisations"

Yours faithfully

MS. PHUMELELE XIMBA
RESEARCH OFFICE

cc.   Faculty Officer (Christel Haddon)
cc.   Supervisor (Prof. M Maharaj)

Founding Campuses:      ▭ Edgewood      ▭ Howard College      Medical School      ▭ Pietermaritzburg      ▭ Westville