ERP PROJECTS: AN EXAMINATION OF THE FACTORS INFLUENCING ADDITIONAL UNPLANNED EFFORT IN THE PROJECT LIFE-CYCLE

by

Marie Melina Ng Cheong Tin

A dissertation submitted to the

Department of Information Systems

University of Cape Town

In partial fulfilment of the requirements for the degree of

Master of Business Science

November 2005

ACKNOWLEDGEMENTS

I would like to express my gratitude first and foremost to my parents, to whom I dedicate this piece of work. Thank you for your spirit and guidance throughout this journey. On a similar note, I thank my sister for her moral and practical support especially at a very critical time in this project.

My thanks go to my supervisor Professor Derek Smith for his guidance in seeing this research through and also for teaching me about independence and perseverance. Thank you to Dr Brian O'Donovan and Mr Irwin Brown for their kind assistance. My thanks also go to Dr Joan Mann who kindly shared useful information with me in the beginning stages of this project.

I express my gratitude to the various project managers involved in this study for kindly granting me their precious time to participate in this project and for their willingness to provide the information needed.

To my dear colleagues at Knowledge Crucible, thank you for giving me the space, understanding and friendship.

For their continuous support and friendship, I am grateful to Peter Kao, Aayesha Patel, Heleen Louw, Mag Singaravelloo and Farzana Bayat. You are special people to me.

Melina Ng Cheong Tin
November 2005

ABSTRACT

For over a decade, ERP systems have been the target of significant amounts of investment in organisations. Some have reaped the benefits anticipated while others struggle to achieve the required level of success. In fact, based on available statistics, numerous organisations have faced problems in keeping their allocated budget and time schedules on track often facing the threat of failure, escalation or significant redirection in their projects. As a result, organisations are seen to spend what can be termed as additional unplanned effort (AUE) in order to try and achieve a certain level of success given budget and time constraints.

Using the concept called AUE, derived from topics such as ERP project success and failure, the ERP life-cycle framework and critical success factors (CSFs) relevant to the life-cycle phases, this study attempted to investigate the factors that influence AUE in the phases of the ERP life-cycle which in this study consist of the pre-implementation and implementation phases specifically. A sub-objective was also to investigate the possible influence that the presence of factors, responsible for escalation of commitment (EoC) in IT projects, have on AUE in ERP projects.

Based on a qualitative multiple case-study of 5 ERP projects at different organisations, results showed that there are several factors that influence AUE in satisfying CSFs in each phase of the life-cycle. Particularly, in the pre-implementation phase, factors such as the justification for ERP adoption, the formalisation of an ERP vision, the finalisation of an ERP package choice, the stability of organisational structure, the organisation and flow of the acquisition process, the nature of market conditions and the type of internal and external partnership were found important in influencing AUE in that phase. In the implementation phase factors such as the formalisation of an implementation strategy, the management of organisational momentum and resistance to change, the maintenance of external partnership relationships, conditions external to the organisation, the nature of the organisation and the management of project factors were found important.

An important finding in this study is that the pre-implementation phase is characterised more by inadequate effort rather than AUE in satisfying CSFs and that that inadequate effort leads to a corresponding AUE in the implementation phase in satisfying relevant CSFs in that phase. The study also revealed inter-relationships among factors influencing AUE within a particular life-cycle phase. Furthermore, it was found that the AUE spent by an organisation in satisfying CSFs in an ERP project is likely to also be influenced by the presence of EoC factors but in varying degrees.

TABLE OF CONTENTS

LIST OF FIGURES & TABLES

CHAPTER 1 - INTRODUCTION

1.1 Background to the Research Problem

IT investments and their contributions to firm value spur considerable debate (Remenyi, 2000). Over a decade of research on the business value of information technology has produced mixed findings, and enterprise systems are not exempt from the controversy. Businesses across the world and across various different industries have welcomed the idea of an Enterprise Resource Planning (ERP) system given the extent of its promises to offer "the perfect solution" to remaining competitive in this "global village".

An ERP system is package software that provides a total, integrated solution to enable an organisation to manage its use of resources such as materials, stock, human resources and its functions such as its supply chain, finance and sales (Nah, Zuckweiler & Lau, 2003). ERP systems evolve from the concepts of Materials Resource Planning (MRP) and Manufacturing Resource Planning (MRP II) and extend the scope of planning beyond the internal supply chain to include the scheduling of supplier resources and customer demands (Chen, 2001).

According to a study at Gartner Research (Eschinger, 2001), product license revenue for the total worldwide ERP market slightly exceeded US$5.26 billion in 2003 representing a 3.6% increase and is expected to experience a compound annual growth rate of 5.7% through to 2008 (Eschinger, Pang & Biscotti, 2004). This is an encouraging figure for ERP vendors given the three preceding years of continuous decline experienced on the market (Steenstrup, Genovese, Zrimsek & Eschinger, 2003).

The top five vendors in terms of license revenue in the ERP world market in 2003 were SAP, PeopleSoft, Oracle, Sage and Microsoft (Eschinger *et al.*, 2004). It is reported that by 2001, SAP had registered implementations in 30 000 sites worldwide and established a user population of more than 10 million (Sammon, Adam & Elichirigoity, 2001). With SAP as the world's leading vendor, adoption rates are expected to soar, even though not at hyper growth rates previously experienced (Eschinger *et al.*, 2004).

Steenstrup *et al.* (2003) predict that the growth in the ERP market will come primarily from non-traditional vertical markets such as retail, services, public sector and asset-intensive industries as well as small and midsize businesses. In the traditional markets such as manufacturing and distribution, it is expected that users will focus on consolidating vendor offerings across the enterprise (Steenstrup *et al.* 2003). In research performed on the European market, results show that increasingly, mid-size companies have become a major target market for ERP implementations in Europe given the close-to-saturation trend within big companies (i.e. more than 1,000 employees), which are now focusing on ERP II efforts. These essentially consist of redesigning existing ERP processes to include features of a constantly evolving business context (Van Everdingen, Van Hillegersberg & Waarts, 2001).

Yet, despite this global dimension and sustained momentum, the track record of ERP implementations does not consist entirely of success stories. Advertised examples such as the FoxMeyer Drugs case study (Scott & Vessey, 2002; Legare, 2002); Hershey Food Corp. (Sumner & Hamilton, 2005); Dell and Unisource (Bingi, Sharma & Godla, 1999) among others indicate the level of risk associated with ERP implementations. Although investments in information technology (IT) and information systems (IS) continue to increase, projects continue to fail (Cule, Schmidt, Lyytinen & Keil, 2000) and among those are ERP projects.

1.2 Problem Statement

The reasons behind ERP failure and models for successful implementation have been investigated quite extensively in past research (Bingi *et al.*, 1999; Sumner, 2000; Sammon *et al.*, 2001; Gable, Sedera & Chan, 2003). Yet today, ERP systems implementations still fail, often cost more than estimated, take longer than planned, and are often scaled back in midstream.

An extensive part of the academic literature deals exclusively with ERP implementation issues but ignores the way acquisition decisions are taken and the way they impact on the overall project (Stefanou, 2000). Past research on ERP problems have dealt particularly with the implementation phase, giving results either via case studies (e.g. Vogt, 2002; Murray & Coffin, 2001; Sumner, 1999, 2000; Holland, Light & Gibson, 1999) or based on more general findings (e.g. Nah *et al.*, 2003). Contributions to the body of knowledge have been in terms of frameworks, models and critical success factors for successful implementation.

Thus, problems that have been observed and reported in research have been generally referred to as "implementation" problems. By tackling the issue from this narrow perspective, less emphasis has been placed on the distinct life-cycle phases and a particular focus has been on identifying critical success factors (CSFs) for ERP implementation (Bingi *et al.*, 1999; Holland *et al.*, 1999; Esteves-Sousa & Pastor-Collado, 2000; Robey, Ross & Boudreau, 2000; Hong & Kim, 2002; Tan & Pan, 2002; Nah *et al.*, 2003; Shaw, 2003).

The ERP life-cycle can be viewed as consisting of three main phases: the Pre-Implementation or Acquisition, Implementation and Post-Implementation phases respectively (Chang & Gable, 2000). The problems experienced with ERP projects are most often related to the implementation phase, causing research attention and efforts to delve into that particular phase only, often neglecting issues pertaining to the other phases, more specifically the pre-implementation phase. Some authors (Stefanou, 2000; Franch & Pastor, 2000; Verville, 2002; Verville & Halingten, 2002a, b) stress the importance of this phase in ensuring overall ERP project success. However, while considerable research effort has focused on the success and failure of ERP implementations, few studies shed light on the factors that impact on the ERP acquisition phase in particular and on the overall success of the project.

Considering the existing research on ERP project failure, an important theme that emerges is the extent to which delays are experienced at distinct stages of their life-cycle and the influence such delays have on the overall project success. Project delays refer to the completion of the project being later than originally planned (Eden, Williams, Ackermann & Howick, 2000). While researchers have investigated the reasons for ERP failure (Vogt, 2002) and identified critical success factors (Bingi *et al.*, 1999; Holland *et al.*, 1999) for ERP projects, very little has been said on the characteristics of situations where ERP projects are neither entirely successful nor necessarily failures, i.e. challenged (Standish Group, 1995) or troubled projects (Sumner & Hamilton, 2005). There is therefore a need for additional research that analyses the delays experienced during particular life-cycle phases. More particularly, the amount of additional unplanned effort spent in overcoming various obstacles constituting those delays and in satisfying the various CSFs, needs further investigation. Additional unplanned effort, from here onwards referred to as AUE, can be defined as the effort spent in carrying out a task *in addition* to what was originally allocated to it.

The phenomenon of the "runaway project" has been the subject of considerable research lately (Keil & Flatto, 1999; Keil, Mann & Rai, 2000). It has largely been identified in the literature on troubled information systems development projects but has not necessarily been applied to the more particular case of the ERP project. An interesting question is whether ERP projects are influenced by those same factors (Staw, 1981; 1997) that cause IT projects to escalate and therefore become "runaway projects". Survey results do indicate that between 30 percent and 40 percent of all IT projects exhibit some degree of escalation (Keil *et al.*, 2000).

Escalation of commitment (EoC) is a situation whereby unanticipated problems cause projects to run behind schedule and where despite negative feedback, projects continue to consume valuable organisational resources such as money, personnel, time and effort (Boonthanom, 2003). Escalation of commitment (sometimes referred to as escalation for short) in a project and "runaway" projects are not necessarily synonyms, but rather, runaway projects are a consequence of escalation (Mann, 1996). One keyword in the definition of EoC is "continuation", whereby commitment to a project continues or is sustained through the allocation of resources, despite negative feedback relating to project performance and its likelihood of success (Mann, 1996).

1.3 Purpose of the Research

The purpose of this study was to investigate the extent to which AUE is spent by an organisation in an attempt to satisfy CSFs and therefore improve the level of success of its ERP project. The study intended to identify the factors influencing that AUE in two distinct phases of the ERP life-cycle: the pre-implementation (or acquisition phase) and the implementation phase, where problems are usually encountered. Furthermore, this research study aimed at investigating the extent to which factors known to influence EoC also contributed to this AUE in the respective life-cycle phases. Overall, the research intended to compare the pre-implementation phase with the implementation phase based on the factors found to influence AUE spent in satisfying CSFs in each phase, and in dealing with possible EoC.

1.4 Research Context

In this study, the notion of additional unplanned effort (AUE) has been derived and developed to denote the extra amount of objectively quantifiable resources, namely time and cost among other constraints such as planning, verification and control required to carry out a certain task (Adam, Sammon & Carton, 2004). Thus, the study first tried to examine the factors that encourage such AUE in an organisation's attempt to satisfy CSFs and secondly analysed the extent to which this AUE is also influenced by the presence of factors that are known to influence EoC (Staw, 1981; Staw & Ross, 1987; Staw, 1997) in a project. The context of this research study is depicted in Figure 1 below.

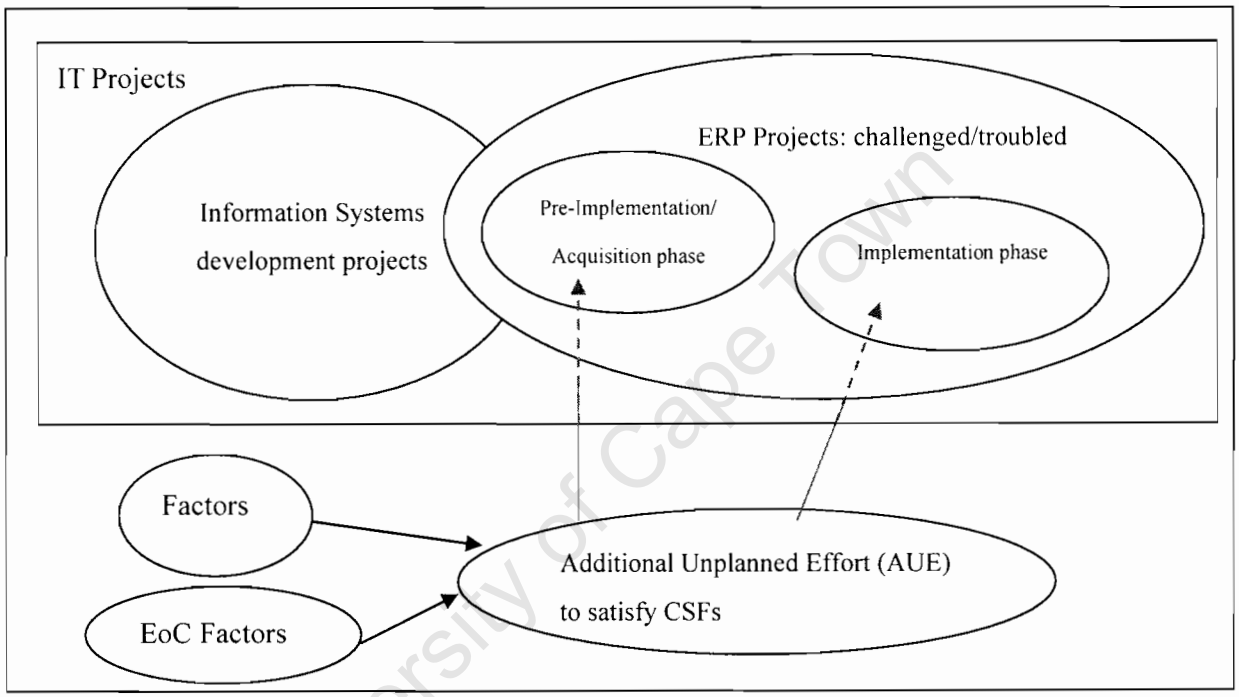


Figure 1: Research Context

The above diagram puts the ERP project into context as being one type of IT project, but it also shows that the particular interest of this research is with troubled/challenged projects. The diagram shows that the purpose of this study was to investigate the factors that cause each particular phase of the ERP life-cycle to undergo AUE in satisfying CSFs and also to examine the possible influence that EoC factors have on the occurrence of such AUE.

It is worthwhile noting that, so far, the theory of EoC has been applied to information systems *development* projects whereas an ERP project qualifies more as a packaged software project with some degree of development usually associated with it. This is why the research model below refers to IT projects as the bigger set of which development and ERP projects are a subset.

1.5 Research Methodology

The research method adopted for this study is qualitative and empirical in nature, using more specifically the case-study approach as is often the case in the field of Information Systems (Darke, Shanks & Broadbendt, 1998). A total of five organisations and their respective ERP projects constitute the cases discussed in this thesis. Despite the fact that case-studies are often criticised for their lack of rigour and the limitation in the extent to which their results can be generalised (Yin, 1994), it was considered as the most appropriate method of conducting this research study especially in the attempt at understanding the interaction between IT-related innovations such as ERP implementations and organisational contexts (Orlikowski & Baroudi, 1991).

1.6 Value of the Research

This study should contribute to improving the existing knowledge about ERP projects and should be of benefit primarily to current and potential ERP clients as well as consulting organisations which are usually hired as implementation partners on ERP projects. The findings of this research should guide the decision-maker on an ERP initiative and raise awareness of important factors which are likely to attract AUE and therefore encourage project delays in different phases of the life-cycle. Furthermore, this study should assist ERP project decision-makers in detecting threats of AUE, also through the possible presence of EoC factors during the project. Overall, this study intends to contribute to existing research in the ERP field particularly with regards to project success and failure.

1.7 Assumptions

This study assumes that, from the perspective of a derived concept, AUE is a reasonable measure of the more general term "project delay" and when taken to an extreme may constitute a situation of escalation of commitment. It is also assumed that organisations in general experience their ERP project evolving along a series of phases constituting the ERP life-cycle which is a founding principle for this research study. Furthermore, it is understood that the AUE considered in this study is spent towards satisfying CSFs in order to improve the level of project success. Finally, this research relies on the assumption that responses from the project managers provide accurate and credible information necessary for this study.

1.8 Scope and Limitations

Due to budget restrictions and the fact that data collection necessitated face-to-face interaction, this study could only be carried out within the region of the Western Cape in South-Africa, where the researcher is based. The only exception was for case C2 for which the researcher had the opportunity of carrying out the interview during her trip home to Mauritius. The study was also limited by the fact that it was not only difficult to identify organisations which experienced troubled ERP projects, but also those which were open to discussion on the topic. This made the sampling exercise for the case-studies difficult.

1.9 Definition of Terms

In this study, it is important to note the definition of the terms at the basis of the discussion:

- ERP life-cycle: distinctly two phases: the pre-implementation or acquisition phase and the implementation phase.
- Additional Unplanned Effort (AUE): effort spent in carrying out a task in addition to that which was originally allocated.
- Escalation of commitment (EoC): when an organisation continue to allocate resources to projects even though there are negative signs that show that these projects may possibly be failing coupled with uncertainty surrounding the likelihood of goal attainment.
- Factors *influencing*: – factors that have a role in causing AUE based on perceptions of respondents. No measuring instrument.

1.10 Organisation of Dissertation

This dissertation is organised in seven chapters. Chapter 2 provides a critical review of the literature dealing with IT project success and failure in general, the concept of ERP, the ERP life-cycle framework and ERP project success and failure. The latter is discussed specifically in the context of CSFs, which are widely researched. The concept of escalation of commitment is presented and its relevance to ERP project success highlighted. Finally, the chapter ends with important research implications based on the literature survey and indicates the gap in knowledge that this study attempts to address.

Chapter 3 details the research methodology used to conduct this study, i.e. gather data and explore the research questions. The chapter specifically presents the research approach, the case study approach more particularly and defends its suitability to this research. It also provides information on the particular research design and data analysis techniques that were utilised. Chapter 4 includes the profiles of the five cases studied providing background to each ERP project and summarising the events that impacted on performance and progress during the life-cycle. The chapter also provides graphical summaries and comparisons of the relevant project data collected in the survey questions.

Chapter 5 contains the analysis of the interview data collected and presentation of the findings. Chapter 6 is an extension of the analysis presented in the previous chapter as it derives implications based on supporting literature reviewed in Chapter 2. Chapter 7 summarises and concludes the study. The research questions are revisited and conclusions are drawn. Limitations of the study are outlined and areas of future research recommended.

CHAPTER 2 - LITERATURE REVIEW

This chapter presents a review of the literature on the concepts relevant to this study more specifically IT project success and failure and Critical Success Factors (CSFs), with a specific focus on ERP systems, the ERP life-cycle and issues pertaining to the phases, especially the implementation and pre-implementation phases. The phenomenon of project escalation of commitment (EoC) in the context of IT projects is also discussed. Finally, implications are made to indicate relevant alternatives for research.

2.1 Challenged IT Projects

A project is seen as a finite piece of work i.e. it has a beginning and an end (Butterick, 2000) and is temporary. According to the Project Management Institute, a project creates a unique product, service or result (PMI, 2000) and is a "novel" initiative (Wideman, 2000) even though individual tasks within a project may be common to other projects. For example, even though many different enterprises may start projects to implement a software package such as an ERP system from the same vendor, the results of these projects will be unique (at a level of detail) to that enterprise, its business processes and people.

The Standish Group (Standish Group, 1995) classifies projects into three distinct types: *project success* whereby projects are completed on-time and on-budget with all functions and features as initially specified. The second type is *project challenged* which refers to a project that is completed and operational but over-budget, over the time-estimate and which offers fewer functions that originally specified. The third type is *project impaired* which is a project that is cancelled at some point during the life-cycle (Standish Group, 1995). Fig. 2.1 below shows a 10-year comparison of the three categories in the IT field.

Figure 2.1: IT Project Performance 10-year Comparison (Standish Group, 1994; 2004)

In 1994, the group produced a famous report, CHAOS, which estimated that on average only 16.2% of software projects in America get completed on time and within budget (Standish Group, 1994). This figure improved to 28% in 2000 (Collins & Miller, 2001) and to around 34% in 2003 only to recede again to 28% in 2004 (Hayes, 2004). Challenged projects constituted 54% of IT projects in 2004 (compared to 52.7% in 1994) while impaired ones are on the decline at 18% (compared to 31% in 1994).

According to Gunson, de Blasis, Esteves & Pastor (2004), dictionary definitions of success that apply to the context of IS implementations are: "the degree or measure of attaining a desired end, the accomplishment of an aim or purpose, also a favourable termination of venture" (p. 3). Failure is then the reverse of these definitions. Central to the success/failure of a project is the concept of project evaluation, whereby the project is evaluated against a certain number of success criteria previously defined. IT evaluation in general has been a much debated topic (Klein & Beck, 1987; Strassman, 1990; Brynjolfsson 1993; Willcocks & Lester, 1993; Smithson & Hirschman, 1998; Bannister & Remenyi, 1999; Remenyi, 2000; Khalifa, Irani & Baldwin, 2000; Tangpong, 2002; Jani, 2003) probably because organisations have been experiencing a steady increase in the significance of their IT expenditures, including ERP investments, for the past decade or so and they struggle to derive a satisfactory return on their investment.

Evaluating Project Success

Given the widespread and increasing concern about challenged and failed IT projects on the market, it would be important to grasp an understanding of the various constraints that influence the success of failure of a project. These constraints are namely time, cost, scope and quality depicted in a four-cornered star, each corner pointing at a constraint (Wideman, 2000; 2004). According to Wideman, those constraints are "inextricably intertwined": scope-quality pair up to signify performance, scope-cost represents viability, cost-time represents effort while quality-time represents competitiveness. A three-dimensional tetrahedron placing each constraint as a vertex can be drawn as shown Fig. 2.2.

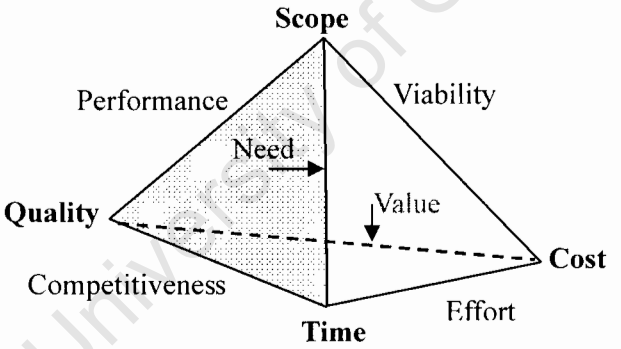


Figure 2.2: Davis's Project Management Tetrahedron (Wideman, 2004)

Thus, each edge of the tetrahedron connects a pair of constraints showing a set of important factors and requirements at play during a project: competitiveness, effort, need, value, performance and viability that together define the project's overall success. Marasco (2004) added to this model by suggesting a fifth dimension to project success, risk thus giving the pyramid a square base. According to Marasco (2004), risk becomes the altitude variable whereby its inverse corresponds to the probability of success of the project. A high-risk project will thus have a low probability of success, a low altitude and a bigger square base area (which denotes more time, cost, quality and scope values).

2.2 The Concept of an ERP System

ERP Background

Coined in the early 1990s by the Gartner Group, the term "enterprise resource planning" (ERP), enterprise or enterprise-wide system means an application package that supports many, even most, aspects of an organisation's information needs, linking back-office operations to front-office operations as well as internal and external supply chains (Verville & Halingten, 2002a,b). ERP traces its roots to Material Requirements Planning (MRP) and Manufacturing Resource Planning (MRP II) (Chen, 2001; Davenport, 1998).

The purpose of ERP systems is to improve resource planning by extending the scope of planning to include more of the supply chain than in MRP II. A key difference is that while MRP II has focussed on the planning and scheduling of internal resources in view of adding agility, flexibility and mass customisation to the traditional manufacturing process (Chamberlain & Thomas, 1995), ERP strives to plan and schedule supplier resources as well, based on the dynamic customer demands and schedules (Chen, 2001). ERP systems serve many industries and numerous functional areas in an integrated fashion from supply chain management, inventory control, manufacturing scheduling and production, sales support, customer relationship management, financial and cost accounting and human resources (O'Leary, 2000).

Evolution of ERP Systems

The key driver behind the development of ERP systems is the need for companies to be seamlessly connected around the globe (Davenport, 1998). This situation of "seamless information flow" is a goal towards which each and every organisation that has a long-term vision for survival strives or should strive for. The key to this strategic objective lies within another key objective, which is integration of business functions (Kumar & Van Hillegersberg, 2000). Over the past ten years, ERP systems have become increasingly prevalent (O'Leary, 2000). Initially, analysts attributed the "craze" for packaged software purchases such as ERPs to the Year 2000 (Y2K) crisis but even beyond that period, the ERP market still experienced a high demand and analysts were forced to reconsider the reasons behind this trend (Butler, 1999).

The license revenue of the total worldwide ERP market slightly exceeded US$5.26 billion in 2003 representing a 3.6% increase compared to the two previous years (where negative growth had been experienced). It is expected to experience a compound annual growth rate of 5.7% through to 2008 (Eschinger *et al.*, 2004). AMR Research reports that worldwide revenue for ERP, CRM and SCM vendors amounted to a total of US$ 37 billion in 2002 (Shang & Seddon, 2004).

The top five vendors in terms of license revenue in the ERP world market in 2003 were SAP, PeopleSoft, Oracle, Sage and Microsoft (Eschinger *et al.*, 2004). With SAP as the world's leading vendor, adoption rates are expected to soar, even though not at hyper growth rates previously experienced (Eschinger,

2001). This growth in the ERP market is expected to come primarily from non-traditional vertical markets such as retail, services (finance, education, insurance), public sector and asset-intensive industries as well as small and midsize businesses (Steenstrup *et al.*, 2003). Traditional capital-intensive industries such as manufacturing, construction, aerospace and defence have already been extensively explored (Chung & Snyder, 2000).

With the emergence of electronic commerce (e-commerce), enterprises are transforming themselves into vertically integrated organisations, focused on optimising internal enterprise functions to more agile, core-competency-based entities that strive to position themselves within the supply chain and value network, taking advantage not only of business-to-business (B2B) and business-to-consumer (B2C) commerce but also of collaborative-commerce (c-commerce) processes. This implies that organisations need not only compete on the usual availability, quality and cost of their products but also on the quality of their information they can provide to their collaborating partners (Bond, Genovese & Miklovic, 2000).

The demand on ERP processes and systems to meet this trend is causing users to redesign ERP processes to include outward-facing elements. Thus Gartner has coined a new term ERP II to reflect a business strategy and a set of industry-domain-specific applications that build customer and shareholder value by enabling and optimising enterprise and inter-enterprise collaborative operational and financial processes. It is expected that by 2005, the need for enterprises to publish critical information for c-commerce processes will cause ERP II to supplant ERP as the primary enabler of internal and inter-organisational process efficiency (Bond *et al.*, 2000).

2.3 ERP Projects: Investment Implications

In the 1990s, with the increasing importance of globalisation and intensifying competition, many organisations embarked on an IT investment binge such as the acquisition of large integrative package software like ERPs in the hope that these IT "tools" would automatically place them in a comfortable position with automated operations and sudden efficiency (Rajagopal, 2002). They were soon faced with disillusionment when statistics showed that, for instance in 1996, 53% of software projects with a value of US$275 billion, failed (Rajagopal, 2002) and that nine of ten organisations do not implement ERP "right the first time around" (Donovan, 2001).

Indeed, ERP projects often represent the single largest investment in an information systems project in the history of companies, and in many cases the largest single investment in any corporate-wide project (Sumner, 2000) costing hundreds of thousands, even millions to organisations. Thus, the implementation of an ERP system involves an initial purchase decision that is fraught with a high-level of risk and uncertainty (Verville & Halingten, 2002b) and the success or failure of which has a huge impact on the organisation (Shakir, 2000). In the face of uncertainty, given the poor success rates of IT projects in general (Fig. 2.1) and reported "horror stories" of challenged/failed ERP projects such as the FoxMeyer Drugs case, Dell Computer Corp., Dow Chemical and Hershey Food Corp. (Bingi *et al.*, 1999, Sumner & Hamilton, 2005), the decision to acquire a large IT package such as an ERP system is understandably a

complex one that usually requires careful initial evaluation and justification for such large capital expenditure.

Despite the large capital investment that it represents, the decision to implement an ERP system is not purely financial. From the project initiation to the post-implementation review, there are many decisions that have to be made by various stakeholders (Shakir, 2000). Bernroider & Koch (2000) also say that in order to choose the right ERP system, its power and potential needs to be understood from a business impact perspective, as only part of the problem can be dealt with by standard investment calculation methods such as Net Present Value (NPV). Furthermore, they also acknowledge the need for the decision-maker to judge and evaluate all relevant (including intangible) business impacts.

Thus, it is widely acknowledged that ERP systems which require such large capital commitment upfront and with expectations of significant positive business improvements in return, necessitate complex decision-making processes at different stages during the project. They also involve various stakeholders defending their interests and positions. Furthermore, persisting reports of ERP challenges and failures (Sumner & Hamilton, 2005) are a serious cause for concern and hence there is motivation for extensive research in the field.

2.4 The ERP Life-Cycle

The various research topics that have gained attention from researchers concerning the ERP system and concept show that authors have taken multiple angles to their investigations. The topics are listed below:

- ERP adoption (Chung & Snyder, 2000; Everdingen, Hillegersberg & Waarts, 2000; Oliver & Romm, 2000; Shakir, 2000; Sammon & Adam, 2000; Boon, Corbitt & Peszynski, 2004) with a special focus on
- Selection (Sistach, Pastor & Fernandez, 1999; Bernroider & Koch, 2000; Franch & Pastor, 2000; Stefanou, 2001; Knapp & Shin, 2001; Chen, 2001; Verville, 2002; Verville & Halingten, 2002a,b; Razi & Tarn, 2002),
- Business impact (Bernroider & Koch, 2000; Ravarini, Tagliavini, Pigni & Sciuto, 2000; Hitt, Wu & Zhou, 2002) benefits (Shang & Seddon, 2000; Willcocks & Sykes, 2000; Shang & Seddon, 2004) and
- Organisational fit (Volkoff, 1999; Somers & Nelson, 2001; Soh, Kien & Tay-Yap, 2000; Hong & Kim, 2002),
- Implementation issues (Brown & Vessey, 1999; Parr & Shanks, 2000; Adam & Doherty, 2000; Robey *et al.*, 2000; Scott & Vessey, 2002) dealing with
- Critical success factors (Holland *et al.*, 1999; Sumner, 1999; Dembla, 1999; Esteves-Sousa & Pastor-Collado, 2000; Murray & Coffin, 2001; Nah *et al.*, 2003; Esteves & Pastor, 2003),
- Project management issues (Adam *et al.*, 2004)
- ERP success (Scheer & Habermann, 2000; Tan & Pan, 2002; Gable *et al.*, 2003) and failure (Vogt, 2002).

Al-Mashari (2003) provides some twenty-four different ERP research themes according to a review of existing literature. Some of these include themes such as ERP and competitiveness, deployment strategies, change management, performance measurement, successful/failed implementations and risk management. Three innovative dimensions to ERP research are highlighted namely ERP adoption and its business impact, technical aspects of ERP and ERP in IS curricula (Al-Mashari, 2003).

The ERP Project Life Cycle framework

To allow for solid basis for analysis, it is important to place these various research themes mentioned above within the life-cycle framework that is applicable to ERP projects. Indeed, several authors (Gable, Scott & Davenport, 1998; Esteves & Pastor, 1999; Chang & Gable, 2000; Markus & Tanis, 2000; O'Leary, 2000) have focused on the ERP life-cycle process and thus highlighted its importance as a basis to analyse issues pertaining to ERP projects.

A general vision is required where each issue should be analysed and defined according to the dimensions that make up the life-cycle framework (Esteves & Pastor, 1999). Esteves & Pastor (1999) have developed an orthogonal ERP life-cycle framework structured in phases and dimensions based on the research issues they have depicted concerning ERP systems: phases are the different stages of an ERP system life-cycle within an organisation and dimensions are the different viewpoints by which the phases could be analysed. This framework adapted from Esteves & Pastor (1999) and Chang & Gable (2000) is shown below in Fig. 2.3.

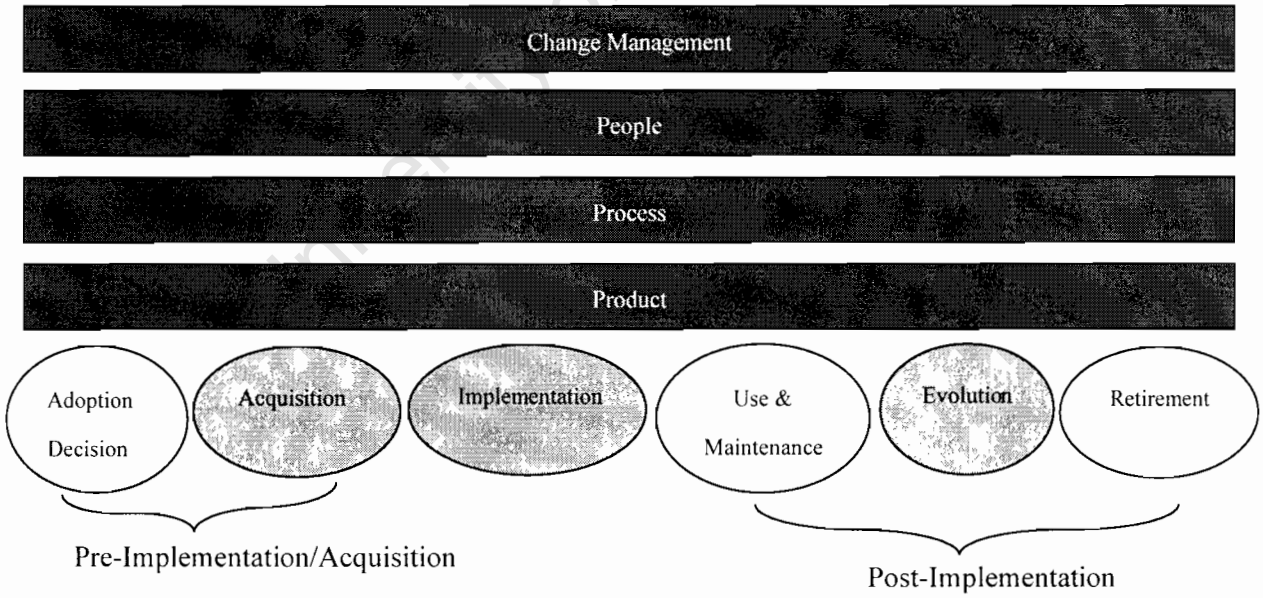


Figure 2.3: The ERP life-cycle framework (adapted from Esteves & Pastor, 1999; Chang & Gable, 2000)

According to Esteves & Pastor (1999), the stages or phases that an ERP system goes through during its life-cycle within an organisation are: the adoption decision phase, the acquisition phase, the implementation phase, the use and maintenance phase, the evolution phase and the retirement phase. Taking Chang & Gable's (2000) model also into account, it is possible to group the first two phases into the pre-implementation phase and the last three into the post-implementation phase.

The above is aligned with a model developed by Razi & Tarn (2002) which promotes the idea that an ERP project consists of a three-phase initiative: Phase 1 starts with the self-evaluation process of rigorous analysis of the capabilities of the business's current system, if there exists one, and also the evaluation of the future processing need and whether the current system is robust enough to sustain and support that processing need. In this phase, the importance of corporate objectives, corporate strategy, future growth potential, current and future business practices, business process reengineering, hardware, software considerations, financial resources and vendor selection are emphasised.

The model then proceeds to phase 2 which consists of the implementation, testing of the selected system and analysis of such tests. The implementation approach or strategy (sequential vs. all-at-once), compatibility of software/hardware, business process alignment, bug fixing, time and cost implications and employee training are critical at this stage. The last phase represents the go-live and system use and maintenance. Major considerations in the last phase are the going-live strategy (sequential vs. all-at-once), performance monitoring and maintenance (Razi & Tarn, 2002).

Using Esteves & Pastor's (1999) model as a basis, during the **adoption decision** phase, managers must question the need for a new ERP system while selecting the general information system approach that will best address the critical business challenges and improve organisational strategy. The **acquisition** phase deals with product selection that is meant to best fit the organisational requirements. The **implementation** stage consists of tasks such as customisation, parameterisation and adaptation of the acquired ERP package according to the needs of the organisation.

The **use and maintenance** phase refers to the use of the product and the expected benefits with minimal disruption. Once a system is implemented and in use, it must be maintained, as corrections are unavoidable and optimisations and general improvements anticipated. The **evolution** phase consists of the integration of more capabilities into the ERP system. For instance, it would involve taking advantage of e-commerce and e-commerce technologies to expand organisational frontiers to collaboration with external partners. Finally, the **retirement** phase corresponds to the stage when the ERP system is now deemed inadequate to the business needs and therefore needs to be replaced by a newer information system approach.

According to Esteves & Pastor (1999), there are four dimensions representing main areas of concern by which the life-cycle can be analysed: product, process, people and change management. In other words, these dimensions represent those by which an ERP system impacts on an organisation when implemented. The **product** dimension refers to aspects related to the ERP product in consideration such as its functionality and hardware and software needs. This is where the software tool capabilities must be in alignment with the business strategy to determine whether it is being used effectively. The **process** dimension refers to the support given by the ERP system to the organisation's core capabilities and processes. An ERP system must help the decision-making required to manage the resources and

functions of the organisation. The **people** dimension concerns the human resources, skills and roles involved during the ERP life-cycle. Skills and roles must be developed to minimise any disruptions caused by the introduction and diffusion of an ERP system in the organisation, to reduce risk and manage complexity while facilitating change. **Change management** is the fourth dimension whereby complex change situations associated with the implementation of a large system are managed so that they yield the right results, in the right time-frame, at the right costs (Esteves & Pastor, 1999).

It is important to note here that the term ERP implementation has often been used in literature to refer to the entire exercise of implementing the system in an organisation, not paying particular attention to the life-cycle model which distinguishes between the pre- and post- implementation phases. For instance, Kwon & Zmud (1987) and Cooper & Zmud (1990) refer to the *implementation* process as a temporal model consisting of six phases: initiation, adoption, adaptation, acceptance, routinisation and infusion which are very similar to the stages described in Fig. 2.3.

In this study, particular attention was given to the first two phases in Fig. 2.3, namely the pre-implementation phase and the implementation phase as a primary objective of the study was to compare those two phases. These phases together constitute the "main" stages during which the system is planned for and installed for the first time and during which project delays are likely to be experienced.

2.5 ERP Risks and Qualified Success

According to Sumner & Hamilton (2005), ERP project risks can be likened to the same ones that IT projects are generally exposed to. These are personnel shortfalls, unreasonable project schedules and budgets, unrealistic expectations, incomplete requirements and a reduced window of opportunity due to late delivery. The risk factors fall under broad categories such as organisational factors, skill set, management support, software design, user involvement, technology planning, project management and project escalation (Baccarini, Salm & Love, 2004). Organisational factors include changes being proposed to project scope and objectives, lack of software expertise and user experience, lack of management support and user commitment (Keil, Cule, Lyytinen & Schmidt,1998) and also the lack of agreement on objectives and requirements (Ewusi-Mensah, 1997). Another set of risks that IT projects in general face are the lack of technical expertise and adequate technological infrastructure to support project requirements (Ewusi-Mensah, 1997) as well as technological newness, project scope and complexity (Barki, Rivard & Talbot, 1993).

According to Boehm (1991), project management failure is often caused by inadequate planning and tracking which lead to unrealistic schedules and budgets and hence overall project failure. Furthermore, Keil *et al.* (2000) suggest that in IT projects, there is a tendency to discount problems and escalate projects because of societal norms (e.g. the need to save face) thus creating an even greater risk of failure. It is important to consider those risks and manage them because lack of risk management during a project life-cycle can contribute to project failure (Willcocks & Griffiths, 1997).

Troubled ERP Projects: a question of qualified success

Software project success or failure is influenced by many project characteristics, such as stability of requirements, knowledge of developers and management, project difficulty, techniques and tools and their appropriateness (Wohlin & von Mayrhauser, 2000). The success (or failure) of enterprise systems is not a monolithic concept. It is rather relative (to the time it is assessed and to the organisation's unique objectives for the system), multidimensional (business benefits, competitiveness, project metrics) (Markus & Tanis, 2000) and cannot be centred only on technical implementation success (Tan & Pan, 2002). Although most of the IS success measures are applicable to ERP systems, there are still aspects of ERP system sophistication that cannot be addressed effectively by IS success measures such as difficulties in practical implementation and the transfer of embedded tacit business knowledge (Tan & Pan, 2002).

Markus & Tanis (2000) define a standard of "optimal success" which refers to the best outcomes the organisation could achieve with enterprise systems, given its business situation, measured against a portfolio of project, early operational, and longer-term business results metrics, operationalised by a timely and within-budget completion, the expected functionality, the system being used by its intended users, and implemented in the correct way taking into account the organisational and cultural values of the organisation (Esteves, Casanovas & Pastor, 2003). This relates to the project constraints illustrated in Fig. 2.2 but both this definition and the diagram of Fig. 2.3 are limited in terms of defining success from the perspective of all stakeholders, not just "intended users" and also from the perspective of organisational and cultural values.

On the topic of value, Bannister & Remenyi (1999) argues that one of the sources of the gap between theory and practice with regards to IT investments and benefits is that the concept of value is ill-defined. Investment decisions such as ERP investments are based on human perceptions of value, however measured, and should be valued in more complex and subtle ways than the raw economic and financial data suggest. Yet, many IT investment decisions are made on purely technical rational grounds. However, for particularly large and complex decisions such as ERP investment decisions, the process of evaluation involves the application and the absorption of a range of input information including data, evaluation techniques, personal experience, personal knowledge, corporate or departmental politics, personal aspirations and intuition; a process of filtration and distillation of complex information to levels manageable to the human mind (Remenyi, 2000).

Several researchers, in fact, have found that both individual and corporate decision makers describe their decisions as being based to a greater or less extent on instinct, gut feeling or act of faith. The more complex the decision, the more likely this seems to be the case (Powell, 1992; Katz, 1993; Farbey, Land & Targett, 1993; Deitz & Renkema, 1995; Remenyi, 2000). Thus, by ignoring this aspect and relying purely on fundamental measures such as metrics, IT investment evaluation is likely to be flawed especially in the case of complex decision-making because while project characteristics interact, quantitative measures ignore that and therefore yield inaccurate results.

Also, success is a difficult outcome to determine because of (i) the difficulty in establishing a correlation between IT spending and productivity, (ii) risk assessment rarely being associated with IT introduction, (iii) the tendency not to do a detailed evaluation of IT spending, (iv) the lack of improvement in IT evaluation over the last decade and (v) the fact that evaluation becomes more difficult as IT spending increases (McLean, Seddon, Torkzadeh & Willcocks, 2002).

In the case of ERP systems, Tan & Pan (2002) present a three-layer success framework. They purport that once seamless technical operations across the ERP system have been achieved, the organisation is said to have attained the fundamental infrastructure success which is a pre-requisite for the next ERP integration phase. In this phase, success requires more than just the existence of standardised information channels across the business processes, but also the cultivation of an environment conducive for information sharing among system stakeholders thus achieving "infostructure" success. To complete the ERP experience-cycle successfully, the next layer of success requires the organisation to ensure that it capitalises on the individual's expertise and that all knowledge is shared across individuals and functions thus achieving knowledge success.

As Gunson, de Blasis, Esteves & Pastor (2004) suggest: "success is temporal and not an absolute and can differ according to the beholder" (p.3). Because success is not an objectively quantifiable outcome, there is significant debate around what is regarded as success or failure and often there are diverging views on the same particular project where one system implementation would be considered successful by some while considered a failure by others (Shaw, 2003).

Hence, in addition to being relative and multidimensional as Markus & Tanis (2000) evoke, ERP success needs to take into account stakeholders' viewpoints as well. Gunson *et al.* (2004) thus advocate a theory of qualified and unqualified success as they argue that success cannot just be categorised according to succeed, challenged or failed as suggested by the Standish group (Standish Group, 1994; 2004) but rather should be an evaluation that takes into account all stakeholders' perspectives (upper management, customers, key users and users, mid-management, employees who are not users, consultants and partners). This may be paralleled with the study by Shang & Seddon (2004) on ERP benefits where the authors also suggest that from a benefit perspective, stakeholders have different perceptions. Without making a distinction between various stakeholders as Gunson *et al.* (2004) do, Shang & Seddon (2004) divided ERP benefits into five dimensions: operational, managerial, strategic, IT infrastructure and organisational.

From a project management perspective, nine knowledge areas of project management for ERP projects that have been identified to guide project success (Guide to the Project Management Body of Knowledge (PMI, 2000): project integration management, project scope management, project time management, project cost management, project quality management, project human resource management, project communications management, project risk management and project procurement management and in

rationale, project review management and global ERP project management (PMI, 2000; Adam *et al.*, 2004).

Based on information garnered from over 10 years on ERP implementation management in multinational companies, Gunson *et al.* (2004) propose a bi-polar model of unqualified success and unqualified failure according to different stakeholder groups: upper management, customers, users, middle management, employees who are not system users, consultants and partners. Thus, Gunson *et al.* (2004) challenge what they consider as an oversimplification of projects classification into succeed, challenged or failed categories by the Standish Group (Standish Group, 1994) as they argue that for it to work, the initial time and cost budgeting and needs requirements have to be realistic and complete without any scope creep, otherwise "two-thirds of IS projects would fall into the challenged or failed category" (p.5). They thus devised models of (ERP) project success according to each stakeholder's perspective and then combine all stakeholder models into a single bi-polar model for success evaluation. The framework is shown in Fig. 2.4 below.

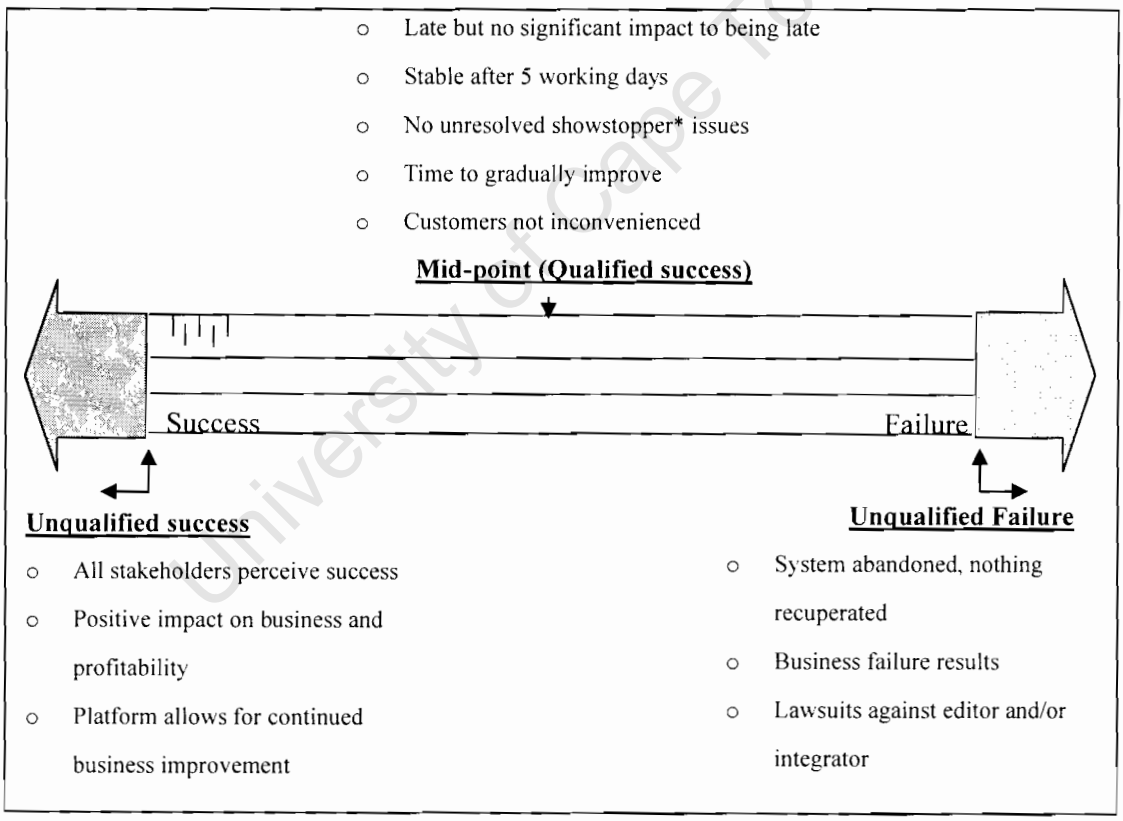


Figure 2.4: Bi-polar IS success model applied to ERP projects (Gunson et al., 2004)

The framework, applicable to any IS project but in this research applied more particularly to ERP projects, depicts two extremes along a continuum: to the one extreme is unqualified success where the project is perceived as a success by all stakeholders, where it is perceived to have a positive impact on business and profitability and where the platform allows for continued business improvement. On the other extreme, there is unqualified failure where the system is abandoned, business failure results and where there are lawsuits against the solution editor or integrator.

Gunson *et al.* (2004) suggest that there is a mid-point of qualified success which strikes a middle-ground between the two extremes whereby the project has been troubled by various issues but eventually stabilises after a certain number of working days (usually 5) and does not inconvenience customers. Also, there should not be any showstopper issues left unresolved. A 'showstopper' is an overriding criterion such as the requirements of the current system having to pass Y2K or having to accommodate the euro – if not respected, these act as showstoppers. Gunson *et al.* (2004) estimate that the actual experience for several projects is likely to show a bell curve (based on their model) with the majority experiencing mid-point qualified success and fewer instances of unmitigated success or failure. Unqualified success implies that all stakeholders view the implementation a success (including post-implementation evaluation for instance a year after). For all stakeholders to perceive an ERP project as a success, it will take continuous post-implementation reviews and evaluations in the year/s following the implementation "go-live" (Gunson *et al.*, 2004).

2.6 ERP Critical Success Factors (CSFs)

CSFs are those few key areas in which satisfactory results will ensure successful competitive performance for the individual, department or organisation (Rockart & Bullen, 1986). For large scale IS implementations such as ERP systems implementations, academic research has largely concentrated on the identification of CSFs and more recently on the relationship between those factors (Esteves *et al.* 2003). For Holland *et al.* (1999) and Light, Holland & Wills (2001), key CSFs in ERP implementation are based on five theoretical constructs, i.e. functional importance, evolution of structure, usage and human acceptance, vision and benchmarking. Based on a specific literature review on CSF research, Boon *et al.* (2004) identified 11 main themes of CSFs related to IS adoption namely: top management support; clear goals and objectives; business process reengineering (BPR); project management; information technology; data, information and knowledge management; outcomes; users; resources; project team competence and interdepartmental cooperation.

According to Markus & Tanis (2000), enterprise system success, best guided by a particular emergent process theory designed by Soh & Markus (1995), varies according to each experience (instance of adoption) but that across the variations, regularities can be found. Firstly, many different things can go wrong in each phase of the ERP life-cycle and not all problems or errors are immediately detectable and therefore not immediately correctable. Secondly, outcomes for each phase can be of three types: optimal, termination or unresolved experience risk. In the latter case, the subsequent phase would inherit the unresolved risks and ultimately lead to sub-optimal success of the project. Furthermore, if different actors are involved in different phases of the life-cycle, there is a higher likelihood that handoffs to a different group of people will increase the chance of unresolved risks from one phase to be carried forward to the next and thus remain unresolved throughout. However, this does not mean that all variances (deviations from standards in the inputs to a process) end up causing sub-optimal project success in the end but that it depends also on probabilistic processes such as bad luck, changing business conditions and interactions with other variances among others (Markus & Tanis, 2000).

Enterprise system success is subject to factors external to the organisation's control despite favourable starting conditions such as competitive position, industry, financial position, prior relevant experience, size, structure and management systems (Markus & Tanis, 2000; Somers, Nelson & Ragowsky, 2000). ERP success also depends on the organisation's motivated behaviour for adopting an ERP with regards to its goals, plans, execution and responses to unforeseen problems; finally because starting conditions and changes in those conditions, goals, plans and actions interact, there are unresolved risks and problems emerge which have a direct impact on the organisation's actions in response to them and therefore on the final outcome of the phase and/or project as a whole (optimal or suboptimal) (Markus & Tanis, 2000). Fig. 2.5 illustrates this.

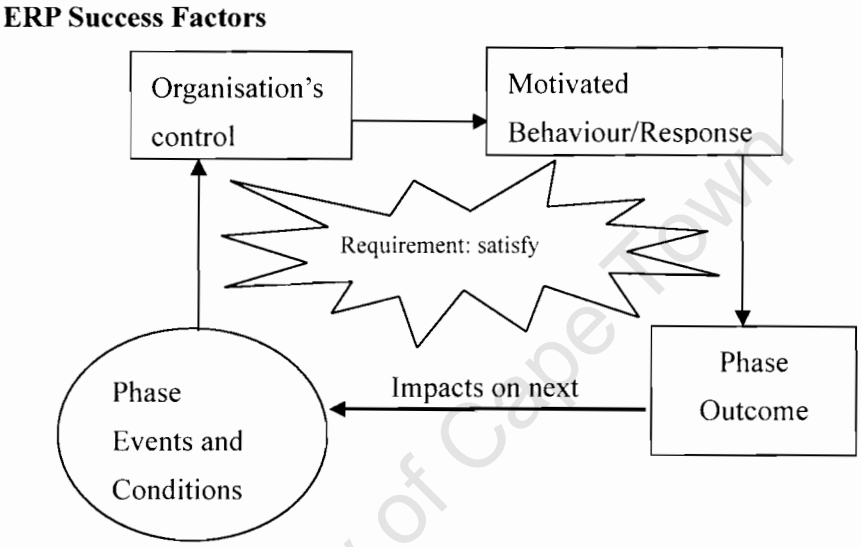


Figure 2.5: ERP Success Factors Framework (adapted from Markus & Tanis, 2000)

Hence, given the organisation's goal of maximising its chances of success in an ERP project, it would be worthwhile to analyse the extent to which CSFs are satisfied within the framework identified by Markus & Tanis (2000) and shown in Fig. 2.5, i.e. organisation's control, motivated behaviour and intermediate/final outcomes also taking into account those life-cycle phases of an ERP project as depicted in Fig. 2.3. It is important now to focus on those particular phases and analyse what implies success in those stages and what are the factors that are at play that influence their success/failure.

ERP Implementation

On the basis of the ERP life-cycle framework as depicted earlier, implementation is the central phase during an ERP project, following the pre-implementation and preceding the post-implementation. Tasks involved during the implementation phase usually include the customisation, configuration, parameterisation and adaptation of the acquired ERP package according to the needs of the organisation. Following Kwon & Zmud's (1987) six-stage model, Rajagopal (2002) found that ERP adaptation was influenced by the increasing usage of the system, the modifications to fit user needs, more training, enhancement of compatibility and integration of functional units. Acceptance and routinisation follow which involve users accepting the system and using it on a routine basis, flaws being corrected, organisational integration realised and the internal functional coordination and benefits observed. Finally,

at the infusion stage, IT integration at global levels are realised as the organisation can contemplate the next innovation for more competitiveness (Rajagopal, 2002).

Implementation CSFs

Esteves & Pastor (2001) developed a unified model of CSFs for ERP implementation and subsequently applied it to the SAP implementation methodology (ASAP) where the implementation process consists of project preparation, business blueprint, realisation, final preparation, go live & support (Esteves & Pastor, 2003). Furthermore, Esteves & Pastor (2003) have identified different perspectives under which those CSFs should be analysed namely tactical and strategic, organisational and technological. The model is shown in Fig. 2.6 below.

Critical Success Factors for ERP Implementation		
	Strategic	**Tactical**
Organisational	• Sustained management support • Effective organizational change management • Good project scope management • Adequate project team composition • Comprehensive BPR • Adequate project sponsor role • Adequate project manager role • Trust between partners • User involvement and participation	• Dedicated staff and consultants • Appropriate usage of consultants • Empowered decision-makers • Adequate training program • Strong communication inwards and outwards • Formalised project plan/schedule • Preventive trouble shooting
Technological	• Avoid customization • Adequate ERP implementation strategy • Adequate ERP version	• Adequate infrastructure and interfaces • Adequate legacy systems knowledge • Formalized testing plan • Adequate data migration process

Figure 2.6: CSFs for ERP Implementations (Esteves & Pastor, 2001; 2003)

While the organisational perspective is related to concerns like organisational structure, culture and business processes, the technological view focuses on aspects specific to the ERP product in consideration and on other technical aspects such as hardware and software needs. Then, the strategic perspective deals with core competencies of the organisation such as its mission and long-term goals while the tactical dimension refers to business activities with short-term objectives.

According to Boon *et al.* (2004) supported by Somers *et al.* (2000), Bingi *et al.* (1999), Murray & Coffin (2001) and Nah *et al.* (2003), the key CSF identified in literature is top management support and involvement as it is argued that top management sets the social agenda for the organisation and is influenced by strategic objectives, responsibility to stakeholders, power, politics and external influences; it also requires the skills, experience, knowledge or wisdom to make judgements and decisions that lead

them to lending their support to an ERP project. This is also supported by Shanks, Parr, Hu, Corbitt, Thanasankit & Seddon (2000), Stefanou (1999) and Sumner (1999). Furthermore, top management commitment influences both commitment to resources as well as change management commitment (Dong, 2001).

Somers *et al.* (2000) and Bingi *et al.* (1999) further acknowledge the need for adequate project championing, user training, technological competence, process delineation, change management and adequate project management as well as the need for reengineering business processes prior to implementation. The need for effective communication and realistic and appropriate expectations, a balanced IS and business team and the avoidance of customisation are also considered as being among the most critical factors. Under the people factors, Sumner & Hamilton (2005) stress that the appropriate usage of consultants together with the role of the project champion are critical. In supporting Esteves & Pastor's (2003) argument, they stress that while effective management of external consultants is important, problems can also occur when the entire project is outsourced to external consultants thus preventing the organisation from developing internal knowledge.

Critical factors such as change management, BPR and avoidance of customisation all relate to the general issue of organisational fit discussed by some authors (Hong & Kim, 2002; Somers & Nelson, 2001). Past research suggests that the reasons behind the high failure rate of ERP implementations are firstly the difference in interests between customer organisations who desire unique business solutions and ERP vendors who prefer a generic solution to a broad market (Swan, Newell & Robertson, 1999) and secondly, failure is mainly due to the relative invisibility of the ERP implementation process (Griffith, Zammuto & Aiman-Smith, 1999) which could be attributed to the complex social interaction of IT and organisation (Markus & Robey, 1988).

More specifically, the principle behind ERP implementations is process-based rather than function-based and hence necessitates disruptive organisational changes (Hong & Kim, 2002) which are linked to other dimensions such as technology, task, people, structure and culture. Those dimensions are encompassed by the dimensions in the life-cycle framework by Esteves & Pastor (1999) supported by Chang & Gable (2000).

Another critical factor mentioned in the list by Esteves & Pastor (2001; 2003), adequate implementation strategy implies what Hong & Kim (2002) refer to as package adaptation vs. organisational adaptation (process adaptation through BPR) which refers to the issue of deciding on which direction to take when implementing an ERP: to adapt (customise, extend and modify) the package to organisational needs or vice versa (Somers & Nelson, 2001). From the list of CSFs, minimal customisation of the ERP package is advocated while the need for comprehensive BPR is acknowledged – both falling under the strategic perspective but belonging to different aspects (the former is a technological factor while the second is an organisational one).

According to Hong & Kim (2002), there is no single ruling. In fact, both the package and process adaptation approaches are only effective when organisational fit is relatively low. Beyond a certain level of organisational fit, more adaptation (whether package or process) will lead to lower implementation success. However, it has been observed that package adaptation (i.e. customisation, extension and modification) have a negative correlation with implementation success thus leading to the claim that process adaptation (i.e. BPR) is a safer choice than package adaptation when organisational fit is low (Hong & Kim, 2002).

According to Parr & Shanks (2000), depending on the physical scope (whether it involves a single or multiple site and/or a regional or international scope), the extent of BPR required or desired and technical scope (selection of modules or full functionality) and the resource scope in terms of time and budget for an ERP implementation strategy can be classified as into three categories. Firstly, it can be comprehensive, usually relevant for multiple sites spanning internationally, thus necessitating extensive customisation or BPR. Secondly, it can be middle-road usually suited for single or multiple sites within a country involving some degree of customisation and BPR. Thirdly, the approach can be classified as vanilla which is suited only for single sites where no customisation is involved and only alignment to the ERP is performed.

The debate concerning the extent of BPR and process adaptation as opposed to the extent of package adaptation that should be embraced during an ERP project is a well known one. BPR, business process re-engineering, is defined as the fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in critical, contemporary measures of performance, such as cost, quality, service & speed (Hammer, 1990). The critical question facing organisations is to decide on the first step i.e. whether the processes should be reengineered first and then improved processes be automated or whether there should be a selection from the "menu " of world class best practices offered by the ERP packages and avoid BPR altogether or reengineer them after implementing ERP (Thawani, 2001). This debate taking place in the field of best business practices for ERP implementations is an ongoing one.

ERP project implementation success is subject to critical factors at the intersection of the tactical and technological dimensions of Esteves & Pastor's (2003) model. These factors are the formalisation of the project plan and schedule which is deemed important especially at the beginning phase of the implementation phase, preventive troubleshooting which is important when the system is being tested and old data being converted, the adequate set-up of infrastructure for the go-live and interfaces with other systems and the adequate knowledge of legacy systems in the organisation (Bingi *et al.*, 1999; Holland *et al.*, 1999).

The issue of organisational fit is an essential theme as presented above and should be a critical concern, among others, at the very outset of the project, i.e. before the implementation phase even when selecting and acquiring the ERP system (Everdingen *et al.*, 2000) hence the importance of the next section discussing the pre-implementation phase.

ERP Pre-Implementation

The ERP pre-implementation phase (Chang & Gable, 2000) consists of two distinct sub-phases: the adoption decision phase (phase during which managers must question the need for a new ERP system while selecting the general information system approach that will best address the critical business challenges and improve organisational strategy) and the acquisition phase (deals with product selection that is meant to best fit the organisational requirements) (Esteves & Pastor, 1999).

While much attention is directed to implementation and post-implementation, for the most part, ERP acquisition is usually ignored (Verville & Halingten, 2002a). The huge costs associated with ERP acquisition are often only realised in hindsight. For instance, an American holding company in the energy business is reported to have spent US$6.5 million for the acquisition of Oracle's ERP over a period of about 6 months (Verville & Halingten, 2002b).

Franch and Pastor (2000) suggest that the numerous reported ERP fiascos are due to a significant proportion of organisations adopting ERPs, overlooking the strategic nature of ERP procurement and therefore underestimating the importance of a systematic procurement process. All too often, management plunges into ERP initiatives less than fully informed with limited knowledge of what to expect. The acquisition of ERP packages is thus wrongfully taken as a given (Sammon & Adam, 2002).

It is important to note that authors usually use the term acquisition when referring to the ERP pre-implementation process, either including the adoption decision phase as part of the acquisition process (Sistach *et al.*, 1999) or treating it as a separate stepping stone to the launch of an ERP initiative (Stefanou, 2000; Verville & Halingten, 2002a; Razi & Tarn, 2002).

In their model called Systematic Help for ERP Acquisitions (SHERPA), Sistach *et al.* (1999) define ERP software acquisition as a decision process that firstly defines the need that could be fulfilled with the help of an ERP product (adoption decision), then secondly finds suitable products and services that would fulfil such a need, thirdly establishes appropriate criteria for the evaluation of ERPs and evaluates candidates in light of those criteria, then selects the best available product and service or possible combination thereof and finally negotiates the final contract with the product vendor and/or service provider. Assuming that the adoption decision has already been taken, Verville & Halingten (2002a) propose a six-stage model of ERP acquisition (MERPAP) which consists of 6 *iterative* processes: planning, information search, selection, evaluation, choice and negotiation as shown in Fig. 2.7.

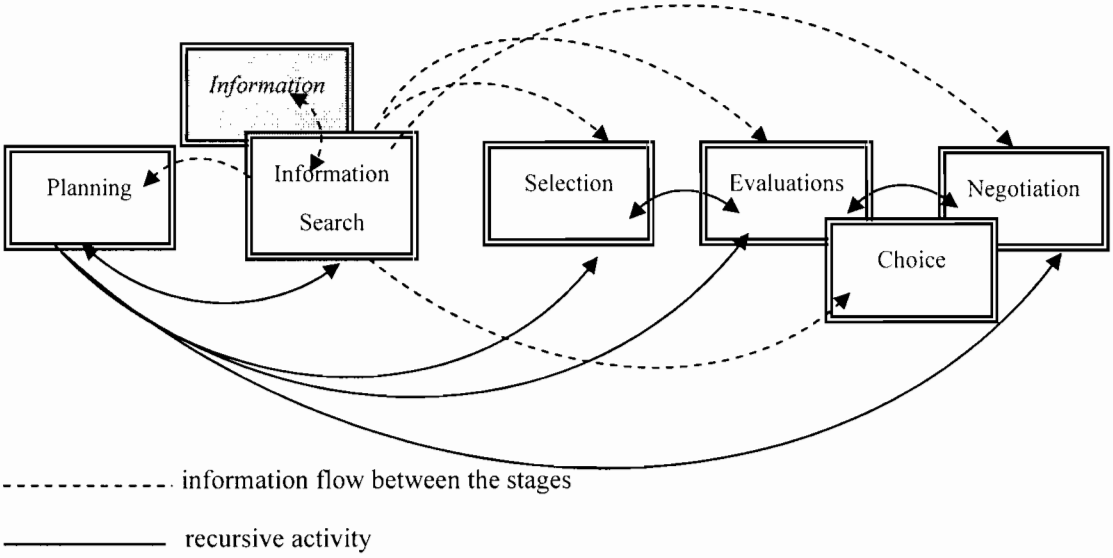


Figure 2.7: ERP Acquisition model (MERPAP) (Verville & Halingten, 2002a)

The planning process involves seven sub-stages: acquisition team formation; acquisition strategies; requirements definition; establishment of selection, evaluation and choice criteria; acquisition issues such as BPR need; marketplace analysis which informs the organisation about the major players on the ERP market; deliverables such as the creation of an Request for Proposal (RFP), formation of an acquisition team, short list of vendors. The next step is the information search process which is an iterative process as information both from internal and external sources always feeds the acquisition process. Factors such as the type or nature of the information, credibility of the sources and possibility of information overload as a result are important to consider at this stage. The selection process essentially consists of evaluating responses to the RFP and creating a short-list of vendors following that evaluation. There is anticipated recursive activity between the selection process and the planning and information search processes and to a greater extent with the next stage, the evaluation process.

The evaluation process deals with three distinct areas, these being vendor, functional and technical. The activities during this process are partly carried out during the planning process (embedded in the marketplace analysis) and are ongoing throughout this process. The choice stage follows when a final recommendation is usually presented to a steering committee or a board of directors who have the authority over the final choice. Choice is designated as a separate process because the final decision can be taken by a different group of people to the acquisition team (i.e. the team performing the information search, selection and evaluation). Once a choice is made, legal negotiations follow. The negotiation stage involves business negotiations that happen continuously to eventually lead to the signing off of the final contract (Verville & Halingten, 2002a).

Transitions during MERPAP do not follow a linear pattern because while some processes are done concurrently, some (all except choice and negotiations) are embedded, iterative and recursive, the latter indicating the ongoing nature of activity/feedback/adjustment/input between them. For instance, as new information is fed into the planning process, plans for other processes are adjusted or changed

accordingly. Nevertheless, there is an apparent overall sequential progression that takes the organisation from one stage to the next until the negotiation stage.

From an evaluation perspective, given the strategic nature of ERP and its major organisational, technological and behavioural impact, it is argued that a broad perspective of ERP systems adoption and acquisition (including evaluation) is required (Stefanou, 2001). According to the latter, the number of ERP implementations that fail to meet expectations is indicative of the magnitude of not only the problems involved during implementation, but also of the importance of the ex-ante evaluation (this is the predictive evaluation which is performed in order to estimate and evaluate the impact of future situations) and the selection process of ERP software. The cost of making a decision concerning the acquisition of ERP software can account for as much as 30 percent of the overall cost of the investment and the selection process can consume up to 20 employees for 14 months (Hecht, 1997).

Stefanou (2001) proposes a conceptual framework of ERP software ex-ante evaluation consisting of four phases namely (i) business vision which is the starting point for ERP initiation/acquisition, followed by (ii) the identification of requirements (iii) the analysis of business needs and (iv) identifying capabilities and constraints in relation to ERP software candidates (using selection criteria for vendor, product and implementation partner). From an evaluation perspective, ERP pre-implementation requires the organisation to obtain the desire and commitment to change by all people in the organisation before proceeding to implementation and post-implementation phases (Stefanou, 2001). An ex-ante evaluation over the entire life-cycle (thus stressing the importance of this exercise during pre-implementation) is necessary in order to assess potential benefits and the *total* investment required for selecting, purchasing, implementing, operating, maintaining and extending the proposed ERP system. This estimation, furthermore, should include both quantitative and qualitative measures for both the operational performance and strategic positioning of the organisation (Stefanou, 2001).

During the pre-implementation phase corresponding to the initiation phase according to Kwon & Zmud (1987), decisions are made based on global competition, high volume of data, a need for rapid decision making, the extent of incompatibility among systems and a need for connectivity. The adoption phase decisions are influenced by investment decisions, cost-benefit analyses, choice of appropriate technology and vendor and the suitability of innovation for the firm (Rajagopal, 2002).

Pre-Implementation CSFs

As explained, the issue of ERP pre-implementation/acquisition is important because it is the stage that precedes the implementation process and thus presents the opportunity for decision-makers to examine the various dimensions and implications of purchasing and implementing an ERP system prior to the commitment of significantly large sums of money. As explained by Stefanou (2001), there is a need for an ex-ante evaluation of implementing an ERP system which takes into account both quantitative and qualitative aspects. Thus, ERP selection and evaluation criteria need to be formalised to minimise subjectivity and thus ensures reliability of the selection process (Franch & Pastor, 2000).

Verville (2002) determines a set of factors that are deemed critical to a successful pre-implementation of ERP systems. These factors, shown in Fig. 2.8, overlap with those initially considered as critical to ERP implementation. The overlapping factors are top management commitment, adequate project team composition and skills, well-defined project management structure, adequate change management, good communication both inwards and outwards and user buy-in among others (Verville & Halingten, 2002b). In addition to those factors, there are those ones that are considered critical to successful ERP pre-implementation specifically.

Critical Success Factors for ERP Pre-Implementation

- Planning – initialising implementation CSFs
- Adequate cross-over of acquisition team members to the implementation team
- Careful selection of the acquisition team members
- Interdisciplinary/cross-functional skills of the acquisition team members
- Formality of the structure of the acquisition process
- Rigour
- Leadership
- Clear and ambiguous authority
- Strong management commitment
- Definition of the requirements – a must prior to even beginning looking at vendors
- Establishing selection and evaluation criteria
- User involvement in the acquisition process itself } Internal partner relationship
- User involvement in the vendor demonstrations
- User buy-in of the final choice
- Vendor relationship } External partner relationship
- Implementation partner relationship

Figure 2.8: CSFs for ERP Pre-Implementation (Verville, 2002)

Verville (2002) argues that since many of the factors that need to be accounted for during the acquisition process are the same as those that are critical to the implementation process, it is important to deal with many of those implementation CSFs at the acquisition phase, hence the importance of planning. Dvir, Raz & Shenhar (2003) strongly support this view by showing that project success is positively correlated with project planning which is viewed as essentially the investment in requirements definition and development of technical specifications. The pre-implementation phase is a phase during which major decisions are made as to the project's objectives and planning the project's execution. In fact, it is argued that project success is actually insensitive to the level of implementation of practical methods and tools such as various project management software packages thus placing greater emphasis on the importance of planning (Dvir *et al.*, 2003).

Furthermore, when bringing an acquisition team together, it is important to involve users and project people who would not only be part of the acquisition process but who would also be involved with the subsequent implementation of the ERP system, thus providing 'project memory' and continuity during that phase. There is also a need to include individuals with equally diverse skills on the acquisition team so that each can complete a set of specific tasks within the project as well as perform a certain specific functional and/or advisory role based on the individual's abilities or past experiences (Verville, 2002).

Clear authority stands out as a CSF as it is argued that ambiguity in authority tends to diffuse accountability and increase the possibility of the process being diverted, unduly shortened or of conflict arising. Verville (2002) acknowledges the importance of structure in the acquisition process and the setting of such a structure during the planning activity. Also, to ensure adequate structure of the acquisition process, there is an underlying need for clear authority and management to oversee the process otherwise a poorly defined structure in the acquisition process can hinder the timetable and budget of the entire project ultimately (Verville, 2002).

Besides structure, rigour is also a critical factor at this stage because the more rigorous the acquisition process is the more successful the implementation phase is likely to be. Important preliminary work needs to be taken care of in the acquisition phase such as the definition of requirements and addressing issues regarding BPR (more generally deciding on an adaptation/implementation strategy). Another important factor in the acquisition process is user buy-in in the acquisition process itself (representatives on the decision-team), during vendor demonstrations and in the final choice – this relates to what Verville (2002) calls internal partnership approach that secures the user as an ally at the very outset of the project. Good external partnership relationships with the vendor and/or implementation partner are also a very important factor during the acquisition phase because of the long-term nature of these relationships.

Overall, the evaluation, selection and implementation of ERP systems involve making multiple decisions during the life-cycle of the ERP project. Shakir (2000) found that decisions made during the ERP life-cycle can be classified according to relevant models, namely the administrative, adaptive and political models. In addition, the findings suggest that decisions during an ERP life-cycle are structured or semi-structured where a small number of alternatives are evaluated and objectives defined to guide the process. Often, however, personal and group politics influence decision making (Shakir, 2000). In fact, despite the fact that an organisation may be striving towards satisfying the various CSFs discussed so far, it is also acknowledged that decision-making can easily become a complex and escalated process due to other factors (organisational, social, individual and/or political) that may encourage what is termed escalation of commitment.

2.7 Escalation of Commitment & Runaway IT projects

Escalation of commitment (EoC) is the phenomenon whereby individuals and organisations continue to allocate resources to projects even though there are negative signs that show that these projects may possibly be labelled as "failing courses of action" coupled with uncertainty concerning the likelihood of goal attainment (Brockner & Rubin, 1985; Staw & Ross, 1987; Brockner, 1992). The relevance of this section is to establish a link between troubled ERP projects and the phenomenon of escalation of commitment. This may help to better explain the persistence of ERP project failures despite the significant attention that has been given to this problem and the recommendations that have been made to satisfy critical requirements.

Background Debate

Field-based studies show that escalation occurs across a wide range of industries including the government sector (Ross & Staw, 1986; Drummond, 1994). Early studies found evidence of an escalation effect in general contexts. For instance, those responsible for a losing course of action will invest more than decision makers not responsible for prior losses (Staw, 1976). Again, people can become so committed to a position that they will pay more for a monetary reward than it is worth (Teger, 1980). They expend substantial amounts of time and money to achieve a receding or elusive goal (Brockner & Rubin 1985) and also, the more money a person has spent on a project; the more likely he or she will stick to the venture (Arkes & Blumer, 1985).

Staw (1997), however, points out that not all the evidence has been so supportive of the escalation effect. Some studies have shown that repeated negative feedback can lead to withdrawal instead of persistence. Staw (1997) argues that even though there are data supporting both sides of the escalation question, the crux of the debate has rested so far on definitional rather than empirical grounds. While Brockner & Rubin (1985) and Staw & Ross (1987) define escalation as the product of uncertain situations, where neither persistence nor withdrawal is an obvious solution, authors such as Bowen (1987) have insisted that tests of escalation include complete information about the probabilities and consequences of future actions.

Thus, according to Staw (1976, 1981, 1982, and 1997), Brockner & Rubin (1985) and Staw & Ross (1987), decision makers become locked in an escalation situation through a "syndrome of decision errors" where individuals are believed to err in escalation situations because negative outcomes are not attended to properly. However, Bowen (1987) argues against the validity of the conclusions drawn from escalation research. He argues that there is no evidence that subjects in prior escalation or entrapment studies were given feedback information which could be considered as clearly negative. Rather, it was more of an equivocal nature and thus represents a flaw in the research approach, since escalation theory relies on the principle that resources are continually committed in the face of clear *negative* feedback and not merely *equivocal* ones. Thus, Bowen (1987) argues that what Staw (1976, 1981, 1982) and others have identified as decision errors might be more appropriately described as decisions made in the face of difficult dilemmas, and one cannot "technically" err in an ill-structured, equivocal decision situation. Simonson & Staw (1992) and Staw (1997) refute Bowen's arguments saying that simply showing that persistence is reduced by altering the clarity or direction of investment information does not solve the problem of escalation. If escalation occurs under conditions of uncertainty, then procedures that provide clear-cut probabilities and outcomes may eliminate the very conditions underlying escalation effects (Staw, 1997).

EoC in IS Software Projects

Commitment to an IS development project is an important factor for its successful completion (Newman & Sabherwal, 1996) but today, more than 40% of all IS projects exhibit some degree of escalation and those projects that escalate usually have project outcomes that are significantly worse in terms of

perceived implementation performance (Keil *et al.*, 2000; Mann, 2003). While escalation is a general phenomenon, IT investments represent a particularly appealing context for several reasons.

Firstly, investments in information technology represent a significant and growing fraction of total capital expenditures for most organizations (Roach, 1991; Schnitt, 1993). Secondly, IS projects exhibit certain characteristics, namely, the invisible nature of software, the volatility of requirements, and the intangibility of benefits, which all create ambiguity and may cause those IS projects to be particularly prone to escalation (Keil & Flatto, 1999). The failure rate of information systems development projects is alarmingly high and it seems that the persistence of this problem through several decades has somehow forced IS professionals to accept failure as inevitable (Mahaney & Lederer, 1999).

Factors influencing EoC

Escalation of commitment appears to be caused by a combination of project management as well as psychological, social, and organizational factors (Keil *et al.*, 2000). Staw & Ross (1987) supported by Mahaney & Lederer (1999) proposed a general classification scheme to place previously researched determinants of escalation and identified four categories: project, psychological, social and organisational determinants respectively as summarised in Fig. 2.9.

Determinants of Escalation of Commitment (EoC)	
Project	Viewed as a long-term investment
	Large and long-term payoff structure
	Setbacks seen as temporary
	High costs associated with closing
	Lack of feasible alternatives
Psychological	Self-justification for continuation
	Sunk-cost effect
	Belief that risk can be brought under control
	Decision-makers holding themselves responsible for failure
	Overestimation of chances of success by project champion
Social	Face-saving – need to save face
	Leadership, social rewards anticipated for continuation
Organisational	Organisational inertia
	Organisational Politics
	Institutionalisation

Figure 2.9: Factors influencing Project Escalation of Commitment
(adapted from Staw & Ross, 1987, Mahaney & Lederer, 1999 and Mann, 2003)

Project determinants are the objective attributes of a project, the project's benefits and costs. A project is likely to be continued with high commitment if it is perceived as a long-term investment, if it is expected to have a large payoff, and if it has a long-term structure. It is furthermore likely to be continued when closing costs are high, when the salvage value is low and also when there is a lack of alternatives.

Psychological determinants cause individuals to take an optimistic view; thus showing an unwillingness to admit that an earlier decision was wrong. These factors have been identified by Staw & Ross (1987) and appraised by Staw (1997). Factors in this category include self-justification (people convince themselves that they are right and thus commit more resources because they need to justify their

decision), optimism and illusions of control (overestimating likelihood of success and believing that risks can be brought under control always), framing (being risk averse in positive situations and risk seeking in negative situations) and sunk costs effects (commitment based on the fact that resources have already been spent and that the end goal is near).

These psychological factors relate to four key theories (Keil *et al.*, 2000; Mann 2003; Mahaney & Lederer, 1999) namely self-justification theory, prospect theory, agency theory and approach-avoidance theory. Keil *et al.* (2000) show that elements of all four theories have predictive validity on EoC, thus indicating that they are not mutually exclusive but rather complementary.

There are also social forces that may hold a decision-maker to commitment. Escalation situations are usually multiparty events rather than those affect just a single individual, because managers make decisions in an organisational context (Staw, 1997). Social determinants of escalation include: face saving (withdrawing from a project might induce fears of accusation of incompetence) and leadership norms (the anticipated rewards for persistence and sign of leadership) (Staw, 1997).

Features of an organisation and its interaction patterns also influence how escalation situations are handled. Organisational factors that affect commitment are institutional inertia (loose coupling between organisational goals and actions), political problems (those directly involved and employed by a project are likely to resist its dismantling for instance) and institutionalisation (a project can become so closely tied to the values and purposes of the organisation that it becomes unthinkable to consider withdrawal).

While the consideration of social determinants treats escalation as a micro or individual decision, it is also necessary to consider macro-level variables, i.e. structural determinants and contextual effects, in order to fully understand the phenomenon of escalation. These refer to influences from external parties such as government and external partners/businesses (Staw, 1997).

Mahaney & Lederer (1999; 2003) have investigated the reasons for project failure from the perspective of the project manager. Their research study was to determine the relationship between the various project manager roles (planning, organising, controlling and leading) with project "runawayness". According to them, project "runawayness" and escalation of commitment are influenced by project management factors such as poor planning, poor estimation, size of project, requirements specification problems, misunderstanding of requirements specifications, newness of technology, rate of personnel turnover on the project, poor monitoring and control and lack of senior management sponsorship.

Relevance to ERP Projects

As discussed, the ERP life-cycle is a process that can be fraught with events and risks that need to be managed. While CSFs are one way of guiding decision-makers to ensure project success in terms of satisfying key constraints (time, cost, scope and quality), there are factors that can also cause disruptions and delays during the project. Disruptions are events that preclude the contractor/vendor/implementer completing the work as agreed, while delays occur when the completion of a project (or phase thereof)

takes place later than originally planned (Eden *et al.*, 2000).

While not satisfying CSFs could cause project delays and therefore AUE, occurrence of EoC during the ERP life-cycle process and decision-making could add to the extent to which the project is further delayed. Hence, in addition to the need to satisfy CSFs in the ERP life-cycle, there would also be a need to manage factors that are known to influence EoC and that could result in the project becoming a runaway one.

2.8 ERP Effort and AUE

Based on the model by Wideman (2000) and Davis (cited Wideman, 2004) (see Fig. 2.2), time and cost together constitute ***effort*** spent on the project. Given the set of CSFs identified in the pre-implementation and implementation phases respectively, it would be important to know which of those CSFs in a particular phase requires the most effort in terms of dealing with disruptions and delays, i.e. which CSFs usually require **additional unplanned effort (AUE)**, in the pre-implementation and implementation phases respectively. There is a relationship between those two phases, these being temporal phases along the life-cycle where the one phase's outcome impacts on the next (Markus & Tanis, 2000). Hence, a relationship could also exist between the AUE spent to satisfy CSFs in the pre-implementation phase and the AUE spent to satisfy CSFs in the implementation phase.

In ERP literature, the term effort usually refers to implementation effort with special emphasis on the human resources (Francalanci, 2001) needed to physically implement the system. More specifically, implementation effort is operationalised as the total man months taken for tasks performed by project managers and by operating teams and functional units. The key drivers of that effort are the size of the software package (total number of modules and sub-modules) and contextual factors (organisational size, total number of users and per-module number of users) (Francalanci, 2001). For Barki & Pinsonneault (2002), the effort required to implement ERP systems depends on the level of improvement in organisational integration which consists of business process integration and technological integration.

However, in this study, a broader perspective is taken of effort as it does not focus necessarily on quantitative measures of the costs of implementing the system but rather on the subjective perception of the amount of effort required to satisfy CSFs in each phase. The fact that ERP projects are widely reported to suffer from cost overruns and serious delays (Themistocleous, Irani, O'Keefe & Paul, 2001) is the premise for this study.

ERP success in terms of competitiveness, value, performance (Wideman, 2000) and the achievement of the required level of organisational integration as discussed by Barki & Pinsonneault (2002) can only be realistically determined once the system has been implemented first and post-implementation evaluation and upgrades launched (i.e. such assessment takes place over renewed periods of time after the first implementation) (Gunson *et al.*, 2004). Effort, need and viability, however, are constructs that can be viewed as being manageable while the project unfolds. This is probably because time, cost and scope are

more visible and therefore more manageable than quality during a project.

In fact, according to Adam *et al.*'s (2004) key areas of ERP project management, it can be implied that time and cost management are areas that bear estimating and budgeting components (activity duration estimating", "cost estimating" and "cost budgeting") compared to "planning", "verification" and "control" which are common to all areas, thus implying that they are the most objectively measurable and manageable constraints.

2.9 Summary and Research Implications

ERP projects undergo delays which impact on overall success of the project (Themistocleous *et al.*, 2001). Research tends to focus on the importance of the individual life-cycle phases namely the pre-implementation and the implementation phases discussing CSFs pertaining to each particular stage. However, as Markus & Tanis (2000) highlighted, intermediate outcomes of the one phase impact on the next. This is seen in measures of overall success, i.e. suboptimal success in the pre-implementation phase may cause suboptimal success in the implementation phase as it inherits unresolved risks from the previous phase. However, sub-optimal success in one stage does not automatically mean overall sub-optimal success because there are other factors at play such as bad luck and changing business conditions (Markus & Tanis, 2000).

Project success is made of four constructs namely time, cost, scope and quality (Wideman, 2000; 2004). The latter explains that each paired combination of these factors denote a richer success construct (see Fig. 2.2) namely effort, competitiveness, need, value, performance and viability. In addition to those constructs, Markus & Tanis (2000) proposed that success (in terms of those constructs) is influenced by factors belonging to three main dimensions: organisation's control, motivated behaviour and intermediate/final outcomes in the life-cycle phases.

Given these dimensions, the basis of the life-cycle framework and CSFs pertaining to each phase, a new concept, called AUE is derived to denote the additional effort spent to satisfy CSFs in each phase to achieve a certain level of success while bearing in mind that success is not an objectively quantifiable outcome (Shaw, 2003; Gunson *et al.*, 2004). Furthermore, given the set of EoC factors known to lead to project runawayness, it would be useful to know whether the presence of such factors in ERP projects also contribute to AUE in the life-cycle phases.

It would also be worth investigating the extent to which AUE is spent overcoming obstacles and satisfying CSFs in the one phase, and the impact such AUE would have on the AUE spent in the next phase. For instance it might be possible that if AUE is spent on satisfying CSFs in the pre-implementation phase in the face of events causing delays and disruptions, it might reduce the AUE spent satisfying CSFs in the implementation phase. This is because, as Verville (2002) argues, there are overlapping CSFs, i.e. factors that need to be accounted for during the acquisition process that are the same as those that are critical to the implementation process.

2.10 Research Questions

Based on the above implications, the following research questions are presented:

1. What are the factors that influence AUE spent in the attempt to satisfy CSFs during the ERP life-cycle, specifically in:

   a. the pre-implementation phase?

   and the

   b. the implementation phase?

2. Is there a relationship between the AUE spent satisfying CSFs in the pre-implementation phase and the AUE spent satisfying CSFs in the implementation phase?

Given the above research questions, the next chapter details the methodology that was applied to carrying out the research study.

CHAPTER 3 - RESEARCH METHODOLOGY

This chapter details the methodology followed for this research study. Given the research questions presented at the end of Chapter 2, the research model underlying those questions is first presented followed by a discussion of the research approach, the research design, the data collection techniques utilised, the research instrument, the data analysis techniques employed and the methodological concerns relevant to the study.

3.1 Research Model

The implications from the literature review revealed that a valid research area to investigate within the field of ERP is the extent to which AUE is spent overcoming project delays occurring along its life-cycle and trying to improve the level of success by satisfying CSFs. More particularly, it was noted that such AUE should be investigated in two distinct phases of the ERP life-cycle: the pre-implementation and the implementation phase.

From a life-cycle perspective, as shown in the previous chapter, there are CSFs that need to be satisfied distinctly in each of the pre-implementation and the implementation phases. The pre-implementation phase, referred to as just the acquisition phase by some (Verville & Halingten, 2002a, b; Verville 2002, b) or selection by others (Stefanou, 2000), is just as important a phase as the implementation phase and yet usually receives less attention than the latter (Franch & Pastor, 2000). The section on project escalation emphasised an important area of research within project management, where authors have identified that failures of software projects, especially large projects such as ERPs, can be attributed to escalation of commitment to some "failing course of action" (Staw & Ross, 1987; Brockner, 1992).

The research models underlying this study are shown in Fig. 3.1a and Fig. 3.1b. In Fig. 3.1a, the model shows the main construct measure at the basis of this study, AUE and the relationships that were investigated with regards to its occurrence. Firstly, however, it is important to place AUE within the context of project success as defined by Davis and Wideman (Wideman, 2004) with special emphasis on the time-cost combination of effort, which is considered in this study as an objective measure of project performance and success.

Secondly, it is also important to highlight the continuum along which project success evolves, as explained by Gunson *et al* (2004), where a project is said to experience success along a time continuum from a period of qualified success to one of unqualified success. This study adopted the view that the AUE spent by an organisation in achieving a certain level of success in its ERP project was more related to qualified success than unqualified success. Thus, the model shows that there are events and conditions that may cause an organisation to spend AUE in trying to achieve some level of qualified success. It also indicates that the presence of EoC factors could contribute to accentuate this AUE.

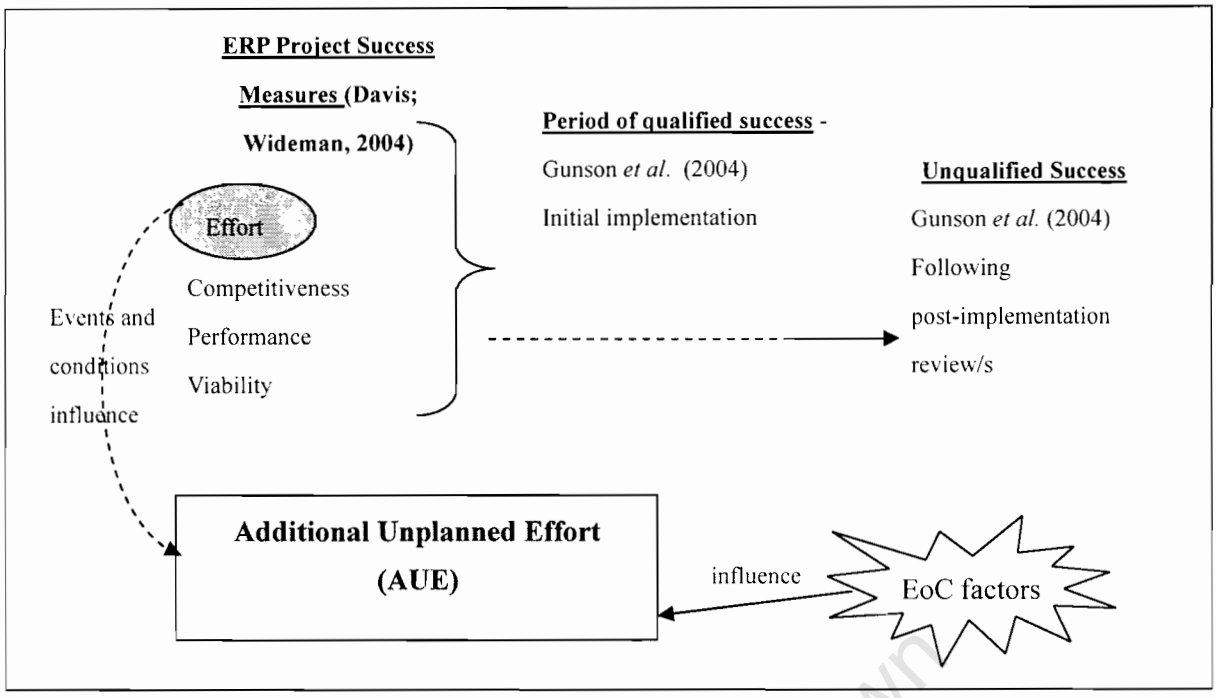


Figure 3.1a: Factors influencing AUE in an ERP project

Fig.3.1b below depicts the concept of ERP project performance (success/failure) as defined by Markus & Tanis (2000) where special attention must be given to the influence between the one phase's outcome and the next phase starting conditions. Thus, the model proposes that the AUE spent to satisfy CSFs in the pre-implementation phase impacts on the AUE spent to satisfy CSFs in the next phase. The purpose of this study was also to investigate the nature of this relationship between the two phases.

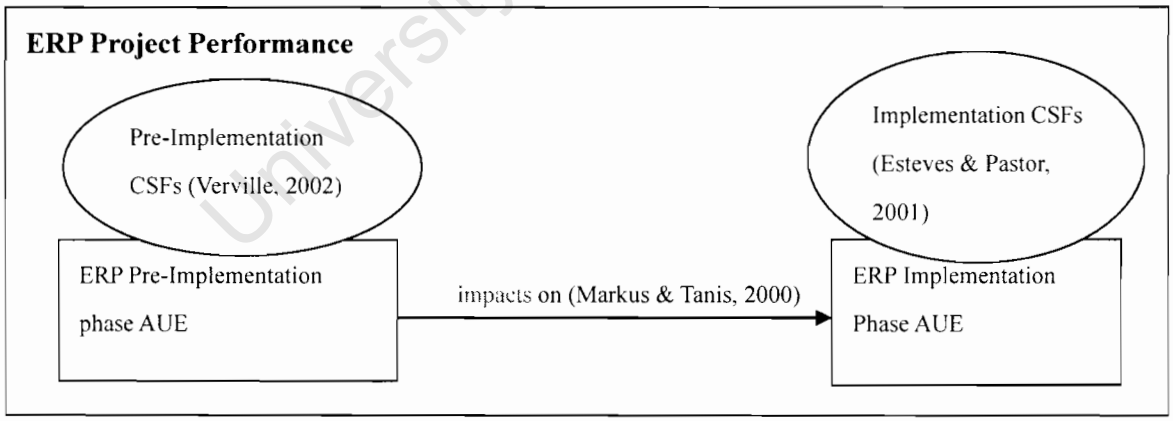


Figure 3.1b: AUE in the ERP life-cycle – Relationship between the two phases

Fig. 3.1a and Fig. 3.1b together form the basis for the research questions identified in the previous chapter, illustrating the objectives of this research study.

3.2 Research Approach

Research methods can be classified in a number of different ways: quantitative or qualitative, positivist or interpretive, empirical or non-empirical. Information systems research methods may fall under any of these broad categories even though there has been significant debate about which method would be the best (Kaplan & Duchon, 1988).

Quantitative vs. Qualitative Research

Initially, there was an assumption especially within American information systems research that research designs should be based on the positivist model of controlling variables and testing pre-specified hypotheses (Kaplan & Duchon, 1988). However, exclusive reliance on statistical testing of hypotheses has been criticised in the social sciences where it has even been labelled as potentially disastrous (Cook & Campbell, 1979). Psychologists and social scientists strongly argue that science cannot proceed by incremental gains achieved through statistical significance testing (Meehl, 1978) and that theory-building is highly effective through inductive qualitative research rather than through continual hypothesis testing (Glaser & Strauss, 1967).

Furthermore, it is argued by various authors (Cook & Campbell, 1979; Manicas & Secord, 1983; Maxwell, Bashook & Sandlow, 1986) that the study of social systems involves uncontrolled variables, meaning that methods for studying closed systems do not apply as well in natural settings as in controlled ones. Also, the need for context-based research has been highlighted in a variety of disciplines such as information systems, necessarily incorporating more interpretive and qualitative methods. These yield a better understanding of what is actually is occurring in a given situation (Kaplan & Duchon, 1988). In information systems research, qualitative methods and interpretive perspectives are widely used with in fact a move towards combining those qualitative and quantitative methods to provide a richer contextual basis for interpreting and validating results (Kaplan & Duchon, 1988; Gable, 1994; Drury & Farhoomand, 1997).

Empirical Research vs. Non-Empirical Research

There is the need to differentiate between mathematical research methods and others because the former concerns symbol systems without having any direct reference to objects in reality. The non-mathematical methods are focused on reality. There are two main categories of non-mathematical approaches that are usually referred to: one that is based on whether the research questions refer to what is part of reality, or whether they are based on the utility of an artefact (something made by human beings). The former category is the one that is of interest in this particular research study. A further classification exercise leads to differentiation between conceptual-analytical approaches, i.e. methods for theoretical development and empirical research approaches (Järvinen, 2004).

Empirical research can involve observation (Schwandt, 1997) or direct fact-finding about issues (Kling, 1991) while non-empirical methods focus on ideas, frameworks and speculations rather than on observations (Alavi, Brooke & Carlson, 1990). Empirical studies themselves also differ according to

whether their approach is a theory-testing or theory-creating one (Järvinen, 2004). In theory-testing studies, methods such as laboratory experiments, surveys, field studies, field experiments are used. The theory/theories, model/s or framework/s are either taken from the literature or developed or refined for that study. Ultimately, theory-testing research questions seek to establish whether observations confirm or falsify those theories.

In contrast, theory-creating studies utilise approaches such as the case-study, ethnographic method, grounded theory, phenomenography, contextualism, discourse analysis, longitudinal study, phenomenological study and hermeneutics among others to uncover, for instance, which kind of construct or model could describe and explain the observations gathered or which theory could explain why acts, events, structure and thoughts occur (Järvinen, 2004).

The Case-Study Approach

The selected method of research for this research study is the case-study approach. A case-study is an empirical enquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident (Yin, 1994). Benbasat, Goldstein & Mead (1987) characterise a case-study as one or more entities examined in its natural setting with no experimental controls or manipulations applied to it and where contemporary events and contextual conditions are covered (Yin, 1994). In this type of research, the researcher does not have to specify a set of independent and dependent variables prior to the research and changes in research site selection and data collection methods are possible during the research (Benbasat *et al.*, 1987).

Traditionally, the case-study research method is classified as a theory-creating research approach but there are other case-study types (Cunningham, 1997) which belong to different research approach categories. Usually, intensive case-studies are theory-creating while comparative cases are theory-testing. Case-study research is suited to practice-based problems that are in their formative, early stages where the practical experiences of the actors and the context of action are important (Benbasat, *et al.*, 1987) e.g. the field of information systems (Orlikowski & Baroudi, 1991; Myers, 1997; Darke, Shanks & Broadbendt, 1998).

In this particular study, the researcher has set out to establish links among various research themes pertaining to ERP projects: life-cycle phases, project success within those phases, extent of delays suffered during those phases as well as the possible threat of escalation of commitment. It uses the case-study approach (comparative cases/multiple case-studies) of an explanatory nature with an element of exploration (Yin, 1994) to trace the link between the ERP pre-Implementation and implementation phases in specific contexts and relate conclusions to established theories identified in the literature surveyed. While explanatory case-studies usually answer "how" and "why" types of research questions (Yin, 1994), exploratory case-studies usually answer "what" types of questions. This study first set out to *explore* the factors that are likely to influence AUE during a certain phase of an ERP project but also investigate *how* the two phases are related based on those uncovered factors.

Tellis (1997) advocates that in exploratory research, fieldwork and data collection may be undertaken prior to definition of the research questions and hypotheses while explanatory cases are suitable for doing causal studies.

Multiple case-studies

In some fields, multiple case-studies have been considered as a different methodology to single case-studies, but according to Yin (1994), the choice between single- and multiple- case methods is one of research design with both being included under the case-study strategy. However, the evidence from multiple case-designs is often considered more compelling and the overall study hence regarded as more robust (Herriott & Firestone, 1983) as single case-designs are usually heavily criticised for their inability to provide a generalising conclusion.

At the same time, the rationale for single case-studies cannot be satisfied by multiple cases as by definition, the unusual, rare, critical or revelatory case are likely to involve single cases. In multiple case-designs, every case should serve a specific purpose within the overall scope of enquiry and together should follow a "replication", not sampling logic (Yin, 1994). If similar results are obtained for a certain number of cases studied, then replication logic is said to have taken place. This is the case whether one is repeating certain critical experiments or whether one is limited to a few cases due to the expense or difficulty in performing a certain operation on subjects or is limited by the rarity of occurrence of a certain syndrome (Yin, 1994).

In multiple case-studies, each case must be carefully selected so that it either predicts similar results (literal replication) or produces contrasting results but for predictable reasons (theoretical replication). Multiple cases strengthen the results by replicating the pattern-matching, thus increasing confidence in the robustness of the theory (Tellis, 1997). In this particular research study, the multiple case-design approach was adopted in order to answer the research questions presented in the previous chapter and illustrated in Figs. 3.1a and b.

The cases that were specifically targeted were those ERP projects that experienced delays and disruptions during their life-cycle and hence had to spend AUE to try and keep the project within the bounds of qualified success. This investigation would be predicting a literal replication in the cases studied, i.e. similar results confirming those obtained from answering the research questions. Where there are contradicting results, the questions would have to be revised and retested with another set of cases. Due to the limited time available for this study, this would not be feasible and hence theoretical replication is not sought after here.

3.3 Research Design

This section discusses the research strategy or action plan that is meant to logically link the data collected to the research questions (Yin, 1994). Details of how the study was initiated, the process that was followed, the role of the researcher and the units of analysis are presented.

Initiation

In April 2004, a series of interview questions from a first version of the research instrument were pilot-tested with 5 different individuals who had project management experience. The researcher then finalised the instrument before setting out to identify appropriate case-study subjects, i.e. organisations that were currently implementing or had just implemented an ERP package and had experienced delays and disruptions during the various stages of the project. Given the sensitive nature of the investigation, care had to be taken when approaching potential case respondents as the researcher was fully aware that getting outright acknowledgement of such a phenomenon taking place during a project would be difficult, especially before establishing trust between the researcher and the case respondents. Financial and geographical constraints had also to be taken into account, as the researcher was limited to travel within the Western Cape area, more particularly Cape Town, South Africa for data collection (which involved face-to-face interviews).

Together with the study supervisor, the researcher established a contact list of organisations based in Cape-Town, South Africa that are either clients of ERP packages, vendors or system integrators. An email together with a covering letter endorsed by the researcher's institution and academic department, describing the research topic and providing assurance of anonymity and confidentiality was sent to those identified companies asking them whether they had recently or were currently implementing an ERP system and whether they were undergoing project delays in terms of time and resources. If so, they were asked about their willingness to participate in the study and responses were awaited via email.

Very little success was achieved with contacting vendors directly when they were asked to provide a list of their clients, because the information was judged too sensitive. System integrator firms were more welcoming even though they took a very long time to respond with an acceptance to participate in an interview. However, there was still some degree of resistance on their part to discuss troubled projects and understandably so. Of 15 companies that were contacted and who responded to the email, only 13 expressed their interest in participating in the study especially in terms of allocating time for the interviews. Of these 13, 4 were from the consulting/system integrator end of an ERP project and 9 from the client side. During the interviews, it was found that one of the respondents from the consulting-side (from Oracle Consulting) could not or was reluctant to refer to any particular project even when keeping the identity of their client/s undisclosed; another (IBM Consulting) referred to a project that took place prior to the Y2K era and was hence deemed unfit for comparison with the other cases since a time limit (completion of projects had to be not more than 5 years old) had been established. Thus, from the consulting side, only 2 interviews qualified.

During one of the client-side interviews it was found that the date of the project was outside the boundaries set by this research study and also that the ERP issues that were being discussed were not referring to a project that had gone through the life-cycle model. Of the rest of the potential respondents on the list, 5 (from the client side) failed to confirm an interview time despite repeated invitation

attempts and eventually the researcher had to exclude them from the process. Hence, this reduced the sample of client cases to 4. Of these, the interviews from the consulting firms' representatives could not reveal the identities of the organisations in question. Meanwhile, the researcher established contact with an organisation based in Mauritius which had just undergone severe setbacks in its ERP implementation. With the approval of the study supervisor, the researcher solicited the participation of this organisation in her research study, which was accepted. Hence, despite having 7 qualifying interview data sets, effectively the researcher performed 5 case-studies for which an organisational description was available.

Process

Following email responses and confirmation of acceptance to participate in the study, the researcher proceeded with setting up interview appointments with a contact person at the relevant organisations. It was specified that this contact person had to be one of the decision-makers on the project, i.e. a member of the steering committee who would be a top management executive closely tied to the project from beginning to end, preferably a project manager or high-level consultant. These appointments were set by email or via direct phone calls and a copy of the interview questions were forwarded to the intended interviewee to allow him/her to gauge the topic prior to the interview. This ensured an optimised use of the allocated hour for that interview. The process of obtaining specific dates, times and venues of each interview was a time-consuming exercise that altogether took up to about 4 weeks to complete and for data to be gathered. For the interview with the Mauritian-based company, the researcher performed the research task during a personal trip to the island.

Role of the Researcher

The role of the researcher in this project was that of an independent inquirer about the issue of ERP project delays and disruptions, investigating the factors that would influence AUE in the project. The data recorded on the interview tapes were transcribed and stored electronically on the researcher's PC and on the university's network. Printouts of such transcripts and other physical documents were duly considered as highly confidential and were therefore kept at all times in the researcher's office which was locked.

Units of Analysis

This research is in the form of a multiple-case design with holistic units (Yin, 1994) where the unit of analysis under scrutiny at each site is the instance of an ERP project at that organisation. Based on the research questions no logical subunits were identified even though a bigger time schedule would have allowed for data to be collected according to functional areas of the organisation instead of at a broad level. Holistic designs have been criticised especially in the case of single case-studies for being conducted at an abstract level, lacking any clear measures or data (Yin, 1994). This problem was tackled here by ensuring that more than one case was observed (hence the multiple case-design) and that also respondents fell under more than one industry sector and organisational size as much as possible. Furthermore, of the 7 interviews during which data was gathered, two were from consulting firms that acted as system integrators, and the identities of the clients concerned by those projects were

strictly undisclosed. Hence, those cases could not be included as units of analysis together with the other cases. The following table (table 3.1) summarises the cases involved in this study.

Case Unit ID	Industry	Organisation Size *	ERP Product	Project launch year	Interviewee profile
C1	Power & Engineering	Med	Impact	2000	Systems Integration Manager
C2	Manufacturing	Small	Sage	2001	Project Manager
C3	Retail	Big	Best of Breed. Core: JDEdwards	2000	Project Manager
C4	Higher Ed.	Med	PeopleSoft	1999	Project Manager
C5	Government	Big	SAP	2001	Technology Implementation Manager

Table 3.1: Units of Analysis

* Key: Small: 100-999
Medium: 1000- 4,999 } Number of employees
Big: > 5,000 } (range)

3.4 Data Collection Techniques

Data collection for case-studies can rely on many sources of evidence of which six can be considered as most important: documentation, archival records, interviews, direct observation, participant-observation and physical artefacts (Yin, 1994). When there is a shift in focus from technological to managerial and organisational issues, as is the case here, qualitative research using such aforementioned techniques is effective in understanding and explaining social phenomena (Myers, 1997). Yin (1994) stresses that no single source has a complete advantage over all the others and that in fact, they are highly complementary. In this particular research, methods such as direct-observation, participant-observation and physical artefacts were not deemed suitable or relevant. Direct-observation was not suitable because the projects had either already taken place or were under current post-implementation phases while the strengths of this particular method are the fact that it covers events in real-time and contextually.

The participant-observation technique is most frequently used in anthropological studies of different cultural or sub cultural groups as it proves to be insightful into interpersonal behaviour and motives but can also prove to be impractical due to its time- and cost-consuming nature, tendency for selectivity and reflexivity and also the fact that it is prone to bias due to investigator's manipulation of events (Yin, 1994). The physical or cultural artefact method was the least relevant of all techniques as this method relies on a technological device, tool or instrument or some other physical evidence. Again, it has its

relevance more in the context of anthropological research.

The main source of evidence for this research was the *focused* interview in which the respondent was interviewed for a specified period of time (1 hour). Even though the researcher focused on the open-ended questions for the gathering of crucial information on project delays and the AUE spent during each life-cycle phase, the interview was designed in the form of a set questionnaire (see Appendix A) and each respondent was asked the same questions, following the same sequence to ensure consistency in structure across all interviews. The focused interview style was chosen over the open-ended style because at the outset, the researcher had already tried to identify cases that had experienced problems of delays and disruptions during their ERP projects.

The researcher then proceeded with developing a questionnaire set around the research problem in order to now corroborate evidence that would be collected. The interview questions were pilot-tested with a selected number of 4 individuals before being used for the actual cases. These individuals were chosen according to their previous ERP project implementation knowledge as well as their experience of academic research and publication. 3 of these individuals are members of academic staff at the University of Cape Town with previous work experience on ERP projects and 1 has past ERP project implementation experience at a South African bank where he had been previously employed.

During the interviews, the researcher ensured that the questions were read out as worded in the questionnaire, thus not adapting her wording to the particular respondent's responses and conversation and hence avoiding asking leading questions. However, when further probing was required, the researcher applied her judgement to dwell on certain points being made by the respondent and thus the interview was allowed to be of an open-ended nature at appropriate times. The researcher was equipped with a tape-recorder thus making sure that she had captured all that was said for her to spot salient points at a later stage while transcribing the tapes.

Given the sensitive nature of the research problem, it was difficult to have access to documentation and archival records from the various organisations concerned. In fact, retrievability and accessibility are the main acknowledged weaknesses of these techniques (Yin, 1994). However, on the basis that the use of multiple sources of evidence (data triangulation) is strongly advocated as a major strength of case-study data collection, the researcher also requested access where possible to any available documentation and/or and archival records from the organisations. This took into consideration that case-studies' findings should be based on the convergence of information from different sources, not quantitative or qualitative data alone (Yin, 1994). In most cases the researcher was referred to documentation available in the form of website content and online media releases. Archival records were too sensitive to gain access to, especially regarding information on time and budget overruns within the projects. Online and media documentation proved useful in corroborating facts stated by the respondents and also to fill in gaps where they had omitted to specify some details or to provide the bigger picture where they had been too focused on detail.

Also, Yin (1994) warns of multiple evidence sources imposing a greater burden on the researcher than data collected from one single source. To master multiple data collection techniques as well as the methods of analysing them, (i.e. a combination of historical, operations and survey research) requires some degree of training in a multidisciplinary environment, otherwise the opportunity to address a broad array of issues and establish converging lines of enquiry may be lost.

3.5 Research Instrument

This section describes the research instrument, i.e. the interview schedule that was used to gather the information for this study. A copy of the questionnaire is attached as Appendix A.

The interview schedule was divided into four main sections in order to structure the information gathered according to the research questions initially presented. Respondents were asked to think of the pre-implementation and the implementation phases separately. A cover page providing instructions and a glossary of terms that were to be utilised in the interview accompanied the interview questions. This proved to be particularly useful in preparing the respondent for the interview and thus preventing the researcher from wasting time explaining the research objectives and main concepts during the limited time allocated for the interview.

Section 1 of the questionnaire dealt with the background aspects of the project such as dates of the project launch, project budget size (range values), project objectives, project scope in terms of the number of modules implemented as well as the size of the targeted user group and finally the overall time spent from launch to final go-live. These data constituted important background information on the cases even if not particularly relevant in the actual analysis of the results.

The second section tackled the pre-implementation phase of the project, first enquiring whether the project spent AUE in that phase and if so, for how long in calendar time, to what extent and whether it was deemed important. The section then proceeded to enquire about the events that the interviewee believed caused AUE in that phase. This was an open-ended question. Section 3 had a similar purpose this time with regards to the implementation phase. Thus questions in Sections 2 and 3 addressed the first set of research questions but only partly because at this stage respondents had not yet been asked to match this AUE to the satisfaction of CSFs. This was done in Section 4 of the questionnaire.

Section 4 dealt with AUE in relation to the satisfaction of CSFs in each phase and also gathered data for both phases thus enabling comparisons to be made between the two phases. This addressed the second research question of this study. Thus, questions 18 and 19 of this section were crucial in collecting the respondent's perception of the effort spent (inadequate or even no effort) and the extent of AUE spent (significant or not significant) in satisfying particular CSFs in each phase. The list of CSFs was obtained from the relevant literature. Furthermore, question 20 dealt with the sub-objective of this research which is to investigate the possible influence that EoC factors (obtained from literature) have on also causing AUE in the project. The remaining set of questions in section 4 collected more general

data on the project size, cost, complexity, success, budget and time overruns based on respondents' perceptions. Also, questions on the organisation's industry sector, its organisational size and the interviewee's role on the project were asked here.

3.6 Data Analysis Techniques

Data analysis consists of examining, categorising, tabulating, or otherwise recombining the evidence to address the initial propositions of the study. Every investigation should start with a general analytic strategy before applying four dominant analytic techniques that are recommended (Yin, 1994): pattern-matching, explanation-building, time-series analysis and program-logic models. The purpose of first having a general analytic strategy is to treat the evidence fairly, to produce compelling analytic conclusions and to rule out alternative interpretations thus guiding the researcher through the process choosing among those different modes of analysis and ensuring the research is completed successfully (Yin, 1994).

Yin (1994) recommends that the researcher uses a general strategy that follows the theoretical propositions that led to the case-study, as opposed to developing a descriptive framework for organising the case-study unless the study is not guided by any theoretical propositions but is rather a descriptive one. In this research study, the objectives and design of the case studies are based on the research propositions, reflecting the set of research questions stated earlier in this chapter. Based on an extensive literature survey, those research questions are put in context by the research model (Figs. 3.1a, b earlier) thus providing a general analytic strategy to the case-study evidence.

More precisely, the research propositions are that there are events that take place during an ERP project life-cycle that cause delays and disruptions in individual phases. Those delays and disruptions cause the organisation to spend more effort on striving towards satisfying success criteria (CSFs) for these phases. This extra effort is read as additional unplanned effort (AUE), the extent of which may differ in each phase and even under the presence of factors known to cause escalation of commitment (EoC). One of the objectives of the research was to also show how this AUE differs according to the different life-cycle phases and thus show the relationship between the phases.

Also, another objective was to show to whether those factors that are known to cause EoC are present and whether they contribute to influencing AUE in each phase. Hence, the theoretical models (Figs. 3.1a, b) guiding this research helped focus attention on certain data and helped organise the case studies and define alternative explanations (Yin, 1994). The mode of analysis adhered to in this research is mainly thematic analysis of the interviews, pattern-matching of the analysed data, with some use of explanation-building.

Thematic Analysis

Since the data for this research study was gathered by means of interviews, a valid analytic technique is thematic analysis. Thematic analysis is said to share many principles with content analysis but is of a

more exploratory nature, as opposed to being concerned by frequency of occurrence (Boyatzis, 1998). In this study, once information was gathered, thematic analysis was the method used to analyse the informant's talk about their experiences of their ERP project. From interview transcripts, themes and patterns were extracted and common ideas from informants were grouped together under those themes. Themes are identified by bringing together components or fragments of ideas or experiences which would be meaningless when viewed alone (Aronson, 1994; Leininger, 1985). Using an interpretive approach (Constas, 1992; Leininger, 1985) as a starting point, the researcher's task was to merge common ideas into themes, in a coherent way so that they provide meaningful results when linked together.

Pattern-Matching

Pattern-matching logic compares an empirically based pattern with a predicted one, or with several alternative predictions. If the patterns coincide, the results can help a case-study strengthen its internal validity (discussed in the next section). In the case of explanatory studies, such as this one, the patterns are expected to be related to the dependent or independent variables. In this particular case, the process involves a simple pattern approach (as opposed to patterns based on rival explanations or a pattern of non-equivalent dependent variables) whereby there is a minimal variety of dependent (AUE in ERP life-cycle phase) and independent variables (events causing delays and disruptions, factors causing escalation of commitment, satisfying success criteria in that life-cycle phase) (Yin, 1994; Garson, 2003). Yin (1994) however warns of the lack of precision in the pattern-matching procedure as there can be no precise comparisons or a way of ensuring so because of the fact there are no quantitative or statistical criteria to satisfy. To counter this problem, the researcher was careful not to postulate on very subtle patterns in order to draw convincing conclusions.

Explanation-Building

Explanation-building is a special type of pattern-matching but more difficult. The goal is to analyse the case-study data by building an explanation about the case (Yin, 1994). This procedure is mainly relevant to explanatory case-designs. To "explain" a phenomenon, a set of causal links has to be established. However, these causal links may be difficult and complex to measure in a precise way. Explanation-building is particularly compelling when there are plausible rival explanations which can be rebutted. Explanation-building can also be a supplement to pattern matching, as when it is used to generate a new, more plausible model after pattern matching disconfirms an initial model. It is with the latter intention (i.e. as a supplement instead of an alternative) that this method is utilised in this research even though time constraints would not allow for its full application. This would entail performing iterations of the process in view of making any new significant theoretical propositions through replication. As stated earlier, theoretical replication falls outside the scope of this study.

3.7 Methodological Concerns

A research design is meant to represent a logical set of statements and therefore has to be trustworthy, credible, confirmable and data-dependable (Yin, 1994). To establish the quality of empirical social research, four tests have been commonly used: construct validity, internal validity, external validity

and reliability. In general, reliability is the extent to which a measurement procedure yields the same answer however and whenever it is carried out. Validity is the extent to which it gives the correct answer (Gorman & Clayton, 1997).

Construct validity is concerned with establishing correct optional measures for the concepts being studied. This tactic usually occurs during data collection with measures such as the use of multiple sources of evidence and establishing a chain of evidence. In this study, the researcher made sure that what was being measured, i.e. AUE was clearly defined for the respondent prior to the interview and that questions were both of an open-ended and closed nature, for instance asking the informant to estimate the extent of the effort allocated to a particular CSF and also using responses to open-ended questions to support or enrich such information.

From the open-ended questions, the researcher gathered information on what caused delays and disruptions during those phases and hence AUE and used thematic analysis and pattern-matching to categorise the information so as to confirm and enrich the survey-type of results (see question 18, 19, 20 of the questionnaire in Appendix A). Furthermore, to ensure construct validity, the researcher made sure that both her study supervisor and respondents validated the various steps of composing the study report. Due to time restrictions, it was more difficult to obtain commitment from interview respondents, but steady reviewing from the research mentor was adequate enough.

Internal validity is also a concern for causal or explanatory case studies where an investigator is trying to determine whether event x led to event y. In this study, no specific causal relationship was being investigated but it was rather an exploration of the type of relationship that exists between the pre-implementation and the implementation phases of the ERP life-cycle. The researcher used the results of the first research question (factors that have been identified to influence AUE in each phase as well as particular CSFs concerned by that AUE) to compare the two phases. The same was done with the set of EoC factors and the possible influence they have on AUE. Based on those results, the relationship that exists between those two phases was inferred.

The concern over internal validity, for case-study research, can be extended to the broader problem of making inferences (Yin, 1994) because a case-study where an event cannot be directly observed, an inference must be made. The investigator would then "infer" that a particular event resulted from some earlier occurrence based on an interview or documentary evidence. Internal validity would require for this inference to be correct, that all rival explanations and possibilities be considered and that the evidence be convergent. Yin (1994) acknowledges that specific tactics for achieving this result are difficult to identify. The researcher adopted a rigorous pattern-matching process with the possibility of supplementing it with some degree of explanation-building of all evidence gathered to address this concern.

External validity deals with the problem of knowing whether a study's findings are generalisable

beyond these immediate case-studies. This is a major barrier in doing case-studies (Yin, 1994; Kennedy, 1979). Kennedy (1979) argues that while survey results rely on *statistical* generalisation, case studies rely on *analytical* generalisation. In analytical generalisation, the investigator is actually striving to generalise a particular set of results to some broader theory.

According to Garson (2003), generalisability of findings is a function of the range and diversity of settings in which a theory is tested, not of the testing methodology per se. He further adds that judicious case selection to identify cases illustrating the range of a theory may result in more generalisable research than an attempt to test the same theory based on a random sample of survey respondents. Moreover, if case research is replicated, generalisation of case-based findings can be further enhanced. In this particular study, this issue is addressed by the fact that a multiple-case design approach has been adopted thus establishing grounds for replication (literal not theoretical) logic.

Lastly, the case-study research needs to be reliable, i.e. its procedure should yield the same answer time after time (Gorman & Clayton, 1997). Reliability demonstrates that the operations of a study such as the data collection procedures can be repeated to provide the same results (Yin, 1994). Yin, 1994 stresses that the emphasis is on repeating the *same* case over and over again and not on replicating the results of one case by doing *another* case study. This was ensured by keeping a record of all procedures followed in initiating and carrying out the research study. The researcher built a case-study design protocol to keep track of procedures to be followed when collecting data from the interviews and from available documentation. Also, a case-study database was kept to store all empirical data (questionnaire answers and interview transcripts).

In summary, this research study adopted the multiple case-study approach in the attempt at answering the research questions posed at the end of Chapter 2. The research context and model which are at the basis of this study have been shown and discussed. This was followed by a discussion of the research approach underlining this study. The qualitative method was justified and the empirical nature of the research elaborated. The research design and the steps followed by the researcher were detailed followed by a description of the data collection techniques that were utilised. The research instrument (interview questionnaire) was described and its sections explained with regards to their relevance to the research questions. This was followed by a description of the data analysis approaches that were employed. A section discussing the various methodological concerns in this study was presented and measures taken to ensure validity under all aspects have been explained.

CHAPTER 4 – CASE PROFILES

This chapter provides a profile of all the cases discussed describing the context of the selected ERP project and important facts regarding their evolution over their acquisition and implementation phases. All 5 cases presented show evidence of delays and disruptions experienced during the project life-cycle. First, a short background of each organisation is provided followed by the chronology of milestones during each phase and the events that took place and significantly impacted on the progress of the project are summarised.

4.1 Cases

C1

C1 is a designer and manufacturer of industrial boiler plants in South Africa. It currently employs more than 3000 people. It was initially owned by an African-based engineering group but was later sold, in 2001, to a big multinational, a worldwide service provider in power generation whose head-office is in France.

In March 2000, following a lengthy initiation process from its systems department, a decision was taken by the management at C1 to adopt an ERP package in order to replace their old in-house system. A 6-7 month selection process followed, at the end of which ***Baan*** was chosen as the most suitable solution among a certain number of options. The decision committee deemed Baan as the most "convincing" compared to the others and also relied on it being a well-established brand.

The decision was communicated to the head-office of the owner-group at the time and a budget of 2.5M rands was requested for the ***Baan*** implementation. While waiting for the approval of the said budget, C1 called in an outside consultant who would help them "learn about the functionality of Baan and how exactly it would fulfil their requirements especially in the areas of the Bills of Material (BoM) and Inventory Control." (The term "Bills of Material" is defined as a listing of all subassemblies, intermediate parts and raw materials that go into a parent assembly showing the quantity of each required to make an assembly – ELMO Solutions, 2005)

While this exercise was under way, during late 2000, news that the company (C1) was likely to be sold to another group spread and that, consequently, the budget request for the Baan project was "on hold." It was later confirmed that the company was now under new ownership. C1 thus had to redirect the budget request to the right board of directors. However, the new owner did not approve C1's initial choice of Baan and decided that C1 should rather implement ***Impact*** as the ERP package instead of Baan, reason being that all its other subsidiaries had successfully acquired and implemented ***Impact***. C1 had no choice but to follow the group's strategy.

Having learnt from the Baan investigative exercise that Baan may have, in fact, not necessarily been the right choice and that an ERP implementation might be more complex than what they had initially anticipated, C1 decided to hire one of their ex-systems manager, who had worked with them for over 25 years and who had been on the team which wrote their home-grown system, to be a main advisor on the

Impact implementation and to drive its development.

The implementation officially started early 2001 and the first targeted function was the BoM. Soon, through the implementation of the BoM, C1 realised that they had been operating in a sub-optimal way and that there was now potential for increasing efficiency in its manufacturing processes, more than they had previously anticipated. Thus, they realised that the project would first require a significant business process re-engineering (BPR) effort before they could finally implement ***Impact***. This need for process optimization was also made compulsory by the fact that the South African economy at the time was undergoing difficulties, showing depression in its export market, forcing enterprises to become more competitive.

It was therefore decided to put the ***Impact*** implementation "on hold" in order to perform the BPR exercise first. Consequently, the timeline for the project was revised and officially extended to two years instead of a year and a half. However, the BPR exercise followed by the implementation took longer than expected as the organization decided to perform a thorough enterprise-wide effort to include requirements from all departments. The project's implementation eventually underwent an additional 6-month delay with a budget overrun of about 25%. It was completed and delivered in June 2003.

C2

C2 is part of one of the biggest groups of companies operating in the food sector in Mauritius. C2 is a major supplier of feed mainly for poultry, farm and domestic animals. It currently employs around 400 people of a total workforce of some 2000 employees in the group. In June 2001, the group decided to implement a ERP package in its subsidiaries to achieve a broad range of objectives in terms of inventory reductions, procurement improvements, consolidated uniform reporting, productivity and revenue increases among others.

A selection process headed by a high-level decision-making committee consisting of important representatives of all targeted subsidiaries followed. Advisors were hired from a local consulting firm to assist in the acquisition process. The process was planned to take around 5 months but eventually extended to 18 months. The result of the "search" period of the Acquisition phase led to the selection of 3 best candidate solutions: ***JD Edwards***, ***Navision*** and ***Sage***. Management teams of each subsidiary benefited from a demonstration from each of the 3 candidates and each had the chance to make their own opinion individually concerning their preferred option.

The final decision rested with the group's high-level decision committee which made a final choice in favour of ***Sage***. The decision was based on factors such as cost and also on the need to satisfy the requirements of a wide range of commercial activities within the group, ranging from manufacturing companies to service-providers; activities include production of animal feed, poultry, dairy goods, fast-food chains as well as shipping, marketing and IT services. ***Sage*** was deemed not only the most cost-effective option but also the solution that offered the "best fit" to the group as a whole.

To reach this final choice, the group underwent a lengthy acquisition process where pros and cons of each option were weighed and compromises had to be made to satisfy all companies. Hence, important stagnant periods were observed during the final stages of the acquisition process namely during the evaluation, choice and final negotiations.

C2 was the first on the list of the 20 subsidiaries to start the implementation. To assist with the process, a team of implementers from the vendor's location in South Africa were hired. The local team that had assisted the group with the acquisition process had done the preliminary investigation and requirements specification for C2 but an adequate and rigorous hand-over with the ***Sage*** implementation team had lacked and thus represented potential loss of important information for the implementation team. Furthermore, the team was under significant pressure to implement the system within a limited timeline to minimise cost.
This had a significant impact on the project's implementation: the planned duration of the implementation was 6 months but it finally took 16 months to be complete.

In fact, the implementation process witnessed two "go-live" dates, the first one being when the project was delivered on time (i.e. within 6 months) by the ***Sage*** implementation team but heavily below expectations, as significant functionality had either been left out or implemented without adequate testing. This necessitated a decision by the group to re-start the implementation this time under the responsibility of the group's in-house IT firm which found that it had to re-work a good portion of the preliminary investigation and requirement specifications, this time more thoroughly.

The system, at C2, was delivered in June 2004 with a 10 month implementation delay and a highly significant budget overrun (close to 100% suspected). Five main functional areas were targeted: manufacturing, HR, sales and distribution, inventory management and finance. The group proceeded with the implementation of individual ***Sage*** modules in two of its smaller companies. The next implementation of comparable scope to C2's is currently under way, also under the supervision of the in-house IT firm.

C3

C3 is a specialist retail group with more than 900 stores across its operations in South Africa, and markets more than three major brands in the country. Following an evolution of over 35 years, with its first operation in 1968, the group focuses on the retailing of health, beauty and lifestyle products and services. It operates a supply chain management infrastructure based on a centralised shared services model which includes distribution and logistics, merchandise services, IT, marketing, organisational development, finance and administration.

The group had initially acquired a ***JDA*** license and implemented its Merchandise Management System (MMS) module for its Replenishment function. Also, for its warehousing department, C3 had acquired a system called ***Supply Chain Manager (SCM)*** Warehouse Management System. However, in June 2000, an ERP vision emerged where there was a realisation by the IT department that ***JDA MMS*** could be optimised through wider implementation across all business functions. Despite the lead for the selection of ***JDA*** as its

software of choice (having acquired the license already), the organisation still wanted to make sure that they were "making the right choice" and thus scanned the market to evaluate other options. Six months later, around December 2000, C3 confirmed ***JDA*** to be their choice for an ERP implementation with the exception of ***Retalix/Storeline*** which was chosen as their Point of Sale (POS) system. The implementation of the ***Retalix/Storeline*** system was identified to be a "prerequisite and building block" for the ERP implementation and therefore was launched straight away. This proved to be far from a simple task as it has currently started a fourth year of implementation, past its targeted duration of two years.

Concurrently, there was a strategic move undertaken by the group since 1999 to enter the pharmacy industry and thus acquire a number of pharmacies across the country. This, in parallel with the selection process for ***JDA***, was becoming of increasing concern within the group and eventually by the IT department, especially regarding the integration of those pharmacies into the scope of the ***JDA*** implementation.

This indeed constituted a major change in business requirements for the ERP project. While it had been decided at the end of the acquisition phase that the implementation would start with the major two brands of the group, there was a sudden "deflection" where it was decided that the new priority of the ***JDA*** implementation would be the pharmacies. This proved a lengthy and difficult process and the IT team also realised that for the finance and administration departments ***JDA*** may not be very suitable. Hence, a sub-acquisition process started around June 2001 where C3 investigated the possibility of buying another software module to suit the finance and administration section. The final choice was made in favour of the ***SAP Financials*** module.

Meanwhile, another strategic business move occurred within the group where it decided to acquire licenses from the UK to open a new type of beauty store in South Africa. This occurred during the later part of 2001 and thus, by early 2002, new business requirements had to be added to the scope of the ERP implementation. This created another "deflection" for the IT team where efforts had to be split to accommodate all changes and additions to the project scope. In fact, a severe shortage of IT staff was experienced as a result of the overwhelming amount of disruptions in the project implementation caused by those changes in business requirements.

Thus, the implementation phase was put "on hold" to allow for a "finalisation of context" to take place where the requirements specification would be finalised to reflect recent business changes and also to assimilate the new technological landscape, given the fact that a number of software modules from different "breeds" had been purchased. Thus, the need for a framework of integration of those different brands of software had to be formulated. Eventually, such a framework was finalised towards the later part of 2002, when it was decided that ***JDA MMS*** would be implemented as the core transactions processing system at the "heart", integrating ***SAP Financials***, an upgraded version of ***SCM Warehouse Management System*** and ***Retalix/Storeline***. Finally, in Nov 2002, the finalised ERP project was launched for implementation with an anticipated budget of 24M rands.

The project is currently still in its implementation phase. It was planned to be completed and delivered within 18 months. However, it is undergoing a delay with approximately 10% overrun over a budgeted total of 42M rands for the implementation. The new anticipated duration is of 30 months with a revised target delivery for June 2005.

C4:

- **Background to ERP adoption**

C4 is a higher-education institution in South Africa employing a total workforce of about 5,000 people. During the 1980s and 1990s, a "deliberate and planned process of internal transformation" took place to meet the country's *new* challenges in the higher education sector.

One significant step C4 took towards this transformation was to establish a vision of how its business processes should be best supported especially in the context of Information Technology. This was triggered by a major budgeting error and led the institution to decide to review its administrative and management information systems in 1994. A special committee was formed to investigate the problem and make recommendations for a solution. This exercise took about 8 months and culminated in the recommendation to select ***SAP*** as a ready-made solution for the enterprise. At that time, the notion of an ERP was not yet widespread especially in South Africa. Hence, the investigating committee at C4 had not initially set out to specifically select an ERP package such as ***SAP***.

In August 1995, the project (Project 1) was officially launched with a preliminary project definition to map ***SAP*** functionality to the organisation's requirements. This lasted about 4 months. The requirements specifications concerned mainly the Finance, Human Resources and Student Administration business units of the organisation. At that time, ***SAP*** did not offer a Student Administration module but was going to build one. However, soon afterwards, ***SAP*** communicated to C4 that it would not proceed with it. To cater for such a change, C4 decided to start the in-house development of the module in parallel with the implementation process that had started and later on integrate it with the ***SAP*** modules. In fact, C3 started to develop its own Student system in view of convincing ***SAP*** to eventually take over the development using C3 as a pilot site.

Thus, in February 1996, at the start of the academic calendar, C3 "kick-started" its Implementation phase of the ***SAP*** Finance and HR modules. Headed by an important steering committee and a separate project management group, the institution successfully installed the Finance module in January 1997 followed by the HR module in March 1998, both "go-lives" being on target.

However, the creation of the Student Administration system proved to be the most difficult of the project. In August 1997, ***SAP*** announced its intention to develop such a module in collaboration with C4. The latter thus stopped the current efforts to develop an in-house Student system to embark on an intensive requirement specification exercise of about 7 months with ***SAP***. This, in fact, marked the beginning of a sub-acquisition process within Project1 that culminated in an agreement for C4 to officially serve as ***SAP***'s

pilot site for the development of a Student system. The pilot site agreement coincided with the end of Project 1 which comprised the official delivery of the ***SAP*** Finance and HR modules. The development of the Student Administration system spun off from Project 1 to become a separate project (Project 2) which is discussed later in this section.

Project 1 was reportedly delivered "under-budget", this being due to the fact that during the preliminary definition phase, budget estimations regarding hardware requirements had been revised based on fears that the initial budget was insufficient. Also, the non-delivery of the Student Administration system which was initially in the requirement specifications for Project 1 explains why there was such a significant budget leftover in the end. In fact, with a total implementation cost ranging between 10M and 50M rands, Project 1 was completed with a surplus of about 3-4M rands which was later on utilised at the start of Project 2.

- **Project 2**

C4's Student Administration system component evolved over a peculiar life-cycle characterised by multiple changes in direction and several sub-acquisition decisions. As mentioned earlier, in February 1996, the development of the Student Administration system became the responsibility of C4's own in-house staff when ***SAP*** decided it would not develop one. Then, in August 1997, ***SAP*** changed its mind again and decided to develop one, called Campus Management system in collaboration with C4. Independent in-house efforts stopped and were redirected to a new project which then became an official one (Project2) when the pilot-site agreement was signed between ***SAP*** and C4 in March 1999. It is important to recall that the need for a Student Administration system was recognised as a first and foremost priority at the very outset of C4's ERP initiative, at the beginning of Project 1.

For a year and a half, progress was made with the release of several preliminary versions of the system for testing. There was also dynamic interaction between the project and other pilot sites that had emerged in a number of universities abroad where levels of progress were shared and discussed. However, by August 2000, some degree of uncertainty settled in as to whether the pilot site was looking promising in terms of both time as well as functionality. Therefore, the project team was asked to assess the market, namely a number of possible alternatives to ***SAP***'s pilot solution.

In March 2001, the steering committee reviewed financial reports, milestone plans and progress for the project. It was becoming apparent that the project was slowly being reduced in scope and that the final product could well be below expectations. However, the market evaluation for alternatives showed no other better solution than ***SAP***'s. Therefore, in August 2001, for want of better options, C4 decided to remain a pilot site for ***SAP*** while continuing its efforts to be on the lookout for new candidates on the market. Also, a decision was taken to start focusing on in-house enhancements of the home-grown system especially with regards to functionality that was known to be crucial and urgent for the Student system.

Thus, the project embarked on a "holding" pattern where it reached a standstill torn between the unavailability of better options and the necessity not to "waste" time. This situation lasted for over a year. Eventually, in November 2002, ***PeopleSoft*** emerged on the international market including South Africa,

as a new player in the Higher Education sector with its Enterprise Campus Solution. In early 2003, C4 launched an investigation to assess the suitability of the new candidate for its requirements and came to the rapid conclusion in April 2003 that it was indeed a better option. Then, final negotiations with ***PeopleSoft*** took place. A new budget and timeline was set and the Implementation started in September 2003. With a budgeted time of 2 years, it is anticipated that it will go overboard by about 6 months.

C5

C5 is a City Council in South-Africa, reformed in December 2000 to combine its 7 local authorities into one single provincial Council. It employs more than 28 000 people with a total operating budget of R10 billion per year. The decision of the reform led to the initiative of installing an ERP system in order to integrate the information systems across all the locations into one single system which would act as the administrative backbone for the entire city. Areas of operations identified as requiring major and urgent transformation included inventory management and procurement, revenue and profit optimisation and reduction of the arrears bill. Also, in addition to functional requirements, another important objective of the project was the standardisation of business processes at the City's administration.

The decision to adopt an ERP took place in March 2001. This decision was reportedly not "taken lightly". First, awareness for the need of a certain system was given by a general IT audit of the local authorities. The Council was then faced with four options: to maintain current systems and upgrade them as necessary, stay put, custom-build an ERP solution or buy an off-the-shelf one. To assist with this first decision, advisors from an international firm were hired. The first option and third option were eliminated on account of costs. The second option was not considered because of the fact that existing systems were providing largely inadequate support to the City's administration. A packaged ERP solution was thus considered to be the "way to go."

Once the decision to adopt an ERP was made, the process that followed consisted of 3 major acquisition steps: to select the software/vendor, the implementation partner and the hardware implementer. The selection process spanned over 8 months and involved a team of over 50 people. A conscious effort was made at the outset of the project to obtain organisation-wide buy-in as much as possible. Thus, it is reported that despite 3 major political leadership changes in 3 years, the project was hardly threatened thanks to the unanimous buy-in from important high-level parties.

The outcome of the acquisition phase pinpointed ***SAP*** as the chosen software and a leading consulting firm as its software implementation partner. A different firm was also chosen as the hardware implementer. After finalising the choice of ***SAP***, the organisation embarked on its implementation phase with the software implementer during January 2002. The first task that was tackled was the standardisation of business processes, identified as a critical pre-requisite to a successful ERP implementation. This BPR exercise lasted approximately two months and resulted in the replacement of 113 different old systems by a single one.

The implementation plan divided the project into two distinct functions: the Expenditure portion and the Revenue portion. A maximum total of 17 months was budgeted for the implementation including the BPR

exercise; 10 months for the Expenditure portion and 17 months for the Revenue portion (14 months for the pilot system – delivered on time). The Expenditure side went "live" within 12 months and the Revenue portion was delivered in 20 months. These delays are reported to be "fairly acceptable" by the project's team leaders especially *given* the size and complexity of the project. However, being at the heart of a public organisation in a politically sensitive environment, the project was subject to significant open criticism by various opposing parties in the media.

The ***SAP*** modules implemented include HR, Plant & Maintenance, Inventory Management, Procurement and Finance for the Expenditure side; the Industry Solution for Utilities (ISU), the Billing engine as well as Real Estate for the Revenue side. The implementation of the Revenue component was relatively more complex than the one for the Expenditure component as the dimension of their impact on the user group is different. While the Expenditure side targeted the administrative personnel of the City, a total of 2500 users across the HR, Finance and Purchasing departments, the Revenue component would impact on the public at large (customers), a population of 3.2 million in total. The City could not afford to have the slightest percentage of error in its Revenue system that could eventually threaten its survival.

Hence, for the Revenue component, a major deliverable in terms of a pilot system was scheduled to be presented first using one of the municipalities as pilot site and converting its citizens to the new Billing cycle. The pilot system went "live" on time, i.e. within 14 months but it however highlighted the risk that the system could still be tolerant to an unacceptable level of error rate in capturing payments from citizens due to high levels of "unclean" data. This required a delay of about 3 months to allow for the cleaning of the data before the implementation could spread across all municipalities. The two sections of the project, Expenditure and Revenue, were significantly disparate in terms of size, complexity and criticalness. In fact, it is reported that the delay incurred during the Revenue implementation was "a business decision balancing the cost of the potential impact of incorrect conversion against the cost of delaying the implementation." With an official total budget of R265m for a planned 17 months, the project underwent an implementation delay of 3 months with a budget overrun of about 10% which was not considered as extremely significant by its project leaders if not, in fact, warranted. The project was complete and went "live" in September 2003.

In summary, the cases presented in this chapter all refer to ERP projects that experienced delays and disruptions during their project life-cycle. As seen, the cases differ from one another in terms of the size and scope of the projects but however, together they constituted a relevant set of instances for the analysis of AUE that took place during those projects. The following chapter delves into the analysis of the results obtained from the research.

CHAPTER 5 – ANALYSIS OF RESULTS

Based on the research model depicted in Chapter 3 and the research propositions that were derived, this section presents the analysis of the case-studies performed during this study. Using the method of identifying patterns and themes from the techniques of pattern-matching and thematic analysis, as discussed in the methodology section, the cases have been analysed and dominant themes extracted. The results are presented in two sections. The first presents the data gathered from questions 18 and 19 of the questionnaire (See Appendix A) on the respondent's perception of the extent of AUE spent on satisfying CSFs during each phase of their project. AUE is mapped on an effort scale ranging from "no effort" to "significant AUE". The second section deals with the qualitative results obtained from the open-ended questions of the interview. An analysis of those results is provided with the extracted themes as headings.

5.1 AUE in the Life-Cycle

The following table, Table 5.1, shows the perceived effort and AUE spent on each CSF in the pre-implementation phase by each organisation presented in this study.

	Effort (perceived) Scale				
Pre-Implementation CSF	No Effort	Inadequate Effort	Adequate Effort	AUE (not significant)	AUE (Significant)
Planning		C1, C2	C3, C5		C4
Adequate Cross-over to Implementation team		C1,C2,C3	C4,C5		
Careful selection of acquisition team members	C1	C2,C3	C4,C5		
Rigour		C1,C2	C3,C4,C5		
Leadership		C1	C2,C4	C3,C5	
Clear and unambiguous authority			C2,C3,C4,C5	C1	
Strong management commitment			C2,C4,C5	C1,C3	
Definition of requirements		C1,C2	C4,C5		C3
Establishing selection and evaluation criteria		C1	C5	C3	C2,C4
User involvement in ERP acquisition process itself		C1,C2,C3	C4	C5	
User involvement in the vendor demos	C1	C3	C2	C4,C5	
User buy-in the final choice	C1	C2,C3	C4,C5		
External partner relationship (vendor or/and implementation partner)		C1,C2,C3	C5		C4

Table 5.1: AUE on Pre-Implementation CSFs

As can be seen, the pre-implementation CSFs received varying degrees of effort from the organisations. For instance, C1 was perceived as having spent *no effort* in the careful selection of acquisition team members, user involvement in vendor demonstrations and in the final choice. C5, however, claims at least *adequate effort* in satisfying all pre-implementation CSFs except for leadership, user involvement in vendor demonstrations and also user involvement in the ERP acquisition process itself. C2 experienced *inadequate effort* in satisfying several of the factors and significant AUE in establishing selection and evaluation criteria. C4 experienced the most AUE in this phase.

Table 5.2 shows the perceived amount of effort and AUE spent by each case on each implementation CSF.

	Effort (perceived) Scale				
Implementation CSF	No Effort	Inadequate Effort	Adequate Effort	AUE (not significant)	AUE (Significant)
Sustained Management Support			C2,C4,C5		C1,C3
Effective Organisational Change Management			C5	C4	C1,C2,C3
Good Project Scope Management			C2,C4,C5	C1,C3	
Adequate Project Team Composition		C3	C5	C1,C2	C4
Comprehensive BPR		C2	C3,C4,C5		C1
Adequate Project Champion Role				C5	C1,C2,C3,C4
User Involvement and Participation			C4,C5		C1,C2,C3
Trust between partners			C4,C5	C3	C1,C2
Dedicated staff and consultants			C5	C3	C1,C2,C4
Strong communication inwards and outwards			C4,C5	C1,C2,C3	
Formalised project plan schedule			C5	C3	C1,C2,C4
Adequate training program			C1,C2,C3,C4,C5		
Preventive troubleshooting		C2	C1,C3,C4	C5	
Appropriate usage of consultants			C1,C5	C3	C2,C4
Empowered decision-makers			C1,C2,C3,C4,C5		
Adequate ERP Implementation Strategy			C3,C4,C5		C1,C2
Adequate ERP version			C1,C2,C3,C4,C5		
Avoid Customisation			C1,C2,C3,C4,C5		
Adequate Infrastructure and Interfaces			C1,C3,C4,C5		C2
Adequate legacy systems knowledge			C1,C3,C4,C5		C2
Formalised Testing Plans			C1,C2,C3,C4,C5		
Adequate Data migration process			C1,C3,C4	C5	C2

Table 5.2: AUE on Implementation CSFs

It is shown that implementation CSFs also received varying degrees of effort from the organisations. However, in this phase, there are more cases that experienced AUE and even significant AUE for several of the CSFs. From the table, it appears that C1 and C2 are the ones that displayed AUE the most frequently followed by C3 and C4 even though the latter also reported adequate effort spent on many CSFs in this phase. C5 claims *adequate effort* on most of the factors.

Given the above details of the AUE spent satisfying CSFs in each phase, the next section presents a qualitative analysis of the information on this AUE, obtained from the open-ended sections of the interview with the informants.

5.2 Qualitative Analysis

This section presents a qualitative analysis of the results obtained from the 5 company cases described in the previous chapter. Based on the responses to the focused interviews, themes pertaining to AUE in each life-cycle phase have been extracted. Those themes essentially characterise the extent of effort and AUE experienced during those phases respectively with regards to events and conditions that caused that AUE. The discussion presents the themes under headings and pertinent quotes from the interviews with the profiled cases given as supporting evidence.

A clear distinction is made between the impact of the uncovered themes on the phases of the ERP life-cycle, i.e. the pre-implementation and the implementation phases. This is crucial to the research questions. An additional section relates to the investigation of the possible influence of EoC factors on AUE in each phase. Next, based on those factors that have been uncovered in the discussion and responses obtained from the interviewees, the relationship between the two phases is explored.

5.2.1 Pre-Implementation phase – AUE Themes

Based on the data gathered from the interview questionnaires, a comparison of the estimates of the additional unplanned effort (AUE) experienced by each case, as reported by the respondent, is shown below in Fig. 5.1.

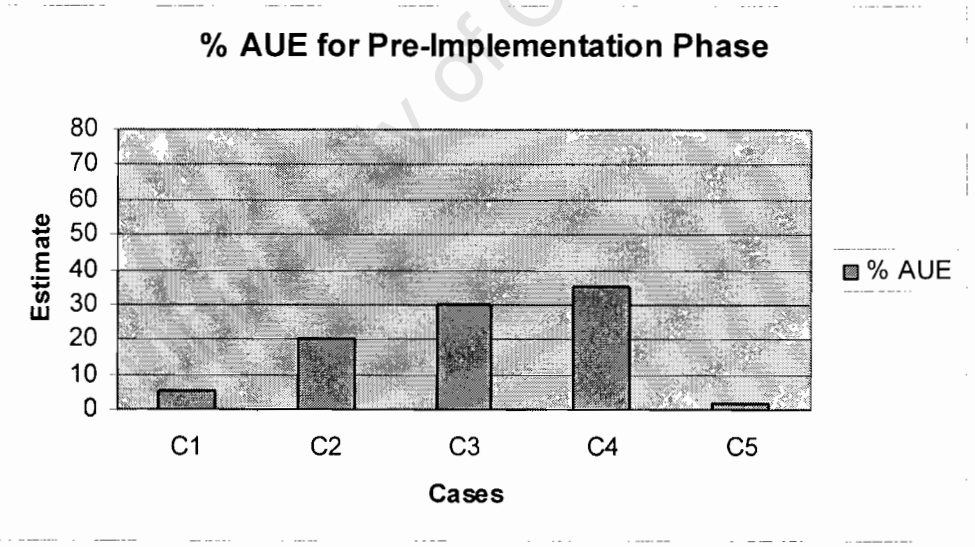


Figure 5.1: AUE in Pre-Implementation phase

The results show that C4 suffered the most (35%) from AUE in the pre-implementation phase followed by C3 (30%), C2 (20%) and C1 (5%) and C5 (2%) which seems to show significantly less AUE in that phase. The discussion now delves into the reasons for the occurrence of AUE in the pre-implementation phase for each case, linking factors that caused it to pre-implementation CSFs. Hence, the themes that were found to characterise AUE spent in the pre-implementation are as follows:

JUSTIFICATION FOR ERP ADOPTION

This relates to the rationale or motivation behind the organisation's initiative to implement a particular ERP system in the first place. It was found that in some of the cases, especially C1 and C2, the basis for adopting an ERP was an important factor in determining the effort spent in satisfying certain CSFs such as planning and initialising for the implementation phase, definition of requirements and establishment of selection criteria. From the cases studied, the following reveal the various reasons for adopting an ERP package in each instance.

> C1: *"...we could not possibly keep up with these home-written COBOL programs."*
>
> C2: *"...each company in the group was running its own in-house system running on DOS or using plain EXCEL. At some point, the group realised that it needed to invest in an ERP system for each subsidiary to increase efficiency and competitiveness."*
>
> C3: *"...we needed to replace our core transaction processing system; on the one end that concerned installing a POS system but on the other it also concerned streamlining our major business processes, namely the buying and selling of products/merchandise, pricing and tracking of stock movements."*
>
> C4: *"...we wanted an integrated system – the key driver for us is that we were experiencing serious problems with our current systems which were all home-grown. We were really looking for a packaged solution as opposed to continuing upgrading those home-grown solutions"*
>
> C5: *"...the Council had four options of which buying an off-the-shelf package was the most viable one. Upgrading existing systems was too expensive as well as building a tailor-made ERP from scratch, keeping current systems was definitely not an option."*

It is very important to note that the ERP initiatives discussed here were first-time initiatives for C1, C2 and C5 but not for C3 and C4 but the analysis focuses on the exercise of acquiring and implementing an ERP solution (or part thereof) within the context of a project to which a particular budget has been allocated. However, as in the case of C4, previous ERP projects (Projects 1 and 2) are considered as part of a bigger ERP initiative within the organisation and hence, in this particular section, become relevant to the discussion.

From the information gathered, it is apparent that the motives for adopting an ERP system were not as clearly defined in certain cases as they were in others and more importantly, some cases reveal that their motives were less supported by a certain ERP vision to which their initiative was aligned. For instance, while C5 had analysed four different sourcing options before deciding on adopting an ERP system, C2 made the decision based on a particular practical problems they were experiencing across all subsidiaries in the group, thus showing a relatively more limited vision in their endeavour.

Here, it is important to note that C2 clearly realised at the group level that an adoption decision for an ERP system would be fit for the whole group and not just for one particular subsidiary but yet, the exercise of aligning this vision with the actual requirements of the group does not appear thorough – hence a lack of rigour in that process. As stated:

> "*There was a need to get rid of those old in-house systems in all major subsidiaries; 3 short-listed options were presented to all management teams of all subsidiaries concerned. In the end, it was clear that the basis for adopting an ERP was to implement a one-fits-all solution, thus paying significantly less attention to the suitability of the chosen solution to the particular subsidiary's (C2 in this case) requirements.*"

Discarding home-grown Excel and DOS-based systems seem to be the first and foremost priority and the group's vision was to implement a system that could immediately bring a solution to all subsidiaries even though those subsidiaries operated in different industry sectors completely. This being the basis of ERP adoption, very little effort was spent on planning ahead for each individual ERP implementation, defining requirements for each subsidiary before looking at vendors and establishing selection and evaluation criteria for each.

At C1, the reason that drove the organisation's willingness to implement an ERP was the mere fact that it was becoming impossible to continue operations with the outdated home-grown system thus showing a lack of strategy or vision. In fact, at C1, a selection for an ERP package took place twice. Though it is reported that the main reason behind this was on account of organisational restructuring, it was also acknowledged that the proposal to acquire Baan would not have gone ahead due to the fact that

> "*...the R2.5M budget requested for was meant only to cover software, but we realised that another R2M would be required to cover new hardware and communication systems etc...*".

This reflects the fact that the pre-implementation phase at C1 lacked not only rigour but also planning in terms of providing for the implementation phase of the project through the proper establishment of selection and evaluation criteria since such realisation would have occurred had those criteria been set before making a choice.

At C3, the decision to adopt an ERP took place in a different context because of the fact that the organisation had already invested in various ERP modules but not following an enterprise-wide implementation. It must be reminded here that under case C3, the ERP initiative extends over three distinct projects even though the one of particular interest which constitutes the unit of analysis is project 3. Specifically, C3 had acquired a JDA license having implemented its Merchandise Management System (MMS) module for its Replenishment department as well as the Supply Chain Manager (SCM) system. Following a general organisation vision (Odyssey), a project was launched with the purpose of establishing an integrated enterprise-wide platform.

The pre-implementation phase of this project was essentially characterised by a bias towards the enterprise-wide implementation of existing systems, especially JDA across the whole organisation even though it is reported by the respondent that C3 still took longer than expected. It will be seen later that in

addition to those six months, C3 spent AUE in trying to finalise what the respondent refers to as "the context". In total, C3's pre-implementation phase was delayed by 18 months in terms of calendar time in order to finalise this "context".

Similarly at C4, an ERP package license had already been acquired through the implementation of SAP in the finance and human resources functions in a previous project instance. In fact, the requirement of developing a student administration system was initially part of the scope of that first project (Project 1 is described in the profile section to provide background information to the student administration project, Project 2). C4 had the task of identifying the correct software that would cater for such a student administration system and that would also integrate with the existing SAP system in the background. Hence, the context in which the student administration project at C4 evolved was rather complex given those set of prerequisites such as the importance of merging with SAP as well as the importance of implementing very organisation-specific requirements in terms of functionality of the student system.

C4's lengthy pre-implementation process may in fact not have been due to the absence of an ERP vision supporting their basis for adopting an ERP system. In fact, it is claimed that C4 was among one of the first higher-education institutions in South Africa to have invested in pre-packaged software for its administrative departments.

> *"...Project 1 was not a project at that time, it started as an investigation. It was known that there was a problem but the solution was still to be uncovered. The whole research led to the idea of implementing an ERP which was a relatively new idea at that time especially in the context of higher-education."*

The emphasis should be laid here on the persistence of C4's ERP vision from Project1 to Project 2. The organisation seized the one incident of a "*major budgeting error*" to "*re-evaluate its techniques and systems*" to look for a long-term strategic solution.

> *"...at the time of issuing the RFP, we did not know that an ERP would be the solution. A strategic information systems committee was set up to lead the investigation. Based on its recommendations to select SAP, the Council decided to embark on the project."*

At C5, a similar vision was at the basis of the decision to adopt an ERP system in the first place:

> *"...the thinking started when the City adopted a strategy to become a metropole, a smart city strategy. The CIO presented the idea of implementing an ERP to the whole of the city. Basically, they went on the route to first get complete buy-in from all parties: political and administrative before they ventured further."*

Furthermore, this measure to ensure complete buy-in also contributed to sensitising the organisation at an early stage as to the importance of involving key members on the pre-implementation/acquisition team:

> *"...they went on the route to first get complete buy-in from all parties, political and administrative before they ventured further. Hence, they went through a rigorous software selection process using external advisers, involving key members on the acquisition team."*

In C4's case, where the ERP initiative was split into multiple projects, buy-in had to be acquired and maintained over several years. However, at the outset (beginning of Project 1), C4's quest for a solution was backed by a

> "*general realisation at all levels that something needed to be done in the whole university system. There had been a major budgeting error and that led to the need for a re-evaluation of our techniques and system. Even though we did not set out necessarily to choose an ERP, we identified a problem, came up with generic requirements which were complex and extensive.*"

This is to be contrasted sharply with C1's case where the first instance of ERP selection (for ***Baan***) was driven by a few high-level executives at just subsidiary level, when in fact the authority and buy-in would have had to ultimately be obtained from the parent company in France.

This theme was also found to tie in closely with the next theme which relates to ERP vision.

FORMALISATION OF AN ERP VISION

It is important to compare the extent of the presence of an ERP vision at the outset of each of the cases presented here. Even though all of them had a primary goal of eliminating inefficiencies caused by the outdated legacy systems and integrating their departments into one single system, there is some contrast among the cases.

C1's ERP vision developed internally and in an ad-hoc manner as the project evolved, similar to a discovery. Its vision was mainly an internal one. It belonged to a group whose head-office was overseas and whose other subsidiaries operated independently from one another and that had already implemented an ERP system. Concerning the first ERP selection, although the actual process for selecting ***Baan*** took six to seven months, which was considered reasonable by the organisation according to the respondent, the process was rather superficial,

> "*...they [the committee] hadn't gone into great depths to ensure that the package was really what we needed – frankly I think they did it rather superficially...*"

This shows C1's weakness in their ability to determine their requirements before looking at possible vendors, which is another CSF in the pre-implementation phase of an ERP project. Also, what was revealed is that C1 did not involve key organisational staff on the acquisition process. The initiative for ERP adoption at C1 was local, i.e. it was not an initiative launched by the group head-office.

> *"...there was a lack of understanding as to what a computer software package requires as definition...Once they [the engineers] saw what the computer package could do, they realised the benefit of it – they were amazed and thought it should have been done years before."*

This shows that the ERP initiative at C1 was not only one that was driven internally but also had to be promoted to the head-office. This had to take place twice given the organisational restructuring that took place in the meantime. Essentially, in both instances, the need for a bigger organisational vision (and therefore buy-in) with adequate head-office commitment was deemed important.

"...the first decision to go for Baan was taken without buy-in from our parent company. Our IT steering committee consisted only of C1's members. It was not done on purpose but it was just thought that the parent company would not have much of a contribution because we each essentially operate in two different industries. So, they would not know much about our requirements; the second and final decision for Impact was not something that we came up with. The new owner said that's what we must implement."

At C2, the ERP adoption decision emerged at a group level and therefore was common to all other subsidiaries in the group even though those subsidiaries operate independently of one another and perform very distinct commercial activities ranging from manufacturing to non-manufacturing ones.

"...a high-level committee at the group level was leading the process and they had ensured that the three short listed options were presented to all management teams of all subsidiaries concerned. This reflected an adequate vision from the start but eventually, it seems that this exercise was redundant after all, because in the end the final choice was not something we had recommended."

Even though the decision to adopt an ERP package occurred at a group level at C2, this decision was based on practical problems affecting daily operations at the various subsidiaries – on a more strategic level, there seemed to be a lack of vision. As mentioned in the previous section on the basis for ERP adoption, not only did this have an impact on the effort spent on ensuring that individual subsidiaries' requirements were being adequately met but also on the fact that effort spent to obtain buy-in from all parties (extensive vendor demos) was wasted because buy-in in the final choice was inexistent.

Contrasted with this is C3's context, where the big retail group operates on a shared services model. The main objective for implementing an ERP was to integrate their major brands onto a single platform of core services including finance, warehousing, point-of-sale and merchandising. Thus, beyond the replacement of old systems and the integration of functional units laid a strategic business vision to which the ERP initiative had to be aligned.

"...initially when we (IT department) started this whole program with ERP, we created a vision called Odyssey 2005 which was targeting to implement the package we were to select across the entire organisation to integrate all its administrative functions and share them among all our subsidiaries selling our 3 major brands..."

However, despite the presence of this organisation's vision, it will be seen later that the initiative of implementing an ERP at C3 was mainly championed by its IT department, thus creating problems for obtaining full buy-in in actual decisions (see Internal Partnership theme).

C4, not a group but a big organisation, also identified strategic objectives at the outset of its ERP initiative. In fact, from a chronological perspective, C4's case emerged at a time, in 1995, when ERPs were relatively new as a concept especially in South Africa and especially in the higher-education sector. It was as a result of a rigorous investigation process that the option of an ERP presented itself, among other non-ERP options.

The main trigger was

> *"...the firm realisation that something needed to be done in the whole university system. We had had a major budgeting error and therefore we had to re-evaluate our systems. At Council level, we agreed that the university should think ahead and build a vision of how it wants to operate in the future. We did not set out necessarily to choose an ERP system, the notion was not yet widespread then but we soon found out that that could be the answer. "*

C5's ERP vision is rooted in the City council's mission undertaking major transformation in order to integrate seven local authorities, their systems, procedures and policies. There was a realisation that it was operating inefficiently with existing systems and therefore a long-term vision in terms of the objective of becoming a metropolis, hence the "smart city strategy", was necessary.

> *"...trying to maintain and integrate 113 legacy systems was simply not a viable option...the ERP programme was the largest component of a whole strategic transformation initiative, the Smart City Programme, geared towards establishing an e-government infrastructure."*

It is apparent from this discussion that where there is first an underlying organisational realisation and need for transformation and for a more strategic enterprise vision, the reason for adopting an ERP system then extends beyond the mere replacement of legacy systems and the integration of functional units via ERP modules. The *ERP mission* becomes more grounded in the organisation's mission.

FINALISATION OF ERP PACKAGE CHOICE

Following the first and second themes discussed in the previous sections, the basis of ERP adoption and ERP vision respectively, the next step is to discuss the basis for choosing a particular ERP package in each case. This is with a view of uncovering its possible impact on the way those organisations did or did not satisfy CSFs in the pre-implementation phase, and also whether it induced them to spend AUE in carrying it out. As discovered during this study, the path leading to the final decision for a specific ERP package may constitute an avenue for delays and disruptions to occur in the ERP life-cycle and hence for AUE to be spent trying to ensure success.

In instances where the organisation is a member of a bigger group of companies, the choice of a certain package is often dictated by the parent company or a decision-committee sitting at the head-office of the group that has the financial authority on the project. This is shown by the cases C1 and C2, the former a medium-sized company and the latter a small company, both child-members of a bigger group. The main difference between C1 and C2 is that C1's owner-company is a multinational whose head office is found overseas (i.e. outside South Africa) while C2 is a subsidiary of a group of companies that are all based, including head-quarters, in one place. In both cases, the final decision was delayed by the decision committee sitting at head-office who disregarded the requirements identified by key users who had been asked to provide such information.

In C1's case, following simultaneous events, i.e. the realisation that ***Baan*** was in fact an unsuitable option

together with the organisation's restructured ownership; the final choice of ***Impact*** was an imposed decision by the new owner, a big multinational, whose basis for the decision was the mere fact that its other existing subsidiaries were satisfactorily running this ERP package already.

> *"...the decision to implement **Impact** did not involve another selection phase – [it] was a straightforward, unilateral decision because every other company in the group had it, so the new head-office thought why it should buy a new software package just for this company."*

Again, the importance given to involving all parties, i.e. both from an end-user perspective as well from a financial authority perspective seems to have been ignored. C1's decision to implement ***Impact***, in particular, came as an order from the new head-office and did not make allowance for the establishment of an acquisition team to investigate whether this package was a more suitable one, compared to ***Baan***, for instance.

At C2, the choice for ***Sage*** was also a decision taken at the highest level by a committee sitting at the group's head-office. The decision was not only based on cost but also on the fact that the group had to satisfy a wide range of business requirements from its subsidiaries, both in the manufacturing and the services sector. The search for a best fit solution was a lengthy and tedious process which in the end necessitated a compromise which did not necessarily satisfy specific requirements of each company.

> *"...demos from each selected candidate (**JD Edwards, Navision** and **Sage**) were viewed by all managers concerned from each company including C2. **Sage** was not necessarily the best choice for C2 in particular. But other factors such as cost and satisfying the group as a whole were the deciding criteria. Eventually, the final decision rested with the committee back at the head-office and at this point, it was their decision, regardless of what other stakeholders recommended or thought. Also, they took a very long time to make this decision; it was not easy. We were kept waiting for about 13 months".*

To reach this final decision, C2 spent more effort than expected. Even though, they had taken a lot of care to involve user representatives in the vendor demonstrations, the same depth of involvement was not observed during the entire acquisition process. The acquisition team itself, in the end, consisted of head-office executives who did not ensure organisational buy-in in the final choice.

A factor to note in C1's case is that the initiative to implement an ERP system came from a local concern while in the case of C2, it was an effort launched by the group for all its subsidiaries. Still, in both these cases, the very final choice was determined by an executive committee sitting at the group level. Also, the main factor influencing the choice was *cost-effectiveness* as the emphasis was less on the need to satisfy requirements.

This should be compared for instance with C3 where, even though the initiative also rested with the group's head-office, there existed a common vision at the outset, to not only implement an ERP package but to also ensure that it would integrate all the brands operations efficiently (since they had already invested in one ERP module for the Replenishment department). An important point to note is that C3's organisation

operates under a shared services model unlike the case of C2.

At C3, the initiative was taken at the group level backed by an official vision in the organisation ("Odyssey 2005"). The difficulty lay in the type of decision that had to be made with regards to C3 contemplating a multiple-product approach. Having acquired a ***JDA*** license, the organisation was faced with a bias towards this package in the pre-implementation phase. From a cost-effectiveness point of view, many were in favour of implementing the same package across the entire enterprise, although they were still willing to invest time in making sure that this package would still be the best choice.

> *"we had bought the JDA license already, so we had to look at how to optimise it. It was quite a long process internally, going through a debate but there was a lead already regarding the **JDA** election...the selection process took longer than expected because we were making sure we weren't being foolish to use that product (**JDA MMS**) – we looked at the market to see what other retailers were using."*

In fact, C3 identified the replacement of their existing Point-of-Sale (POS) system as a prerequisite to the replacement of their core transaction system. Hence, the pre-implementation/acquisition phase was a process that led to the selection of another product, ***Retalix/Storeline*** for their POS function. C3 strategically prioritised it having realised that it is

> *"a building block to installing an ERP eventually and we had not identified any ERP package that had a POS module. We anticipated this to be a project on its own as well, a capital intensive program as POS devices needed to be replaced."*

Thus, C3's pre-implementation phase towards implementing ***JDA MMS*** as its core transaction system was paved with binding parameters such as the fact that it had already acquired a ***JDA*** license previously and the fact that it was acquiring different software for other functions such as the POS. Hence, the end decision really was to find a software platform that could adequately integrate different breeds of software across the entire enterprise, i.e. this "*finalisation of context*".

In addition to the POS system, C3 also acquired different products for its finance and warehousing functions. While the organisation was undergoing business diversification and expansion (discussed in next section), it was also delayed by decisions on acquiring multiple products for the various business units:

> *"...we were also trying to figure out what package to buy for our financials, whether to buy a new package or upgrade our current version of **SCM** for the warehousing. Basically, besides the organisation's new move to acquire pharmacies, the pre-implementation process itself had not moved into the logical process that we eventually moved into, i.e. to realise that we needed to a more integrated project like the one under way now. Our focus was mainly implementing and optimising **JDA MMS**."*

At C4, the path leading to the final decision to implement PeopleSoft was paved with a series of events that caused significant delays and disruptions in the pre-implementation/acquisition phase. Having been

through Project 1, the organisation had already embraced an ERP vision, of which the student module was a major requirement. The basis for the launch of Project 2 is that it occurred as the result of a redirection of Project 1 when ***SAP*** decided not to develop a student administration module. This event forcibly reduced the scope of project 1 and hence led to the under-budget delivery. Since the need for a student administration system was at the core of C4's information system strategy, C4 automatically had to consider an alternative solution which was found in the arrangement where ***SAP*** would oversee a pilot project for the development of the student system. That event, which happened in March 1999, marked the "pre-implementation" process of Project 2 as the decision was taken to implement a custom-built ***SAP*** student system. However, towards August 2000, Project 2 hit stumbling blocks when the progress on the pilot project was slow and unsatisfactory and hence raised concerns within the management team. This caused C4 to

> "*...have a look at the market and see what's out there. That lasted 6 months and happened twice in the project's lifetime.*"

This illustrates that besides the first pre-implementation/acquisition decision by C4 to opt for a custom-built solution from ***SAP***, the organisation was faced with a period where it was difficult to choose any other alternative. The choice that C4 opted for, for almost two years (up to November 2002), was "*not to do anything*". The latter even, though it translated into no progress was clearly expressed by the interviewee as a conscious choice that the steering committee made. What that created in the organisation, however, was "*a sense of uncertainty*" especially given the importance of the student system in the organisation's vision.

From the above discussion, it is possible to establish a link between the theme and the various critical success factors for the pre-implementation phase of the ERP life-cycle as identified in Chapter 2. This is backed by the responses to question 18 in the interview questionnaire where respondents were told to rate whether and, if so, to what extent (based on a qualitative estimation) AUE was spent on each CSF.

Of all the cases, C5's initiative was backed by a relatively more solid ERP long-term vision than in the other cases, as seen in the previous theme sections, and did not consume AUE in finalising its ERP package choice. C4 and C3 also show evidence of a vision and strategy present at the outset that extended beyond providing a solution to specific practical problems, the latter being more the case at C1 and C2. C3's and C4's pre-implementation phases still took significantly longer than they expected resulting in their spending AUE in carrying out the phase because of other factors such as the unavailability of viable options for the one and organisational context and strategic moves for the other.

C1's and C2's case reveal that a lack of or inadequately formulated long-term strategic ERP vision at the outset of the pre-implementation phase can have impact on the direction of effort in satisfying CSFs in that phase. When analysing answers to question 18 of the questionnaire, it is apparent that in both cases (more severely in C2's) there was an absence of effort ("No Effort") altogether in ensuring those CSFs were satisfied.

These three previous themes discussed above, the justification for ERP adoption, the formalisation of an ERP vision and the finalisation of ERP package choice, are interrelated and together affect the extent to which an organisation fares in satisfying CSFs during an ERP project. From the analysis, it is apparent that they have resulted in inadequate effort more than AUE (especially at C1 and C2) in satisfying CSFs such as planning, selection of acquisition team members, rigour, definition of requirements and the establishment of selection and evaluation criteria.

STABILITY OF ORGANISATIONAL STRUCTURE

In addition to those first three themes discussed above, other relevant themes were also found to influence AUE during the pre-implementation phase. For instance, organisational structure and internal context characterised the extent to which an ERP pre-implementation phase could be delayed thus causing AUE during that phase. This was particularly the case for C1 and C3 as discussed below.

At C1, the selection of Baan coincided with the sale of the company to a French multinational. This is a factor which is acknowledged to have:

> *"Certainly played a role in the delaying of the project; head-office knew they were going to sell it, so they just delayed the approval of **Baan**. Meanwhile, we had already started to invest in resources to learn more about **Baan** and to teach the links between Financials, BoM and Inventory modules and how it would fit to the organisation."*

The restructuring process led C1 to incur some extent of sunk effort along the "Baan" route even though the respondent was adamant that

> *"Even if the deal to sell C1 did not happen at that particular time, we would still not have gone ahead with the **Baan** project. We found out that we had underestimated the total cost: the 2.5M requested would only cover software while another 2M would have been required for hardware and network replacements."*

The latter statement reinforces the evidence that overall, the ERP initiative at C1 did not start with a rigorous pre-implementation/acquisition process, where requirements were identified as well as selection and evaluation criteria. With regards to the coinciding acquisition of C1 by another group, this affected project effort in terms of having to re-start the process and request for budget approval from the new parent company. Adjustments had to be made towards establishing the source of financial authority for the project. This was marked by a period of uncertainty.

> *"...people in Cape Town did not know the company was getting sold. All we knew is that the budget for **Baan** had been submitted to the old parent company and we were told that the decision is delayed and is under discussion."*

At C3, the pre-implementation phase first took a period of six months which was still considered as longer than anticipated, around December 2000, when the decision to extend the implementation of ***JDA MMS*** as the core transacting system was taken. This AUE, as mentioned in the previous section, was to ensure that

they were not making a wrong and blind choice guided by pure bias from the fact that they had already acquired the license and hence would benefit in terms of cost-effectiveness. While C3 was proceeding with this initial 6-month long pre-implementation process towards the selection of ***JDA MMS*** as the central ERP platform, the organisation was undergoing negotiations for strategic moves with regards to the acquisition of a series of pharmacies in the group. This constituted not only an expansion of business activities for C3 but also a diversification of business given that it had never traded in the pharmacy industry before. The impact that this had on the project's pre-implementation phase was that the process "stalled".

> *"...soon in this acquisition phase, when we were about to finalise our choice for **JDA MMS** and the scope of the project, we, especially at the IT department, realised that a new system was required because there were now additional requirements hence bigger scope; it was new business function based on a new strategy. Suddenly, we had not provided for that."*

While it had been decided at the end of the initial acquisition process that the implementation of ***JDA MMS*** would start with the two major brands of the group, the focus shifted or "deflected" to the newly acquired pharmacy division.

> *"...it was early 2001, we realised we needed to start a process of putting **JDA** in for pharmacy. That became a priority, changed the initial focus entirely. It extended the process because we had to review the suitability of **JDA MMS** for pharmacy."*

Furthermore, where this organisational strategic move further impacted on the AUE that C3 had to spend on the pre-implementation phase relates to what is referred to as the "*finalisation of context*" in the case profile. Due to the fact that C3 embarked on a multiple-product approach to ERP implementation with the prior acquisition of multiple product licenses namely ***SCM*** and ***Retalix/Storeline*** and ***JDA MMS***, a main task during the pre-implementation phase was to define how those various systems would function together, hence the "context".

> *"...this contributed to extending the finalisation process and hence the implementation phase".*

This process was delayed a second time by another strategic move in the organisation when they decided, during late 2001, to acquire a license to operate an overseas franchise in South-Africa.

> *"We were now reaching the end of 2001, we figured out that **JDA** would not work for the financials, after scanning the market and options, we decided to select **SAP** for our Financials. For the Warehousing system, we decided to upgrade our existing **SCM** license so that it integrates with **JDA MMS**. Now, amid all this, the organisation announces that it is acquiring a new line of business, a beauty franchise from the UK...this created a second deflection in the process."*

This second business had similar implications as to the event of acquiring pharmacies, as additional new requirements had to be identified and included in the scope of the project and C3 experienced a backlog of human resources able to work on this extra component of the project.

> *"We got stuck in a phase of how to bring this new business division in our current systems. At one*

*point we thought we would bring it on **JDA** but we could not see how to make that happen so we thought of taking it first to our legacy system. This further delayed the whole process of finalising the context. The same project team was working on figuring out how **JDA** would work enterprise-wide and on getting that new business onto the legacy system. It delayed us for a good 4-5 months in terms of finally starting implementation. We only got to start towards the end of 2002. The final complete picture took us so long; we were delayed by about a year to start implementing.*"

In contrast with C1 and C3, C5 handled changes in the organisational structure and context relatively better with regards to the occurrence of delays and disruptions during the pre-implementation phase. The latter process took 8 months, roughly about 2 months overdue.

"...the selection process was extensive and spanned over long but not overly so...when we had political turmoil, leadership changes, nothing changed in the process be it the selection or implementation phase...over the last 3 years, we had three mayors, the walkover, different parties in government, and two financial directors. While all that was happening, the threat to the program to stop was reduced, because at all times, right from the start, buy-in was unanimously secured from all parties concerned."

Thus, despite events causing instability, the selection process at C5 was not delayed by more than about 2% which

"...from a budget perspective is minute compared to total project costs. It was a lengthy tender process and everything else around it was well managed."

AUE that was spent was judged not significant and in the case of facing organisational re-structuring and instability, C5 did allocate its AUE to ensuring that there was adequate user involvement during the acquisition process, and complete buy-in for the final choice.

Based on the above analysis, the magnitude of AUE spent on satisfying CSFs was influenced by the changes in organisational structure and its internal context. This factor was found to have an impact mainly on the establishment of clear and unambiguous authority (as in C1's case). The definition of requirements (significant impact), establishing selection and evaluation criteria as requirements keep changing as in C3's case.

ORGANISATION AND FLOW OF THE ACQUISITION PROCESS

From an analysis of the cases observed, it seems that in certain instances, namely C1 and C4, significant delays were experienced due to the fact that the sub-processes constituting the acquisition phase were taking place in a disorderly fashion due to the number of re-iterations of certain sub-steps, for instance, at a later stage in the project. At C1, for instance, following the first selection of ***Baan***, the organisation only then decided to hire an outside expert to advise them on the suitability of the software for their requirements:

*"...after selecting **Baan**, we called in an outside consultant for him to teach us the links between*

inventory control and the Bills of Material (BoM) modules. While this was being undertaken, this whole transfer of ownership for the company was taking place and by the time, the deal was closed, we had spent time and money on learning how to use Baan."

This, again, shows that inadequate effort had been spent by C1 to satisfy important success criteria such as the definition of its requirements before looking at potential vendors and the establishment of selection and evaluation criteria. This caused the organisation, upon the realisation that it had insufficient knowledge of the package it selected, to spend this effort after the choice had been made. Furthermore, this effort became a sunk cost to the company when it turned out that the choice itself was obsolete and that another package was to be chosen.

In case C2, significant delays occurred not only at the stages of the evaluation and final choice of package as explained earlier but also when the organisation had to almost re-do the requirements definition task which was inadequately done at the pre-implementation phase.

*"...we hired a team of local experts to advise us on the choice of package. Once **Sage** was selected, after a huge delay still, a team of experts from the vendor, **Sage**, in South-Africa was shipped here. These people took over from the local consultants and did a rushed job so much so that in the end, the implementation went totally wrong because the requirements definition was not done in depth and the hand-over was also inadequate. This sent us back to the drawing board, i.e. having to redo the exercise. By then, we had already incurred sunk costs all the way to a failed first implementation."*

Besides the impact this had on the first implementation of the system, this shows that a serious lack of effort was allocated to the definition of requirements, coupled with a lack of monitoring of the quality of service delivered by the external advisers during that phase contributed to the fact that tasks from the acquisition phase had to be re-done at a later stage. It is also apparent that C2 experienced difficulty in maintaining a close relationship with both the advising consultants and the implementation partner, not withstanding the fact that the transition or cross-over between the two teams was sub-optimal.

In C4's case, the pre-implementation process for the student administration system spanned over many years and over two projects, and because of the fact that several acquisition decisions were made, sub-stages of the process were iterated thus presenting a disturbed cycle.

*"...you could argue that the acquisition phase took 2, 3 or even 5 years because of so many periods of iterations during the process. First, there was a period when we considered ourselves pilot members for **SAP Campus Management** which was one acquisition decision. Then, we went through a period of re-looking at the market thus re- iterating the search phase that lasted 6 months. That was not conclusive at all; we stagnated there because we did not have any option but to carry on being a pilot site. There were no better options for almost 2 years. We looked at the market again when **PeopleSoft** came into the picture, also lasted about 6 months. Because of this, we also had to have continuous and regular meetings with the steering committee members, keep everyone involved and informed"*

Thus, C4 had to spend AUE on planning for implementation, keeping track of requirements every time the

process stagnated and also in maintaining user involvement in the process over a lengthy period of time. It can be argued in C4's case that it is the overall acquisition process that was re-iterated and not sub-stages within a process even though those sub-stages experienced significant stagnation due to unsatisfactory progress by the service provider on the pilot system, and also due to market conditions.

As an indication of such stagnation at C4, significant AUE can be observed for particular CSFs such as planning and initialising for the Implementation phase, definition of requirements and the establishment of evaluation and selection criteria. However, it can be observed that at C2 and C1, it is their inadequate effort that led them to the re-iteration of sub-stages of the same acquisition process. In C1's case, requirements had to be re-looked at just before the launch of the implementation phase whereas at C2, AUE was spent when the project first went through a failed implementation.

NATURE OF MARKET CONDITIONS

Even though the analysis points to the weaknesses of organisations during their pre-implementation phases in ensuring adequate bases for adoption and vision, package choice, stability of organisational structure, there are also factors outside the organisation's control, especially with regards to the market environment. These include economic performance and sourcing options, which are sometimes to blame for delays and disruptions and hence AUE during the pre-implementation phase.

For instance at C1, external market conditions such as the general performance of the local economy compared to the rest of the world, and the increased importance of electronic commerce were determining factors in the quality and length of the pre-implementation process, especially when coupled with change in ownership during the course of the process.

> *"..the one factor that really sent us delaying the entire project, i.e. both the pre-implementation process and the implementation process is the fact that South Africa went into depression at that time, very bad for our type of industry as we are mostly focused on exports. The boiler market by its very nature needs large capital expenditure. While we recognised the need to replace our legacy systems, we seemed to have ignored the fact that we also needed a system that would allow our products to be standardised and increase our sales."*

This confirms the point made earlier about C1 not spending *adequate effort* in identifying system requirements and setting selection criteria at an early stage in the pre-implementation phase, thus making their vision, basis for adoption and final choice rather weak.

> *"...at some stage, I came head-to-head with people: so far, we looked at everything as an once-off project; if a hospital required a boiler, they would look at the specific room where it would have to fit –but the type of export market now required a system that could dictate commonalities with previous boilers built, something that could also track stock. Basically our BoM had to be revamped- the whole business process."*

To come to this realisation only after having chosen the ERP package to be implemented translates into a

kind of reverse pre-implementation process for C1. It might be argued though that the change in the nature of the export market and the state of the South African economy revealed themselves only gradually, while they were going through the process. Also, it could be argued that their attention was at the same time taken up by the change in company ownership and debates about the new package to install. Nevertheless, the above discussion demonstrates that a change in market conditions, i.e. external to the organisation, provoked a delay in the project by the postponement and re-iteration of critical stages of the pre-implementation process thus causing AUE.

In the case of C4, market conditions played a major role in causing the multi-year delay in the finalisation of the pre-implementation process, especially with regards to the choice for PeopleSoft. While ***SAP***'s ***Campus Management (CM)*** was becoming a less viable option, given the unsatisfactory progress of the pilot system, the market did not provide better alternatives for a relatively long period of time, which caused the steering committee to make another type of selection decision, which they called a "non-decision" or "holding process":

> *"...around Aug 2000, we reached a point where **CM** was slowly disqualifying itself – we decided to have a look at the market to see what other options were available – for 6 months, we looked and found nothing. We decided, for want of any better, to stay with **CM** but we were definitely launching a search process for another package."*

C4 maintained that it had no other option but to wait for the market to sort itself out because none of the ERP vendors had yet developed a pre-packaged module for the higher-education sector. The waiting period witnessed several overseas trips by the project manager with the purpose of investigating problems that overseas institutions have in terms of implementing an ERP package and the solutions they use to address these problems.

> *"while we were agitating another search exercise for alternative options, our project manager was sent to other institutions and user-group conferences overseas, mainly in the US, to find out what kind of packages they use, whether our problem is general and what solutions there are -turns out that other institutions also experienced the same problem; not having a solution specifically developed for the higher-education sector. Furthermore, us being in South Africa, it would be even less likely to source a solution as fast as customers in the US or Europe."*

Hence, the delay at C4 towards selecting ***PeopleSoft*** almost took 2 years because of the fact that the organisation had to wait for the market to offer more and better options than the existing ones both from the perspective that the ERP software market was underdeveloped for the higher-education sector and also from the basis that C4 found itself in a disadvantaged position being geographically distanced from the main source of support for such innovative software.

In dealing with factors outside the organisation's context such as the state of the economy, geographical location or lack of local sourcing options, organisations like C1 and C4 had to suspend their pre-implementation phase either to re-assess the market (in the case of C4) or to re-define their requirements prior to implementation (in the case of C1). This market re-assessment at C4 translated into

AUE especially with regards to the overall planning task towards initialising the implementation phase's success factors. For C1, with the initial inadequate effort at taking market conditions into account, it was subsequently faced with AUE in satisfying those pre-implementation CSFs such as planning and definition of requirements at a later stage of the project, after the choice for the package was made.

TYPE OF PARTNERSHIP APPROACH

Another factor that was depicted as being influential in determining the extent to which a pre-implementation phase of an ERP project may be delayed is the type of partnership approach adopted by the organisation during the process. Partnership refers to both the internal partnership set up among the various user communities in the organisation as well as interaction with external partners such as the vendor and/or implementation partner (if applicable).

Type of Internal Partnership

The analysis reveals the way in which the effort spent in ensuring success in their pre-implementation depends on the type of internal partnership approach adopted by that organisation. Whether the latter involves its users in the process, in the vendor demonstrations as well as in the final choice or whether it ignores its importance determines success in both the phase and the overall project success. In fact, it was found that in this phase, it is rather inadequate effort that characterizes this factor as opposed to AUE. It is discussed later that ignorance of its importance in the initial stage of the acquisition process, can lead to AUE either later in the phase or later on in the project, i.e. in the implementation phase.

In C1's case, it was observed that there was a lack of effort in involving users in the process, including vendor demonstrations, as well as the final choice, due to the fact that it was probably not deemed important by the decision-makers. On the one hand, for the first selection (***Baan***), C1 not only failed to involve users from its own internal organisation but also from the head-office where the authority of choice lay. This resulted in a lack of general buy-in from all parties as the process of getting approval for the initial budget was stagnant and inadequate.

> *"...for the selection of **Baan**, no one from the parent company was involved because management thought they would not add much value to the process since the parent company is essentially involved in a different industry (energy generation) but then later on when we needed approval from them, it took a long time plus there was the motion to sell the company occurring in parallel which we ignored."*

Thus, from an internal user community perspective, C1 failed to get buy-in in the pre-implementation phase. As will be seen later, this resulted in AUE spent in this regard at the start of the implementation phase.

> *"...it was disappointing that people especially from marketing and engineering departments did not want to buy into the proposed solution (BPR) until they saw the first two drafts."*

From the analysis, C1's inability to obtain buy-in was more the result of the lack of effort in first defining requirements and establishing the selection and evaluation criteria, as discussed earlier in this chapter. In

addition, very little effort was allocated to obtaining user buy-in overall. The internal partnership approach at the pre-implementation level at C1 was not adequate in ensuring success in that phase. This led, as will be seen later, to AUE being spent on obtaining buy-in at a later stage in the project life-cycle.

At C2, there was an apparent lack of effort in obtaining user buy-in especially in the final choice. This is reflected in Fig. 5.2. An interesting point to observe was that the steering committee sitting at head-office level ensured the involvement of the user community extensively in the vendor demonstrations, but excluded the same community and its key user representatives from the final choice:

> *"...there were those 3 options that the high-level committee had short-listed but then they wanted a good sample of managers from each subsidiary concerned to get involved in the process of evaluating those options based on what they understood their requirements to be. But it remains that the final choice was still theirs and theirs only – and generally, recommendations were not pointing at the package which was chosen. So, at the end of the acquisition phase, we were faced with a buy-in problem still, if not a worse one."*

Hence, contrary to C1, C2 had seen the importance at the pre-implementation phase of involving the user representatives in the acquisition process and vendor demonstrations, but unfortunately failed to sustain this effort by making sure that buy-in was also obtained in the final decision. In fact, it emerged that the basis of the final choice was not as much the satisfaction of requirements as the cost-effectiveness of providing a global solution to all subsidiaries, as has been discussed previously. The consequence of this for C2 was that AUE had to be spent in reviewing the evaluation and selection criteria and obtaining this buy-in from the user community at a later stage, thus repeating the relevant acquisition stages, and delaying the project.

For C3, given the complexity of the project, i.e. having to decide on a multiple-product approach and more importantly to decide on the package which would be at the core of the enterprise's operations, the organisation needed the buy-in from top-management level. The championing of the project, however, essentially lay with the IT department.

> *"when we were trying to decide whether or not to implement JDA as our core system and also decide on what other packages to buy, it was not a business focus yet; C3 was not yet convinced we needed to do that yet. It was really where IT took a stance and said that we really did need it. IT was championing the initiative. Also, what that meant was that the Business was not putting IT under any pressure to complete the project in a specific time frame."*

Furthermore,

> *"another way in which lack of top management buy-in delayed our pre-implementation was when we had to accommodate the second wind of change in business when we acquired the UK franchise. Because management did not buy-in into our whole initiative, we had to use the same resources to do two jobs. They would not give us the resources to hire a different team to integrate the new entities' requirements in our system. Because they did not think this project was important enough they did not think it was going to be detrimental to divert resources."*

At C3, additional effort had to be spent not only on getting top management to commit to the integration project, but also in defining requirements as the scope of the project was growing due to the series of organisational business imperatives. The problem was three-fold:

> *"...there was management/business that did not see the point of the integration framework, and then we (IT department) had to champion the project plus understand the pharmacy business in order to factor in new requirements then again obtaining no support from management because the organisation itself has yet to learn about its new line of business."*

The three cases discussed above can be contrasted with the other two cases where it was deemed that *adequate effort* was allocated to obtaining buy-in from the user community. C4 and C5 both reported that overall, their effort spent on involving users in the entire acquisition process consumed AUE but not to a significant level.

> C4: *"...the steering committee consisted of members representing all user groups and who had a very good view of their requirements of the system and how they fit in the bigger picture. When it came to vendor demonstrations, we made sure that those key user representatives were present. Because the committee consisted of a large number of individuals it was time consuming to arrange for regular meetings to which attendance would be satisfactory and those demos also took a lot of time to put together and also we had to meet to give feedback and evaluate together."*

> C5: *"...the selection process spanned over long. We had to deal with a selection committee of about 50 people. From a people management point of view, this was a massive task. Plus operating in a politically charged environment, there were people in complete favour, some who would be neutral or uninterested and some who would be totally against the project. We had to go at lengths to make sure that despite this politically charged environment, we get complete buy-in from the key decision-makers and leaders."*

Hence, the type of partnership approach adopted by an organisation internally, i.e. with its user community, in getting involvement throughout the acquisition process is crucial in ensuring the success of that phase especially in terms of securing buy-in. It can be observed that in cases where organisations allocated, in their view, adequate effort and even AUE but not to a significant level to satisfying CSFs such as the involvement of users in the acquisition process, vendor demos and final choice, the overall extent of AUE spent in the pre-implementation phase was relatively less compared to those who reportedly spent an inadequate effort in addressing those issues. However, it could be argued that C4's total AUE in the pre-implementation phase is still higher than C3's even though it dedicated more effort than C3 to address buy-in issues in that phase. This was due to the significant AUE spent in planning, establishing selection criteria and maintaining external partner relations. (see Table 5.1).

Another important point is that C1, C2 and C3 who apparently spent inadequate effort in gathering user buy-in in the acquisition phase, also report similar inadequate effort in the careful selection of acquisition team members. Even though none of the respondents explicitly discussed this issue especially in regards to the impact it had on the success of the phase, their captured perceptions tend to support this.

This is to be contrasted with C4 and C5 where, on average, adequate effort was deemed to have been spent in gathering user buy-in as well as in selecting the acquisition team members. This issue is raised here to make highlight that adequate effort spent in carefully selecting decision-makers ensures that, on the decision-making team, are key user representatives whose understanding and position on the committee would allow them to provide the necessary contribution to secure the required buy-in from the user community at large.

Type of External Partnership

External partnership refers to the long-term and sustainable interaction between the organisation and an external partner such as the ERP vendor and/or the software implementer consulting on the project. For some, inadequate effort in this respect constituted a shortcoming in the pre-implementation phase and caused the project to suffer at a later stage. For others, even though the organisation realised the importance of this success factor, its fulfilment was subject to difficulties partly due to external conditions.

For C1, C2 and C3, specifically, the building of a sustainable relationship with external partners was judged to witness inadequate effort in the pre-implementation phase. For C1, the strategy to outsource systems acquisition and implementation was limited to the hiring of a business expert, an ex-staff member who not only worked with the legacy systems but also knew the business throughout including weak or inefficient areas. Even with regards to their first selection of ***Baan***, C1 hired the services of a ***Baan*** expert because they had identified a specific area where they felt too ignorant to go forward without anticipating that such assistance would be required on a long-term basis.

> *"...called an outside **Baan** consultant to learn specifically about BoM, to teach us the links between Inventory and BoM."*

With regards to the second and final choice of Impact, C1 only realised the importance of hiring an outside consultant to assist on the project by the time the pre-implementation phase was concluded. Overall, external partnership was not an issue of concern during that phase at C1.

At C2, it was also deemed that effort towards building a sustainable relationship with the external partner/s was inadequate. First, C2 hired the services of an advisory firm to assist on their selection process. These pre-implementation advisors were in charge of conducting a preliminary analysis of requirements at C2 and other subsidiaries and handed over their work to the implementation team. However, only with hindsight did the company realise that the requirements definition was not thorough enough to serve as a basis for an adequate implementation. This task had to be reworked at a later stage after the unsuccessful implementation.

> *"the team of outside consultants that helped us on selecting the package turned out not to be the ones to be our software implementers because we had chosen a package for which support could only be sourced from South-Africa where the vendor was located. We found at a later stage that our requirements were not thoroughly defined enough, that there was inadequate handover between the two teams basically. We had not addressed that in that phase."*

C3 also claimed inadequate effort spent on building a sustainable relationship with its external partner during the acquisition phase.

> *"...during the evaluation period, there was some iteration because we changed consultants. The person who had overseen the evaluation activity that led to the selection of **JDA MMS** as the core system left and the new person came and redid the exercise, reworking through the processes and requirements in greater detail."*

Furthermore,

> *"some external consultants from the initial team left at a critical point thus causing work to be repeated by new people. In the overall picture of the project, the process was stagnating waiting for that repeated work to be completed. All this is also related to the fact that the project had not yet gained a business focus and was still being championed mainly by the IT department."*

This acknowledged inadequate effort on C3's part reflected in AUE spent in establishing evaluation and selection criteria as well as in finalising requirements definition (see Table 5.1).

C4, on the contrary, claims to have spent significant AUE on the establishment of sustainable external partner relationship during the pre-implementation phase which directly impacted on the delay experienced during that phase.

> *"...things were stagnating in terms of decisions: we really were reaching a point where **Campus Management** was excluding itself...if the progress in terms of pilot site trials with the vendor had remained on track, we would have been implementing **CM** today. Somehow, we relied a lot on the commitment made by the headquarters in Germany not realising that the support would have to come from the local branch. So, there was a lot of lobbying."*

The above statement refers to the ***SAP CM*** pilot project, but with regards to the selection of ***PeopleSoft*** as the new student administration package, C4 also went through a period of uncertainty in choice because of the newness of the vendor in the country, especially with regards to the higher-education sector.

> *"...our planning task took longer than expected with regards to **PeopleSoft**. We were facing a problem in terms of implementation partner scarcity as we were not finding one that could satisfy us on all plans: quality, price and support. All this was because of the newness of the software, the **PeopleSoft** student system in the country."*

Hence, in both stages of the project, i.e. when ***SAP CM*** was being considered as the candidate of choice through the pilot agreement and also when ***PeopleSoft*** emerged on the local market, C4 faced difficulties in trying to establish satisfactory external partner relationship. In the first instance, it was with regards to guaranteeing support from local consultants and in the second, it was concerning the scarcity of knowledge and skills on the premature local market.

From the above analysis and upon analysis of Tables 5.1 and 5.2, it is observed that C1, C2 and C3 all claim to have applied *inadequate effort* in establishing sound external partner relationships in the pre-implementation phase whereas C4 is the only organisation who spent significant AUE in trying to do so. C5 claims to have spent adequate effort with regards to that CSF. Based on the qualitative analysis,

from C4's perspective, significant AUE in establishing external partner relationship was paralleled with a similar significant AUE in planning and initialising the implementation phase. Interestingly, an inadequate effort in the one was matched by a similar inadequate effort in the other at C1, C2 and C3 while C5 reported a similar match of an adequate effort spent in both CSFs.

5.2.2 Implementation Phase – AUE Themes

The graph in Fig. 5.2 shows a comparison of the percentage of AUE spent during the Implementation phase of the ERP project. The figures represent estimations based on the respondents' perceptions.

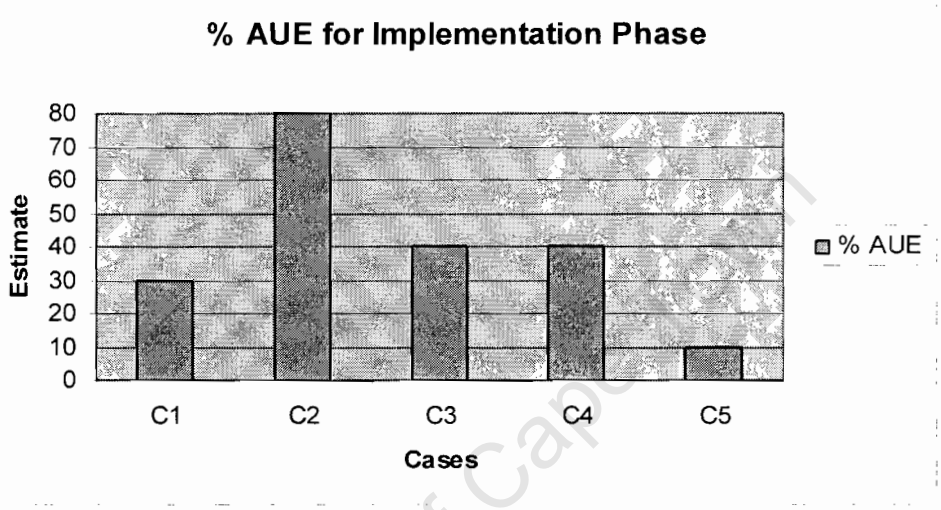


Figure 5.2: AUE in Implementation phase

C2 reports the highest degree of AUE at 80% which is significantly higher than the rest of the cases. It is followed by C1 (30%), C4 (40%), C3 (40%) and C5 (10%) respectively. It is critical to point out here that at the time of gathering these data, C3 and C4 were still undergoing implementation and gave estimation of anticipated AUE and time to project completion. Based on those comparison figures and supportive qualitative data from the interviews, this section analyses the themes that characterise AUE in each case.

FORMALISATION OF IMPLEMENTATION STRATEGY

A qualitative analysis of the interview data revealed that in certain cases, especially at C1 and C2, the strategy chosen to implement the ERP software package influenced the degree to which AUE was spent in that phase. All cases were focused on implementing selected modules of the package with C3 adopting a multiple-product approach in that respect. It was also found that most cases adopted a strategy to implement selected modules of the chosen ERP software as opposed to implementing the whole suite, with the exception of C5 where the project involved implementing the highest number of modules of ***SAP*** - 7 in total (see Appendix B for details of the technical scope of the discussed projects).

All cases seem to reveal that their ERP implementation strategies were more geared towards adapting the organisation and its business processes to the software as opposed to customising and modifying the software to suit their needs. This is reflected in that all cases claimed adequate effort in avoiding

customisation even though only C3 and C5 reported spending adequate effort in performing comprehensive BPR.

At C1, it was found that the lack or inadequacy of effort in satisfying pre-implementation CSFs such as planning, definition of requirements, and establishment of selection and evaluation criteria specifically led to a late realisation of the potential strategic benefit that a ERP software package could give the organisation. Since C1 struggled to obtain management commitment with regards to implementing an ERP in the first place and also in identifying the actual requirements for an ERP, the implementation phase was launched with very little definition of such requirements and strategy.

> "*there was a lack of understanding by the engineering department as to what the software could do for them and we were already in the implementation phase. The package was chosen already but the important user community had not bought in yet.*"

Hence, the lack of implementation strategy at the outset of the implementation phase is also acknowledged to be a consequence of the lack of involvement and buy-in from key users/department during the previous decision-making during the pre-implementation phase. It was then only in the beginning of the implementation phase that the team of system implementers tackled the task of defining system requirements thoroughly both for the sake of that preliminary task but also in view of obtaining buy-in.

> "*...we literally sat with the engineers to analyse drawings and try to align our production process with the software functionality. We set up a timeline with the BoM, timing of the whole production process and see how we could standardize the process. One thing we were all aware of was this business requirement for standardisation and efficiency due to current market conditions.*"

Once the necessary buy-in was obtained, only then did C1 come to realise that their organisation required a re-engineering effort in order to be able to implement ***Impact***. Also, only then could they decide on an overall approach, i.e. which module to implement first and which unit to target first.

> "*... We decided on a strategy whereby we would allow input from crucial departments like engineering, marketing, drawing office and wanted to a thorough, rigorous job, even if late. We realized we needed to optimize the use of the software and adapt our processes to it once we found what it is capable of. This realisation of the need for BPR came late in the project really put on hold the implementation. In other words, we were doing what should have been done when we were still motivating the whole project.*"

Thus, at C1, the timing of the decision to perform a BPR exercise only at the end of the pre-implementation phase cost them significant AUE in relevant CSF categories as illustrated in Table 5.2 earlier, namely "adequate implementation strategy" and "comprehensive BPR".

At C2, the implementation phase revealed relatively more AUE than in the other cases; it is indeed found that several CSFs were perceived to have consumed *significant* AUE as seen in Table 5.2. More specifically, C2 spent significant AUE due to the fact that it had to go through a failed-first implementation and encountered several obstacles during the second one, following the inadequate effort in addressing

several pre-implementation CSFs as shown in the previous section.

> *"...the team of implementers from South Africa took over from the acquisition consultants and delivered a system that did not work at the end. It was a complete failure and we now had spent money shipping them over. We sent them back home and re-launched the implementation. When that happened, that's when we realized that many things had not been done properly at the pre-implementation stage."*

In the first implementation, C2 had underestimated the importance of several of the critical tasks in the acquisition phase and also that of establishing an adequate implementation strategy at the outset of the implementation phase and that both management and implementers agree to. C2 had made no formal decision on whether the implementation approach would be a phased one or big bang one for instance, but left the outside consultants to steer the process.

> *"...essentially we were expecting the system to be delivered to us somehow according to requirements of which we knew very little in great depth ourselves. We allocated most of that responsibility to the outside consultants which in the end cost us everything. We virtually had very little strategy in place except for the fact that we knew that we would not modify the software; it was going to be more of a plug-in approach which surely did not work. We did not even know whether we needed any BPR for instance"*

For the second implementation, C2 had to reiterate tasks that had suffered from inadequate effort in the pre-implementation phase such as "planning", "definition of requirements" and adequate cross-over to implementation" and spent AUE setting up a new implementation team to redo those tasks.

> *"...once it was finally decided to source the implementation of the ERP system from the group's in-house IT company, this in itself was a decision that had to be taken. Then, the new team had to sit with management to decide on a strategy and project plan for the whole group. Took more time again"*

The implementation strategy, in this case, consisted of making C2 the first of the five subsidiary-implementations and the modules specifically selected for the particular company were to be implemented with minimal BPR.

> *"we had already lost so much time and we needed a working system soon. C2 was hence the first to go. 5 functional areas and modules were to be implemented at C2 within a fixed timeline of 6 months"*

However, it was soon discovered that requirements definition for C2 was not rigorous.

> *"the new team had to spend time re-looking at the work that was handed over from the team of analysts from the pre-implementation phase. To proceed, they had to first come up with more thorough specs. This constituted a revision of strategy and schedule automatically."*

At C3, C4 and C5, it was claimed that the formalisation of an implementation strategy consumed adequate effort (Table 5.2). This is probably because it was planned for during the pre-implementation phase, as adequate effort was spent on "planning" (significant AUE in C4's case) and "rigour" and "definition of requirements" (significant AUE in C3's case) in that phase.

MANAGEMENT OF ORGANISATIONAL MOMENTUM AND RESISTANCE TO CHANGE

During the implementation phase, another important theme that was revealed to have influenced AUE is the gathering and sustenance of momentum from important parties, including top management and key users in the project. This is a theme that is closely linked with the internal partnership theme identified from the pre-implementation phase and to the implementation strategy theme discussed above. The organisation needs to assess how the implementation of the new system will change the way the organisation operates. Cases where this theme was particularly present are C1, C2 and C3.

At C1, difficulty in gaining momentum mainly concerned key user groups and decision-makers whose buy-in was not secured in the acquisition phase. As explained in the previous section, at the realisation of the need for BPR only in the implementation phase, C1faced difficulties and spent significant AUE to communicate the purpose of the ERP project to its key user departments, namely the engineering department and marketing personnel. To achieve this, C1 had to invest extra effort in ensuring (i) a sustained management support, (ii) a strong role for the project manager in leading this additional effort, (iii) involving users extensively to promote the idea, and (iv) increasing their level of dedication and belief in the project, as well as (v) establishing trust between user groups, management and system consultants from the IT department.

> *"It was disappointing that user groups mainly, not people on the steering committee, did not want to buy into the project until they saw the first two drafts. The project manager (PM) had to spend a lot of time convincing them that the system was required and would work better for all. Then, because this was consuming resources, management and steering committee members became weary of financial cost overruns and also loss of momentum for the project. Hence, PM had to spend time reassuring management and keep their support level high."*

C1 sourced the expertise to implement the project in-house and did not experience a problem of trust between partners such as external consultants. Furthermore it did not have problems with the hardware or software vendor. However, the difficulty of gathering buy-in from relevant departments came from the fact that the IT department found itself as the main champion of the initiative and had to mediate between top management and floor managers. In this sense AUE was spent establishing trust between those parties internal to the organisation.

Also C1 spent significant AUE on implementing effective organisational change management and in gathering organisational momentum and dedication from those key user departments.

> *"When we realised that BPR was imminent, we hit the resistance to change factor. The people in the engineering and production section were quite happy with the way they operated and saw no need for change. This is where we had to spend so much extra time sitting with them in the drawing office, understanding how manufacturing works and explaining to them how the system would bring good changes; how market conditions were an imposing threat."*

C2, also as a result of its inadequate effort of gathering buy-in from users during the overall acquisition process especially in the final choice, spent significant AUE in involving users in the implementation phase. This was paralleled by similar AUE in establishing trust between partners, both from an external as well as an internal point of view, even though it reported a non-significant additional effort in ensuring sustained management support throughout the phase.

> *"...we first had to resolve the failed implementation with our outsourced team of expatriate experts who did a rushed, superficial job that did not work and left us like that. Also, we had to decide what to do next. All this took a lot of extra effort we had not foreseen. All along, Management of the group was very well aware of the criticality of installing an ERP so it did not take too much convincing to be done at this level to still have this project implemented and ensure sustained support from the top."*

The in-house team of implementers hit obstacles when carrying out the second implementation as they found out that requirements had not been specified rigorously and hence had to reiterate preliminary tasks. At this point, user groups, in this particular instance C2, were exhausted and impatient especially given the fact that buy-in was not sought from them in the final choice.

> *"...there was resistance and impatience from user on all levels: psychological, operational and even emotional. First,* ***Sage*** *was not particularly their first choice when they asked to evaluate options. Now, they were asked to put time aside again to assist with the second team. There was an element of trust that had to be managed from them plus we had to get them to believe in the system and project overall."*

This lack of trust from user departments made resistance to change in work processes even more difficult.

> *"We also faced strong resistance to change when it came to implementing changes in business and work processes. Some people were very weary and felt threatened."*

While it did not require significant AUE to maintain support from top management for the second implementation, the project management team had to spend significant AUE in its role to gather momentum and overcome resistance from users in the organisation.

For C3, similarly, the consequence of inadequate effort spent in the pre-implementation phase in obtaining adequate user buy-in throughout the pre-implementation phase is the significant AUE spent during the implementation phase on obtaining both a sustained top management support as well as ensuring adequate project championing. This is due to the fact that C3 was already struggling to gather management commitment in the pre-implementation phase. Even though C3 spent AUE in obtaining management support and in defining requirements in the pre-implementation phase

> *"the problem of getting management to buy-in persisted in the implementation phase. They became convinced of the integrated framework and its complexity only by 2003 when IT had been left to champion the project all the time - we really spent long trying to make management understand the extent of the complexity of installing* ***JDA MMS*** *to integrate the different systems. Once we got more management support, we had to proceed to get more users to involve themselves in the implementation, dedicate time and belief and ultimately to trust us."*

Compared to C4 and C5, C1, C2 and C3 underestimated or spent inadequate effort in gathering user buy-in in the acquisition process and the final choice with C1 even reporting "no effort". With regards to obtaining management support and commitment in the pre-implementation phase, C1 and C3 particularly struggled and spent some AUE in that respect (Table 5.2) while C2 reported that it had spent an *adequate* amount of effort as it did not struggle to convince management of the need for an ERP. Overall, the combination of inadequate effort and AUE in satisfying pre-implementation CSFs led to significant AUE being spent on implementation CSFs such as sustained management support, adequate project champion role, user involvement and participation, trust between partners, dedicated staff and consultants as well as adequate inward communication.

At C4 and C5, gaining momentum for the implementation phase was not a problem that consumed AUE even though C4 suffered from the most severe AUE in the pre-implementation phase. In both cases, it was reported that they had spent adequate effort and had successfully gathered the necessary buy-in from important parties including commitment from management. This is probably due to the fact that the basis for ERP adoption and hence ERP vision was strategically driven at the outset, championed by top management as opposed to it being the IT department's responsibility (as in C1 and C3). At C2, momentum was lost because of the failed-first implementation.

MAINTENANCE OF EXTERNAL PARTNERSHIP RELATIONSHIP

The establishment of sustainable long-term partnerships with an external partner such as the software vendor or third-party implementation consultants is a critical success factor in the pre-implementation phase as discussed earlier. C1, C2 and C3 acknowledged that they had spent inadequate effort in that respect in their pre-implementation/acquisition phase while C4 spent significant AUE, and C5 adequate.

This reported inadequate effort was observed to have an impact on the implementation phase. C1 resorted to sourcing its expertise and consulting internally in the implementation phase and reported spending adequate effort on the usage of its internal consultants,

> *"...we decided to select consultants with the necessary knowledge of the business as well as the technology. We chose as project manager someone who has been in a senior position in the organisation and hence who would not only have a good knowledge of the business but also who has the ability to manage the various parties,"*

C2 also adopted a similar strategy of hiring internal consultants in the implementation phase following a failed first implementation. However, the situation was more complicated because of the fact that the organisation had to go through a failed first implementation by the foreign system implementers. When the in-house team re-launched the implementation, it was only then that it realised that advisory external consultants from the pre-implementation phase had done a superficial requirement specification. Upon realising this, their insufficient effort in supervising external partner relationships in the pre-implementation phase had consequences in the implementation phase and cost the organisation a whole implementation cycle to realise that it would rather hire its own (in-house) consultants who had the

best knowledge of the business processes to take charge of the implementation process.

> *"we realised only too late that the overseas experts were in fact not experienced enough with the technology itself, plus they had no knowledge of our business and also we realised we needed people who know the local market. These people were from overseas hence knew very little of the local context. All this resulted in us having to think very carefully about who could redo the work the best given all these mistakes."*

C3, C4 and C5 all relied on external consultants both in the pre-implementation and in the implementation phase. C3 claims to have eventually spent non-significant AUE in determining the appropriate usage of consultants in the implementation phase (Table 5.2). From the pre-implementation phase, they had struggled to secure the necessary buy-in from a first team of external evaluation consultants and had to bear with re-iterated analysis work by a second team. This impacted on the implementation phase as it delayed its start while also moving the focus away from the actual needs for additional external experts on the implementation team.

> *"...we had already gone through a change in consultant in the first phase. That caused rework and we also were struggling to obtain buy-in from the management and users. We felt we were under-resourced to handle the business changes in the first phase. We needed more external people as we were phasing into the implementation phase but we did not recruit. We should have, now we are facing a delay for implementation."*

At C4, even though significant AUE had been spent on securing long-term sustainable relationship with the vendor and external consultants, problems spilled over to the implementation phase. From the ***SAP CM*** project perspective, the pre-implementation and implementation phases overlapped. A pilot system was being developed of which gradual releases of versions and prototypes would indicate the system's adequacy. The lack of support and dedication from the local branch of consultants accompanied by a lack of alternative options on the market created a situation whereby the organisation had to spend significant additional effort lobbying with the vendor and consultants for better support for implementing the system.

> *"..on the one hand we had unsatisfactory progress with the pilot project and lack of support from **SAP** locally. While we were still fighting that and looking around for better options, we decided to re-focus our own internal IT resources to performing enhancements of the current in-house system to optimise the time we had."*

C4 hence had to spend the effort determining how to best use its own internal resources and sustain the dedication and vision during the "holding" period.

> *"even though this allowed us to have an even better understanding of the need for the functionality of a student system, this exercise of re-focusing efforts on in-house enhancements happened intermittently during these periods of uncertainty; was quite disruptive for our internal consultants."*

Hence, in conclusion, the degree to which the organisation struggles to maintain sustainable long-term external partner relationships in the implementation is seen to be a consequence of inadequate effort in addressing the same issue in the previous phase. C4 is the exception, where factors beyond the

organisation's control were at play. The impact on the implementation CSFs relate to the AUE (significant in most cases) spent on determining the appropriate usage of consultants and maintaining dedication to the project both from external and internal consultants.

CONDITIONS EXTERNAL TO ORGANISATION'S CONTROL

Factors outside the organisation's control that are to blame for delays and disruptions and hence AUE during the pre-implementation phase may carry forward to the implementation phase and impact on the AUE spent in that phase as well. The cases that mainly demonstrate this theme in the implementation phase are C1, C2 and C4.

In C1's case, the realisation that the unfavourable state of the South-African economy and the increasing importance of e-commerce would force the organisation to review its production and marketing strategy came rather late in the pre-implementation phase as discovered earlier and hence delayed the project significantly especially the start of the implementation phase.

> "*The state of the economy became more and more of concern for the business and finally forced the organisation to take conscience of the importance of this ERP software to turn around business in the long-term. It was a long struggle to get to this point of organisation-wide realisation*"

At C2, on the contrary, market conditions affected the project essentially in the implementation phase when it was clearly difficult to identify a source of support from the local market, as the vendor was not represented locally. C2 found itself in a dilemma because on the one hand the consultants they hired from overseas had inadequate knowledge, not only of the business itself, but of the local market and hence could neither assess the work done by the previous advisory consultants nor apply sufficient knowledge to the implementation. On the other hand, there was no source of local support for ***Sage***.

> "*...being geographically remote from our vendor, **Sage** and not having a source of support locally, we thought it logical to hire consultants directly from the vendor. When the first implementation failed, we had to re-assess our strategy. We could not afford to hire expatriate consultants again but then there were no local experts and also we realised we needed people who understood the local market.*"

At C4, market conditions influenced delays and disruptions in the project in the pre-implementation phase as well as in the implementation phase. Factors such as the inability to obtain adequate support from the local consultants and the inability to obtain alternative options as and when it was required (due to the fact that the global and hence the local market was not ready yet for the new industry sector which is higher-education) impacted on the implementation of the ***SAP*** pilot system and also on the acquisition process leading to the selection of a different software. When PeopleSoft was finally selected, it was still a problem for C4 to source the required expertise to assist on the implementation.

> "*It is really a function of the newness of the software **PeopleSoft Student System** in the country. Already, the higher education sector itself is a relatively new sector catered for by ERP vendors in general, imagine for South-Africa. We are among the only higher institutions to be doing this, so really there is a huge scarcity of expertise, experience both locally and abroad and lack of track*

record locally. We had to recruit internationally"

At C5, the implementation process was delayed in the beginning due to the advent of floods in Europe, causing the shipment of new hardware required as necessary infrastructure to the launch of the process to arrive late. This forced the process into stagnation beyond the organisation's control.

"it was beyond our control and delayed the implementation especially for the first component of the project: the expenditure side. But because we had no option but to source the hardware from overseas, we had to bear with it but it cost us in time, not significantly though."

Overall, in the implementation phase, the way in which market conditions caused delays and additional effort were a function of the fact that the organisations were in different geographical locations to potential service providers. They were therefore subject to factors outside their control such as natural calamities (C5), scarcity of expertise on the local market (C2, C4) and abroad (C4) and having to deal with the lack of knowledge of the local market by overseas consultants (C2, C4).

In C1's case, the lack of key users' awareness to and understanding of the implications of the current state of affairs in the local and global economy led to the delay of the important task of forming an adequate implementation strategy and more particularly the timing of the decision to perform a BPR exercise. For C5, the impact was essentially on the delay of the infrastructure for implementation and the formalisation of the project schedule, while at C2 and C4 the impact was on the appropriate usage of consultants, as AUE had to be spent on deciding if and from where to source external consultants, or else how to make best use of existing internal resources.

NATURE OF ORGANISATION

In certain instances, there were factors pertaining to the organisation itself, its nature and setting that contributed to the delays and disruptions experienced during the implementation phase. More particularly at C4, it is reported that they

"...had miscalculated the sequence of implementation plus from the new software perspective, there are areas where the implementation turns out to be more difficult such as changing the fees handling system. Because of the nature of the business being constrained to a certain academic cycle, it means we only have a certain period during which we can implement. If we miss the bus, we have to catch it next academic cycle."

Hence, the project at C4, which was still current at the time of the interview, was highly dependent on the organisational academic calendar, which imposed constraints on timing of implementation and testing of modules. Also, it was found that because of dependencies between functionality, implementation had to be carefully timed otherwise the impact on business operations would have been disastrous.

"Current systems are tightly integrated. So, options to update bits and pieces at a time are constrained. Changes in the finance system affect other subsystems. Changing the fee system in the middle of the academic year requires that the old and the new system calculate in the same way otherwise there is a risk of miscalculations which can be disastrous to business."

Hence, C4 had to spend AUE on obtaining adequate knowledge of business processes and current legacy systems before delving into implementation. It also had to set out formalised testing plans based on the restrictions of the organisation's operations cycle. Overall, this also impacted on the organisation's effort in following an adequate implementation strategy.

In C2's case, the fact that the organisation, at group level, decided in its implementation strategy to target C2 as the first subsidiary to undergo implementation meant that it served as an example for future subsequent implementations, having been on the "bleeding edge" of the process.

> *"C2 was the first of five main targeted subsidiaries and was the first one to take the plunge and experience all the difficulties, obstacles and mistakes that the team of implementers would learn from for the rest of the cases. This is how to it turned out to be organised by the group."*

This theme impacted on the extent to which project championing had to be strengthened in the face of such obstacles, as it would have most likely had an impact on the entire implementation process.

> *"we were faced with a lot of resistance by employees at C2 who were getting more and more frustrated with the lengthy and repeated process. Their work was being disrupted too much according to them. Project management and championing had to be firm there and also we had to get trust and dedication back from them."*

At C5, the organisational setting was politically charged, thus the project underwent potential threats from organisational instability during its implementation. Even though the respondent at C5 claimed that the political "*turmoil*" was managed by ensuring *"complete"* buy-in from all parties at the outset in the pre-implementation phase, he acknowledged that it required strong leadership from both the project sponsor (the City) and from the project managers, who had to spend some additional effort to make sure buy-in would not be lost in those times of uncertainty.

> *"Throughout the implementation cycle, we had three mayors, a walkover, different parties in government, and two financial directors. We even had to deal with a different organisational structure which changed from committee to executive mayoral structure. At some point, the strategic director was retrenched. So, amid all this upheaval, we had to go at great lengths in securing buy-in from important people so that the project does not get stopped through some political lobby."*

Hence, the political nature of the environment at C5 and its being prone to organisational instability had a strategic impact on the implementation process. It could have threatened the life of the project and would have required AUE in terms of stronger project sponsorship and management to ensure continuity. Similarly, in the case of C2, the fact that it was the first of a series of implementations within the group and given the state of morale of the organisation following the previous implementation that failed, the organisation had to spend significant AUE on the level of project sponsorship and management, on behalf of the group, in getting back the buy-in, overcome resistance and also learn from the mistakes of being first to implement the system. As in the case of C4, unforeseen restrictions coming from the nature of an organisation's operations can cause AUE on a more tactical level in terms of scope management, knowledge of current legacy systems and development of formalised testing plans (Table 5.2).

MANAGEMENT OF PROJECT FACTORS

Another important theme that arose from the case studies is the impact that project factors such as complexity and scope, resource allocation and staffing problems had on the implementation process and the extent to which it caused delays.

Complexity and Scope

The cases presented here all differ in scope and complexities (refer to Appendix B to see details of scope and perceived complexity). The most ambitious project was at C5 given the size of the organisation and scope of implementation (merging 7 organisations, a total of more than 28 000 staff, and serving more than 3 million residents).

> *"This project is the largest local government **SAP** implementation worldwide. Its complexity and scope were massive to manage and required rigorous project management procedures. Some of the integration costs had been underestimated as well as the software licensing. But these were not as significant as when we hit a crisis with incorrect data conversion with the revenue side which was the bigger component of the project."*

Hence, C5's main project delay was the AUE spent on repairing errors in the data conversion process. It was a conscious business decision to delay the project as the potential impact of implementing the wrong data was too risky.

> *"The Revenue system is very complex and mission-critical. Plus the data extremely sensitive – about billing people for services like electricity etc...Importance of installing a correct system, with minimal error rate. Even 1% is not acceptable. In that light, one would say that it was worth delaying the project by a few months at that stage. A failed conversion would have been disastrous on the other hand; the cost of the failure would have been half a billion rand easily."*

Hence, in C5's case the delay was considered highly justified, the project being nearly at its end and also given the significance of its size and total value invested already.

> *"At this stage, the bulk of the money is already spent and also given its scope and complexity, a certain degree of delay is anticipated, it is likely to happen to make sure things are made right."*

In C3's case, the second biggest project in the sample of cases presented here, the project consisted of merging products from four different vendors to be implemented for a user workforce of nearly 10,000. At the time of data collection, the project at C3 was still undergoing implementation but the respondent communicated realistic fears that the planned timeline to delivery may be too optimistic.

> *"So far, we might not be too much over budget but our predictions could be wrong about the real project size plus it looks like software licenses have been underestimated for instance for SAP. We easily are going to spend 4 times what was originally quoted. The implementation of the Assets portion onto SAP has been done about 23 times over. We might have to reduce scope in order to deliver adequate level of functionality and hence avoid too much delay."*

Resource allocation – staffing problems

In some cases namely at C3 and C4, finding resources of the right expertise and in the right amount was an obstacle for the project to proceed smoothly even though implementation plans and strategies existed. For instance, in C3's case, once in the implementation stage, the organisation had planned to recruit more human resources but somehow was not able to fulfil this strategy. The result was that:

> "we *might be undergoing a delay, spending 30 months implementing instead of 18 because we are understaffed, because of not recruiting when it was critical. Yet, we had agreed to recruit more people, but did not. On the one hand, we significantly under-spent on the implementation but we can see that we are going to run behind because our existing resources can't handle the load because the project size estimation is likely to be wrong. Right now we don't know how quickly we can do it and get the people in."*

From the above, it can also be seen that C3's capacity problem and the overlooked importance of recruiting additional resources at a critical time was indirectly the result of the lack of management support that persisted from the acquisition phase. The IT department, being "alone" in championing the project, lacked the authority to decide on such a critical factor and also lacked the vision to realise its importance.

In C4's case, the resource allocation problem was multi-fold in the sense that, on the one hand, the organisation struggled to obtain the right expertise and support for this innovative type of ERP module (higher-education and student administration) and on the other hand, the organisation also struggled to retain resources it had managed to obtain from overseas during the project.

> "*not only was it difficult to source people, we spent a lot of money recruiting directly from overseas. It was a huge project overhead because we had to shop around ourselves plus we have to deal with the people leaving in the middle of the implementation. Just now we lined three people in major functional areas, ready to roll-out and suddenly, one of them dropped out, the other was here briefly then left, then the other one spent 5 months out of 18 months. We went from 3 external staff to nil. We had to revisit the plan, certainly a big delay there.*"

This situation had further consequences on the level of dedication and quality of morale of the team members.

> *"This is bad for the team because it creates situations of instability and uncertainty."*

The cases revealed that certain particular project factors such as the complexity and scope of the project itself as well as the difficulty in obtaining adequately skilled resources and in retaining them are influential in the difficulties encountered during the implementation phase. The resulting impact was the AUE spent in ensuring data conversion and migration in C5's case, ensuring adequate scope management for C3 and obtaining a formalised plan and schedule, and maintaining dedication among staff and consultants in the cases of C3 and C4.

5.2.3 EoC factors and AUE

A sub-objective of this research study was to identify whether, besides those factors found to influence AUE in the ERP life-cycle in the previous sections, the presence of EoC factors also contributed to that AUE. Respondents were asked to identify on a scale of 1-5 (not important – extremely important) how important each of the 15 stipulated factors was in influencing AUE in each phase. Furthermore, they were asked whether there was a relationship between the two phases, i.e. whether the presence of a factor in the pre-implementation phase led to its presence in the implementation phase. Based on the respondents' perception, the following diagram illustrates the *average* perceived importance of EoC in influencing AUE in the ERP life-cycle. Details of the scores both on average and for individual EoC factors per case are available in Appendix C.

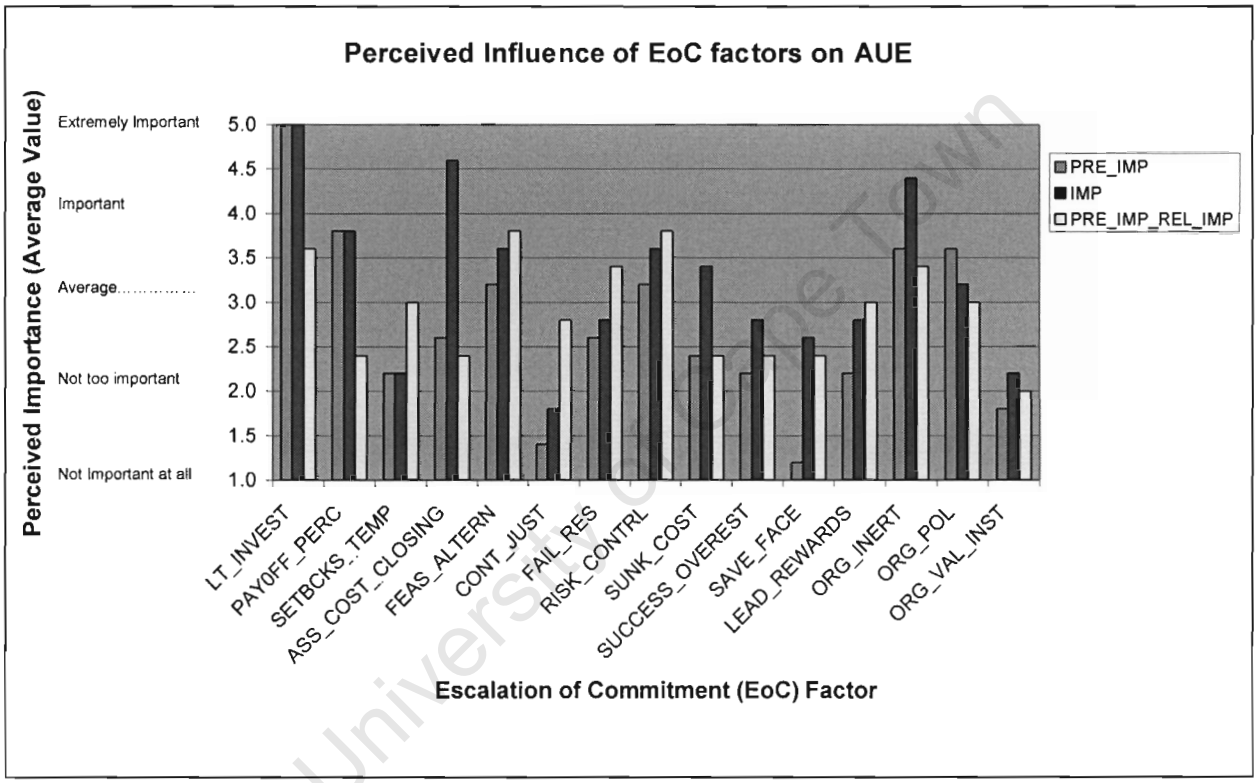


Figure 5.3: EoC Factors influencing AUE

Fig. 5.3 shows for each EoC factor, an average value (for the 5 cases) of the perceived importance of that factor in the relevant life-cycle phase. The series PRE_IMP denotes the pre-implementation phase, IMP refers to the implementation phase and PRE_IMP_REL_IMP denotes the relationship between the pre-implementation and the implementation phase as perceived by the respondent.

The 15 EoC factors have been named in abbreviated format in Fig. 5.3. The full names for these factors are as follows:

- LT_INVEST - project being seen as a long-term investment,
- PAYOFF_PERC - project involving a large and long-term payoff structure,
- SETBCKS_TEMP - setbacks seen as temporary,
- ASS_COST_CLOSING - high-costs associated with closing the project,
- FEAS_ALTERN - the lack of feasible alternatives,

- FAIL_RES - decision-makers holding themselves responsible for failure,
- RISK_CONTRL - the belief that risk can be brought under control,
- SUNK_COST - the desire not to waste sunk costs,
- SUCCESS_OVEREST - the overestimation of chances of success by project champion/s,
- SAVE_FACE - the need for decision-makers to save face and not appear "bad" to others,
- LEAD_REWARDS - leadership rewards anticipated for persistence,
- ORG_INERT - the degree of inertia in the organisation,
- ORG_POL – organisational politics,
- ORG_VAL_INST - the institutionalisation effect, the situation whereby the project has become too closely tied to the organisation to consider withdrawal.

The following figure, Fig. 5.4 provides a graphical breakdown of the perceived importance of each *individual* EoC factor on influencing AUE in the life-cycle phases as reported by each respondent. Those figures also include average scores for each factor.

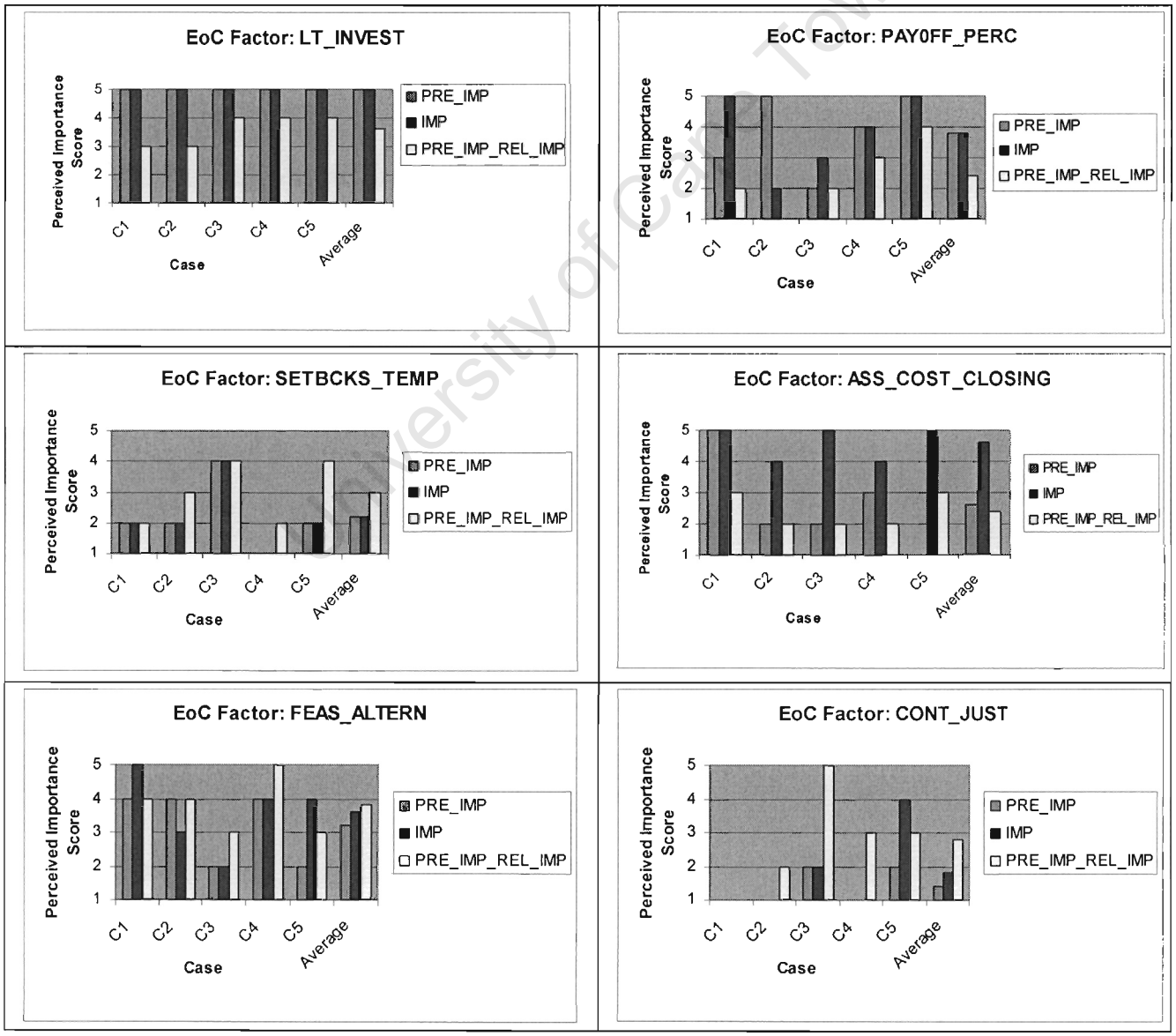


Figure 5.4: Individual breakdown of EoC factors influencing AUE

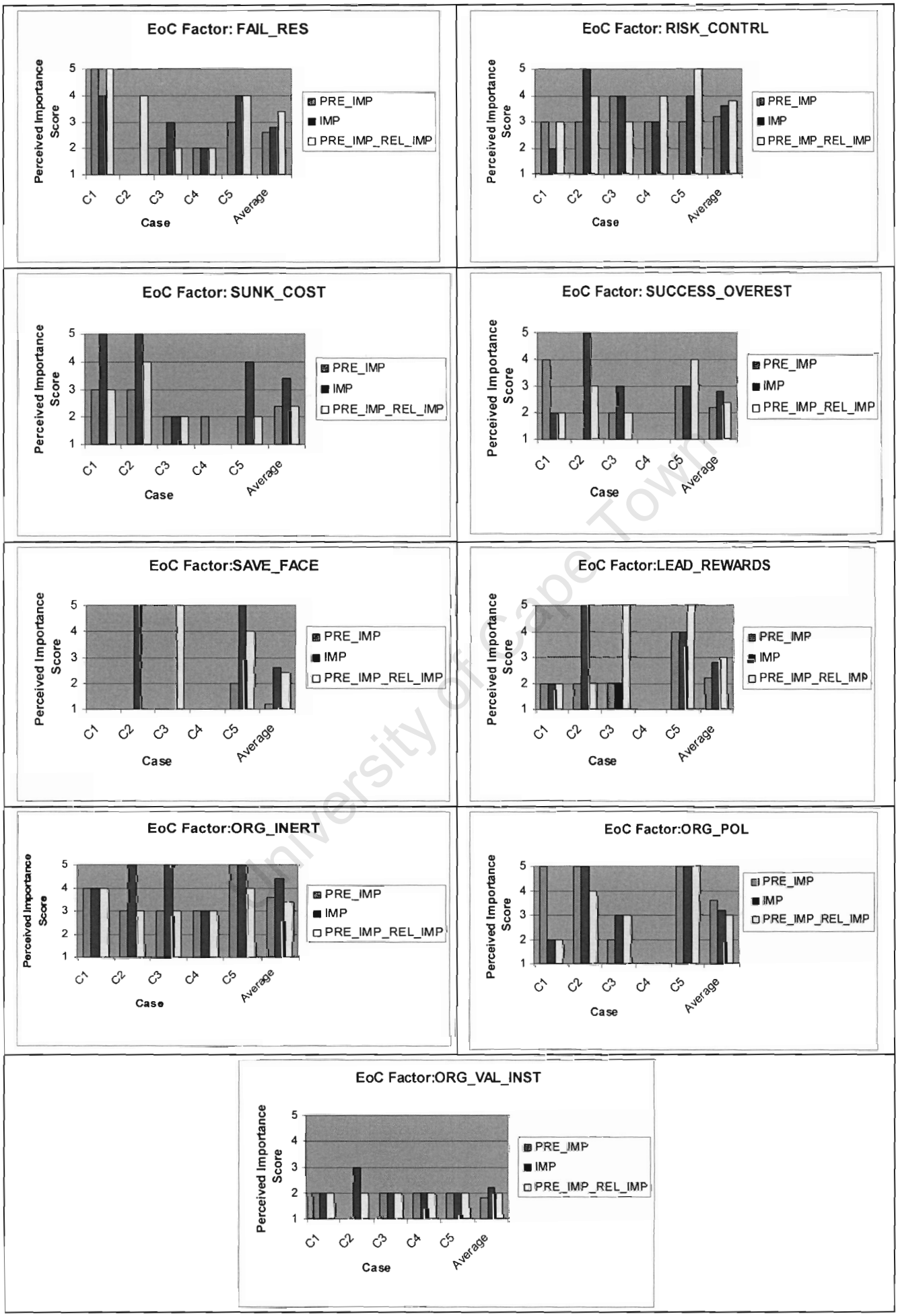


Figure 5.4 (continued): Individual breakdown of EoC factors influencing AUE

Figure 5.4 reproduces respondents' perception of the importance that each EoC factor had on causing AUE in their ERP project life-cycle. The vertical axis of each bar graph refers to the same scale as illustrated in Figure 5.3 (1 denoting "Not Important at all" and 5 indicating "Extremely important"). The Average scores showed in the last column of each bar graph correspond to the scores in Figure 5.3.

In this analysis, the average score of '3' on the scale was used as benchmark to determine the relative importance of each EoC factor in each life-cycle phase and also the relationship between the two phases. Hence, factors whose importance was perceived as below '3' were regarded as relatively less important as those which scored '3' and above. The same applied to the scores for the perceived relationship between the two phases. Hence, while values numerically close to '3' such as '2.8's were not disregarded as meaning that the factor was unimportant but rather less important than other factors with a higher score. Appendix C provides a "spreadsheet view" of Fig. 5.4.

Following this rationale, the following table, Table 5.3, extracts the list of factors that were found to be important (average score of 3 and above) in the pre-implementation phase, the implementation phase or both phases.

EoC Factor scoring 3 and above	**Pre-Implementation phase**		**Implementation phase**		**Perceived Relationship**
	Rank	**Value**	**Rank**	**Value**	**(Average score)**
Project considered as a long-term investment	1	5.0	1	5.0	3.6
Project involved a large payoff and long-term payoff structure	2	3.8	4	3.8	2.4
High costs associated with closing project	-	2.6	2	4.6	2.4
Lack of feasible alternatives at this stage	5	3.2	5	3.6	3.8
Belief that risk can be brought under control	5	3.2	5	3.6	3.8
Desire not to waste sunk costs	-	2.4	7	3.4	2.4
Organisational inertia	3	3.6	3	4.4	3.4
Organisational politics	3	3.6	8	3.2	3.0

Table 5.3: EoC Factors influencing AUE in ERP life-cycle

In the ***pre-implementation phase***, it was found that the EoC factors that are perceived to have the most influence (above average value of 3) on AUE spent during that phase are in ranked order: the project being considered as a long-term investment (5.0), the project involving a large and long-term payoff structure (3.8), organisational politics (3.6), organisational inertia (3.6), the belief that risk is something that can be brought under control (3.2) and lack of feasible alternatives at this stage (3.2). If based on a ranking system, these factors can be assigned rank values as illustrated in Table 5.3 above. Factors with equal average scores also have equal ranks, e.g. organisational inertia and organisation politics both occupy rank 3 for that phase. Similarly, lack of feasible alternatives and the belief that risk can be brought under control both occupy 5th rank.

In the ***implementation phase***, the factors that scored above 3 on average and hence were perceived to influence AUE in that phase in ranked order are: the project being considered as a long-term investment (5.0), the high costs associated with closing or stopping the project (4.6), organisational inertia (4.4), the project involving a large and long-term payoff (3.8), the belief that risk can be brought under control and the lack of feasible alternatives (both 3.6), the desire not to waste sunk costs (3.4) and organisational politics (3.2). In this phase, there were more factors that were deemed influential on AUE by respondents. As Table 5.3 indicates, those factors were also ranked and those with equal scores have equal ranks. This refers particularly to the factors belief that risk can be brought under control and the lack of feasible alternatives. Both factors occupy 5th rank.

From an analysis of Table 5.3, it is observed that the factor of the project being perceived as a long-term investment (**LT_INVEST**) was acknowledged in all cases to be the most important factor in determining AUE in ***both*** the pre-implementation and implementation phases (rank 1 in Table 5.3). All cases allocated extreme importance (5) to this factor in the pre-implementation and implementation phases (refer to Fig. 5.4 for individual cases). In general, a higher than average relationship (3.6) was acknowledged between the two phases for that factor.

The factor, the project involving a large pay-off and long-term structure (**PAYOFF_PERC**) was acknowledged to be important in influencing AUE in both phases. Table 5.3 shows that this factor occupies rank 2 in the ***pre-implementation*** phase and rank 4 in the ***implementation*** phase. Individually, C2, C4 and C5 gave it above-average importance (5,4 and 5 respectively) in the pre-implementation phase while in the implementation phase C1, C4 and C5 acknowledged above-average importance (5,4, and 5 respectively). Even though this factor scored the same average importance value (3.8) in both phases, it obtained a higher rank in the pre-implementation phase than in the implementation phase thus indicating that overall, it is relatively more important in influencing AUE in the first phase as in the next. A below-average (2.4) was perceived between the two phases for this factor.

The factor of high costs (**ASS_COST_CLOSING**) being associated with closing or stopping the project was deemed to influence only the ***implementation*** phase with an importance of rank 2 while it occupies less than average importance in the ***pre-implementation*** phase (no rank). On an individual level, this factor was revealed to influence AUE in both phases at C1 (importance 5 in each phase); only in the implementation phase at C2 (importance 4), C3 and C5 (importance 5). It was given average importance (3) in the pre-implementation phase and judged important (4) in the implementation phase at C4. Similarly to the previous factor, a below-average relationship (2.4) was acknowledged between the two phases for this factor.

The factor, organisational inertia (**ORG_INERT**), was perceived as being equally important in either the pre-implementation or the implementation phase (rank 3). With reference to individual cases, it scored 5 in the ***implementation*** phase at C2, C3 and C5 and scored 4 at C1. At C4, the factor was given only average importance in either phase. In the ***pre-implementation*** phase, the factor was considered important at C5 (5) and C1 (4). At C3, it scored average importance (3) in the pre-implementation phase. Table 5.3 shows that

in absolute terms, this factor obtained a higher score in the implementation phase (4.4) compared to the pre-implementation phase (3.6) but in relative terms, it occupies the same importance. An above-average relationship (3.4) was depicted between the two phases for this factor.

The lack of feasible alternatives factor (**FEAS_ALTERN**) occupies the 5th rank in both the pre-implementation and the implementation phases. On an individual level, this factor scored higher than average importance at C1 (4), C2 (4) and C4 (4) in the ***pre-implementation*** phase. In the ***implementation*** phase, C1 gave it even higher importance (5) while C2 gave it average importance (3). At C4, the factor was equally important (4) in both phases. C3 considered this factor to be less than average (2) in influencing AUE in either phase while C5 gave it importance (4) in the implementation phase. In all cases, it was viewed that there is a relatively strong relationship between the two phases based on this factor with an average value of 3.8 (see Table 5.3).

The belief that risk can be brought under control (**RISK_CONTRL**) is a factor that shares the same rank (5th) as the previous factor, FEAS_ALTERN, in both phases. From an individual perspective, all cases allocated at least an average importance (3) to the factor in the ***pre-implementation*** phase with C3 rating the factor at importance level (4). In the ***implementation*** phase, only C1 gave the factor a below-average importance (2) while C2 allocated extreme importance (5) to it; C3 and C5 gave a rating of (4) and C4 maintained its rating of (3). Overall an above-average relationship (3.8) was acknowledged between the two phases for this factor.

The desire not to waste sunk costs (**SUNK_COST**) was revealed to be only of importance in the ***implementation*** phase (rank 7) overall and does not have any rank for the ***pre-implementation*** phase. From Figure 5.4, the individual cases show that in the pre-implementation phase, only C1 and C2 deemed it of average importance (3) while the other cases gave the factor a below-average rating (2) for that phase. In the implementation phase, C1 and C2 raised the importance to 5 while C5 to 4. C4 rated it as not important at all (1) in the implementation phase. C3 maintained it as (2). Overall, a relatively weaker relationship (2.4) was perceived to exist between the two phases concerning this factor.

Organisational politics (**ORG_POL**) is another factor considered to influence AUE in ERP projects. In the ***pre-implementation*** phase, it occupies 3rd rank together with organisational inertia (ORG_INERT) while in the ***implementation*** phase it occupies the 8th rank. Hence, organisational politics is revealed as more important in the pre-implementation than in the implementation phase. It is to note however that while in absolute terms, the average value scores for this factor in each phase differ by 0.4, in relative terms, the ranks differ rather significantly. Individually, the cases where organisational politics was perceived to be important in the pre-implementation phase are C1, C2 and C5 (importance 5 for all). However, in the implementation phase, only C2 and C5 acknowledged its importance (5) and C3 its average importance (3). C4 did not consider it as important at all in either phase. An average relationship (3.0) between the two phases was acknowledged for this factor.

From Table 5.3, it is observed that where factors bear an above-average relationship thus indicating a

stronger relationship, they bear the same rank in both phases. This is particularly the case with the factors LT_INVEST, ORG_INERT, FEAS_ALTERN and RISK_CONTRL. These factors occupy 1st, 3rd and 5th ranks respectively in either phase.

Conversely, it seems that a weaker relationship was perceived for those factors that scored a higher rank in the pre-implementation phase compared to the next. Specifically, the factors, PAYOFF_PERC and ORG_POL scored relatively more important ranks in the pre-implementation phase than in the implementation phase. Also, for those factors that were not considered important in the pre-implementation phase (no rank), namely ASS_COST_CLOS and SUNK_COST but were ranked in the implementation phase (2 and 7 respectively, see Table 5.3), a relatively weaker relationship (2.4 respectively) was noted between the two life-cycle phases.

It would also be interesting to analyse those factors that scored ***below average*** in ***either*** phase, as shown in Fig. 5.3. These are setbacks seen as temporary (SETBCKS_TEMP), decision-makers trying to justify continuation (CONT_JUST), decision-makers holding themselves responsible for failure (FAIL_RES), overestimation of chances of success by project champion/s (SUCCESS_OVEREST), the need to "save face" so as not to look bad to others (SAVE_FACE), leadership and social rewards for persistence anticipated (LEAD_REWARDS) and organisational institutionalisation (ORG_VAL_INST). Even though those factors scored below-average overall, they were deemed influential in certain individual cases.

Given the average scores for those above-mentioned factors (Table 2 – Appendix C), it is also noted that they were deemed relatively more important in the implementation phase than in the pre-implementation phase except for SETBCKS_TEMP where it was deemed equally important in either phase. In terms of the perceived relationship between the two phases, some of them obtained an average score or higher thus indicating that even though they were not deemed important in influencing AUE, respondents still perceived that their presence in the one phase would influence their presence in the next. This was found to be the case for SETBCKS_TEMP (relationship score, 3.0), FAIL_RES (3.4) and LEAD_REWARDS (3.0).

With reference to Fig.5.4, it can be observed that at C1, the factor decision-makers holding themselves responsible for failure (FAIL_RES) was considered important in both the pre-implementation (5) and implementation phases (4). At C3, this factor was only deemed important in the implementation phase (3). C5 recognised the average importance (3) of the factor in the pre-implementation phase and its importance (4) in the next phase while C2 did not see its importance at all in either phase. C4 rated the factor below average (2). Overall, a relationship score of 3.4 was obtained for this factor thus indicating an above-average relationship between the two phases.

The situation of decision-makers trying to justify continuation (CONT_JUST) was judged an important factor only at C5 in the implementation phase (4). The rest of the cases attributed less than average importance to it. Also, overall, a weaker relationship (average of 2.8) was perceived between the two phases with regards to this factor.

The factor of overestimating the chances of success (SUCCESS_OVEREST) by project champions was seen as influential towards AUE only at C1 (4) in the pre-implementation phase; at C2, the factor was seen as extremely important (5) only in the implementation phase. The other cases did not rate this factor higher than average in importance. Overall, a relatively weaker relationship (2.4) was observed between the two phases with respect to this particular factor.

The need to "save face" (SAVE_FACE) is a factor that was only deemed important (5) at C2 and C5 in the implementation phase. In the pre-implementation phase, all cases rated this factor as not important at all except for C5 with a rating of (2). Overall, this factor scored a below-average value for the relationship between the two phases (2.4).

Similarly, the factor of social rewards anticipated for persistence (LEAD_REWARDS) was seen as important at C2 and at C5 only. At C2, it was of extreme importance (5) but only in the implementation phase, while at C5, both phases were rated at (4). At C5 and C3, there was a definite relationship perceived between the two phases based on this factor. Overall, this factor reveals an average relationship score of (3.0).

Setbacks being seen as temporary (SETBCKS_TEMP) is a factor that was seen as important (4) only at C3 in both phases. The other cases perceived a below-average importance (2) for this factor in either phase. In terms of relationship between the phases, this factor scored an average value of (3.0).

The factor of organisational institutionalisation whereby a situation becomes so closely tied to organisational values to consider withdrawal (ORG_VAL_INST) was given below-average scores by all respondents in either phase except for C2 which gave this factor an average score (3) in the implementation phase. In general, respondents also did not perceive any strong relationship between the phases based on this factor (2.0).

Based on the above analysis of the various themes found to have been influential in causing AUE in the pre-implementation and implementation phases together with the analysis of the extent to which factors known to influence EoC have played a role in influencing this AUE, the next section will summarise the findings and discuss implications based on such findings.

5.3 Summary and Implications

In the previous section, results showed that in the pre-implementation phase, C4 suffered the most from AUE followed by C3, C2, C1 and C5 respectively. In the implementation phase, C2 experienced the most AUE followed by C3 and C4 equally, then by C1 and C5 respectively. The following figure shows a comparison of the estimated values for such AUE between the two phases per case.

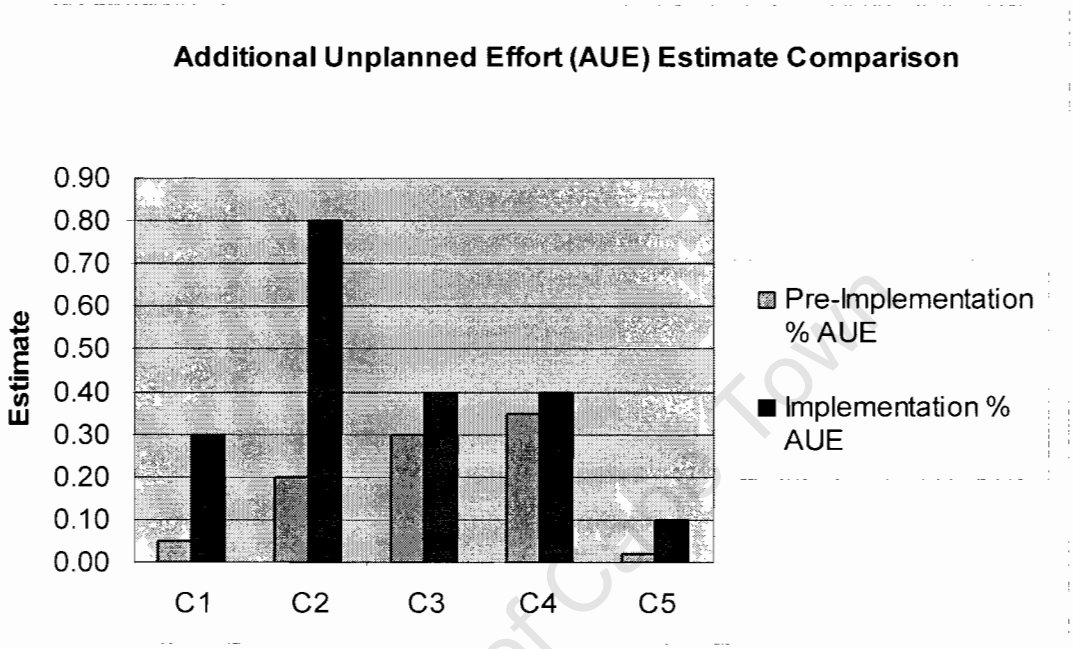


Figure 5.5: Comparison of AUE for all cases in both phases

There is sharp contrast between the amount of AUE spent on the pre-implementation phase and the implementation phase for C1 (6 times the AUE spent in the pre-implementation phase), C2 (4 times) and C5 (5 times) even though when viewed in absolute terms, C2's AUE in both phases is the most significant among all three cases. For C3 and C4, AUE spent in the implementation phase is not more than 1.5 times more than AUE spent in the pre-implementation phase in both cases (1.3 times for C3 and 1.1 times for C4).

It would be worthwhile to compare those AUE estimates with the perceived importance of time and budget delays and also the overall perception of success on the projects as shown in Appendix B-Fig. 4. C1 and C5 perceived their projects as significantly more successful compared to other projects in their organisations while C2, C3 and C4 perceived an average level of success. When comparing time and budget delays, it can be seen that C2, C3 and C4 indeed reported a higher extent of delay compared to C1 and C5 overall with C2 claiming significantly more than in other projects. This is followed by C4 (quite more for time and more for budget) and C3 (more for both time and budget). Thus it appears that where budget overruns and time delays were more severe, project success was perceived as relatively less. However, for conclusions to be drawn, these estimates alone are insufficient since there are various factors that are the cause of such estimated AUE, as the analysis revealed. Hence, the analysis performed in the previous chapter provides grounding for the implications as provided below.

	Pre-Implementation AUE Factor	Pre-Implementation CSF	Case	Implementation CSF impacted on due to Inadequate Effort	EoC factor influencing AUE in Pre-Imp phase
ERP Mission	1. Justification for ERP adoption 2. Formalisation of ERP Vision	• Planning and initialising for Implementation CSF • Leadership • Rigour • Careful selection of acquisition team	C1, C2 – inadequate effort C3,C4,C5 – Adequate/ AUE for some	• Adequate implementation strategy • Sustained management support	• Project seen as a long-term investment (C3,C4,C5) • Project involves long-term payoff (C4,C5)
	3. Finalisation of ERP package choice (links to 1. & 2.)	• Definition of requirements • Establishment of selection and evaluation criteria • Careful selection of acquisition team	C1– inadequate effort C2, C3, C4- AUE C5– adequate effort	• Adequate implementation strategy • Sustained management support • User involvement and participation	• Project seen as a long-term investment (C2, C3,C4) • Project involves long-term payoff (C2,,C4) • Lack of feasible alternatives (C2, C4)
	4. Stability of Organisational Structure–e.g business moves, ownership takeover (links to 3. above)	• Definition of requirements • Clear and unambiguous authority • Establishment of selection and evaluation criteria • Leadership	C1, C3, C5 – AUE but also inadequate effort for some CSFs	• Adequate implementation strategy • Adequate project champion role • Adequate Scope management • Formalised implementation plan and schedule	• Organisational politics (C1, C5) • Organisational inertia (C1,C3,C5) • Belief that risk can be controlled (C1,C3,C5)
	5. Organisation and Flow of Acquisition process	• Planning and initialising for Implementation CSF • Definition of requirements • Establishment of selection and evaluation criteria • Adequate cross-over to IP	C1, C2 – inadequate effort C4 – AUE	• Adequate implementation strategy • User involvement and participation • Trust between partners	• Project seen as long-term investment (C4) • Lack of feasible alternatives (C4) • Project involves long-term payoff (C4)
	6. Nature of Market conditions (links to 5. above)	• Planning and initialising for Implementation CSF • Definition of requirements	C1– inadequate effort C4 – AUE	• Comprehensive BPR (C1) • Adequate implementation strategy • Formalised project plan and schedule • Project scope management	• Project seen as long-term investment (C4) • Project large & long-term payoff (C4) • Lack of feasible alternatives (C4)
	7. Type of Internal partnership	• User involvement in process and final choice • Strong management commitment • Careful selection of acquisition team • Leadership	C1, C2, C3– inadequate effort C4, C5 – AUE	• Sustained management support • Adequate Project champion role • User involvement • Trust between partners • Staff and user dedication • Adequate inwards/ outwards communication	• Organisational politics (C5) • Project seen as long-term investment (C4,C5) • Project large and long-term payoff (C4,C5)
	8. Type of External Partnership	• External partner relationship • Planning and initialising for Implementation CSF	C1,C2,C3 – inadequate effort C4 – AUE	• Appropriate usage of consultants • Dedication of staff and consultants	• Project seen as long-term investment (C4) • Project large and long-term payoff (C4) • Lack of feasible alternatives (C4)

Table 5.4: Implications based on Pre-Implementation factors found

Table 5.4 above displays and summarises the various factors pertaining to the pre-implementation phase that were found to characterise the AUE that an organisation spends in order to ensure success in this particular life-cycle phase. These factors are: the justification for ERP adoption, the formalisation of an ERP vision, the finalisation of an ERP package choice, the stability of organisational structure, the organisation and flow of acquisition process, the nature of market conditions and the type of internal and external partnership.

Based on the analysis of the findings in the previous section, links to the relevant pre-implementation CSFs are provided (2nd column) together with the cases (3rd column) that were found to be concerned by this association. Where relevant, inter-linkages between pre-implementation factors are also indicated. Furthermore, given the inadequate effort spent on pre-implementation CSFs as shown by some cases in the analysis and the impact that it had on causing AUE in the implementation phase, the table shows the relationship between the pre-implementation factor, CSFs and the relevant *implementation* CSFs that are impacted on. Finally, the table also shows, for those cases where AUE was spent satisfying the pre-implementation CSFs, the EoC factors that were perceived to be at play in influencing AUE in that phase.

From Table 5.4, it is observed that the planning and initialising for implementation, the definition of requirements and the establishment of selection and evaluation criteria are the pre-implementation CSFs that appear the most frequently, thus indicating their importance and the inter-links that exist among the various pre-implementation factors, based on those CSFs. From Table 5.1, it was seen that those CSFs were said to have attracted inadequate effort more particularly at C1, C2 and C3 while in others AUE was spent (especially at C4) to satisfy them.

Three important sets of findings are summarised in the above table. Firstly, it is possible to see which pre-implementation CSFs received inadequate effort from which cases. Secondly, the implementation CSF this inadequate effort had an impact on in causing AUE in the implementation phase is shown. Thirdly, the table also shows the cases where AUE was experienced during the pre-implementation phase due to the role an EoC factor played in influencing this AUE.

In most instances, C1 and C2, as observed in the analysis, are the cases where inadequate effort was generally reported for most pre-implementation factors and CSFs. Even though C1 and C2 did not both necessarily spend inadequate effort on each of those CSFs, it is a general observation compared to other cases that they failed to spend adequate effort on most of them (see Table 5.1). Consequently, those cases had to re-iterate pre-implementation tasks (as discussed in the analysis) thus displaying a recursive acquisition process and also spending AUE on several implementation CSFs such as adequate implementation strategy and obtaining sustained management support, user involvement, staff and consultants dedication among others. C2's major AUE in the pre-implementation phase relates to the instance when the choice for the ERP package, ***Sage***, had to be made, and when it took significantly longer than expected for the group to make a choice, because the recommended option was not cost-effective according to the group, thus making cost-effectiveness the primary basis for package choice and also

because on that basis, other alternatives appeared infeasible.

In contrast, C3 and C4 experienced the most AUE in the pre-implementation phase. C3 experienced AUE in merging the enterprise-wide vision that was at the basis of the project's initiative, as found in the analysis, with the championing of the actual project (IT department vs. top management). The misalignment between vision and championing caused C3 to spend AUE to obtain sustained management to plan for implementation, establish leadership and also to finalise the context of acquiring multiple products (package choice). Another reason for C3's AUE in the pre-implementation phase on defining their requirements, establishing its selection and evaluation criteria for the ERP candidates and eventually finalise their choice of product/s, relates to the simultaneous business moves that the organisation underwent at that time.

At C4, all pre-implementation factors were relevant in explaining AUE that was experienced, essentially with planning and initialising implementation CSFs, establishing selection and evaluation criteria, ensuring user involvement and sound external partner relationships. Factors that influenced significant AUE at C4 are most particularly market conditions, organisation and flow of the acquisition process and external and internal partnerships. Even though C5 reported the least AUE in either phase, it still acknowledged some AUE (not significant) for certain CSFs, namely maintenance of leadership and user involvement in the process.

Furthermore, those EoC factors that have been acknowledged to influence AUE in the pre-implementation phase are: project seen as long-term investment, project involving a large and long-term payoff, organisational politics, organisational inertia, the belief that risk can be brought under control, and the lack of feasible alternatives in order of importance. The cases particularly affected by those factors in this phase are shown in brackets in Table 5.4 (last column) i.e. where it is indicated that AUE was spent by a particular organisation on satisfying a CSF in this phase (refer to column "case"), a connection to the EoC factor influencing AUE in that phase was established.

The following table, Table 5.5, provides a summary of the factors that were found to influence the AUE spent during the implementation phase.

Implementation AUE Factor	Implementation CSF	Case	EoC Factor influencing AUE in Imp. phase
1. Formalisation of Implementation Strategy	• Adequate implementation strategy • Comprehensive BPR • Adequate Project Champion role	C1, C2 – AUE	• Project seen as long-term investment (C1,C2) • Project long-term payoff (C1) • Organisational inertia (C1,C2) • High costs assoc. with closing the project (C1,C2)
2. Management of Organisational Momentum and Resistance to Change (links to 1. above)	• Sustained management support • Adequate project champion role • User involvement and participation • Trust between partners • Dedicated staff and consultants • Effective organisational change management	C1, C2, C3 – AUE	• Organisational inertia (C1,C2,C3) • Organisational politics (C2,C3) • High costs assoc with closing (C1,C2,C3) • Desire not to waste sunk costs (C1,C2) • Belief that risk can be brought under control (C2,C3)
3. Maintenance of External Partnership Relationship	• Appropriate usage of consultants • Dedicated staff and consultants	C2,C3,C4 – AUE	• Organisational inertia (C2,C3,C4) • Belief that risk can be brought under control (C2,C3,C4) • Desire not waste sunk costs (C2)
4. Conditions external to organisation's control -natural calamities -economic conditions -scarcity of expertise -inadequacy of foreign experts	• Adequate implementation strategy • Appropriate usage of consultants • Adequate infrastructure and interfaces • Formalised schedule	C1,C2,C4,C5 – AUE	• Organisational inertia (C1,C2,C4,C5) • Desire not to waste sunk costs (C1,C2,C5) • High costs assoc. with closing (C1,C2,C4,C5) • Lack of feasible alternatives (C1,C2,C4, C5)
5. Nature of Organisation -organisation operational calendar -unstable environment -group context	• Adequate implementation strategy • Adequate project champion role • Trust between partners • Dedicated staff and consultants • Formalised testing plans • Adequate knowledge of legacy systems • Adequate scope management	C2,C4,C5 – AUE	• Lack of feasible alternatives (C2,C4,C5) • Organisational politics (C2, C5) • High costs assoc with closing (C2,C4,C5) • Organisational inertia (C2,C5)
6. Management of Project Factors -complexity and scope -resource allocation and staffing problems	• Adequate data conversion/migration • Formalised schedule • Dedicated staff and consultants • Adequate scope management • Empowered decision-makers • Effective organisational change management	C3,C4,C5 – AUE	• Project seen as long-term investment (C3,C4,C5) • Project involves long-term payoff (C3,C4,C5) • High costs assoc. with closing (C3,C4,C5)

Table 5.5: Implications based on Implementation Factors found

The six main implementation factors that were found to characterise AUE spent in that phase are as follows: the formalisation of an implementation strategy, the management of organisational momentum and resistance to change, the maintenance of external partnership relationship, conditions external to the organisation, the nature of the organisation, and the management of project factors. In accordance with the analysis and based on Table 5.4 earlier, it is seen here that the case most concerned with AUE generally is

C2, as it appears in almost all rows, followed by C3 and C4.

For those pre-implementation factors and CSFs where C1 and C2 showed inadequate effort, as seen in Table 5.4, it was found that a corresponding AUE was spent in the implementation phase affecting CSFs such as adequate implementation strategy, user involvement, staff and consultants' dedication, trust between partners, change management among others.

C3 and C4 also experienced AUE in the implementation phase; in fact to a greater extent than C1 but less than that spent by C2 (Fig. 5.1). However this comparison is in absolute terms and the focus should also be on the comparison between the amount of AUE spent in the pre-implementation phase and the AUE spent on the implementation phase by each case. As mentioned in the beginning of this chapter, on a *comparative* basis, C1, C2 and also C5 spent 6, 4 and 5 times respectively the AUE they spent in the pre-implementation phase on their implementation phase.

In C3 and C4's case, it seems that the amount of AUE spent by each in the pre-implementation was sustained in the next phase. This gives an indication that, in addition to the fact that inadequate effort spent on satisfying CSFs in the pre-implementation phase causes a corresponding AUE to be spent in the implementation phase, there are factors pertaining to the implementation phase itself that are particularly prone to AUE. Furthermore, the findings show that there are conditions such as the unavailability of options and lack of skilled expertise and support on the market that persist throughout the life-cycle and therefore cause a similar AUE in both phases. From Table 5.5, these are factors for which C3 and C4 appear most often (in 3rd column): namely the type of external partnership relationship, conditions outside the organisation's control, nature of the organisation and management of project factors.

The reason why for C3 and C4, AUE appears consistent in both cases is the fact that they had faced the same kind of obstacles in the pre-implementation phase and also the fact that similar unfavourable circumstances persisted during the implementation phase. For instance, at C3, because of organisational structural instability and the misalignment between enterprise vision and project championing, the organisation experienced AUE in gathering momentum and buy-in from top management from that time. This is reflected in the similar *significant* AUE the organisation revealed for factors such as sustained management support, user involvement, staff and consultants dedication, adequate project champion role and empowered decision-making in the implementation phase.

At C4, its pre-implementation phase faced obstacles pertaining especially to the fact that the organisation did not have alternative options that would enable them to make a choice. This was due primarily to the newness of the field (higher-education) in the ERP arena, and the lack of local options for vendors as well as consulting experts. Hence, C4 spent AUE on factors such ERP choice, organising the flow of their acquisition process, managing market conditions and managing external partnerships. These problems persisted, especially the latter one, in the implementation phase of the ***PeopleSoft*** student system package. This caused the organisation to spend similar AUE on corresponding factors such as maintaining sufficient long-term external partnership, dealing with conditions outside their control such as scarcity of expertise

and staff turnover on the project.

In absolute terms, C5 spent the least amount of AUE in either phase and hence appears as the one that suffered the least from delays and disruptions during the project even though when the two phases are compared, the organisation did spend 5 times the AUE in the implementation phase. In the pre-implementation phase, factors such as maintaining adequate internal partnership among all stakeholders involved AUE especially with regards to user involvement in the process and final choice and maintaining leadership within a politically charged environment. In the implementation phase of C5, because of the size of the project (100M-500M rands range), the few factors that caused AUE were organisational factors such as the unstable political climate during the life-cycle, as well as project factors such as the incorrect data conversion on the revenue system. Those created significant enough concern to warrant AUE in order to ensure the satisfaction of relevant CSFs.

Furthermore, Table 5.5 also shows the various EoC factors that were perceived to be important in influencing AUE in the implementation phase (last column) based on the results from Fig. 5.4 in Section 5.2.3. It is indicated in brackets which cases relate to the particular EoC factor. In accordance with Table 5.3, EoC factors that influence AUE in the implementation phase in order of importance are: project seen as long-term investment, high costs associated with closing the project, organisational inertia, project involving a large and long-term payoff, the lack of feasible alternatives, the belief that risk can be brought under control, the desire not to waste sunk costs, and organisational politics.

5.3.1 Summary

Based on the analytical discussion and implications, the following can be summarised for this research study:

- Both the pre-implementation and implementation phases of the ERP life-cycle experience AUE in the attempt to satisfy CSFs in the respective phases. However, this AUE appears to be more important in the implementation phase than in the previous phase. In fact, it was found that the pre-implementation phase tends to suffer more from inadequate effort with regards to satisfying several CSFs in that phase which leads to a corresponding AUE being spent on satisfying CSFs pertaining to the implementation phase. However, where there are persisting conditions throughout the life-cycle such as lack of sourcing options on the market, it was found that a similar extent of AUE was experienced in both phases.

- The following factors were found to influence AUE in the attempt to satisfy CSFs in the ***pre-implementation*** phase: the justification for ERP adoption, the formalisation of an ERP vision, the finalisation of an ERP package choice, the stability of organisational structure, the organisation and flow of acquisition process, the nature of market conditions and the type of internal and external partnership.

- The following factors were found to influence AUE in the attempt to satisfy CSFs in the

implementation phase: the formalisation of an implementation strategy, the maintenance of organisational momentum and resistance to change, the maintenance of external partnership relationship, conditions external to the organisation, the nature of the organisation and the management of project factors.

- Based on the AUE factors found in the study, a relationship was established between the two phases. It was found that inadequate effort spent on satisfying CSFs in the pre-implementation phase caused a corresponding AUE to be spent the satisfaction of CSFs in the implementation phase. Hence, a relationship between the two phases was uncovered.
    - Specifically, inadequate effort spent on the formalisation of ERP mission, the finalisation of ERP package choice and the organisation and flow of the acquisition process in the pre-implementation phase create AUE in the establishment of an adequate implementation strategy.
    - Also, the inadequate effort spent in the organisation and flow of the acquisition process and establishing adequate internal partnership in the pre-implementation phase impact on the AUE spent in maintaining organisational momentum and managing resistance to change in the implementation phase.
    - Inadequate effort spent in dealing with the nature of market conditions in the pre-implementation phase create AUE on the management of project factors in the implementation phase
    - Similarly, inadequate effort spent on the establishment of sustainable external partnership in the pre-implementation phase leads to AUE on maintaining such external partnership in the implementation phase.

- Furthermore, *inter-relationships* among AUE factors were found in each phase.
    - In the ***pre-implementation*** phase, it was found that the formalisation of the ERP mission and the finalisation of ERP package choice impacted on each other i.e. an inadequate effort spent in the one would cause AUE spent in the other. Also, inadequate effort spent in maintaining stability in the organisational structure impacts on AUE spent in the finalisation of ERP package choice as well as the organisation and flow of the acquisition process. Similarly, inadequate effort spent in assimilating the nature of market conditions impacts on AUE spent on both external partnerships and the organisation and flow of the acquisition process.

    - In the ***implementation*** phase, inadequate effort spent in managing conditions external to the organisation's control leads to AUE being spent on establishing an implementation strategy as well as maintaining sound external partnerships. Similarly, inadequate effort in attending to the nature of the organisation itself leads to AUE in maintaining organisational momentum and managing resistance to change. It was found that organisational momentum/resistance to change and the management of project factors mutually impact on each other in terms of AUE this phase. Finally, inadequate effort spent on the setting-up of an implementation strategy creates AUE in maintaining organisational momentum and managing resistance to change.

- The following EoC factors were perceived to influence AUE in the ***pre-implementation*** phase: project seen as long-term investment, project involving a large and long-term payoff, organisational politics, organisational inertia, the belief that risk is something that can be brought under control and the lack of feasible alternatives in order of perceived importance.

- The following EoC factors were perceived to influence AUE in the ***implementation*** phase: project seen as long-term investment, high costs associated with closing the project, organisational inertia, project involving a large and long-term payoff, the lack of feasible alternatives, the belief that risk can be brought under control, the desire not to waste sunk costs and organisational politics in order of perceived importance.

- A relatively stronger relationship was observed between factors that are deemed as important in the pre-implementation phase as in the implementation phase. Conversely, factors that seem to bear relatively more importance in the first phase compared to the second one were perceived as having a weaker relationship between the two phases. Factors that were deemed to have a relatively stronger relationship than others are: project seen as a long-term investment, lack of feasible alternatives, the belief that risk can be brought under control, organisational inertia and organisational politics.

5.3.2 AUE Model

This section presents a model that can be derived from the analysis and implications.

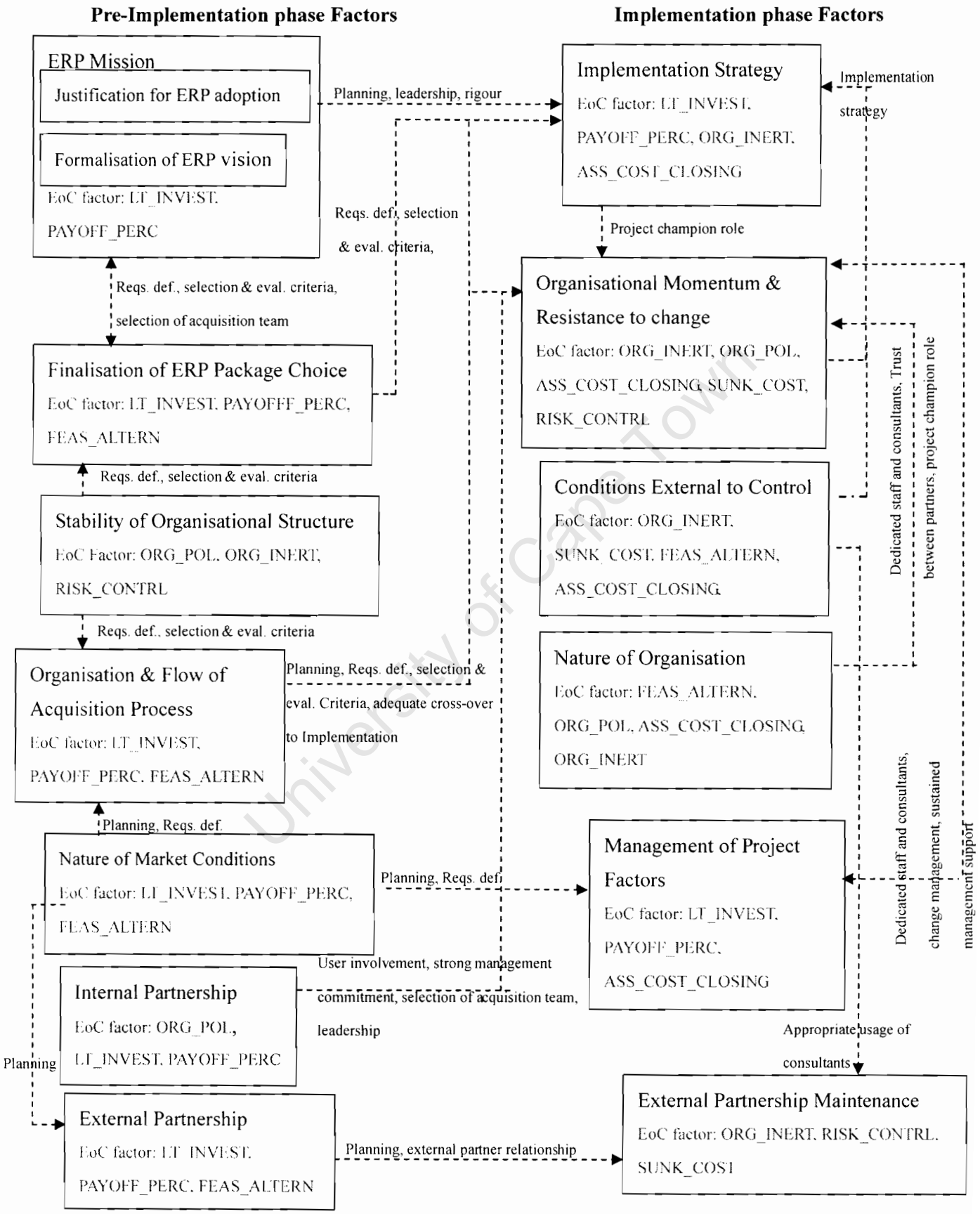


Figure 5.6: AUE Model

The AUE model distinctly shows the two phases considered in this study as constituting the main phases of the ERP life-cycle. The eight pre-implementation factors and the six implementation ones, extracted from the qualitative analysis, are shown on the left and right side respectively. As explained in the analysis, it was found that where there is an underlying organisational realisation and need for transformation and for a more strategic vision, the basis for adopting an ERP is grounded in an overall strategic ERP mission. This is shown by the grouping of those two factors in the model indicating this mission. Based on the Tables 5.4 and 5.5 and the accompanying analysis, links among those factors are shown together with the relevant CSFs that are affected.

From the pre-implementation phase to the implementation phase, it can be seen that CSFs that accompany the various links as labels are those that were said to have attracted *inadequate effort* mostly by C1 and C2 in this study. Namely, there is a relationship between the inadequate effort spent in the formalisation of an ERP mission, the finalisation of an ERP package choice, the organisation and flow of the acquisition process and the AUE spent in the formalisation of an implementation strategy. Also, there is a relationship between the inadequate effort spent in the organisation and flow of the acquisition process, and in the type of internal partnership within the organisation and the AUE spent in maintaining organisational momentum in the implementation phase. It was found that inadequate effort spent in dealing with some market conditions in the acquisition phase can influence AUE on the management of certain project factors in the implementation phase. Also, the inadequate effort spent in managing good external partner relationships from the acquisition phase leads to AUE in maintaining the same type of relationship in the next phase.

Also, as previously discussed, there are ***inter-relationships*** among the ***pre-implementation*** factors and these are shown by arrows with relevant connecting CSFs. For instance, ERP mission was seen to influence the basis for ERP choice and in return the basis on which the final choice is made can also have an impact on the overall ERP mission (as observed more particularly with C2 where the final choice was finally guided by measures of cost-effectiveness and global suitability instead of what had been recommended). The stability of the organisational structure especially with regards to new acquisitions by the business (C3) or new ownership takeover (C1) influences the final choice, as well as the organisation and flow of the acquisition process. Market conditions such as economic performance locally and abroad, geographical remoteness and lack of sourcing options locally impact on the smooth flow of the acquisition process as well as on the organisation's ability to establish a long-term relationship with external partners, as in C4.

Similarly, the model shows ***inter-relationships*** among the ***implementation*** factors. More specifically, it shows that conditions external to organisational control such as natural calamities (C5), economic conditions (C4), scarcity of expertise (C2, C4) and inadequacy of foreign experts' knowledge of local conditions (C4) can impact on the implementation strategy. The model also shows that conditions outside the organisation's control also impacts on the maintenance of sound external partnership in the implementation phase via the appropriate usage of consultants. This refers particular to the cases of C2 and C4.

Also, the nature of the organisation such as the specific operational calendar by which the organisation functions (C4), an unstable political environment (C5)and the fact that the implementation is taking place in the context of a group-wide effort (C2) can impact on the overall organisational momentum and encourage resistance to change from internal partners.

There is a mutual relationship between organisational momentum/resistance to change and project factors: for instance, to manage complexity and scope and resource allocation problems (C3, C4), sustained management support is required but at the same time, such obstacles can represent a threat to momentum especially in dealing with resistance to change and maintaining morale and dedication among personnel.

The model also shows a mutual relationship between implementation strategy and the maintenance of organisational momentum and management of resistance to change. On the one hand, implementation strategy impacts on organisational momentum and resistance to change via the adequacy of project championing and in return organisational momentum and resistance to change impacts on ERP implementation strategy. This was particularly the case at C1 and C2.

Finally, the various EoC factors that have been found to be relevant to influence AUE in each phase are also shown. A relationship between those EoC factors found to be important and the AUE factors was inferred based on the cases' individual perceptions for each "important" EoC factor in that phase. For instance, for the factor finalisation of ERP package choice, it was found that C2, C3 and C4 spent AUE to satisfy CSFs such as requirements definition and establishing selection criteria. From an analysis of C2, C3 and C4's perception of EoC importance (Fig. 5.4), it can be observed that of the factors that were deemed important on average, the factors that were considered important for these cases are: project seen as long-term investment (LT_INVEST) for C2, C3 and C4; project having a long-term payoff (PAYOFF_PERC) and lack of feasible alternatives (FEAS_ALT) for C2 and C4.

Hence, by combining such perceptions and the findings on the AUE spent by each case in the respective life-cycle phases, the relationship between the EoC factors and the AUE factors is inferred in the model in Fig. 5.6. An important finding in this study is the relationship that was perceived between the two phases based on the presence of EoC factors such as project seen as a long-term investment, the lack of feasible alternatives, the belief that risk can be brought under control and organisational inertia in the pre-implementation phase and their presence in the next.

The next chapter derives implications of the above discussion based on the literature surveyed in Chapter 2 and also attempts to support the model in Fig. 5.6.

CHAPTER 6 - IMPLICATIONS BASED ON LITERATURE

This section discusses the analysis and results presented in the previous chapter in light of the literature surveyed and reviewed in Chapter 2.

6.1 AUE & ERP Project Performance

In Chapter 2, the notion of additional unplanned effort (AUE) was developed from the model by Wideman (2000) and Davis (cited, Wideman, 2004). The latter show that project success is a function of quality, scope, time and cost. However, because success is not an objectively quantifiable outcome (Shaw, 2003) and evolves over a continuum of qualified and unqualified success (Gunson *et al.*, 2004), it is argued in this study that, as the project unfolds, the constructs that provide a realistic basis for monitoring success are effort, need and viability (Wideman, 2000). From Adam *et al.* (2004), time and cost are the areas that bear estimating and budgeting components implying their measurable and manageable quality as constraints during a project. Hence in this study, effort was considered as a combined measure of time and cost and was used as the main variable to analyse a project's performance along its life-cycle.

The temporal model developed by Markus & Tanis (2000) show that ERP success depends on initial starting conditions and events, factors outside the organisation's control, the organisation's motivated behaviour for adopting an ERP and response to external factors which together contribute to an outcome in the life-cycle phase that impacts on the next phase. Within this framework, project success is ensured by satisfying critical success factors as identified by Verville (2002) and Verville & Halingten (2002a) for the pre-implementation/acquisition and by Esteves & Pastor (2001; 2003) for the implementation.

Since it has been widely acknowledged that ERP projects are usually paved with difficulties that lead them to experience severe delays and disruptions and even failure (Bingi *et al.*, 1999; Sumner & Hamilton, 2005), this study finds its relevance in the analysis of effort delays and disruptions, i.e. effort (combination of time and cost) spent on a task in addition to what was allocated to that task in carrying out a project and more specifically to satisfy the various critical success factors identified in literature within the context of the life-cycle framework. This effort delay was termed *additional unplanned effort* in this research study.

6.2 AUE in the Pre-Implementation phase

Overall in the project's life-cycle, all cases reported at least average time and budget delays respectively (see Appendix B – Fig. 4). In the pre-implementation phase, it was seen that all cases experienced AUE but in varying degrees. In this phase, it was found that C4 and C3 suffered significantly more from AUE than the other three cases. Factors that were found to characterise AUE in this phase are the overall ERP mission (justification for adoption and vision), the finalisation of an ERP package choice, stability of organisational structure, organisation and flow of the acquisition process, nature of market conditions and type of internal and external partnerships. When analysing the effort spent on the individual CSFs in the pre-implementation phase, it was found that C1 and C2 reported inadequate effort for most of those CSFs

namely the planning and initializing for implementation, adequate requirements definition, establishing selection and evaluation criteria, user involvement, strong management commitment, leadership, adequate cross-over to implementation team and adequate external partner relationship.

As Chang & Gable (2000) indicate the pre-implementation phase consists of the adoption decision phase and the acquisition phase. In the first one, the organisation must question the need for a new ERP system while deciding on the approach to address business challenges and strategy. In the second one, the organisation evaluates and selects the product that will best fit organisational requirements aligned with the strategy defined in the first sub-phase. Hence, as the model in Fig.5.6 shows, the ERP mission (incorporating the adoption decision and strategy formulation) is related to the basis for the final package choice in which important CSFs have to be attended to. These CSFs include the definition of requirements, the latter being considered a must prior to consulting vendors (Verville, 2002), the establishment of selection and evaluation criteria and also the careful selection of acquisition team members. The latter is deemed important to provide for team members who will be involved on the next phase thus ensuring continuity and with diverse skills and knowledge to fulfil a complementary blend of advisory roles on the decision-making process (Verville, 2002).

Another factor that influences the final choice is the stability of the organisational structure of the business, i.e. strategic business moves and acquisitions or new ownership takeovers are likely to disrupt the process as it creates changes to the definition of requirements and project scope (Shanks *et al.*, 2000) and also the selection criteria while also creating uncertainty as to the source of authority (Verville, 2002) especially in the case of new ownership takeovers. Those links are shown in Fig. 5.6. Taking into account Verville & Halingten's (2002a) model in Fig. 2.7, it can be inferred that such disruptions in organisational structure would cause recursiveness of activities in the process thus causing AUE.

This above-mentioned recursiveness affects the organisation and flow of the acquisition process. The extent of delays and disruptions experienced during the pre-implementation/acquisition process can be regarded as a function of the way the process is organised. The acquisition phase consists of a number of sub-steps as identified in the literature (Sistach *et al.*, 1999; Verville & Halingten, 2002a). Those steps are outlined to take place in a generally sequential pattern, even though it is stressed especially by Verville & Halingten (2002a) that these steps are both iterative and recursive. Nevertheless, to achieve the end result which is the final choice and negotiation over a particular option, those outlined steps (decision to adopt, search for candidate solutions, selection of candidate solutions, evaluation of candidate solutions and final choice and negotiation) need to flow from the one to the other in sequential progression.

Another factor that affects AUE during the pre-implementation phase is market conditions. This would be categorised as factors outside the organisation's control in Markus and Tanis's (2000) model supported by Somers *et al.* (2000). As was the case for C4 where there was a lack of options on the market either to develop the ***SAP*** system further or to acquire a new package, the consequence was that it triggered a motivated response from the organisation to withhold its process and concentrate on in-house enhancements of the legacy system. This was AUE spent in the face of unforeseen events. Again, this

factor also influences the organisation and flow of the process as it forces the organisation to re-iterate earlier steps.

In his conceptual framework for ERP software *ex-ante* evaluation, Stefanou (2001) stresses the importance of analysing capabilities and constraints in relation to ERP software vendors and partners based on the adequate establishment of selection criteria for the product as well as the implementation partner. This is supported by Verville (2002). Hence the importance of the external partnership factor in the proposed model above. This factor can however cause AUE in the pre-implementation phase if the organisation struggles to create such long-term strategic relationship with its external partners especially when induced by unfavourable external conditions such as the lack of local support or unavailability of expertise worldwide as seen in C4.

One important factor that is also critical for the organisation to consider is the internal partnership it strikes with various users and stakeholder groups. As Verville (2002) supported by Franch & Pastor (2000) indicates, user involvement in the acquisition process, vendor demonstrations and final choice are critical to the project's success. For certain cases, it was seen that this proved to be a daunting task and not all managed to allocate the required effort to it (C1, C2) while some (C3) struggled with it in both phases.

As the model suggests, there is a relationship among those factors discussed above and the ones found to characterise AUE in the *implementation* phase. However, an important finding of this study is that more often than not, the cases revealed that inadequate effort instead of actual AUE in the pre-implementation phase is what characterises AUE overall in the project, more specifically in the implementation phase. In other words, as Franch & Pastor (2000) suggest ERP failures are due to the fact that organisations wanting to adopt an ERP usually oversee the strategic importance of procurement and wrongfully take the acquisition of ERP packages as a given (Sammon & Adam, 2002).

6.3 AUE in the Implementation phase

The analysis showed then that those organisations that reported to have spent inadequate effort in satisfying the various CSFs in the pre-implementation phase experienced AUE in the implementation phase, *comparatively* more than those cases that claim to have spent adequate and even AUE on pre-implementation CSFs.

Factors that characterise AUE in the implementation phase are implementation strategy, organisational momentum and resistance to change, external partnership, external conditions, organisational factors and project factors. From the unified model developed by Esteves & Pastor (2003), these factors can be categorised according to the four typical dimensions in the matrix in Fig. 2.6 in Chapter 2.

The implementation strategy factor is viewed as a strategic factor both from an organisational and technological perspective depending on whether the organisation, such as in C2, spent AUE in deciding how to approach the whole process (organisational) or whether the organisation spent AUE in deciding

how to adapt to the ERP and how far to customise the package (technological). This factor was found to affect the implementation strategy CSF as well as the comprehensive BPR and adequate project champion role CSFs as supported by Somers *et al*. (2001) and Hong & Kim (2002).

The organisational momentum and resistance to change factor is both a strategic and tactical factor as it concerns sustained management support, adequate project champion role, user involvement and trust between partners, which are all strategic factors in Esteves & Pastor's (2003) unified model. The factor was also found to impact on the dedication of staff and consultants which is a tactical factor. According to Boon *et al*. (2004), one of the key CSFs in ERP projects is sustained top management support as this in turn influences other factors such as the way external influences are handled, organisational factors and politics are dealt with and overall responsibility to the various stakeholders in the project.

External conditions such as natural disasters and economic conditions may affect all dimensions as classified by Esteves & Pastor (2003) as the CSFs impacted may fall in any quadrant of their unified model (Fig. 2.6), thus relating the four dimensions on the matrix: tactical, strategic, organisational and technological. This is because the range of external factors outside an organisation's control can be of various types and hence can impact the project in various ways too. For instance, from Table 5.5, it may impair the formalising of an implementation strategy and project schedule, disturb the appropriate usage of consultants and delay the laying of adequate infrastructure interfaces for the project (Esteves-Sousa & Pastor-Collado, 2000; Esteves & Pastor, 2003). The impact of the external partnership factor is tactical and organisational as it was found to affect CSFs such as appropriate usage of consultants and dedicated staff and consultants. This is also supported by Bingi *et al*. (1999), Shanks *et al*. (2000) and Sumner (2000).

Organisational factors such as operational calendar, unstable environment and business group context as explained in the model can affect the project tactically as well as strategically depending on the CSF they impact on. Where such factors pertaining to the nature of the organisation impact on the implementation strategy (Murray & Coffin, 2001; Holland *et al*., 1999), adequate champion role and scope management (Shanks *et al*., 2000; Holland *et al*., 1999; Sumner, 1999; Somers *et al*., 2000), it is seen as strategic. The nature of the organisation can be considered to affect the project tactically when impacting on the trust between partners, staff and user dedication, the formalisation of testing plans and schedules and the adequacy of legacy system knowledge (Stefanou, 1999; Holland *et al*., 1999; Shanks *et al*., 2000; Sumner & Hamilton, 2005) in Esteves & Pastor's (2003) model.

Finally project factors such as complexity and scope and resource allocation problems can fall under the tactical as well as the strategic perspective in Esteves & Pastor (2003). As the model in Fig. 5.6 shows, on the one hand it can affect factors such as adequate data conversion, formalised plan and schedules (Holland *et al*., 1999; Esteves-Sousa & Pastor-Collado, 2000; Bingi *et al*., 1999) and even staff and user dedication (Stefanou, 1999) and on the other hand it can also affect the scope management which is a strategic factor according to Esteves & Pastor's (2003) model also supported by Shanks *et al*., (2000), Holland *et al*., (1999), Sumner, (1999) and Somers *et al*., (2000).

As with pre-implementation AUE factors, the implementation AUE factors are also inter-related. An important link is for instance between project factors and organisational momentum and resistance to change. As explained earlier, one of the critical factors affected by organisational momentum is sustained management support which is recognised by many authors (Boon *et al.*, 2004; Nah *et al.*, 2003; Somers *et al.*, 2000; Murray & Coffin, 2001; Bingi *et al.*, 1999) as a key CSF. Also, top management support influences commitment to resources as well as change management commitment (Dong, 2001). The same applies to the link between organisational momentum/resistance to change and external conditions as sustained management support is required to face external influences outside the organisation's control (Boon *et al.*, 2004).

Also, the proposed model in Fig. 5.6 shows a relationship between the nature of the organisation and organisational momentum and resistance to change, based on the fact that factors such as typical operational calendar or politically charged environments may impact on the level of dedication from staff and users, as well as trust between partners. It hence requires adequate top management and project championing to be managed as supported by Boon *et al.* (2004) and Dong (2001) who acknowledge the importance of sustained management in the face of factors such as politics and organisational influences.

External conditions may affect the effort required to obtain sound external partnership relationship in the implementation phase, especially in the face of events such as the lack of local support or scarcity of expertise worldwide as seen in C4 and C2, as it can impinge on the appropriate usage of available consultants on the project (Bingi *et al.*, 1999; Shanks *et al.*, 2000). Similarly, external conditions were found to affect implementation strategy especially in the face of uncontrolled natural disasters or unfavourable economic conditions, as in C1 and C5, as they may disrupt the realisation of such strategy. ERP success depends on factors external to the organisation's control and on its motivated behaviour with its responses to unforeseen problems (Somers *et al.*, 2000).

Relationship with the Pre-Implementation phase

As Verville (2002) suggest many of the factors that need to be accounted for during the pre-implementation phase are the same as those that are critical in the implementation phase and hence indicate the importance of planning in the first phase. From the model, in Fig. 5.6, the relationships between the factors influencing AUE in the two phases are shown and the relevant CSF impacted on is also labelled. In accordance with Verville's (2002) argument, the inadequate effort spent by organisations to satisfy CSFs particularly consisted of a lack of planning and initialising for the implementation phase as this CSF appears on almost all relations.

From the analysis and derived model, it was found that inadequate effort spent on the various pre-implementation factors and related CSFs has an impact in terms of causing AUE in corresponding implementation factors. A possible contribution of this study lies with the various relationships that were found to exist between those pre-implementation factors that experience inadequate effort and those implementation factors that, as a result, experience AUE.

6.4 Perceived Influence of EoC factors on AUE

A sub-objective of this study was to investigate whether factors known to influence the phenomenon of escalation of commitment (EoC) are present in ERP life-cycle phases and whether they influence the AUE that is spent in that phase. Also, the study tried to investigate whether there is a relationship between two phases based on the presence of a particular EoC factor. Even though a wide range of literature is available and has been surveyed for this study, it was apparent that almost none of them attempted to investigate the presence of EoC in ERP projects, specifically with regards to their impact on the life-cycle phases. Hence, the findings of this study in this respect are thought to provide perhaps a new avenue for future studies.

Based on the findings, the proposed model in Fig. 5.6 shows that 6 factors were perceived as influential to causing AUE in the pre-implementation phase and 8 in the implementation phase. This result was obtained based on the fact that these factors scored more than an average perceived value of importance (3). This therefore indicates that EoC factors are present during the ERP life-cycle phases and confirms that these factors may contribute to the AUE spent in ERP projects. The factors that were ranked the highest in both phases are project viewed as a long-term investment and project viewed as having a large and long-term payoff, both being project determinants as identified by Staw (1997) and Mahaney & Lederer (1999). The second factor was however found to occupy a more important role in the pre-implementation phase than in the implementation phase. More project factors seem to be of influence in the implementation phase namely high costs associated with closing the project and the lack of feasible alternatives.

Besides project determinants, some psychological and organisational determinants were also perceived as present in both phases. From the literature, escalation of commitment is usually attributed to psychological, social and organisational forces in addition to project determinants which are considered as more objective attributes of a project (Staw & Ross, 1987; Mahaney & Lederer, 1999). However, in this study only a few such factors scored more than average importance: the belief that risk can be brought under control (psychological), organisational inertia and politics (organisational) and the desire not to waste sunk costs (psychological) but since these factors were acknowledged, it can be viewed as evidence of the importance of such subjective factors pertaining to psychological, personal and group politics (Shakir, 2000; Keil *et al.*, 2000; Mann, 2003) in ERP decision-making. Factors belonging to the social determinant groups were not viewed as important by respondents.

Importantly, this study also found that certain EoC factors namely the project being seen as a long-term investment, the lack of feasible alternatives, the belief that risk can be brought under control, organisational inertia and organisational politics were factors present in both phases for which respondents perceived a higher than or average relationship thus indicating that the combined presence of such project, psychological and organisational factors are likely to encourage AUE in the pre-implementation phase *thus* leading to a similar AUE in the next phase.

It has to be acknowledged that this study faced limitations in the extent to which information of a subjective and sensitive nature could be accessed, especially with regards to psychological behaviours of

decision-makers on the project. Hence, it is very possible that respondents' views were limited by the fact that they were reluctant to admit to any sensitive information concerning the attitude of their peers. Also, it is to be observed that none of the projects exhibited actual escalation of commitment situations thus possibly explaining the perceived insignificance of many non-project determinants. Nevertheless, the findings of this study concerning the perception of the presence of EoC factors as being influential in causing AUE in the respective ERP life-cycle phases and the additional link established between those phases based on the relationship between the detected presence of common EoC factors in each individual phase provide an innovative contribution to the field and a basis for future investigations.

CHAPTER 7 – CONCLUSIONS

For well over a decade, organisations worldwide have initiated enterprise-wide information management systems projects implementing Enterprise Resource Planning (ERP) systems. These projects often represent the single largest investment in an IS system in the history of those organisations and in many cases the largest single investment (Sumner, 1999). An initiative of such magnitude often faces daunting challenges from the many events and obstacles that may threaten its success.

From the perspective of the ERP project life-cycle and the critical factors known to influence success in each phase, this research study, by means of case-study analysis, proposed to investigate the events that can threaten ERP projects success by forcing organisations to spend additional unplanned effort in trying to satisfy those CSFs during the pre-implementation and the implementation phases distinctly. This additional unplanned effort was measured based on the interview respondents' perceptions.

7.1 Research Propositions Revisited

The following research questions were posed at the beginning of this dissertation:

1. What are the factors that influence AUE spent in the attempt to satisfy CSFs during the ERP life-cycle, specifically in:
   a. the pre-implementation phase?

   and the

   b. the implementation phase?
2. Is there a relationship between the AUE spent satisfying CSFs in the pre-implementation phase and the AUE spent satisfying CSFs in the implementation phase?

7.1.1. AUE in the ERP Life-Cycle

In the cases studied, it was found that AUE is experienced in both phases of the ERP life-cycle even though it appears that this AUE is more significant in the implementation phase. Furthermore, it was found that the pre-implementation phase is likely to be more characterised by inadequate effort in satisfying particular CSFs thus causing a corresponding AUE to be spent in the implementation phase. Also, where there are persisting conditions throughout the life-cycle such as lack of sourcing options on the market, it was found that a similar extent of AUE was experienced in both phases.

The following factors were found to influence AUE in the attempt to satisfy CSFs in the pre-implementation phase: the justification for ERP adoption, the formalisation of an ERP vision, the finalisation of an ERP package choice, the stability of organisational structure, the organisation and flow of acquisition process, the nature of market conditions and the type of internal and external partnership.

The following factors were found to influence AUE in the attempt to satisfy CSFs in the implementation phase: the formalisation of an implementation strategy, the maintenance of organisational momentum and resistance to change, the maintenance of external partnership relationship, conditions external to the organisation, the nature of the organisation and the management of project factors.

In addition to identifying those factors just mentioned, the study also investigated the possible influence of EoC factors on the AUE spent in the life-cycle. Particularly, in the pre-implementation phase, the following factors were perceived as important in causing AUE: project seen as long-term investment, project involving a large and long-term payoff, organisational politics, organisational inertia, the belief that risk is something that can be brought under control and the lack of feasible alternatives in order of perceived importance.

Similarly, in the implementation phase, the following EoC factors were deemed influential towards AUE: project seen as long-term investment, high costs associated with closing the project, organisational inertia, project involving a large and long-term payoff, the lack of feasible alternatives, the desire not to waste sunk costs, the belief that risk can be brought under control and organisational politics in order of perceived importance.

7.1.2. *Relationship between the two phases*

Based on the factors found to influence AUE, a relationship has been established between the two phases and a model (Fig.5.6) was derived to illustrate this relationship. Importantly, it was found that there is a relationship between the *inadequate effort* spent in the ***pre-implementation*** phase on the formalisation of the ERP mission, the finalisation of ERP package choice, the organisation and flow of the acquisition process and the *AUE* spent in the ***implementation*** phase on the formalisation of the implementation strategy. This is shown in Fig. 5.7A below.

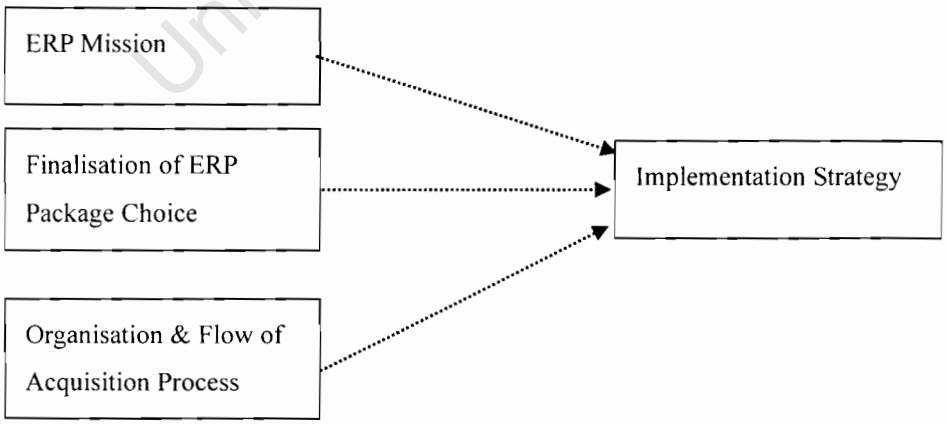


Figure 5.7A: Extract 1 from AUE Model

Similarly, there is a relationship between the *inadequate effort* spent in the organisation and flow of the acquisition process in the ***pre-implementation*** phase and the *AUE* spent in maintaining organisational momentum and managing resistance to change in the ***implementation*** phase. A similar relationship was found between internal partnership within the organisation established during the ***pre-implementation***

phase and the maintenance of organisational momentum and management of resistance to change in the ***implementation*** phase. This is illustrated in Fig.5.7B.

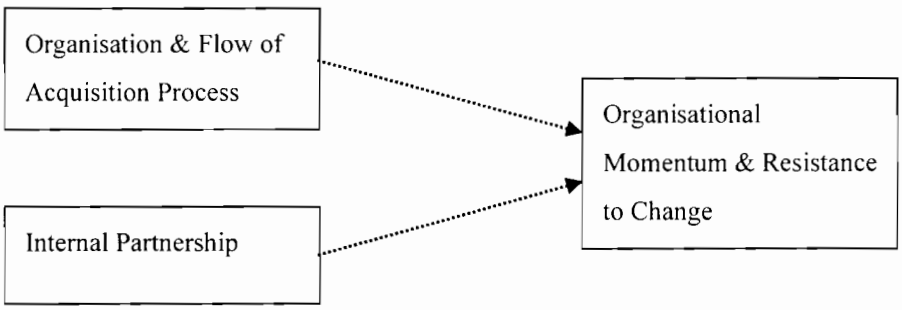


Figure 5.7B: Extract 2 from AUE Model

It was also found that inadequate effort spent in dealing with market conditions in the ***pre-implementation*** phase influences AUE on the management of certain project factors in the ***implementation*** phase. Also, the inadequate effort spent in managing good external partner relationships from the ***pre-implementation*** phase leads to AUE in maintaining the same type of relationship in the ***implementation*** phase. These are shown in Fig. 5.7C and 5.7D below.

Figure 5.7C: Extract 3 from AUE Model

Figure 5.7D: Extract 4 from AUE Model

The study also determined that there are *inter-relationships* among those ***pre-implementation*** AUE factors found to influence AUE: the effort spent on the formalisation of the ERP mission influences the finalisation of ERP package choice and in return, the basis on which the final choice is made also has an impact on the overall ERP mission. Figure 5.7E extracts this mutual relationship from the AUE model.

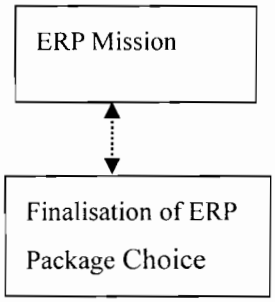


Figure 5.7E: Extract 5 from AUE Model

The stability of organisational structure influences the effort spent in finalising ERP package choice as well as maintaining the flow of the acquisition process as shown in Fig. 5.7F.

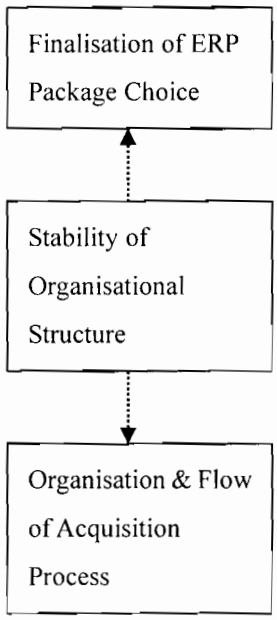


Figure 5.7F: Extract 6 from AUE Model

The nature of market conditions such as economic performance locally and abroad, geographical remoteness and lack of sourcing options locally impact on the smooth flow of the acquisition process as well as on the organisation's ability to establish a long-term relationship with external partners.

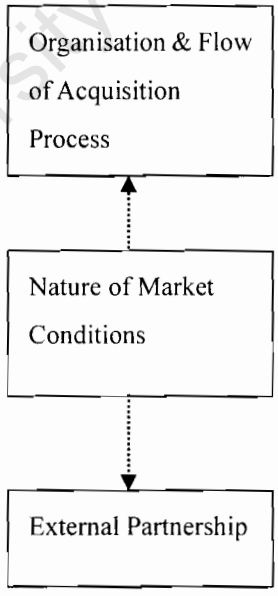


Figure 5.7G: Extract 7 from AUE Model

Similarly, the study found *inter-relationships* among the ***implementation*** AUE factors. More specifically, it was determined that conditions outside the organisation's control such as natural calamities or economic conditions impact on the effort spent in formalising an implementation strategy and on maintenance of external partnership. Fig. 5.7H captures this relationship.

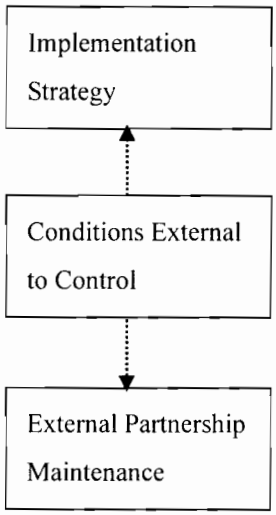


Figure 5.7H: Extract 8 from AUE Model

Also, the nature of the organisation itself such as its specific operational calendar or its attached political environment impacts on the effort required to maintain organisational momentum and manage resistance to change from internal partners. Fig. 5.7I illustrates this.

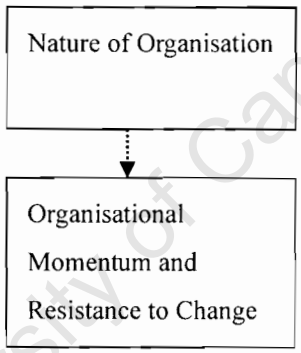


Figure 5.7I: Extract 9 from AUE Model

Also, it was found that the effort spent to manage project factors such as complexity and scope and resource allocation problems influences AUE in the maintenance of organisational momentum especially in dealing with resistance to change and maintaining morale and dedication among personnel. Conversely, it was also found that the effort spent in maintaining momentum and managing change through the adequate management support can also impact on the effort spent in managing project factors. This is depicted in Fig.5.7J below.

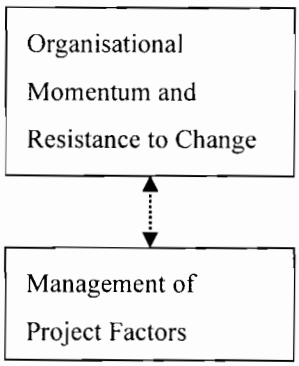


Figure 5.7J: Extract 10 from AUE Model

The study also found a relationship between the effort spent on formalising an implementation strategy and the effort spent on maintaining organisational momentum and managing resistance to change. This is shown in Fig. 5.7K below.

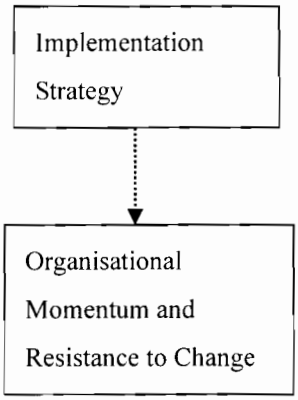


Figure 5.7K: Extract 11 from AUE Model

Concerning the relationship that exists between ***EoC*** factors influencing AUE in the two phases, it was revealed by the study that the factors, project seen as long-term investment, lack of feasible alternatives, the belief that risk is something that can be brought under control and organisational inertia create a stronger relationship between the two phases compared to the other factors that also scored above-average importance. Furthermore, it was found that there is a relatively stronger relationship between EoC factors that are deemed as important in the pre-implementation phase as in the implementation phase. EoC factors that bear relatively more importance in the first phase compared to the second contribute to a weaker relationship between the two phases.

7.2 Limitations of the Research

The results obtained from this research study and the extents to which they can be generalised are limited by the fact that only a small number of cases have been investigated. Despite the strength of it being a multiple-case study, put forward in Chapter 3, it remains a weakness of this research approach to not allow for generalisability. However, the nature of this study being more of an exploratory than explanatory nature, the intention of the researcher was to attempt to contribute to the field by focusing on specific cases and hopefully uncover pertinent issues that could likely be missed in a more positivist approach.

Due to budget restrictions and the fact that data collection necessitated face-to-face interaction, this study could only be carried out, with the exception of C2, within the region of the Western Cape in South-Africa, where the researcher is based. Also, the study was limited by the fact that it was not only difficult to identify organisations which experienced troubled ERP projects but also which were open to discussion on the topic. This not only made the sampling exercise for the case-studies difficult but also, it made the extent and depth of the information gathered on this topic difficult as it was found that respondents were not likely to express their personal opinions of their peers on the project especially with regards to their attitude and behaviour on the project.

7.3 Implications for Future Studies

It is suggested that further exploratory studies be conducted on the relationship between escalation of commitment and additional unplanned effort spent during the ERP life-cycle. Further empirical research in collecting additional information and in actually measuring the level of satisfaction of those CSFs with regards to AUE in each phase is also recommended. Also, it would be of value in the future for quantitative studies to develop measures of AUE spent and EoC incurred in each life-cycle phase and compare them to establish relationships between the two measures. Qualitative studies should be conducted to further explore the relationships among the various AUE factors found in this study. In this manner, additional findings and analyses will contribute to a better understanding of the phenomenon of additional unplanned effort during ERP projects.

Also, future studies should further explore the relative importance of EoC factors between the two phases. Based on new data sets and improved measurements, they should review the relative importance of those factors that were deemed *not so* important in this study but that could be revealed important in other cases. In this manner, additional knowledge relating the phenomenon of escalation of commitment to ERP projects and additional unplanned effort will be available.

BIBLIOGRAPHY

Abraham, D.L. 2002, 'A Contingency Model for Organisational Technology Adoption Decision making Concerning Innovative Technologies', *Proceedings of the Eighth Americas Conference on Information Systems,* pp 1992-1998, from Association for Information System Electronic Library (AISeL) database.

Adam, F. & Doherty, P. 2000, 'Do ERP Implementations have to be lengthy? Lessons from IRISH SMEs', *Conférence de l'Association Information et Management (2000)*, Montpellier, France. Retrieved: August 10, 2003 from http://www.aim2000.univ-montp2.fr/pdf/adam.pdf.

Adam, F., Sammon, D. & Carton, F. 2004, 'Project Management Issues in Implementing ERP – Towards an Approach more suited to ERP projects,' *AIM 2004 program*, Retrieved: November,10,2004,from http://www.aim2004.int_evry.fr/pdf/AIM04_Adam_Sammon_Carton.pdf

Al-Mashari, M. 2003, 'Enterprise Resource Planning (ERP) Systems: A research agenda', *Industrial Management & Data Systems*, vol.103, no.1, pp.22-27. Retrieved: May 3, 2004 from Emerald Library database.

Alavi, M., Brooke, G. & Carlson, P. 1990, 'The Ecology of MIS Research: A Twenty year status review', *Proceedings of the 10th Conference on Information Systems*, Boston, MA,pp. 363-374.

Appleton, E. 1997, 'How to Survive ERP,' *Datamation*, vol.43, No.3, pp.50-53. Retrieved: April, 27, 2003, from Expanded Academic ASAP database.

Arkes, H. & Blumer, C. 1985, 'The psychology of sunk costs,' *Organizational Behavior and Human Decision Processes*, vol.35, pp.124-140.

Aronson, J. 1994, 'A Pragmatic View of Thematic Analysis,' The Qualitative Report, vol.2, no.1. Retrieved: May, 14 2003 from http://www.nova.edu/sss/QR/QR2-1/aronson.html

Baccarini, D., Salm, G. and Love, P. 2004, 'Management of risks in information technology projects,' *Industrial Management and Data Systems*, vol. 104, No.4, pp. 286-295. Retrieved: March, 12 2005 from Emerald Library database.

Bannister, F. & Remenyi, D. 1999, 'Value Perception in IT Investment Decisions', *The Electronic Journal of Information Systems Evaluation*, vol.2, No.2. Retrieved: November, 20, 2002, from http://www.iteva.rug.nl/ejise/vol2/issue2/paper1.html

Barki, H. & Pinsonneault, A. 2002, 'Explaining ERP Implementation Effort and Benefits with Organisational Integration,' *Cahier du GReSI*, Février 2002, pp. 1-27. Retrieved: May, 10 2003 from http://gresi.hec.ca/SHAPS/cp/gescah/formajout/ajout/test/uploaded/cahier0201.pdf

Barki, H., Rivard, S. & Talbot, J. 1993, 'Toward an assessment of software development risk,' *Journal of Management Information Systems*, vol.10, No.2, pp.203-225. Retrieved: February, 15, 2003, from Business Source Premier database.

Barone, C.A., German Jr., R.F., Katz, R.N., Long, P.E. & Walsh, B 2000, *Information Technology, Systems, and Services in Higher Education, A Primer*, Educause & NACUBO, U.S.

Benbasat, I., Goldstein, D.K. & Mead, M. 1987, 'The Case Research Strategy in Studies of Information Systems', *Management Information Systems Quarterly*, vol.11, pp. 369-386.

Bernroider, E. & Koch, S. 2000, 'Differences in Characteristics of the ERP System Selection Process between Small or Medium and Large Organisations', *Proceedings of the Sixth Americas Conference on Information Systems (AMCIS 2000)*, Long Beach, CA. pp. 1022-1028. Retrieved: May 11, 2003, from Association for Information System Electronic Library (AISeL) database.

Billington, J. 1997, 'A Few Things Every Manager Ought to Know about Risk,' *Harvard Management Update*, vol.2, No.3, pp.1-12.

Bingi, P., Sharma, M.K. & Godla, J.K. 1999, 'Critical Issues affecting ERP Implementation,' *Information Systems Management*, vol.16, No.3, pp.7-14. Retrieved: March, 12, 2003, from MasterFILE Premier database.

Block, R. 1983, *The Politics of Projects*, Yourdon Press, Prentice-Hall, New York.

Blumenstalk Mingus, N 2002, 'Understanding IT Project Risk,' *System Development Management*, 32-10-21. Retrieved: February, 20, 2003, from Auerbach Publications database.

Boehm, B. 1991, 'Software Risk Management: Principles and Practices', *IEEE Software*, vol.8, No.1, pp.32-41.

Boland, R.J. 2002, 'Design in the Punctuation of Management Action', *Workshop on Managing as designing: Position Papers.* Retrieved: April 2, 2003, from http://design.cwru.edu/Positions/boland.doc

Bond, B., Genovese, Y. & Miklovic, N. 2000, 'ERP is dead – Long Live ERP II', *Strategic Planning*, Research Note, October 4, 2000. Retrieved: February, 20, 2003, from Gartner database.

Boon, O., Corbitt, B. & Peszynski, K. 2004, 'Reassessing critical success factors for ERP adoption – a case study', 8th Pacific Asia Conference on Information Systems, PACIS 2004, pp. 2184-2190. Retrieved: October 8, 2004, from http://www.pacis-net.org/file/2004/p05-006.pdf

Boonthanom, R. 2003, 'Information Technology Project Escalation" Effects of Decision Unit and Guidance,' *Proceedings of the twenty-fourth International Conference on Information Systems (ICIS),* pp. 378-388. Retrieved: March, 25, 2003, from Association for Information System Electronic Library (AISeL) database.

Bowen, M.G. 1987, 'The Escalation Phenomenon Reconsidered: Decision Dilemmas or Decision Errors,' *Academy of Management Review*, vol.12, No.1, pp.52-66. Retrieved: April, 23, 2003, from Business Source Premier database.

Boyatzis, R. E. 1998. *Thematic Analysis and Code Development*, Sage Publications, Inc. Thousand Oaks, CA.

Brockner, J. & Rubin, J.Z. 1985, *Entrapment in escalating conflicts: A social psychological analysis*, Springer-Verlag, NewYork.

Brockner, J. 1992, 'The Escalation of Commitment to a Failing Course of Action: Toward Theoretical Progress', *Academy of Management Review*, vol.17, No.1, pp39-61. Retrieved: May, 21, 2003, from Business Source Premier database.

Brooks, F.P. 1987, 'No Silver Bullet: Essence and Accidents of Software Engineering,' *IEEE Computer*, vol.20, No. 4, pp.10-19.

Brown, C. & Vessey, I. 1999, 'ERP Implementation Approaches: Toward A Contingency Framework', *International Conference on Information Systems (ICIS 1999),* Charlotte, North Carolina, pp.411-416. Retrieved: March 14, 2003 from ACM Digital Library database.

Brynjolfsson, E 1993, 'The Productivity Paradox of Information Technology: Review and Assessment,' *Communications of the ACM*, vol.36, No. 12, pp. 66-77. Retrieved: November, 23, 2002, from ACM Digital Library database.

Butler, J. 1999, 'Risk Management Skills needed in a Packaged Software Environment', *Information Systems Management*, vol.16, no.3, pp.15-20. Retrieved: April 21, 2003, from MasterFILE Premier database.

Butterick ,R., 2000, *The Interactive Project Workout* 2nd edition. London: FT Prentice Hall.

Caldas, M.P. & Wood, T. Jr. 1998, 'How Consultants can help organisations survive the ERP Frenzy,' submitted to the Annual Meeting of the Academy of Management, August 1999. Retrieved: March 21, 2003, from http://200.18.48.121/artigos/artigo_1.pdf

Carlsson, C. & Fuller, R. 2002, 'Project Scheduling with fuzzy real options', *Cybernetics and Systems '2002, Proceedings of the sixteenth European Meeting on Cybernetics and Systems Research, Vienna. Austrian Society for Cybernetic Studies*. Retrieved: June 1, 2003, from www.google.com.

Chamberlain, W. & Thomas, G. 1995, 'Future of MRP II: headed for the scrap heap or rising from the ashes?' *IIE Solutions*, vol.27, no.7, pp. 32-35. Retrieved: March 10, 2003, from InfoTrac OneFile database.

Chang, S. & Gable, G. 2000, 'Major Issues with SAP Financials in Queensland Government,' *Proceedings of the 2000 Americas Conference on Information Systems*, Long Beach, California, pp. 972-976, from Association for Information System Electronic Library (AISeL) database.

Chen, I.J. 2001, 'Planning for ERP Systems: analysis and future trend', *Business Process Management Journal*, vol.7, no.5, pp.374-386. Retrieved: March 22, 2003, from Emerald Library database.

Chung, S. & Snyder, C. 2000, 'ERP Adoption: a technological evolution approach', *International Journal of Agile Management Systems*, vol.2, no.1, pp.24-32.

Collins, C & Miller, R. 2001, *XP Distilled*. Retrieved: March 10, 2003 from http://www.rolemodelsoftware.com/moreAboutUs/publications/xpDistilled.php

Constas, M.A. 1992, 'Qualitative Analysis as a public event: the documentation of category development procedures,' *American Educational Research Journal*, vol.29, no.2, pp.253-266.

Cook, T.D. & Campbell, D.T. 1979, *Quasi-Experimentation: Design and Analysis Issues for Field Settings*, Houghton Mifflin, Boston, MA.

Cooper, R.B. & Zmud, R.W. 1990, 'Information Technology Implementation Research: A Technological Diffusion Approach,' *Management Science*, vol.36 no.2, pp.123-139.

Cule, P, Schmidt, R, Lyytinen, K & Keil,M 2000, 'Strategies for heading off IS project failure,' *Information Systems Management*, vol.17, No.2, pp.65-73. Retrieved: May, 24, 2003, from Business Source Premier database.

Cunningham, J.B. 1997, 'Case-Study Principles for different types of cases', *Quality and Quantity*, vol.31, pp.401-423.

Darke, P., Shanks, G. & Broadbendt, M. 1998, 'Successfully completing case-study research: combining rigour, relevance and pragmatism,' *Information Systems Journal*, vol.8, no.4, pp.273-289. Retrieved: May, 8 2003, from Business Source Premier database.

Davenport, T.H. 1998, 'Putting the Enterprise into the Enterprise System', Harvard *Business Review*, vol.76, no.4, pp.121-131. Retrieved: April 12, 2003 from Business Source Premier database.

Deitz, R & Renkema, T. 1995, 'Planning and justifying investments in information technology: A Framework with case study illustrations,' in A. Brown & D. Remenyi (eds), *Proceedings of the Second European Conference on Information Technology Investment Evaluation*, The Operations Research Society (UK), pp. 28-41.

Dembla, P. 1999, 'Enterprise Resource Planning: Business Drivers and Critical Success Factors', 3rd Annual SAP Asia Pacific, *SAPPHIRE'99*, Institute of Higher Learning Forum, pp.40-51. Retrieved: October 10, 2002 from http://www.business.vu.edu.au/sapconf/

Dillon, S. 1998, 'Descriptive Decision Making: Comparing Theory with Practice,' *33rd Annual Operational Research Society of New Zealand Conference*. Retrieved: April 2, 2003, from http://www.citeseer.nj.nec.com/simon60new.html

Dong, L. 2001, 'Modelling top management influence on ES implementation', *Business Process Management Journal*, vol. 7, pp.243-250. Retrieved: April 10, 2003, from Emerald Library database.

Donovan, R.M. 2001, 'Successful ERP Implementation the First Time,' *Performance Improvement, Access Business Online*. Retrieved: March 12, 2003, from http://www.rmdonovan.com/pdf/perfor8.pdf

Drummond, H. 1994. 'Too Little Too Late: A Case Study of Escalation in Decision Making', *Organisation Studies*, vol.15, no.4, pp.591-607. Retrieved: May 12, 2003 from Business Source Premier database.

Drury, D. & Farhoomand, A. 1997, 'Improving Management Information Systems Research: Question Order Effects in Surveys', *Information Systems Journal*, vol.7, no.3, pp. 241. Retrieved: October 14, 2004 from http://www.blackwell-synergy.com/links/doi/10.1046%2Fj.1365-2575.1997.d01-20.x

Dvir, D, Taz, T. & Shenhar, A.J. 2003, 'An Empirical Analysis of the relationship between project planning and project success,' International Journal of Project Management, vol.21, pp.89-95. Retrieved: September, 12, 2004, from Elsevier Science database.

Eden, C., Williams T., Ackermann, F. & Howick, S. 2000, 'The role of feedback dynamics in disruption and delay on the nature of disruption and delay (D&D) in major projects,' *Journal of Operational Research Society*, vol. 51, No. 3, pp. 291-300. Retrieved: September, 12, 2003, from http://www.managementscience.org/research/delay.asp

ELMO Solutions 2005, *Bills of Material definition*. Retrieved: November 16, 2005 from http://elmo.irisco.com/elmobom/bill-of-materials-definition.htm

Eschinger, C. 2001, 'Market Share: ERP Software, Worldwide, 2003 (Executive Summary,' *Gartner Dataquest – Executive Summary*. Retrieved: October, 12, 2004 from Gartner Research database.

Eschinger, C., Pang C. & Biscotti, F. 2004, 'Market Share: ERP Software, Europe 2003 (Executive Summary),' *Gartner Dataquest – Executive Summary*. Retrieved: October, 12, 2004 from Gartner Research database.

Esteves, J.M. & Pastor, J.A. 1999, 'An ERP life-cycle-based research agenda', *International Workshop on Enterprise Management Resource & Planning Systems (EMRPS)*, pp. 359-371. Retrieved March 10, 2003 from http://www.lsi.upc.es/~jesteves/EMRPS99.pdf

Esteves-Sousa, J. & Pastor-Collado, J. 2000, 'Towards the unification of critical success factors for ERP implementations,' *Proceedings of the 10th Annual Business Information Technology (BIT) 2000 Conference*, Manchester. Retrieved: March, 21, 2003, from http://www.lsi.upc.es/~jesteves/bit2000.pdf

Esteves, J. & Pastor, J. 2001, 'Enterprise Resource Planning Systems Research: An Annotated Bibliography', *Communications of AIS*, vol.7, No.8, pp. 1-51. Retrieved: March, 12, 2003, from Association for Information System Electronic Library (AISeL) database.

Esteves, J., Casanovas, J. & Pastor, J. 2003, 'Modelling with Partial Least Squares Critical Success Factors Interrelationships in ERP implementations', *Proceedings of the ninth Americas Conference on Information Systems (ICIS)*, pp.446-451. Retrieved: Feb, 15, 2004, from Association for Information System Electronic Library (AISeL) database.

Esteves, J. & Pastor J. 2003, 'Strategic and tactical critical success factors behaviour along the ERP implementation phases', *10th European Conference on Information Technology Evaluation*, pp. 215-224.

Everdingen, Y., van Hillergersberg, E. & Waarts, E. 2000, 'ERP Adoption by European Midsize companies: searching for ERP systems offering a perfect fit', *Communications of the ACM*, vol.43 no.4, pp.27-31. Retrieved: March 25, 2003, from ACM Digital Library database.

Ewusi-Mensah, K. 1997, 'Critical Issues in abandoned Information Systems development projects,' *Communications of the ACM*, vol.40, No.9, pp.74-80. Retrieved: April, 12, 2003, from ACM Digital Library database.

Farbey, B, Land, F & Targett, D. 1993, *IT Investment. A Study of Methods and Practice*, Butterworth Heinemann, Oxford.

Fischer, G. & Palen, L. 1999, 'Design = The Sciences of the Artificial', *Center for LifeLong Learning & Design, University of Colorado at Boulder*, February 8, 1999. Retrieved: March, 27, 2003,from http://www.cs.colorado.edu/~l3d/coures/csci7212-99/pdf/science-of-the-art.pdf

Francalanci, C. 2001, 'Predicting the implementation effort of ERP projects: empirical evidence on SAP R/3,' *Journal of Information Technology*, vol.16, No.1, pp. 33-48. Retrieved: April 12, 2003, from Business Source Premier database.

Franch, X. & Pastor, J.A. 2000, 'On the Formalisation of ERP Systems Procurement', Proceedings of the Continuing Collaboration for successful COTS development, ICSE Workshop, Limerick,Ireland. Retrieved:April,23,2003,from wwwsel.iit.nrc.ca/projects/cots/icse2000wkshp/Papers/13.pdf

Gable, G. 1994, 'Integrating Case Study and Survey Research Methods: An Example in Information Systems', *European Journal of Information Systems*, Volume 3, Number 2, 1994, pp. 112-126. Retrieved: September 12, 2004 from http://www.palgrave-journals.com/ejis/index.html

Gable, G..G., Scott, J. & Davenport, T. 1998, 'Cooperative EWS Life-Cycle Knowledge Management,' Proceedings of the Ninth Australasian Conference on Information Systems, Sydney, Australia, pp. 227-240.

Gable, G.G., Sedera, D & Chan, T. 2003, 'Enterprise Systems Success: A Measurement Model,' *Proceedings of the twenty-fourth International Conference on Information Systems (ICIS)*, pp.576-686. Retrieved: March, 29, 2003, from Association for Information System Electronic Library (AISeL) database.

Garson, G.D. 2003, 'Case Studies', *PA 765 Statnotes: An Online Textbook.* Retrieved: March 15, 2003 from http://www2.chass.ncsu.edu/garson/pa765/statnote.htm

Gattiker, T. & Goodhue, D. 2000, 'Understanding the plant level costs and benefits of ERP: Will the ugly duckling always turn into a swan?', in R.Sprague Jr. (ed.), Proceedings of the Thirty-Third Annual Hawaii International Conference of System Sciences, IEEE Computer Society Press, CA.

Glaser B.G. & Strauss, A.L. 1967, *The Discovery of Grounded Theory: Strategies for Qualitative Research*, Aldine, New York.

Gorman, G.E. & Clayton, P. 1997, *Qualitative Research for the Information Professional, a practical handbook*, Library Association Publishing, London.

Griffith, T.L., Zammuto, R.F. & Aiman-Smith, L. 1999, 'Why new technologies fail?', *Industrial Management*, vol.41 no.3, pp.29-34. Retrieved: April 5, 2003, from EbscoHost Research database.

Gunson, J., de Blasis, J.P., Esteves, J. & Pastor, J. 2004, 'Information Systems Implementations: Models to Determine what Constitutes Success and Failure'. Retrieved: Feb, 09, 2005, from http://www.hec.unige.ch/recherches_publications/cahiers/2004/2004.05.pdf

Haimes, Y.Y., Schoof, R.M. & Chittister, G. 1997, 'A Holistic Management Framework for Software Acquisition', *Acquisition Review Quarterly*, Winter 1997, pp. 55-86. Retrieved: May, 20, 2003, from http://www.dau.mil/pubs/97arq/schoof.pdf

Hammer, M. 1990, 'Reengineering Work: Don't Automated, Obliterate', *Harvard Business Review*, vol. 68, no.4, pp. 104-112. Retrieved: May 10, 2003 from Business Source Premier database.

Hayes, F. 2004, *Chaos is back*. Retrieved: November 20, 2004, from http://www.computerworld.com/managementtopics/management/project/story/0,10801,97283,00.html

Hecht, B. 1997, *Choose the right ERP software*. Retrieved: March 3, 2003, from www.datamation.com/PlugIn/workbench/mfgsys/stories/choose.htm

Herriott, R.E. & Firestone, W.A. 1983, 'Multisite Qualitative Policy Research: Optimising description and generalisability', *Educational Researcher*, vol.12, pp. 14-19.

Hitt, L.M., Wu, D.J. & Zhou, X. 2002, 'Investment in Enterprise Resource Planning: Business Impact and Productivity Measures', *Journal of Management Information Systems*, vol.19, no.1, pp.71-98. Retrieved: September 14, 2003 from Business Source Premier database.

Holland, C.P., Light, B. & Gibson, N. 1999, 'A Critical Success Factors model for Enterprise Resource Planning Implementation,' *Proceedings of the 7th European Conference on Information Systems*, Copenhagen, Denmark, vol.1, pp.273-287. Retrieved: March,21, 2003, from http://www.ben.light.btinternet.co.uk/papers/ERPCSF-ECIS99.pdf

Hong, K.K. & Kim, Y.G. 2002, 'The critical success factors for ERP implementation: an organisational fit perspective,' *Information & Management*, vol.40, No.1, pp.25-40.Retrieved: March, 12, 2003, from Elsevier Science database.

Jani, A. 2003, 'Decision making in Software Projects: A Control Theory Perspective,' *Proceedings of the 2003- Ninth Americas Conference on Information Systems,* Tampa, Florida, pp. 3007-3014. Retrieved: September, 12, 2003, from Association for Information System Electronic Library (AISeL) database.

Järvinen, P.H. 2004, 'Research Questions Guiding Selection of an Appropriate Research Method'. Retrieved: Feb 21, 2005, from http://www.cs.uta.fi/reports/dsarja/D-2004-5.pdf

Judge, A., 1997, *The Art of Non-Decision making and the manipulation of categories.* Retrieved: March 19, 2003, from http://laetusinpraesens.org/docs/nondec.php

Kaplan, B. & Duchon, D. 1988, 'Combining Qualitative and Quantitative Methods in Information Systems Research: A Case Study', *MIS Quarterly*, vol.12 no.4, pp.571-586. Retrieved: Feb 13, 2005, from Business Source Premier database.

Katz, A 1993, 'Measuring Technology's Business Value', *Information Systems Management,* vol. 10, No.1, pp. 33-39. Retrieved: April, 21, 2002, from Business Source Premier database.

Keil, M. 1995, 'Pulling the Plug: Software Project Management and the problem of project escalation', *MIS Quarterly*, vol.24, No.4, pp.637-664. Retrieved: May, 22, 2003, from Business Source Premier database.

Keil, M., Cule, P., Lyytinen, K. & Schmidt, R.C. 1998, 'A Framework for identifying software project risks,' *Communications of the ACM,* vol.41, No.11, pp.76-83. Retrieved: February, 23, 2003 from ACM Digital Library database.

Keil, M. & Flatto, J. 1999, 'Information Systems Project Escalation: a reinterpretation based on Options Theory', *Accounting, Management and Information Technologies,* vol.9, pp115-139. Retrieved: May 20, 2003, from Elsevier Science database.

Keil, M., Mann, J. & Rai, A. 2000, 'Why Software Projects Escalate: An Empirical Analysis and Test of Four Theoretical Models,' *MIS Quarterly*, vol.24, No.4, pp.631-664. Retrieved: May, 18, 2003, from Business Source Premier database.

Keil, M. & Robey, D. 2001, 'Blowing the whistle on troubled software projects,' *Communications of the ACM*, vol.44, No.4, pp.87-93. Retrieved: May, 23, 2003, from ACM Digital Library database.

Kelly, S., Holland, C. and Light, B. 1999, "A Departure from Traditional Systems Development Methodologies: Enterprise Resource Planning (ERP) Systems and the Use of Process Modelling Tools Manchester", in *Proceedings of the 9th Annual BIT Conference,* Manchester, UK.

Kennedy, M.M. 1979, 'Generalising from Single Case Studies,' *Evaluation Quarterly*, vol.3, no.4, pp.661-678. Sage Publications Inc.

Kersten, G.E. & Szpakowicz S. 1994, 'Decision Making and Decision Aiding: Defining the Process, its Representations, and Support', *Group Decision and Negotiation*, vol.3, No.2, pp 237-261. Retrieved: November 24, 2002, from SwetsWise database.

Khalifa, G., Irani, Z & Baldwin, L.P. 2000, 'IT Evaluation Methods: Drivers and Consequences', *Proceedings of the 2000 Americas Conference on Information Systems (AMCIS 2000),* Longbeach, California, pp. 1142-1145. Retrieved: April, 24, 2003, from Association for Information System Electronic Library (AISeL) database.

Klein, G & Beck, P.O. 1987, 'A Decision Aid for Selecting among Information System Alternatives,' *Management Information Systems Quarterly*, vol.11, No.2, pp 177-185. Retrieved: November, 20, 2002, from Business Source Premier database.

Kling, J.L. 1991, 'Adapting Survey Methods to Study the Social Consequences of Computerisation', in Kraemer, K.L. (ed.), *The Information Systems Research Challenge: Survey Research Methods*, Harvard Business School Press, Boston, pp. 291-323.

Knapp, C.A. & Shin, N. 2001, 'Impacts of Enterprise Resource Planning Systems Selection and Implementation', *Seventh Americas Conference on Information Systems (AMCIS 2001)*, pp.1046-1048. Retrieved: April 12, 2003 from Association for Information System Electronic Library (AISeL) database.

Kumar, K. & Van Hillegersberg, J. 2000, 'ERP Experiences and Evolution', *Communications of the ACM*, vol.43, no.4, pp.23-26. Retrieved: April, 20, 2003, from ACM Digital Library.

Kwon, T. & Zmud, R. 1987, 'Unifying the fragmented models of information systems implementation,' in R.J. Boland & R.A. Hirschheim (eds.), *Critical Issues in Information Systems Research*, Wiley, New York, pp.227-251.

Legare, T. 2002, 'The Role of Organisational Factors in Realising ERP Benefits', *Information Systems Management*, Fall 2002, pp. 21-42. Retrieved June, 10, 2003, from IT KnowledgeBASE.

Leininger, M.M. 1985, 'Ethnography and ethnonursing: Models and modes of qualitative data analysis in M.M. Leininger (ed.), *Qualitative research methods in nursing*, Grune & Stratton, FL, pp. 33-72.

Light, B., Holland, C.P. & Wills, K. 2001, 'ERP and Best of Breed: A Comparative Analysis', *Business Process Management Journal,* vol.7, no.3, pp.216-224. Retrieved: May 12, 2003 from Emerald Library database.

Mahaney, R.C. & Lederer, A.L. 1999, 'Runaway Information Systems Projects and Escalating Commitment', *SIGCPR'99*, pp 291-296. Retrieved: May, 12, 2003, from ACM Digital Library database.

Mahaney, R.C. & Lederer, A.L. 2003, 'An Agency theory analysis of Information Technology Projects Success', *Ninth Americas Conference on Information Systems*, pp. 137-1349. Retrieved: November 10, 2003, from Association for Information System Electronic Library (AISeL) database.

Mann, J.E.C. 1996, *The Role of Project Escalation in Explaining Runaway Information Systems Development Projects: A Field Study*, in College of Business Administration, Georgia State University: Atlanta, Georgia.

Mann, J.A. 2003, 'Preventing Runaway IT Projects: Protecting Auditors from Entrapment,' *Proceedings of the 2003- Ninth Americas Conference on Information Systems,* Tampa, Florida, pp. 1350-1360. Retrieved: September, 10, 2003, from Association for Information System Electronic Library (AISeL) database.

Marasco, J. 2004, '*The Project Pyramid*,' Retrieved: June5,2004 from http://www-106.ibm.com/developerworks/rational/library/4291.html

Markus, M.L. & Robey, D. 1988, 'Information Technology and organisational change: causal structure in theory and research', Management Science, vol.34 no.5, pp. 583-598. Retrieved: March 15, 2003 from Business Source Premier database.

Markus, M.L. & Tanis, C. 2000,'The Enterprise System Experience- From Adoption to Success', *Framing the domains of IT management*, Pinnaflex Education Resources, Cincinnati, pp. 173-207. Retrieved: March 14, 2003 from http://www.pinnaflex.com/pdf/framing/CH10.pdf

Maxwell, J.A., Bashook, P.G. & Sandlow, L.J. 1986, 'Combining Ethnographic and Experimental methods in D.J. Fetterman & M.A. Pitman (eds.), *Educational Research: A Case Study', in Educational Evaluation: Ethnography in Theory, Practice and Politics,* Sage Publications, Beverly Hills, CA, pp. 121-143.

McFarlan, F.W. 1981, 'Portfolio approach to information systems,' *Harvard Business Review*, vol.59, No.5, pp.142-150. Retrieved from Business Source Premier database.

McLean, E, Seddon, P, Torkzadeh, R. & Willcocks, L. 2002, 'IS Success Measurement: Guidelines for Future Research,' *Panel at ICIS 2002.*

Meehl, P.E. 1978, 'Theoretical Risks and Tabular Asterisks: Sir Karl, Sir Ronald, and the Slow Progress of Soft Psychology', *Journal of Consulting and Clinical Psychology*, vol.49, no.4, pp.806-834.

Munoz, C. 2003, 'Applying Real Options and Game Theory to Information System Decision making: the Application Service Provider Case', *Proceedings of the 2003- Ninth Americas Conference on Information Systems,* Tampa, Florida, pp. 3364-3368. Retrieved: September, 11, 2003, from Association for Information System Electronic Library (AISeL) database.

Murray, M.G. & Coffin, G.W. 2001, 'A Case-Study Analysis of Factors for Success in ERP System Implementations', *Seventh Americas Conference on Information Systems*, pp.1012-1018. Retrieved: March 15, 2003, from Association for Information System Electronic Library (AISeL) database.

Murray, M.G. & Coffin, G.W. 2001, 'A Case-Study Analysis of Factors for Success in ERP System Implementations', *Seventh Americas Conference on Information Systems*, pp.1012-1018. Retrieved: March 15, 2003, from Association for Information System Electronic Library (AISeL) database

Myers, M.D. 1997, 'Qualitative Research in Information Systems', *MIS Quarterly*, vol. 21, no.2, pp. 241-242. Retrieved: March 10, 2004 from Business Source Premier database.

Newman, M. & Sabherwal, R. 1996, 'Determinants of Commitment to Information System Development: A Longitudinal Investigation', *MIS Quarterly*, vol.20 no.1, pp. 23-54. Retrieved: August 21, 2003 from Business Source Premier database.

Nah, F.F.H., Zuckweiler, K.M. & Lau, J.L.S. 2003, 'ERP Implementation: Chief Information Officers' Perceptions of Critical Success Factors', *International Journal of Human-Computer Interaction*, vol.16, no.1, pp.5-22. Retrieved: May, 12, 2004, from Business Source Premier database.

Nutt, P. 1976, 'Models for Decision making in Organisations and some Contextual Variables which Stipulate Optimal Use', *The Academy of Management Review*, vol.1, no.2, pp.84-139. Retrieved: March 23, 2003, from Business Source Premier database.

O'Leary, D. 2000, *Enterprise Resource Planning Systems: Systems, Life Cycle, Electronic Commerce and Risk*, Cambridge University Press, Cambridge, UK.

Oliver, D. & Romm, C. 2000, 'ERP Systems: The Route to Adoption', *6th Americas Conference on Information Systems (AMCIS 2000),* Long Beach, CA, pp. 1039-1044. Retrieved: May 5, 2003 from Association for Information System Electronic Library (AISeL) database.

Orlikowski, W.J. & Baroudi, J.J. 1991, 'Studying Information Technology in Organisations. Research appraoaches and assumptions,' *Information Systems Research*, vol.2, no.1, pp.1-28. Retrieved: May, 9 2003 from Business Source Premier database.

Parr, A.N. & Shanks, G. 2000, 'A Taxonomy of ERP Implementation Approaches,' *Proceedings of the 33rd Hawaii International Conference on System Sciences*. Retrieved: May20,2003 from http://csdl.computer.org/comp/proceedings/hicss/2000/0493/07/04937018.pdf

Powell, P, 1992, 'Information Technology Evaluation: Is it different?,' *Journal of the Operations Research Society*, vol.43, No.1, pp. 29-42.

Project Management Institute (PMI), 2000. '*A Guide to the Project Management Body of Knowledge (PMBOK GUIDE)*,' Pennsylvania, USA.

Ragowsky, A & Somers, T. 2002, 'Special Section: Enterprise Resource Planning,' *Journal of Management Information Systems*, vol.19, No.1, pp.11-15. Retrieved: April, 12, 2003, from Business Source Premier database.

Rajagopal, P. 2002, 'An innovation-diffusion view of implementation of ERP systems and development of a research model,' *Information & Management*, vol.40, No.2, pp.87-114. Retrieved: April, 25, 2003, from Elsevier Science database.

Ranganathan & Samarah, 2001, 'Enterprise Resource Planning Systems and Firm Value: An event study analysis,' Extended Abstract, *Twenty-second International Conference on Information Systems*, pp.157-158. Retrieved: May, 03, 2003, from Association for Information System Electronic Library (AISeL) database.

Ravarini, A., Tagliavini, M., Pigni, F. & Sciuto, D. 2000, 'A Framework for Evaluating ERP Acquisition within SMEs', *Association Information and Management (AIM) 2000.* Retrieved: April 15, 2003 from www.aim2000.univ-montp2.fr/pdf/Ravarini.pdf

Razi, M.A. & Tarn, J.M. 2002, 'ERP Pre-Acquisition Analysis for Small Companies,' *Decision Sciences Institute 2002 Annual Meeting Proceedings*, pp. 719-724. Retrieved: August 12, 2003, from www.sbaer.uca.edu/research/dsi/2002/toc.pdf

Remenyi, D. 2000, 'The Elusive Nature of Delivering Benefits from IT Investment, *The Electronic Journal of Information Systems Evaluation*, vol.3, No.1. Retrieved: November, 20, 2002, from http://www.iteva.rug.nl/ejise/fr_pre.html

Robey, D., Ross, J.W. & Boudreau, M.C. 2000, 'Learning to Implement Enterprise Systems: An Exploratory Study of the dialectics of change,' *MIT Centre for Information Systems Research*, Massachusetts, June 13, 2000. Retrieved: April, 02, 2003, from http://www.cis.gsu/~drobey/Cis8160/jmisv18.pdf

Roach, S.S. 1991, 'Services Under Siege', *Harvard Business Review*, vol.69, no.5, pp. 82. Retrieved: August 14, 2003 from Business Source Premier database.

Rockart, J.F. & Bullen, C.V. (eds.) 1986, *The Rise of Managerial Computing: The Best of the Center for Information Systems Research, Sloan School of Management, Massachussetts Institute of Technology*, Dow Jones-Irwin

Rosenthal, S.R. & Salzman, H. 1990, 'Hard Choices about Software: The Pitfalls of Procurement', *Sloan Management Review*, Summer 1990, Vol. 31, No.4, pp 81-91. Retrieved: April 15, 2003, from Business Source Premier database.

Ross, J. & Staw, B.M. 1986, 'Expo86; an escalation prototype,' Administrative Science Quarterly, vol.31, No., pp274-297.

Saint-Leger, G. & Savall, H., 2001, 'L'après projet ERP: retour d'expérience sur un changement qui n'as pas eu de lieu,' *Conférence de l'Association Information et Management,* Nantes, Italie.

Sammon, D. & Adam, F. 2000, 'Towards a Model of ERP Software Selection – Widening the Debate,' *Proceedings of the 10th Annual Business Information Technology (BIT) 2000 Conference*, Manchester, UK.

Sammon, D., Adam, F. & Elichirigoity, F. 2001, 'ERP Dreams and Sound Business Rationale,' *Proceedings of the 2001 Americas Conference on Information Systems (AMCIS)*, pp.1131-1135. Retrieved: April 10, 2003 from Association for Information System Electronic Library (AISeL) database.

Sammon, D. & Lawlor, D. 2001, 'An Examination of an ERP Software Selection Process: An Irish Case Study,' *Proceedings of the 11th Annual BIT Conference, Manchester, UK.*

Sammon, D. & Adam, F. 2002, 'Decision Making in the ERP Community,' *European Conference on Information Systems*, Gdańsk, Poland, June 2002. Retrieved: April 12, 2003 from http://www.eta.ktl.mii.lt/~mask/vania/ECIS2002proceedings/davidsammon.pdf

Scheer, A.W. & Habermann, F. 2000, 'Making ERP a Success', *Communications of the ACM*, vol. 43, no.4, pp.57-61. Retrieved: March 13, 2003 from ACM Digital Library database.

Schnitt, D.L. 1993, 'Reengineering the Organisation using Information Technology', *Journal of Systems Management*, vol.44, no.1, pp.14-20. Retrieved: August 23, 2003 from InfoTrac OneFile database.

Schwandt, T.A. 1997, *Qualitative Inquiry A Dictionary of Terms*, Sage publications, London, pp. 183.

Scott, J.E. & Vessey, I. 2002, 'Managing Risks in Enterprise Systems Implementations', *Communications of the ACM*, vol.45, no.4, pp.74-81. Retrieved: March 13, 2003, from ACM Digital Library database.

Shakir, M. 2000, 'Decision making in the evaluation, selection and implementation of ERP systems', *Proceedings of the 2000 Americas Conference on Information Systems,* Longbeach, California, pp. 1033-1038. Retrieved: March 28, 2003, from Association for Information System Electronic Library (AISeL) database.

Shang S. & Seddon, P.B. 2000, 'A Comprehensive Framework for Classifying Benefits of ERP Systems', *Proceedings of the 2000 Americas Conference on Information Systems*, Long Beach California, pp.1005-1014. Retrieved: March 12, 2003, from http://www.ebusinessforum.gr/content/downloads/ap0049.pdf

Shang S. & Seddon, P.B. 2004, 'Enterprise System Benefits: How Should they be Assessed?", 8th Pacific Asia Conference on Information Systems, PACIS 2004, pp. 1229-1240. Retrieved: October 10, 2004, from http://www.pacis-net.org/file/2004/s25-004.pdf

Shanks, G. Parr, A., Hu, B., Corbitt, B., Thanasankit, T., and Seddon, P. 2000, 'Differences in Critical Success Factors in ERP Systems Implementation in Australia and China: A Cultural Analysis', *Proceedings of the 8th European Conference on Information Systems*, Vienna, Austria.

Shapira, Z. 1988, *Prescriptive Models in organisational decision making. Debating rationality: Non-rational aspects of organisational decision making*, Cornell University Press, Ithaca, New York.

Shaw, N.G. 2003, 'Identifying relationships among factors in IS implementation,' Communications of the Association for Information Systems (AIS), vol.11, No.9 , pp.1-22. Retrieved: April 04, 2003, from Association for Information System Electronic Library (AISeL) database.

Simonson, I. & Staw, B.M. 1992, 'De-escalation strategies: A comparison of techniques for reducing commitment to losing courses of action,' *Journal of Applied Psychology*, vol.77, Ppp.419-426.

Sistach, F, Pastor, J.A. & Fernandez, L.F. 1999, 'Towards the methodological acquisition of ERP solutions for SMEs', Proceedings of EMRPS'99. Retrieved: April, 20, 2003, from http://leks.iasi.rm.cnr.it/emrps'99/papers/Sistach.htm

Smith, H.A., McKeen, J.D. & Staples, D.S. 2001, 'Risk Management in Information Systems: Problems and Potentials,' *Communications of the Association for Information Systems (AIS)*, vol.7, Article 13, pp.1-29. Retrieved: April, 18, 2003, from Association for Information System Electronic Library (AISeL) database.

Smithson, S. & Hirschman, R. 1998, 'A Critical Analysis of Information Systems Evaluation,' in A.N Bjorn & G.B. Davis (eds), *Information Systems Assessment: Issues and Challenges*, N.Hollan, Amsterdam, pp. 17-37.

Soh, C. & Markus, M. L. 1995, 'How IT creates business value: a process theory synthesis', *Proceedings of the sixteenth International Conference on Information Systems*, Netherlands: Amsterdam, pp. 29-41.

Soh, C. Kien, S.S. & Tay-Yap, J. 2000, 'Cultural Fits and Misfits: Is ERP a Universal Solution?', *Communications of the ACM*, vol. 43, no.4, pp.47-51. Retrieved: April 10, 2003 from ACM Digital Library database.

Somers, T.M., Nelson K. & Ragowsky, A. 2000, 'Enterprise Resource Planning (ERP) for the Next Millenium: Development of an Integrative Framework and Implications for Research', *Americas Conference on Information Systems 2000*, pp. 998-1004. Retrieved: September 10, 2002, from Association for Information System Electronic Library (AISeL) database.

Somers, T.M. & Nelson, K.G. 2001, 'Organisations and ERP Systems: Conceptualising Fit', *Proceedings of the Twelth Annual Conference of the Production and Operations ManagementSociety,POM-2001,Orlando,FI.*Retrieved:April 12, 2003, from http://www.poms.org/POMSWebsite/Meeting2001/ 2001/cd/papers/pdf/Somers.pdf

Sor, R. 1999, 'Management Reflections in Relation to Enterprise Wide Systems', *Proceedings of the 1999 Americas Conference on Information Systems,* Milwaukee Wisconsin. pp. 229-231, Retrieved: May, 15, 2003, from Association for Information System Electronic Library (AISeL) database.

Standish Group, 1994, 'The CHAOS Report', *The Standish Group*. Retrieved: April 12, 2003, from http://www.standishgroup.com/sample_research/index.php

Standish Group, 1995, 'CHAOS', *The Standish Group*. Retrieved: April 12, 2003, from http://www.projectsmart.co.uk/docs/chaos_report.pdf

Standish Group, 2004, "2004 CHAOS Demographics and Project Resolution', *2004 Third Quarter Report.* Retrieved: May 10, 2005 from http://www.standishgroup.com/sample_research/index.php

Staw, B.M. 1976, 'Knee-deep in the big muddy: A study of escalating commitment to a chosen course of action,' *Oganizational Behavior and Human Performance*, vol.16, pp.27-44.

Staw, B.M. 1981, 'The escalation of commitment to a course of action,' *Academy of Management Review*, vol.6, No.4, pp.577-587. Retrieved: May 10, 2003, from Business Source Premier database.

Staw, B.M. 1982, 'Counterforces in Change,' in P.S. Goodman & Associates (eds.), *Change in Organizations*, Jossey-Bass, San Francisco, CA, pp.87-121.

Staw, B.M. & Ross, J. (1987), 'Behavior in escalation situations: antecedents, prototypes and solutions,' in B.M. Staw & L.L. Cummings (eds.), *Research in Organisational behavio*r, vol.9, JAI Press Inc., Greenwich, Conn., pp.39-78.

Staw, B.M. & Ross, J. (1989), 'Understanding Behavior in Escalation Situations,' *Science,* New Series, vol.246, No.4927, pp.216-220. Retrieved: May 11, 2003, from JSTOR electronic database.

Staw, B.M. 1997, 'The escalation of commitment: An update and appraisal,' in Z. Shapira (ed.), *Organizational decision making*, Cambridge University Press, New York, pp.191-215.

Steenstrup, K. Genovese, Y., Zrimsek, B. & Eschinger, C. 2003, 'Predicts 2004: ERP Market and Vendors', *Gartner Research Note*, Retrieved: October, 12, 2004 from Gartner Research database.

Stefanou, 1999, 'Supply Chain Management (SCM) and organisational key factors for successful implementation of Enterprise Resource Planning (ERP) systems,' *Proceedings of the Americas Conference on Information Systems*, Longbeach, CA, pp.998-1004. Retrieved: May, 18, 2003, from Association for Information System Electronic Library (AISeL) database.

Stefanou, C.J. 2000, 'The Selection Process of Enterprise Resource Planning (ERP) Systems,' *Proceedings of the 2000 Americas Conference on Information Systems,* Longbeach, California, pp. 988-991. Retrieved: May, 18, 2003, from Association for Information System Electronic Library (AISeL) database.

Stefanou, C.J. 2001, 'A Framework for the ex-ante evaluation of ERP software', *European Journal of Information Systems*, Vol.10, No.4, pp 204-215. Retrieved: April 20, 2003, from http://www.web.njit.edu/~jerry/OM/OM-ERP-Papers/ERP-framework.pdf

Strassman, P.A. 1990, *The Business Value of Computers*, Information Economic Press, New Canaan.

Sumner, 1999, 'Critical Success Factors in enterprise wide information management system projects,' *Proceedings of the Americas Conference on Information Systems*, Milwaukee, WI, pp.800-802. Retrieved: May, 18, 2003, from Association for Information System Electronic Library (AISeL) database.

Sumner, M. 2000, 'Risk Factors in Enterprise Wide Information Management System Projects,' *Proceedings of the 2000 ACM SIGCPR conference on Computer personnel research*, Chicago, Illinois, pp.180-187. Retrieved: April, 10, 2003, from ACM Digital Library database.

Sumner, M. & Hamilton, J. 2005, 'The Turnaround ERP project: Strategies and Issues", *Proceedings of the 11th Americas Conference on Information Systems, Omaha, NE,* August 11th-14th 2005, pp. 2093-2098. Retrieved: August, 18, 2005, from Association for Information System Electronic Library (AISeL) database.

Swan, J., Newell, M. & Robertson, M. 1999, 'The illusion of 'best practice' in information systems for operations management', *European Journal of Information Systems*, vol.8, pp. 284-293.

Tan, C.W. & Pan, S.L. 2002, 'ERP Success: the search for a comprehensive framework,' *Proceedings of the 2002 – Eighth Americas Conference on Information Systems*, Dallas, Texas. , pp.925-933. Retrieved: March, 24, 2003, from Association for Information System Electronic Library (AISeL) database.

Tellis, W. 1997, 'Introduction to Case Study', *The Qualitative Report*, vol.3, no.2. Retrieved: February 13, 2005 from http://www.nova.edu/sss/QR/QR3-2/tellis1.html

Thawani, S. 2001, 'BPR or ERP - What Comes First?', Retrieved: November 12, 2005 from http://www.qualityoasis.com/Articles/BPR%20or%20ERP%20What%20Comes%20First%20Rev%201.pdf

Themistocleous, M., Irani, Z., O'Keefe, R.M. & Paul, R. 2001, 'ERP Problems and Application Integration Issues: An Empirical Survey,' *HICSS 34th*, vol. 09, no. 9, pp. 9045-9055. Retrieved: May, 12 2003 from http://doi.ieeecomputersociety.org/10.1109/HICSS.2001.927240

Van Everdingen, Y., Van Hillegersberg, J. & Waarts, E. 2001, 'ERP Adoption by European Midsize companies: Searching for ERP systems offering a perfect fit', *Communications of the ACM,* Vol. 43, No.4, pp. 27-31. Retrieved: May 10, 2003, from ACM Digital Library database.

Verville, J. 2002, 'A Study on the Importance of Team Composition and Group Role Definition in the ERP Acquisition Process', *33rd Annual Conference of the Southwest Decision Sciences Institute*. Retrieved: August 12, 2003, from http://sap.ittoolbox.com/documents/Academic-Articles?page=4

Verville, J. & Halingten, A. 2002a, 'A six-stage model of the buying process for ERP software', *Industrial Marketing Management*, Article in Press, uncorrected proof. Retrieved: May 14, 2003, from ScienceDirect Elsevier Science database.

Verville, J. & Halingten, A. 2002b, 'A qualitative study of the influencing factors on the decision processes for acquiring ERP software', *Qualitative Market Research: An International Journal,* Vol.5, No.3, pp. 188-198. Retrieved: May 12, 2003, from Emerald Library database.

Vogt, C. 2002, 'Intractable ERP: A Comprehensive Analysis of Failed Enterprise-Resource-Planning Projects', *Software Engineering Notes*, vol.27, no.2, pp.62-68. Retrieved: May 12, 2003, from ACM Digital Library database.

Volkoff, O. 1999, 'Using the Structurational Model of Technology to Analyse an ERP Implementation', *5TH Americas Conference on Information Systems (AMCIS 1999)*, Milwaukee, WI. Retrieved: March 11, 2003 from Association for Information System Electronic Library (AISeL) database.

Wideman, M. 2000, *First Principles of Project Management*. Retrieved: March 8, 2003 from http://www.pmforum.org/library/papers/2000/pm1stprn_wideman.pdf

Wideman, M. 2004, *Those Sexy Triangles Again*. Retrieved: March 18, 2003 from http://www.maxwideman.com/musings/triangles.htm

Willcocks, L. & Griffiths, C. 1997, 'Management and risk in major information technology projects,' in L. Willcocks, D. Feeny, and G. Iseli (eds.) *Managing IT as a Strategic Resource*, McGGraw-Hill, Maindenhead.

Willcocks, L & Lester, S. 1993, 'How do organisations evaluate and control information systems investments? Recent UK survey evidence' in D. Avison, J.Kendall & J DeGross (eds), *Human, Organisational and Social Dimensions on Information Systems Development*, North Holland, Amsterdam, pp. 15-39.

Willcocks L.P. & Sykes, R. 2000, 'The Role of the CIO and IT Function in ERP', *Communications of the ACM*, vol.43, no.4, pp.32-38. Retrieved: April 14, 2003 from ACM Digital Library database.

Wohlin, C. & von Mayrhauser, A. 2000, 'Assessing Project Success using Subjective EvaluationFactors'.Retrieved:May21, 2003, from http://www.eecs.wsu.edu/~aandrews/SQJ00.pdf.

Yin, R.K. 1994, *Case Study Research, Design and Methods,* 2nd ed. Newbury Park, Sage Publications.

APPENDIX A - QUESTIONNAIRE

This survey is designed to collect information about your experience on an ERP project that may have exceeded budget and/or time targets during its acquisition and implementation phases.

Instructions

- Please consider an ERP project in your organisation which
    1. is at a **post-acquisition** phase, i.e. either
        a. in a current implementation phase **or**
        b. in a post-implementation phase **or**
        c. completed **and**
    2. which suffered from **delays in terms of budget and time overruns**
- You are/were a project decision-maker (preferably a project manager) on an ERP project that was launched within the past five years in your organisation.

Glossary of Terms

1: An **Enterprise Resource Planning (ERP)** software package is an integrated application software designed to support the business processes of an enterprise across all departments of operation.

***Note**: An ERP project may consist of the implementation of a **single** or **several modules** of an ERP suite depending on the organisation's approach towards ERP implementation. Here, the focus is on the ERP project whether it refers to a single module or many modules of an ERP.*

2. Additional Unplanned Effort: effort spent in carrying out a task in addition to what was originally allocated to it.

3. CSF: stands for Critical Success Factor, a key area which needs to be satisfied to ensure successful performance of the project

4. Escalation of Commitment to a project is a situation where an organisation continues to spend resources [i.e. time, money, people] on a project that has gone over budget and time limits even though it would be advisable that the project either be redirected or stopped .

5. Pre-Implementation/Acquisition phase is the **decision-making** phase of the project life cycle where a selection of the vendor/s has to be made. Typical stages are *rollout planning, search for potential solutions, evaluation of candidate solutions, selection of suitable solutions, choice of the optimum solution and negotiation for the contract with the solution provider.*

6. The **Implementation phase** consists of getting the system and the end-users up and running. Activities include integration/interfacing, data design and migration, end-user training, custom modifications, parameter configuration, infrastructure setup, project and change management.

7. "**Time**" in this questionnaire refers to the **elapsed time** (as opposed to effort time) between two phases or periods in the project. Effort is considered as a combination of time and cost.

Section 1: Background to the Particular Project

1. Project Launch: When did your organisation officially decide to implement an ERP system?

   Month _____ Year _____

2. What is the status of the Project now?

   ☐ Completed Implementation

   ☐ Current Implementation

   ☐ Suspended Implementation

   ☐ Current Post-Implementation

   ☐ Abandoned

3. What is the size of the budget for the entire Project? Please select a range
   - ☐ 0 – 10M (Million Rands)
   - ☐ 10 – 50 M
   - ☐ 50 – 100 M
   - ☐ 100 – 500 M
   - ☐ Above 500 M

4. What were the objectives of the ERP project? (Tick all that apply)

   ☐ IT Cost Reductions

   ☐ Personnel Reductions

   ☐ Inventory Reductions

   ☐ Productivity Improvements

   ☐ Order Management cycle time

   ☐ Increase Revenue/Profit

   ☐ Procurement

   ☐ Speeding up the close of financial month/year end

   ☐ Other _____

5. What was the scope of the Project? (Tick all that apply)

   ☐ Manufacturing

   ☐ Human Resources

   ☐ Sales and Distribution

   ☐ Inventory Management

   ☐ Finance

   ☐ Other _____

6. What was the targeted number of users for this project?
   - ☐ 10,000 or more
   - ☐ 5,000 - 9,999
   - ☐ 1,000 - 4,999
   - ☐ 500 - 999
   - ☐ 100 – 499

7. How much time was planned for the project? If complete, what was the actual time taken?

	Start Month	Start Year	End Month	End Year
Planned	_____	_____	_____	_____
Actual (If Complete)	_____	_____	_____	_____

Section 2: Please focus on the Pre-Implementation phase of your selected ERP project.

8. Did the Pre-Implementation phase consume more effort than originally planned?

   ☐ No ☐ Yes

NB: ***If "No", please proceed to Section 3***

9. How much time was initially planned and how much time was actually taken for the Pre-Implementation/Acquisition phase?

   Planned _____ weeks/months/years

   Actual _____ weeks/months/years

10. Can you roughly indicate the extent of the additional unplanned effort required in the Pre-Implementation/Acquisition phase?

    _____ %

11. How important was this additional unplanned effort to the overall scale/size of the project? (Circle/highlight)

    1 - Not Important at all
    2 - Not too Important
    3 - Average
    4 - Important
    5 - Extremely

    Not Important 1 2 3 4 5 Important

12. What are the events that you believe caused this additional unplanned effort during your Pre-Implementation/Acquisition phase?

Section 3: <u>In this section, please focus on the Implementation phase of your selected ERP project</u>

13. Did/Is the Implementation phase consume more effort than originally planned?

☐ No ☐ Yes

NB: *<u>If "No", please proceed to Question 28</u>*

14. How much time was initially planned and how much time was actually taken for the Implementation phase of the project?

Planned ——— weeks/months/years

Actual (if complete) ——— weeks/months/years

15. Can you roughly indicate the extent of the additional unplanned effort in the Implementation phase?

——— %

16. How important was this additional unplanned effort on the overall scale/size of the project?

Not Important				Important
1	2	3	4	5

17. What are the events that you believe caused this additional unplanned effort during your Implementation phase?

Section 4: <u>Please think about the additional unplanned effort in spent in each phase to answer the following questions</u>

18, 19, 20 ***See Next page***

Q. 18. **-Additional Unplanned Effort spent on Satisfying CSFs-**

PRE-IMPLEMENTATION/ACQUISITION

	AUE		Adequate Effort	Inadequate Effort	No Effort
	Significant	Not Significant			
Planning – initialising Implementation CSFs					
Adequate cross-over of acquisition team to implementation team					
Careful selection of the acquisition team members					
Rigour					
Leadership					
Clear and unambiguous authority					
Strong management commitment					
Definition of requirements – before looking at vendors					
Establishing selection and evaluation criteria					
User involvement in the ERP acquisition process itself					
User involvement in the vendor demonstrations					
User buy-in the final choice					

Q.19. **- Additional Unplanned Effort spent on Satisfying CSFs –**

IMPLEMENTATION

	AUE		Adequate Effort	Inadequate Effort	No Effort
	Significant	Not Significant			
Sustained management support					
Effective organisational change management					
Good project scope management					
Adequate project team composition					
Comprehensive BPR					
Adequate project champion role					
User involvement and participation					
Trust between partners					
Dedicated staff and consultants					
Strong communication inwards and outwards					
Formalised project plan/schedule					
Adequate training program					
Preventive troubleshooting					
Appropriate usage of consultants					
Empowered decision-makers					
Adequate ERP implementation strategy					
Adequate ERP version					
Avoid customisation					
Adequate infrastructure and interfaces					
Adequate legacy systems knowledge					
Formalised testing plans					
Adequate data migration process					

20. Please indicate to what extent the following 15 factors were present during the project's two main phases: the Pre-Implementation/Acquisition phase and the Implementation phase? (tick/highlight) – that would have encouraged the project to consume AUE in order to be managed.

	Pre-Implementation/Acquisition Phase					**Implementation Phase**									
	Not Important at all	Not too Important	Average	Important	Extremely Important	Not Important at all	Not too Important	Average	Important	Extremely Important	**Is the presence of this factor in the Implementation phase due to the fact that it was present in the Pre-Imp/Acquisition phase?** Definitely Yes	Maybe	Neither	Not Really	Definitely No
Project considered as a long-term investment															
Project involved a large payoff and a long-term payoff structure															
Setbacks seen as temporary and therefore not significant enough															
High costs associated with closing or stopping project															
Lack of feasible alternatives available at this stage															
Decision-makers trying to justify continuation															
Decision Makers holding themselves responsible for failure															
Belief that risk is something that can be brought under control															
Desire not to "waste" sunk costs (resources already spent)															
Overestimation of chances of success by project champion/s															
Need to "save face" – "so as not to look bad" to others															
Leadership - social rewards for persistence anticipated															
Degree of inertia in the organisation															
Organisational Politics															
Institutionalisation – too closely tied to organisational values to consider withdrawal															

21. Compared to other typical IS projects undertaken in your organisation, was this project... (circle or highlight).

Note:
1 = significantly less
2 = quite less
3 = less
4 = average
5 = more
6 = quite more
7 = significantly more

Smaller (in size)	1 2 3 4 5 6 7	Larger (in size)
Less Complex	1 2 3 4 5 6 7	More Complex
Less Costly	1 2 3 4 5 6 7	More Costly
Less Successful	1 2 3 4 5 6 7	More Successful
Less Over Budget	1 2 3 4 5 6 7	More Over Budget
Less Behind Schedule	1 2 3 4 5 6 7	More Behind Schedule

22. What was your role on the project? (tick all that apply)

- ☐ Project manager
- ☐ Project team member
- ☐ Project steering committee member with decision right
- ☐ Project steering committee member with no decision right
- ☐ 3rd party consultant
- ☐ Other _____

23. Indicate the number of targeted users for this project

- ☐ 10,000 or more
- ☐ 5,000 - 9,999
- ☐ 1,000 - 4,999
- ☐ 500 - 999
- ☐ 100 - 499

24. Which of the following best describes the end product or service of your organization at this location?

- ☐ Manufacturing
- ☐ Trade. Wholesale and/or Retail
- ☐ Financial Services (e.g., Banking, Insurance)
- ☐ Health Care
- ☐ Government
- ☐ Transportation
- ☐ Higher Education
- ☐ Other (please specify) _____

25. Is there anything else you would like to add concerning your experience of delays and additional unplanned effort on this ERP project?

_____

_____

Thank You for taking the time to complete this questionnaire

If you would like to obtain an electronic copy of the summary of this study, please provide your contact details below.

Name: _____

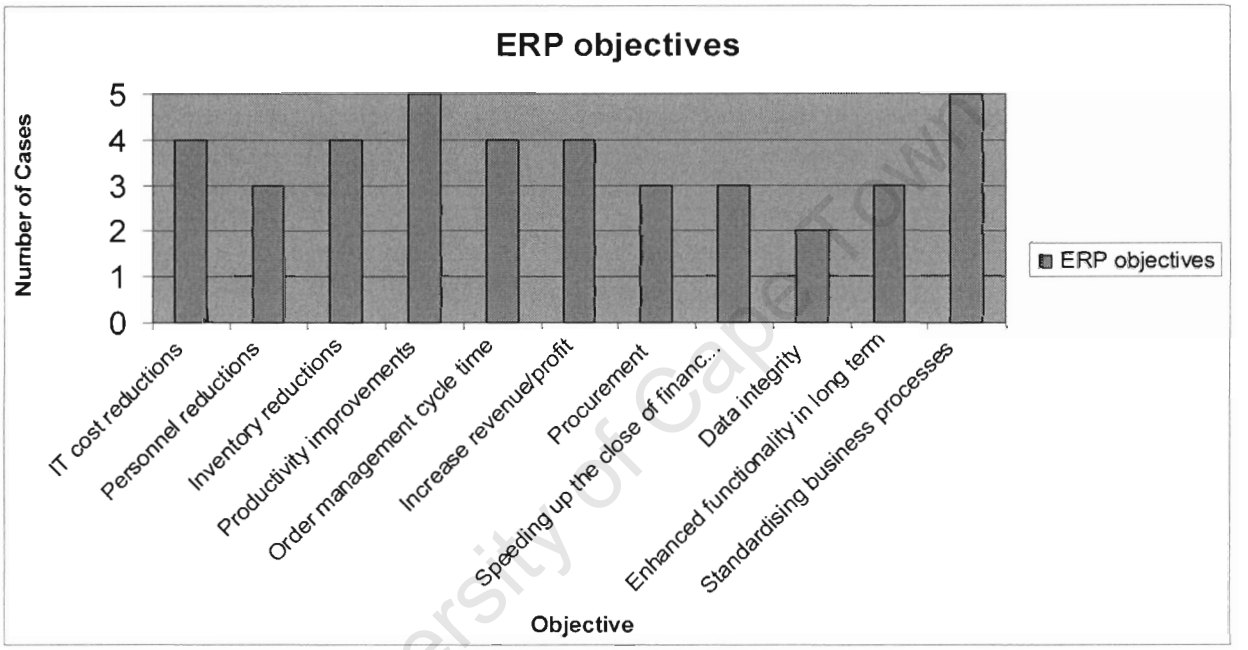
Email: _____

APPENDIX B

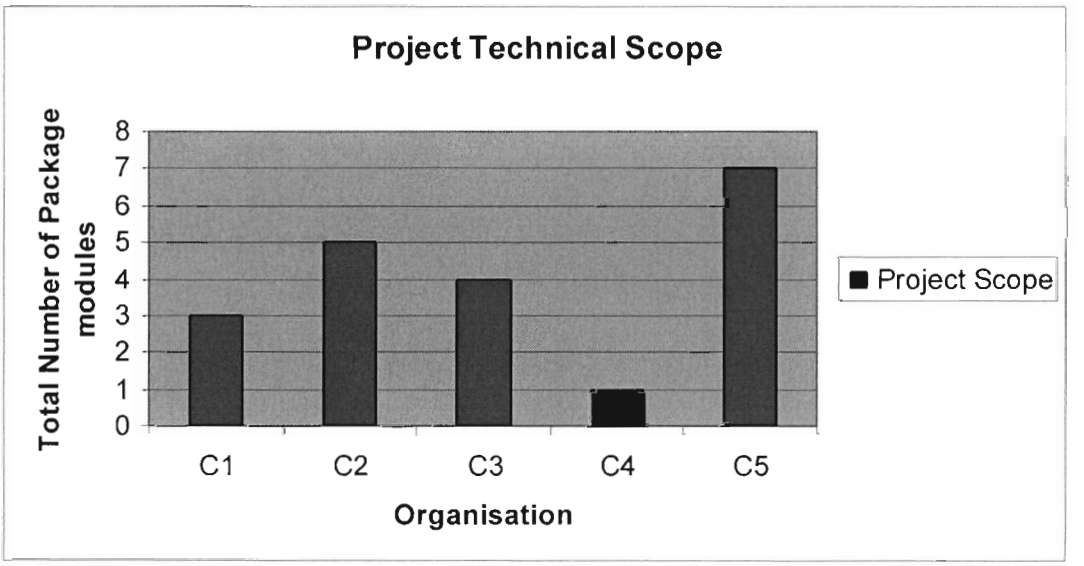
1. Appendix B – Table 1: Comparing project budget, organisational scope (users)

Case	PROJ_BUDGET	ORG_SCOPE
C1	0-10M	1,000-4,999
C2	0-10M	100-499
C3	10-50M	5000-9999
C4	10-50M	1000-4999
C5	100-500M	>10 000

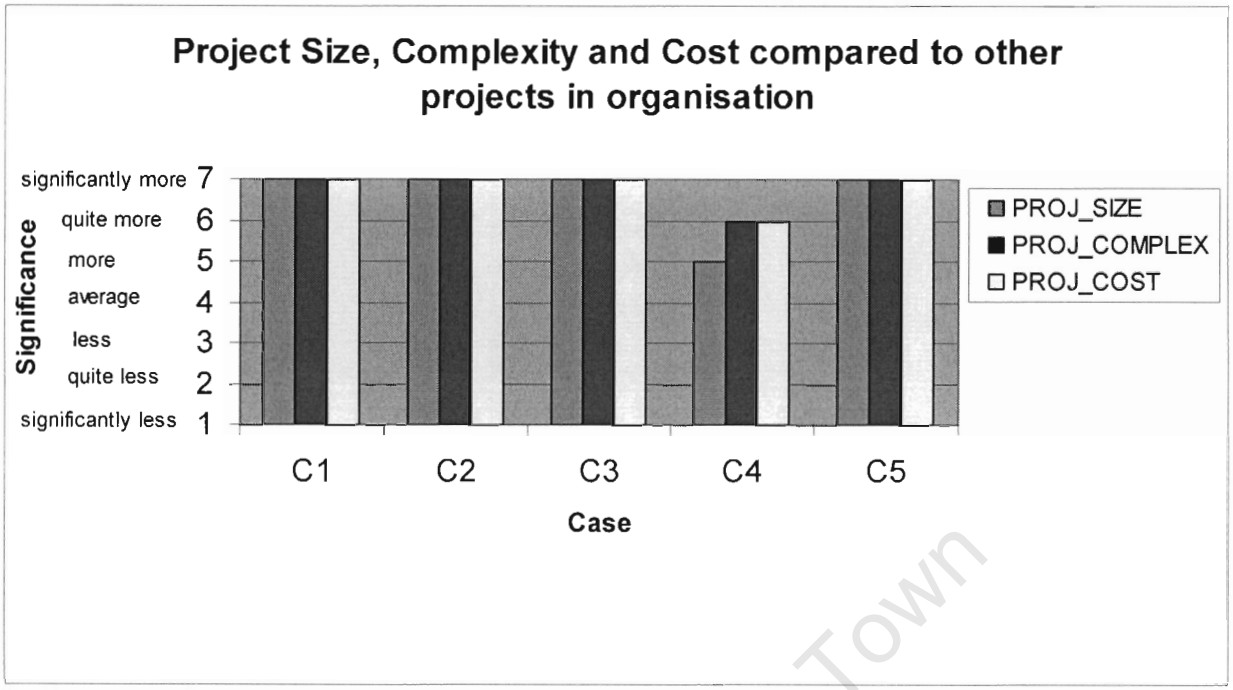
2. Appendix B – Figure 1: ERP Objectives



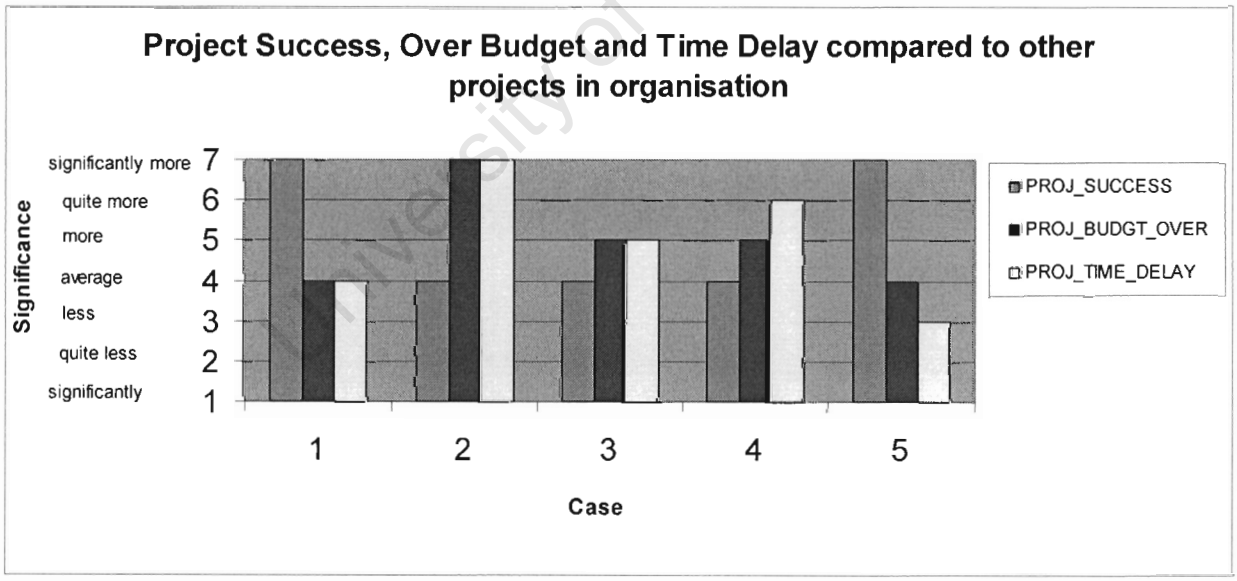
3. Appendix B- Figure 2: Technical Scope



4. Appendix B- Figure 3: Comparing size, complexity and cost



4. Appendix B- Figure 4: Comparing perceived budget delay, time delay and success



APPENDIX C

1. **Appendix C - Table 1: *Average* scores for EoC factors importance and for relationship between PRE_IMP and IMP (refer to Q.20 to understand scale):**

	Life-cycle phase		
	PRE_IMP	IMP	PRE_IMP_REL_IMP
Factor			
LT_INVEST	5.0		3.6
PAY0FF_PERC	3.8		2.4
SETBCKS_TEMP	2.2	2.2	3.0
ASS_COST_CLOSING	2.6		2.4
FEAS_ALTERN	3.2		3.8
CONT_JUST	1.4	1.8	2.8
FAIL_RES	2.6	2.8	3.4
RISK_CONTRL	3.2		3.8
SUNK_COST	2.4		2.4
SUCCESS_OVEREST	2.2	2.8	2.4
SAVE_FACE	1.2	2.6	2.4
LEAD_REWARDS	2.2	2.8	3.0
ORG_INERT	3.6	4.4	3.4
ORG_POL	3.6	3.2	3.0
ORG_VAL_INST	1.8	2.2	2.0

scores of average (3) or higher are highlighted

Relationship scores of average (3, "neither" on scale) or higher are shown highlighted for "important" factors

2. **Appendix C – Table2: Individual scores for EoC factors – spreadsheet supporting Fig. 5.4 in main text.**

LT_INVEST	PRE_IMP	IMP	PRE_IMP_REL_IMP
C1	5	5	3
C2	5	5	3
C3	5	5	4
C4	5	5	4
C5	5	5	4
Average	5.0	5.0	3.6

PAY0FF_PERC	PRE_IMP	IMP	PRE_IMP_REL_IMP
C1	3	5	2
C2	5	2	1
C3	2	3	2
C4	4	4	3
C5	5	5	4
Average	3.8	3.8	2.4

SETBCKS_TEMP	PRE_IMP	IMP	PRE_IMP_REL_IMP
C1	2	2	2
C2	2	2	3
C3	4	4	4
C4	1	1	2
C5	2	2	4
Average	2.2	2.2	3.0

ASS_COST_CLOSING	PRE_IMP	IMP	PRE_IMP_REL_IMP
C1	5	5	3
C2	2	4	2
C3	2	5	2
C4	3	4	2
C5	1	5	3
Average	2.6	4.6	2.4

FEAS_ALTERN	PRE_IMP	IMP	PRE_IMP_REL_IMP
C1	4	5	4
C2	4	3	4
C3	2	2	3
C4	4	4	5
C5	2	4	3
Average	3.2	3.6	3.8

CONT_JUST	PRE_IMP	IMP	PRE_IMP_REL_IMP
C1	1	1	1
C2	1	1	2
C3	2	2	5
C4	1	1	3
C5	2	4	3
Average	1.4	1.8	2.8

FAIL_RES	PRE_IMP	IMP	PRE_IMP_REL_IMP
C1	5	4	5
C2	1	1	4
C3	2	3	2
C4	2	2	2
C5	3	4	4
Average	2.6	2.8	3.4

RISK_CONTRL	PRE_IMP	IMP	PRE_IMP_REL_IMP
C1	3	2	3
C2	3	5	4
C3	4	4	3
C4	3	3	4
C5	3	4	5
Average	3.2	3.6	3.8

SUNK_COST	PRE_IMP	IMP	PRE_IMP_REL_IMP
C1	3	5	3
C2	3	5	4
C3	2	2	2
C4	2	1	1
C5	2	4	2
Average	2.4	3.4	2.4

SUCCESS_OVEREST	PRE_IMP	IMP	PRE_IMP_REL_IMP
C1	4	2	2
C2	1	5	3
C3	2	3	2
C4	1	1	1
C5	3	3	4
Average	2.2	2.8	2.4

SAVE_FACE	PRE_IMP	IMP	PRE_IMP_REL_IMP
C1	1	1	1
C2	1	5	1
C3	1	1	5
C4	1	1	1
C5	2	5	4
Average	1.2	2.6	2.4

LEAD_REWARDS	PRE_IMP	IMP	PRE_IMP_REL_IMP
C1	2	2	2
C2	2	5	2
C3	2	2	5
C4	1	1	1
C5	4	4	5
Average	2.2	2.8	3.0

ORG_INERT	PRE_IMP	IMP	PRE_IMP_REL_IMP
C1	4	4	4
C2	3	5	3
C3	3	5	3
C4	3	3	3
C5	5	5	4
Average	3.6	4.4	3.4

ORG_POL	PRE_IMP	IMP	PRE_IMP_REL_IMP
C1	5	2	2
C2	5	5	4
C3	2	3	3
C4	1	1	1
C5	5	5	5
Average	3.6	3.2	3.0

ORG_VAL_INST	PRE_IMP	IMP	PRE_IMP_REL_IMP
C1	2	2	2
C2	1	3	2
C3	2	2	2
C4	2	2	2
C5	2	2	2
Average	1.8	2.2	2.0