CRITICAL SUCCESS FACTORS FOR IMPLEMENTING AN ERP SYSTEM IN A UNIVERSITY ENVIRONMENT: A CASE STUDY FROM THE AUSTRALIAN HES

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STATEMENT OF ORGINALITY

This work has not previously been submitted for a degree or diploma in any university. To the best of my knowledge and belief this dissertation contains no material previously published or written by another person except when due reference is made in the dissertation itself.

_____	_____	_____
Jens Laurits Nielsen	Date	Place

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ABSTRACT

This research project involves an investigation into critical success factors (CSF) for implementing an ERP system into an Australian university environment. Papers in the ERP and IS research fields have focused on successes and failures of implementing systems into organisations. The Higher Education Sector (HES) in Australia has been found (Beekhuyzen et al. 2001) to embrace the possible benefits that an ERP offer in order to integrate and streamline inefficient processes and improve information flow within the university. The HES in Australia has gone through a series of stages and there exist a continuing struggle for the individual university to sustain a competitive edge and gain more funding, as the government has decreased the funding offered to the sector (Anderson et al. 1999; Sarros and Winter 2001). Existing ERP research has neglected the HES worldwide and in Australia, even though a majority of Australian universities have implemented an ERP solution. Through an extensive literature review, 29 unique CSF's were identified, although none of these factors had a specific focus on the HES. A theoretical framework (Banville and Landry 1989) was developed in order to aid the process of answering the research questions. The theoretical framework was developed on a basis on existing research focusing on information systems implementation success (DeLone and McLean 1992) and ERP research (Brown and Vessey 1999; Holland and Light 1999). The theoretical framework developed comprises six broad factors for consideration, namely: strategic factors, the organisational context, ERP information quality, ERP system quality, ERP project scope and user satisfaction and use.

It was found that interviewees discussed 22 of the 29 factors identified from literature, while also addressing four new factors that were not identified in the literature. These new factors concerned competitive edge, service for students, knowledge management and system ownership. It was also found that although 22 of the factors were addressed, some of the factors were addressed more frequently than others during the interviews.

This research gave an important insight into the implementation school of IS (Iivari 1991) while adding theory and knowledge with a focus on ERP implementation within a university environment located in Australia. It is hoped that future ERP implementations can draw upon and learn from this research project. The author calls for a further investigation into the relationships between the different factors found to contribute to the possibility of a successful ERP implementation in a university environment and a future comparison between different ERP implementations in other HES sites and the differences in the CSF's that might exist.

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Chapter One - Introduction

1. Introduction

The research project that this dissertation will study involves the factors that influence an implementation of an enterprise-wide information system in a large organisation. More specifically, it will examine what the *critical success factors* (CSF) are for implementing an *Enterprise Resource Planning* (ERP) system in a university environment.

This chapter introduces the research project that has been undertaken, giving an outline of why such research has been done, placing the research in context and demonstrating its importance. The research questions are then outlined and finally an overview of the chapters within this dissertation is presented.

1.1. Research Topic Introduction

As discussed above, this research project involves the ERP phenomena and specifically *'what factors can be seen as critical when implementing an ERP system in a university environment'*. Issues regarding the software vendor providing the ERP system are outside the scope of this research project, as is the actual measurement of the critical success factors or the dependency relationship between the factors that will be identified.

A *theoretical framework* (TF) has been developed in order to aid the research process. The framework lists broad factors derived from current literature and they have been examined in this project with regard to an ERP implementation in a university environment. The factors that will be addressed within the theoretical framework will be further discussed in Chapter Three - Theoretical Framework.

Within this dissertation, the words *organisation* and *university* are used interchangeably. The same applies to the words university *environment* and university setting, as well as the *researcher* and the *author*. Due to confidential agreements, pseudonyms will be used in place of the name of the research site that this research project was conducted in. Pseudonyms will also be used instead of the names of people involved and the subjects that were interviewed during the implementation of this project.

1.2. General Project Description

Many researchers and industry experts rate the theme 'ERP implementation failure' to be one of the major topics regarding ERP systems (Davenport 1998) and the implementation of such systems. ERP system research is regarded as a well-justified research area, as it is found to have conceptual links with more or less every major area of *information system* (IS) research (Markus and Tanis 1999).

ERP systems can be seen as a representation of the entire software industry (Sprott 2000), therefore it is seen that the proposed research into an ERP system implementation in a large organisation, such as a university, is very appealing. Investigation into large software packages (which an ERP system is) has been called for in the IS literature (Gable 1998), pointing out that since ERP systems are so frequently used there ought to be a greater push for research into issues relating to the use and implementation of such systems. Success factors in information systems implementation projects have been hard to define (Hirschheim and Lyytinen 1987), even though a number of studies in this field have been presented (DeLone and McLean 1992; Bowtell et al. 1999).

An Australian university is selected in order to investigate the critical success factors for implementing an ERP system. Such a research site is interesting as it presents opportunity to meet with the different users of the system (such as students, academics and administration), the project implementation team that is going to implement the system, management, consultants and to some extent the ERP vendor.

The ERP system that will be investigated is the PeopleSoft ERP system (PeopleSoft 2000), where the University (hereafter called *the University*) decided in 1998 (Thompson 1999, unpublished document) to implement the Financial, Human Resource/Payroll and Student Administration module in an ERP project termed *New Age Business Solutions* (NABS) (NABS 2001b).

2. Research Method

The *research method* chosen for this research project is of a *qualitative* (Järvinen 1999) nature through an *interpretive case study* (Galliers 1992; Klein and Myers 1999), where *data collection techniques* (Järvinen 1999) have consisted of a thorough literature review, secondary data review of documentation regarding the ERP project, observations and interviews. The researcher's ontological research assumptions are fourfold (Hirschheim et al. 1998). Firstly, the researcher views information to consist of subjective meaning and construct reality. Secondly, a focus has been put on the social nature of information systems. Thirdly, human beings are regarded as having a voluntarstic view. Finally, a nominalistic assumption is adopted because the researcher relates to how people in the organisation see the problem (Iivari 1991). An anti-positivistic epistemological stand is taken for this research, as it is believed that the social world can only be understood from the point of view for the individuals who are directly involved in the activities to be studied. Please see Chapter Four Research Method for more in-depth description of the actual research method chosen for the project, along with the research assumptions (Hirschheim and Iivari 1992).

2.1. Research Questions

The research task is to discover the *'critical success factors for ERP implementation in a university'*. In terms of the broad concepts that this research project involves, please note the figure below (Figure 1) that illustrates how the research fits into the existing concepts and literature that the research project comprises:

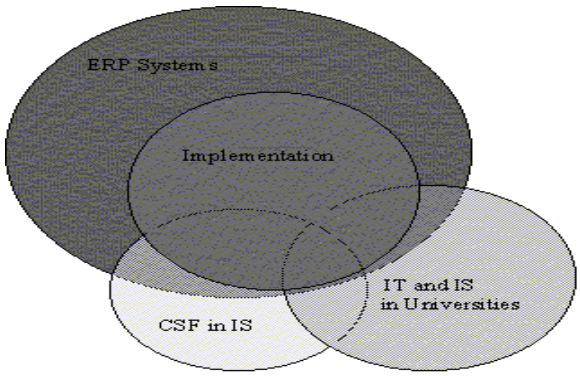

Figure 1 Areas of Research Interest

The figure above (refer Figure 1) shows the areas of interest, specifically focusing on critical success factors (CSF) for the implementation of an information system in a university environment. (All definitions are provided in Chapter Two - Literature Review).

Sub-research questions have been developed to further explore and clarify what the actual research problem is concerning. The *research questions* are identified below:

- What are critical success factors for implementing an ERP system in a university?
- Are CSF's for an ERP implementation in a university setting different from ERP projects in other environments?
- To what extent can the user and the user satisfaction impact on the accomplishment of a successful ERP implementation in a university?
- In what ways can the ERP project scope affect the implementation success?
- Will an ERP system provide the users with enhanced information and an improved quality system?
- Can the identification of critical success factors for an ERP system assist the development of an enhanced quality information system?

NOTE: These questions that are raised above have helped to build a theoretical framework (refer Chapter Three - Theoretical Framework). This framework will be used to assess, analyse and interpret the data collected with regard to the different factors identified in the theoretical framework. Although these questions are represented as 'factual', an interpretive perspective (Galliers 1992; Klein and Myers 1999) is used, taking the participants' perspectives on these questions and linking it to the literature discussed in Chapter Two - Literature Review and representing it in Chapter Six - Research Findings.

3. Project Justification

Previously, four information systems postgraduate students have explored parts of the ERP implementation project at the chosen research site (the University). A phased ERP implementation project has been conducted at the research site, where the project team has implemented parts of the ERP system over a period of time (for a further discussion on this implementation, see section 4 in Chapter Five - Research Site). In 2000, two of the students focused on the Finance module implementation (Chatfield 2000; Mayer 2000), in 2001 another student (Beekhuyzen 2001) focused on the Human Resource/Payroll module implementation project. The fourth and last student focused on no specific part of the three different ERP modules that were implemented, but rather on the impact the ERP implementation had on management (Uervirojnangkoorn 2001).

The twentieth of March 2002 marked the closing day of the ERP implementation project at the University. The University was added to a long list of universities implementing ERP systems (Allen and Kern 2001). A study carried out by the author and other postgraduate students within the University (Beekhuyzen et al. 2001), concluded that 86 % of Australian universities have or are in the process of adopting at least one module of an ERP solution. It is reported that 70% of *Fortune 1000* firms either have or will implement an ERP system (Hoffman 1998) and in many of the organisations that implement these ERP systems, the project represents the largest single IT investment in the organisation's history.

Evidence from the literature suggest that organisations expect the ERP to deliver improved performance (Grabski and Poston 2000) and thus a number of different organisations from a vast, variety of different markets engage in ERP projects. However, a number of these implementation projects have experienced negative financial effects (Davenport 2000b). This is also true for the Australian Higher Education Sector (HES[1]). For example, the University of New South Wales (UNSW), which overspent 20 AUD million dollars for their ERP implementation. UNSW was the first university to implement all of the three ERP vendor PeopleSoft modules (Finance, HR/Payroll and Student) (Lawnham 2001). The Royal Melbourne Institute of Technology (RMIT) (a university in Victoria) is reporting major problems with their implementation (Moodie 2002a; 2002b).

Another issue raised with ERP implementation projects is the fact that the system attempts to streamline the organisation processes by introducing *business best practices* (BBP) through *business process reengineering* (BPR) activities (Koch 2001). There have been reports that the actual ERP system does not work with the organisation that it is intended for (Gibson et al. 1999; Hunter et al. 2000; Caldas and Wood 2001; Moodie 2002b). Considering these expensive large and time consuming projects that have dominated the IT industry since the late 1990s, there should be sufficient research into how to implement such systems effectively. This research should also include a focus on the university environment and more specifically, to also include an Australian focus into the HES. However, no current research is addressing critical success factors for implementing an ERP system in a university environment and thus these research questions examined in this dissertation are of a significant importance.

[1] The Higher Education Sector (HES) in Australia is from here onwards a term that compromises the 38 university members of the Australian Vice Chancellors Committee (AVCC 2002).

3.1. Research Objectives

3.1.1 Theoretical Objectives

The aim of this research is to explore and report on the critical success factors for an ERP implementation in a university environment. ERP implementation cases and critical success factors have been studied with a focus on implementations occurring in other industries, but few studies have been conducted involving implementations in a university environment (for more detail on the current literature, please see the next chapter, Chapter Two - Literature Review). This research project will therefore attempt to bridge the gap in the literature (Heiskanen and Newman 1997) between the ERP implementations and critical success factors for ERP implementations in a university environment. Currently, 86% of Australian universities have or are in the process of implementing at least one module of an ERP system (Beekhuyzen et al. 2001) and it is therefore relevant to study how these systems should be introduced and implemented in a diverse, university environment. In this way the dissertation aims to contribute to the application of theory regarding CSF's to the implementation of ERP systems (for a more thorough presentation the university environment, please see section 3 in Chapter Five - Research Site).

3.1.2 Practical Objectives

It is claimed that in order for IS research to be relevant, IS researchers must in some form or another, be exposed to the practical contexts where IT-related usage and management behaviours unfold (Benbasat and Zmud 1999). This research helps to organise several complex IS phenomena in an appropriate theoretical framework (Benbasat and Zmud 1999). It also identifies factors that can aid the university in future IT projects that will be conducted, as it is claimed that information technology can come and go, but the 'information system lessons remain the same' (Lee 2000). With the current changes in the Higher Education Sector in Australia (as will be discussed in greater detail in section 0 of the next chapter), universities have become increasingly dependent on technology and thus research that can aid universities to identify the optimal implementation of such systems will have a great potential impact.

4. Dissertation Outline

Each chapter of the dissertation is now briefly discussed, presenting the key objectives and contents for each of the chapters in turn.

Chapter Two, Literature Review, investigates the relevant research literature. It deals with concepts of information systems implementations, ERP systems, ERP systems implementation, the Higher Education Sector in Australia and the implementation of information systems in a university environment.

Chapter Three, Theoretical Framework, explores current frameworks with regard to information system success and ERP systems implementations. A number of critical success factors exist in the ERP literature today. These frameworks are evaluated and a new framework will be proposed as an aid to the research questions.

Chapter Four, Research Method, reports on the qualitative research focus that this research project has taken. An anti-positivistic epistemology has been chosen that focuses on ideographic research methods. A case study has been chosen as a research method, with documentation review, observations and interviews as primary sources of data collection. It is the belief of the researcher that this research approach suits the nature of the research and will be appropriate to explore the research questions as set out in section 2.1.

Chapter Five, Research Site, explores the case study chosen for this research project. This chapter involves an introduction to the Higher Education Sector in Australia but focuses on the actual ERP system that has been implemented into an Australian university.

Chapter Six, Research Findings, reports on the findings from this research project. The theoretical framework introduced Chapter Three - Theoretical Framework has been used to aid the research and all aspects of the framework are assessed with an emphasis on the actual findings from the research case study.

A focus has been placed on the organisational context, ERP system quality and information quality, ERP project scope and user satisfaction and use of the ERP system (for more detail on these factors please see chapter three, section 3).

Chapter Seven, Conclusion attempts to show how the research fits in to the existing body of literature in IS and how a contribution has been made. The recommendations and key findings of the study, along with research limitations of the study are also presented. This chapter revisits the research questions and the theoretical framework and offers a summation of the research project, the conduct of the research and its findings.

Appendices can be found after the reference list at the end of this dissertation and are used *extensively* throughout this dissertation. Several of the tables and figures presented throughout this dissertation can also be found in the Appendix section for ease of reference. For specific abbreviations and acronyms used throughout this dissertation, please see Appendix A: Abbreviations and Acronyms. Unpublished documentation referenced in this dissertation can be found in Appendix Q: Unpublished Referenced Documents.

5. Conclusion

This chapter has provided an overview of the research project. The research project involves the implementation of large information system, more specifically an ERP software package, into a large university situated in Australia. The significance of this research has been discussed and research questions have been identified. An outline of the research method and a justification for the undertaking of this research project has been given. Finally, outlines of the remaining chapters within this dissertation have been presented. A thorough literature review on important concepts to this research is presented in the next chapter.

Chapter Two - Literature Review

1. Introduction

In order to research into Enterprise Resource Planning (ERP) systems, a thorough literature review has been conducted with a centre of attention placed on ERP systems and the implementation of these systems. ERP systems have been found to have conceptual links with almost every area of information system (IS) research (Markus and Tanis 1999), thus a literature review on IS implementation has also been included. Previous papers on ERP implementation projects have been reviewed in this chapter, focusing on successes and previous failures in ERP projects. As the research site is an Australian university, the Higher Education Sector in Australia has also been reviewed.

2. Information Systems

An ERP system can be seen as a system that integrates all information that runs through an organisation (Davenport 1998) and can be categorised as a large information system. Järvinen (1991) found the IS field to be broad, with a number of different definitions depending on the IS research view one adopts (see Appendix B: Alter's IS Viewpoints).

This research adopts a definition of an information system that supports the fundamental concepts of what constitutes an ERP system. An *information system* is defined as a 'collection of subsystems defined by functional or organisational boundaries (Iivari 1991), that supports decision-making and control in an organisation (Lucas 1981) by utilising information technology to capture, transmit, store, retrieve, manipulate, or display information used in one or more business processes' (Alter 1996; Davenport 1998).

2.1. Information System Development and Implementation

As identified above, an ERP system can be viewed as a large-scale information system and thus valuable knowledge can be derived from existing literature on information systems implementations. There has been a call in the literature for relevance of information systems research to practitioners (Heiskanen and Newman 1997; Benbasat and Zmud 1999; Lee 1999). Literature on the implementation of information systems in organisations has great potential for practitioners as it can identify issues to improve under future system implementation efforts (Keen 1991), while also helping to build the theoretical background for studies in information systems (James and Smith 1998).

Different areas of study in IS exist, each focusing on different aspects of information systems implementation and development. For example:

- implementation methodologies (Avison 1993; Boahene 1999);
- organisational change (Axelsson 1995; Gasson and Holland 1995; Melin 2000; Dawson 2001)
- organisational structure (Leavitt and Whistler 1958; Mintzberg 1979; Groth 1999)
- business processes redesign and reengineering (Guha et al. 1992; Davenport and Stoddard 1994; Larsen and Myers 1997; Martinsons and Revenaugh 1997)
- user satisfaction (Lawrence and Low 1993)
- IS and information quality (Dahlberg and Järvinen 1997; Salmela 1997; Markus and Tanis 1999)
- project management methods (Silverman 1987; Shtub et al. 1994; Hallows 1998; Ang and Teo 2001)
- software development methods (Box and Ferguson 2001)
- IT and IS in organisations (Larsen and Myers 1997)
- IS success (DeLone and McLean 1992; Ervasti and Iivari 1993; Bowtell et al. 1999)
- power and politics during IS development (Markus 1983; Mouakket and Sillince 1997; Brown 1998)
- design (Fan et al. 2000)

- knowledge management (Davenport and Prusak 1998; Teece 1998)
- requirements gathering (Carroll and Swatman 1998; Urquhart 1999).

The above list is a representation of papers in the great variety of papers published related to information systems development (ISD) and IS implementation. A greater number of areas of study in IS research do exist and the list above is just an example of some of the literature in the field.

The key historical development of the papers published on IS implementation have been from a technical approach of the development of information systems in the 1960-70s. Following this was a focus on large scale information system implementation projects in the 1980s (Barki et al. 1993). This was followed by a business process approach to information systems from the 1990s up to now (Alavi et al. 1990; Avison 1993; Drury and Farhoomand 1999). A majority of the IT and IS projects have been large scale outsourcing activities (Kern 1997; Lacity and Willcocks 1998; Kern and Willcocks 2000) where companies have outsourced the development of IT systems, rather than developing in-house systems. It is outside the scope of this research project to go into detail of each one of these areas of interest or discuss the state of management information systems (MIS) research (Kling 1989).

2.2. Information System Implementation Success

There have been numerous cases of information system failures reported in the IS literature (Hirschheim and Lyytinen 1987). Therefore a significant number of IS research papers in the 1990s (Bowtell et al. 1999) were published attempting to discover the reasons for IS project failures and how to ensure project success (Ervasti and Iivari 1993; Mathieson 1993; Grover et al. 1996; Gorla and Lin 1998). DeLone and Mclean (1992) argue in their extensive, well-cited and influential article that there is no consensus in the IT/IS literature on the measure of information success, thus it is equally hard to define IS success (see section on DeLone and McLean's I/S Success Model in section 2.1.1 in Chapter Three - Theoretical Framework).

IS success factors will also vary depending on the different stakeholders (Bowtell et al. 1999) and the different viewpoints one can have when regarding information systems (Alter 1996) and thus it has been hard to define a set of success factors that fit specific and individual IS implementation projects, because each project can have unique characteristics. Bowtell et al. (1999) disagrees with DeLone and McLean's (1992) information systems success findings. Bowtell et al. (1999) concluded that they had no problem identifying a number of specific factors for IS success, rather than the six fixed broad factors that DeLone and McLean (1992) formed.

3. The ERP Phenomena

There were claims in the 1980s (Porter 1985b) and early 1990s (Earl 1990) that information technology (IT) would change the way people and organisations conduct business. This has been proven to be the case as economics and competition along with IT, (Bancroft et al. 1998) made the introduction of several information systems possible and necessary for doing business (Järvinen 1991).

In the history of the evolution and development of ERP systems, *Material Requirements Planning* (MRP) systems grew to *Manufacturing Resource Planning* (MRPII) systems (Chung and Snyder 1999; 2000) and these systems later evolved to Enterprise Resource Planning (ERP) systems, a term coined by Gartner Research Group in 1992 (Johnson 1999). ERP systems are highly integrated software packages (Holland et al. 1999) that can be customised to cater for the specific needs of an organisation (Laberis 1999; Boudreau and Robey 2000; Esteves and Pastor 2001). The definition that will be adopted for an ERP system within this research, is the following: 'Enterprise Resource Planning (ERP) systems are large software packages (Gefen 2000) that offers the potential to integrate the complete range of an organisation's processes and functions in order to present a holistic view, a total solution, (Brown and Vessey 1999) of the business operations from a single information and IT architecture' (Davenport 1998; Davenport et al. 1998).

In the mid-1990s, ERP vendors were the major success stories in IT, mostly due to the rapid implementation of ERP systems in large capital intensive industries (Chung and Snyder 1999; 2000). ERP has been considered as *'the price for running a business'*, commented by Hillegersberg and Kumar (2000) as it was reported that 70% of Fortune 1000 companies had or were in the process of implementing an ERP system (Hoffman 1998).

However, from the start of this century, ERP vendors (such as Baan, Oracle, SAP, J.D. Edwards and PeopleSoft), have started to look at other industries (Piturro 1999) and expanding their existing services, catering for small to medium enterprises (SME's) and other different industries than those typically implementing ERP systems. ERP vendors have now also tailored their products to fit the university market, in Australia (Lawnham 2001) and word-wide (Chung and Snyder 2000; Scott and Wagner 2001). Within an Australian context, there are some ERP solutions available for the Higher Education Sector (Callista Software Services 2001a; Technology One 2002) that are developed locally. (See section 4.6 below for a more thorough presentation on literature on ERP systems in the Higher Education Sector in Australia).

4. Literature on ERP Implementations

The amount of ERP systems implemented worldwide and the scale of resources (time and economical aspects) invested in these implementation projects do not compare to the research that has been published on ERP systems. Most of the literature has focused on project management and technical implementation issues (Brehm et al. 2001) as well as failures and successes (Willis and Willis-Brown 2002). There is quite a broad *taxonomy* of ERP research classifications, as Al-Mashari (2002) identified 24 subgroups of different topics for ERP research.

However, it is an inadequate representation to assess the monetary investments that has been spent and will be spent in the ERP industry (Chang et al. 2001). This ERP

research taxonomy, along with the extensive review of ERP literature conducted by Esteves and Pastor (2001) failed to find any research topic that focused on CSF's for an ERP system in a university environment.

4.1. Implementation Strategies

There are two distinctive ways of implementing an ERP found in the literature. These phases are termed the *'phased*' implementation and the *'Big Bang'* approach (O'Leary 2000a). Depending on the organisational structure, the complexity of the organisation, economical issues, strategic partners, time constraints and geographical locations (Markus et al. 2000b), the appropriate implementation approach should be selected. The Big Bang approach requires simultaneous implementation of multiple modules of an ERP package, while a phased implementation consists of designing, developing, testing and installing different modules of the same ERP package. The *'Vanilla*' implementation approach is another implementation approach that focuses on minimal customisation of the ERP package (Newing 1998; Holland et al. 1999) and has been found to be a common implementation approach in university environments (McCredie and Updegrove 1999; McConachie 2001).

4.2. ERP Cases: Failures and Success

ERP implementations have been found to be difficult projects to undertake and success is not assured (Goodhue and Haines 2000). "The ways to fail an ERP implementation, outnumbers the ways to succeed it", claims Martin (1998, p. 150). A number of papers in academic journals and newspaper articles report on ERP implementation projects failures with negative economic impacts on the organisations that implemented the systems (Stedman 1999a; Levinson 2001; Fitzsimmons 2002). A survey of one hundred executives of leading organisations found that only one in three ERP initiatives was considered a success (Boston Consulting Group 2000).

On the subject of ERP implementations in a university setting, UNSW was the first Australian university to implement all three modules of the ERP package PeopleSoft, conducting the ERP project in a phased implementation project. According to reports

on the project, the budget increased from $20 million initially, to $40 million AUD (Lawnham 2001). (These ERP failures and successes are presented below in Table 1 and Table 2 respectively. The tables can also be found in Appendix D: ERP Failures, for a list of examples of these ERP project failures and Appendix E: ERP Successes, for a list of examples of ERP project successes).

Below is a table (Table 1) that summarises some of the ERP failures found in the different industries and why they were reported as a failure. The table (Table 1) was created by the author for a list of failures when ERP systems have been introduced to an organisation. For ease of reference, the table below is also shown in Appendix D: ERP Failures, Table 15 ERP Implementation Failures.

Author	**Org.**	**Industry**	**Imp. Scope**	**Why a Failure[2]?**
(Brown 2002)	Adelaide University	Higher Education Sector - Australia	PeopleSoft	Functionality – staff had problems accessing financial information.
(Brown 2002)	ANU	Higher Education Sector - Australia	PeopleSoft	Functionality issues – staff reported that it was hard to get information.
(Madden 2002) (Moodie 2002b)	RMIT	Higher Education Sector - Australia	PeopleSoft – 25-30 million (AUS)	Functionality problems with the system. The university had to take funding from money that was aimed for other research areas to support the implementation project.
(Lawnham 2001)	UNSW	Higher Education Sector - Australia	PeopleSoft	Cost over runs. It was expensive for the university to take people out of normal positions and backfill with

[2] The term *Failure* here can be debated. It is the researcher's collection of cases where negative publications exist on the implementation cases.

				other staff – this had not been budgeted for. 20 million (AUS) reportedly over budget (40 million total). Fist university to implement all three modules of PeopleSoft in Australia. Staff not happy with the benefits of the systems v. the cost.
(SMU 2001)	SMU	Higher Education Section - USA	PeopleSoft	Over budget because of unexpected costs
(Martin 1998)	Kodak	Photos	SAP $500 (US) million (1st time)	Reason not given
(Martin 1998)	Dell	Computer		Changes needs to be able to be made quickly in ordering, manufacturing and other systems, it cannot be done in a highly integrated system.
(Mearian 2000)	Petsmart	Pets and animals	SAP Retail	Hard to incorporate ERP to existing systems
(Marion 1999b)	Boeing The Kellogg's Company	Aircraft manufacturing Food producer	Baan (some modules) Oracle	Can not predict or help with resource planning - economic evidence in almost no growth Economical and low growth, no reduction in business costs (but wrote off $70 million in streamline initiatives)
(Patton 2001)	Nash Finch Co. Corporacion de	Supermarket chain Supermarket chain	SAP - $70 million (US) SAP - $7 million (US)	Pulled out of the project Reported to be late and significantly over budget

	Sumermaercados Unidos			
(Pender 2000)	Siemens Power Transmission	Telecommunications	Baan - $12 million (US)	Not enough funding to continue project.
(Stedman 1998)	Purina Mills	Unknown	SAP	Hired in new SAP trainers (other than those on project to save costs), the consultants lacked background information on the business
(Stedman 2000)	W. W. Grainger Hershey Foods Corp. Whirlpool Corp.	Manufacturing, supplies Food Industry Electric Machines	SAP SAP SAP	Inefficient tracking mechanism Problems when Distribution tracking is important Reason not given
(Hirt and Swanson 2001)	A-dec Inc.	Dental Equipment Man.	Baan	Baan training is seen upon as too expensive
(Holland et al. 2001) (Stedman 1999b)	Reebok	Sports equipment	SAP	ERP system does not fit with organisational processes
(Karpinski 2001)	Nike	Sports equipment	i2 Technologies - $400 mill (US)	i2 Technologies demand and supply planning module where implemented, however Nike reported on losses due to poor performance of the software system

Table 1 ERP Failures Dervied from Literature Review

The table below (Table 2) outlines a summary of ERP successes reported in the literature. The table was created by the author to show evidences of successful ERP

implementation projects and to show why these projects were found to be successful. Some of the factors that contributed to their success can be found in the column termed *Why a success?* For ease of reference, this table can also be found in Appendix E: ERP Successes.

Author	**Org.**	**Industry**	**Imp. scope**	**Why a success[3]?**
(Davenport 2000a)	Earth grains	Bakery Products (USA)	SAP's R/3	Clear strategy Each department had an analyst reporting issues to management Change compensation system to employees after implementation (more rewards) Interpersonal skills for training Strong knowledge of their industry Rethought important business processes
(Martin 1998)	Compaq Computers	Computers		Can run an ERP system because they keep the ERP software out of areas like product forecasting
(Grygo 2000) (Diehl 2000)	U.S. Mint	Coin Production	People Soft - $40 million	Start with a business requirement. People received training in the use of the system Employers were able to see how everything needs to be coordinated. Vendor on the project Senior management involvement Organisation needs to understand that it will be painful and expensive. Expected to provide savings of $80 million over the next seven years.
(Marion 1999a)	Mc Donalds	Fast Food	Lawson Software	Mature software Fined tuned methodologies
(Stedman	Dirona	Truck	Thru-	Reduce inventories

[3] The term *Success* here can be debated. It is the researcher's collection of ERP implementation cases which have been termed a success that are represented here.

Author	Org.	Industry	Imp.	Why a success[3]?
1999c)	SA Moore Corp. Phillip Morris USA	supply producer Manufacturing Industry Tobacco	Prut Technology SynQuest Inc Aspen Technologies Inc	Filling orders on time - improved from 85% to 100% in some cases. Synchronised the steps in the manufacturing process better, helped to schedule production runs down to the minute. Reduced inventory costs.

Table 2 ERP Successes Dervied from LIterature Review

NOTE: These ERP project successes and failures represented in the table above are just some of the cases reported in the literature that the author found, the author is aware that also other ERP projects exist. The tables were meant to show the reader the substantial negative implications for failing in an ERP implementation project and the different factors that were in some of the project addressed and in other projects disregarded.

A number of research papers and reports, as seen above, from the industry have pointed out that ERP system implementations do not actually guarantee the business benefits or the positive payback that were promised (Wheatley 2000). In fact, it has been found that only ten-fifteen percent of ERP implementations are seen as successful. That is, they deliver the expected benefits (Donovan 2000), thus a number of newspaper and journal articles have been published that attempt to address successes for implementing an ERP system correctly and to ensure success for the implementing organisation (Buckhout et al. 1999; Haberman and Scheer 2000; Robinson 2000).

4.3. ERP and Organisational Change

Organisations exist of different structures depending on the different characteristics of the organisation and the environment that they are competing in (Mintzberg 1979).

Research (Groth 1999), has indicated that the introduction of information technology into these organisational structures impact on the existing organisational configurations. There have been strong indications that the benefits from an ERP implementation is actually derived from the change in the organisation and that the ERP system is just an enabler for these changes (Martin 1998).

This leads into the term *business process reengineering* (BPR) and the actual organisational changes that take place after and during a BPR activity. A key focus, but to some extent neglected in the BPR hype (Davenport and Stoddard 1994), is the fact that the change should focus on change of processes and not on change of technology (Jarvenpaa and Stoddard 1993; Davenport and Stoddard 1994). Some ERP literature has attempted to investigate how organisational change can be best managed through an ERP implementation (Alter 1998; Boudreau and Robey 1999; Baskerville et al. 2000; Edwards and Panagiotidis 2000; Aladwani 2001). Research conducted in the field (Groth 1999) indicates that the university structure (or the *professional bureaucracy* as Groth terms it), is particularly resistant to IT related change.

Although this finding in the literature would indicate a strong research interest in this specific area, little has been found. With a focus on a university environment, there has been hardly any research on organisational change for a university that implements an ERP system, other than research conducted by researchers at the research site. This research focused on a comparison between the users of the system (Mayer 2000), organisational influences on the successful implementation of an ERP system (Chatfield 2000) and the influences an organisational culture has on ERP systems implementation (Beekhuyzen 2001; Gregor et al. 2002). It is a fact however, that different users wants different things in an ERP implementations and a key issue is to get the requirements right for the implementation of the system (O'Leary 2000b). According to Askenäs and Westelius (2000), it is not possible for individuals to change the system according to their personal wishes.

4.4. Critical Success Factors for ERP Implementations

According to Rockart (1979), critical success factors (CSF) can be defined as *"those few critical areas where things must go right for the business to flourish"* and CSF's for any information systems project have been a topic for research in the IS research community for quite some time (Bacon 1993). Within an ERP context, CSF's for ERP implementations will, for this research project, be defined as *"factors needed to ensure a successful ERP project"* (Holland and Light 1999, p. 31). Research conducted earlier on CSF's for ERP implementations have developed different factor checklists for ERP implementations.

The following table (see Table 3) lists 29 factors that previous papers and research on CSF's have focussed focused on. The author produced this table due to a number of different CSF papers currently existing in the literature in an attempt to summarise the existing literature. The papers selected have all had a focus on past cases or factors that they have found can contribute to the success of an ERP implementation project. The CSF's will be linked to the findings of this case study in Chapter Six - Research Findings.

CSF No.	Critical Success Factors	Key Authors
1	Appropriate decision making framework	(McCredie and Updegrove 1999)
2	Management structure	(Sumner 1999) (Nelson and Somers 2001)
3	Top management support	(Bingi et al. 1999; Buckhout et al. 1999; Holland and Light 1999; Sumner 1999; Wee 1999; O'Leary 2000b; Trimble 2000; Gable et al. 2001a; Kuang et al. 2001; Nelson and Somers 2001)
4	External expertise (use of consultants)	(McCredie and Updegrove 1999; Sumner 1999; Nelson and Somers 2001)
5	Balanced project team	(Wee 1999; Kuang et al. 2001)
6	Research	(McCredie and Updegrove 1999)
7	Clear goals, focus and scope	(Holland and Light 1999; Wee 1999; Markus and Tanis 2000; Kuang et al. 2001)
8	Project management	(Holland and Light 1999; McCredie and Updegrove 1999; Wee 1999; Markus and Tanis 2000; Trimble 2000; Gable et al. 2001a; Kuang et al. 2001; Nelson and Somers 2001)
9	Change management	(Holland and Light 1999; McCredie and Updegrove 1999; Kuang et al. 2001; Nelson

CSF	Critical Success Factors	Key Authors
		and Somers 2001)
10	User participation	(McCredie and Updegrove 1999; Gable et al. 2001a)
11	Education and training	(McCredie and Updegrove 1999; Sumner 1999; Wee 1999; Trimble 2000; Gable et al. 2001a; Nelson and Somers 2001)
12	Presence of a champion	(Sumner 1999; Gable et al. 2001a; Kuang et al. 2001; Nelson and Somers 2001)
13	Minimal customisation	(Trimble 2000; Kuang et al. 2001; Nelson and Somers 2001)
14	Business process reengineering	(Kuang et al. 2001; Nelson and Somers 2001)
15	Discipline and standardisation	(Sumner 1999)
16	Effective communications	(Sumner 1999; Wee 1999; Gable et al. 2001a; Kuang et al. 2001)
17	Best people full-time – planning of this	(McCredie and Updegrove 1999)
18	Technical and business knowledge	(Sumner 1999)
19	Culture	(Kuang et al. 2001)
20	Monitoring and evaluating of performance	(Kuang et al. 2001)
21	Software development testing and troubleshooting	(Kuang et al. 2001)
22	Management of expectations	(Nelson and Somers 2001)
23	Vendor/customer partnerships	(Nelson and Somers 2001)
24	Use of vendors' development tools	(Nelson and Somers 2001)
25	Vendor package selection	(Brown and Vessey 1999; Nelson and Somers 2001)
26	Interdepartmental cooperation and communication	(McCredie and Updegrove 1999; Nelson and Somers 2001; Akkermans and van Helden 2002)
27	Hardware issues	(McCredie and Updegrove 1999)
28	Information and access security	(McCredie and Updegrove 1999)
29	Implementation approach	(McCredie and Updegrove 1999)

Table 3 CSF's for ERP Implementations from Literature

The table above (Table 3) can also be found in for ease of access. In the next chapter, section 2.2 of Chapter Three - Theoretical Framework, Existing ERP Critical Success

Frameworks and Theories, focuses on existing CSF frameworks and their usefulness for an ERP project in a university environment.

4.5. ERP Future Trends

Aside from the fact that ERP vendors are constantly looking for new markets to enter (as discussed above in section 3), ERP vendors now provide continuous product enhancements to the organisations that already have 'gone live' with their ERP package. *Customer relationship management* (CRM) and *supply chain management* (SCM) are functions that ERP vendors are now attempting to sell to organisations that have already bought and implemented an ERP package (Light 2000; Chen 2001; Hill 2001; Light 2001b; 2002).

The spotlight on possible markets for ERP vendors have been said to be on an organisations' external partners when the ERP attempts to solve the internal operations (Li 2000). This ERP future inter-organisational operations are termed *ERPII* (Chen 2001; Ericson 2001; Lehman 2001) and are considered the next generation of ERP systems.

4.6. ERP systems in Universities – Neglected Focus?

Enterprise Resource Planning systems have arrived in the Higher Education Sector (HES), as many universities worldwide, (McCredie and Updegrove 1999) and in Australia, have adopted an ERP solution in order to cope with the changing environment of the HES (Noble 1998; Crase et al. 2000; Brown 2002). ERP vendors have tailored their products and focussed their strategy into new markets, such as the Higher Education Sector (for a more detail description of the HES in Australia, see section 0). The leading ERP vendor for the HES in Australia has been found to be the ERP vendor PeopleSoft (Wieder 1999; CAUDIT 2001; PeopleSoft 2001) which is known to have a strong focus on *human resource management* (HRM) (University of Michigan 1999).

A study conducted by the author and colleagues showed that PeopleSoft ERP systems have been implemented within fifty-eight percent of Australian universities that have

or are in the process of conducing an ERP implementation. While the world-wide market leader on ERP systems (O'Leary 2000a) called SAP, have been adopted by thirty-five percent in Australia (Beekhuyzen et al. 2001). Little research has been conducted regarding ERP implementations in university environment, compared to the actual extent of ERP implementations in the HES worldwide (Orgill and Swartz 2000) and specifically in Australia (CAUDIT 2001). Specifically, research that focuses on an Australian environment has been neglected when it is understood that fully eighty-six percent of universities in Australia are adopting ERP systems (Beekhuyzen et al. 2001). Little research has been undertaken on this particular topic except for the research mentioned in Chapter One - Introduction, that has been conducted at the same research site through earlier honours, masters and Ph.D dissertations (Chatfield 2000; Mayer 2000; Beekhuyzen et al. 2001; Uervirojnangkoorn 2001; Goodwin (forthcoming)).

Australian newspapers have reported on ERP projects that have failed in University of New South Wales (UNSW), Adelaide University and Royal Melbourne Institute of Technology (RMIT) (Lawnham 2001; Madden 2002).

Factors that have limited the success of these implementations have been reported to be budget overruns and lack of functionality of the system that has been implemented (all of the three mentioned above are PeopleSoft systems)(Lawnham 2001; Brown 2002; Madden 2002). See also Table 1 below where a list of ERP failures is presented. Oliver and Romm (2000a) focused in their paper on ERP systems, called '*The Route to Adoption',* on why universities wanted to adopt ERP systems. However, research data was only collected through websites of the ERP projects at universities in Australia and USA. Mahrer (1999) focused on the changes an ERP system can have on a university and reported on a successful implementation of the ERP package SAP into a Swiss university and found that the critical success factor for this project was the actual strong communication and coherence between the departments in the university.

When implementing an ERP system, universities are faced with the dilemma of how much customisation should be done to the ERP package to fit the organisation that

will implement it or how great changes the university will have to initiate in order to fit the ERP package (Cornford and Pollock 2001). ERP packages incorporates *business best practices*, which are 'defined structures of doing business operations', that an organisation that implements the ERP system can choose to exploit (Davenport 1998; O'Leary 2000a). Lozinsky and Wahl (1998) claim the same as the ERP vendors claim, that ERP systems have '*universal applicability'*, however there is a growing body of evidence that suggests that the assumptions one must make of how an organisation is operating, does not always fit with the actual operations of the university (Bagdon et al. 1998). Heiskanen et al. (2000) found that such industry standards that business best practices in an ERP package entails, are inappropriate for universities as they have a unique structure and decision making process. Regardless, many organisations adopting ERP packages resolve to fitting their organisation to the system rather than the other way around (Davenport 1998; Markus et al. 2000a; Koch 2001).

Some critics of ERP systems, in a university setting, have argued that universities should not be standardised and are impossible to standardise with an ERP package and that ERP packages do not deliver what they intend to deliver in a university environment (Cornford and Pollock 2000).

A study conducted by Allen and Kern (2001) on four ERP implementations in UK universities found that the ERP implementations brought the universities into complex relationships with the ERP vendor and implementation consultants that assisted in the ERP implementation project. The academic culture in universities made it particularly hard to implement such a large system the study also reported on. McConachie (2001) focused on how change was perceived by an Australian university when implementing the ERP system PeopleSoft and she found that the university staff wanted a system, but were weary of the complexity that an ERP system introduced. Chang et al. (2001) found that knowledge management in ERP implementations in the public sector in Australia was particularly hard and needed to be taken into account in order to successfully implement an ERP system.

On the topic of investigation concerning the success factors for implementing an ERP system into a university environment, no substantial research has been conducted. The closest research on this topic is related to McCredie and Updegrove's (1999) paper that focuses on 22 'advices' that they report on when implementing an ERP system in a university setting. These advices are incorporated into Appendix C: ERP Critical Success Factors where a list of CSF's are derived from the literature review. Many universities implement ERP systems as a solution to their information systems needs. The next section, section 5, explores the HES in greater detail. The section tries to show linkage between the changing educational environment and the dramatic increase of universities in Australia that are adopting ERP systems.

5. Literature on the University Sector in Australia

According to the *Australian Vice-Chancellor's Committee* (AVCC) there are thirty-eight individual universities in Australia, with two of them being privately owned and not funded by the government (AVCC 2002). These universities operate in one of the most reviewed sectors in Australia (Hamilton 1997), a sector that has undergone and is in the processes of undergoing a series of restructures as universities respond to change. Change which includes more students, declining public funding and increased government pressures to reform their structures, lower their cost and achieve greater administrative efficiency (Kemp 1999; Li et al. 2000; Sarros and Winter 2001). Research and reports in the Higher Education Sector (HES) in Australia has covered these issues.

In the late 1980s there were calls from the government to attract more students into the universities (Hore and Barwood 1989), then it became clear that universities needed to improve economic efficiency, so a restructuring of the whole university sector took place. Some people claiming the HES has been through a phased termed 'the corporatisation of universities' (Guthrie and Neumann 2001).

In the literature, there has been demand for improvement of quality of education (McConville 2000), however this has been difficult to achieve when government funding has not followed the growth of students in Australian universities (Hoare 1996). This restructuring of universities to become a place for the masses, not just for the elite (Coaldrake 2001) has pushed the universities into a restructure situation where the role of the academics and the knowledge creation has been shifted out of the university debate to some extent (Hort 1996; McCollow and Lingard 1996; Johnston 1998; Sarros and Winter 2001). The major focus of research published regarding the HES has instead focused on restructure (Nicholls and Marginson 1996) and to identify sources of income for the universities (Marginson 1996).

As an answer to government policies, politics, social and economical factors; strategic directions for universities (Anderson et al. 1999) have included the use of information technology to streamline the university operations. These strategies hope to utilise IT in the direction of a possible increase of competitiveness and to improve efficiency by relying on large scale commercial information systems. These large IT strategies were initiated between the mid 90s to late 90s (AVCC 1996a; Meredyth and Thomas 1996). Some of these IT projects were found to be necessary for universities to operate and described as 'necessary for survival' (AVCC 1996a; Yetton 1997; Oliver and Romm 2000b). A steering committee from the AVCC started the *Core Australian Specification for Management and Administrative Computing* (CASMAC) in 1991 and from this committee different approaches to systems development for the universities emerged The universities took different approaches in 1993 when the CASMAC committee decided to share the development costs on a system between the universities.

This consortium became known as *Unipower* (AVCC 1996c) and nineteen universities chose this strategy. Eleven universities chose to focus on another type of system and formed a consortium termed the *UniOn Group*, that later evolved into the development of Callista student Administration system (Callista Software Services 2001b; Cresswell 2001). Three universities known as the *Natural Group* agreed partially on the CASMAC agreement and the remaining three universities decided to either develop the system in-house or purchase the system by another software

vendor. The Unipower project was terminated in 1997 when no useful system was developed (Oliver and Romm 2000b). The next page outlines a graphical presentation of the development of CASMAC to the ERP initiatives found in the HES in Australia today. The following figure (Figure 2) gives a graphical outline of the systems development from CASMAC. The author developed this figure based on information found in the literature. For ease of reference, this figure is also found in Appendix F: System Development from CASMAC.

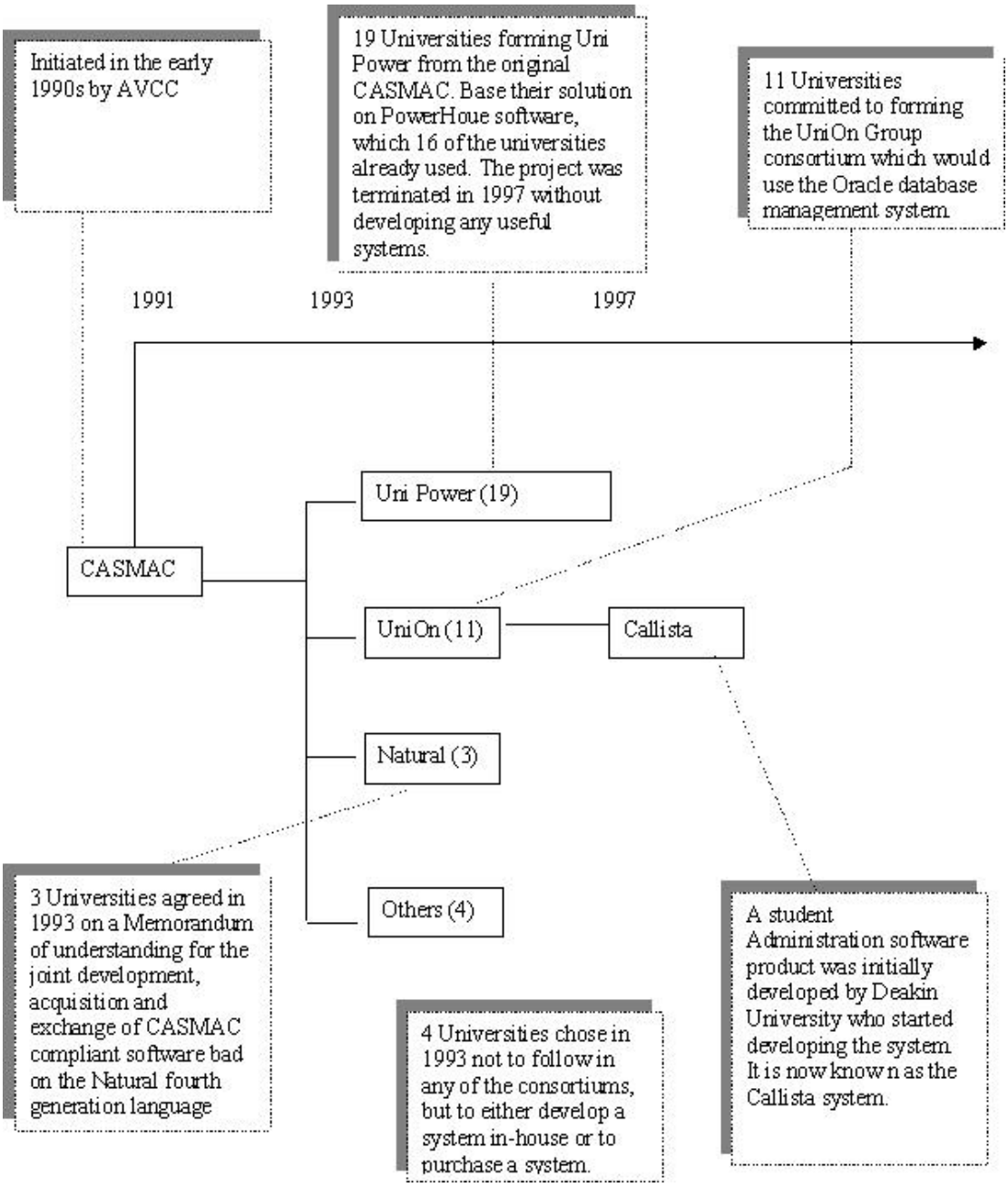

Figure 2 Systems Development from CASMAC

6. Conclusion

This chapter outlined of information systems research that has focused on the implementation and development of information systems. The ERP phenomena was placed in context with the IS field and it was shown what focus the current ERP literature has taken. ERP research has focused on a number of issues as the field has grown and ERP vendors have marketed their products and services on *newer* industries such as the Higher Education Sector, worldwide and also in Australia. A number of failures and successes of ERP implementations have been presented along with a thorough review of literature, which has focused on CSF's for implementing ERP systems, listing 29 factors found in the literature. As seen in this chapter, ERP systems have not been given appropriate research focus based on the size of the industry and the implication an ERP system can have on the organisation that implements it. Specifically in Australia and in the HES, the ERP phenomena has been a neglected focus to date. The Australian HES has gone through a series of changes and this has culminated in the implementations of ERP systems in universities in Australia, therefore further justifying this research.

The following chapter explains the theoretical framework that will be used during this research.

Chapter Three - Theoretical Framework

1. Introduction

In order to research into the critical success factors for an ERP implementation and to have a guidance framework to conduct an examination and capture research data, a theoretical framework has been developed to aid the research process. This chapter introduces how the model has been arranged, discussing current quality frameworks, current information success frameworks and ERP success frameworks. The different factors that are addressed in the chosen model are described in detail, a description of the use of the model is presented and finally a summary of the main points will follow.

2. Determination of the Model

In order to develop a useful theoretical framework that can aid the data collection process and to assess specific success factors for implementing, an ERP system in a university environment, it is important to assess existing frameworks that have been used to classify IS success in the literature. This following section will discuss the existing frameworks present in the literature and also examine the usefulness that these frameworks offer to the research questions this project investigates.

2.1.1 DeLone and McLean's I/S Success Model

DeLone and McLean's model (1992) was chosen as it is one of the most referenced frameworks related to implementation success. The paper incorporates six main success factors as measurements for success. Their study (DeLone and McLean 1992) included an analysis of the literature in connection with practitioners and academics views on information system success and how it was achieved. The authors found that there is no ‘one measure’ in order to view an information system success and thus they developed six different factors (see Figure 3 below) in an ‘I/S Success Model’.

The six success categories identified are the system quality, information quality, use, user satisfaction, individual impact and organisational impact.

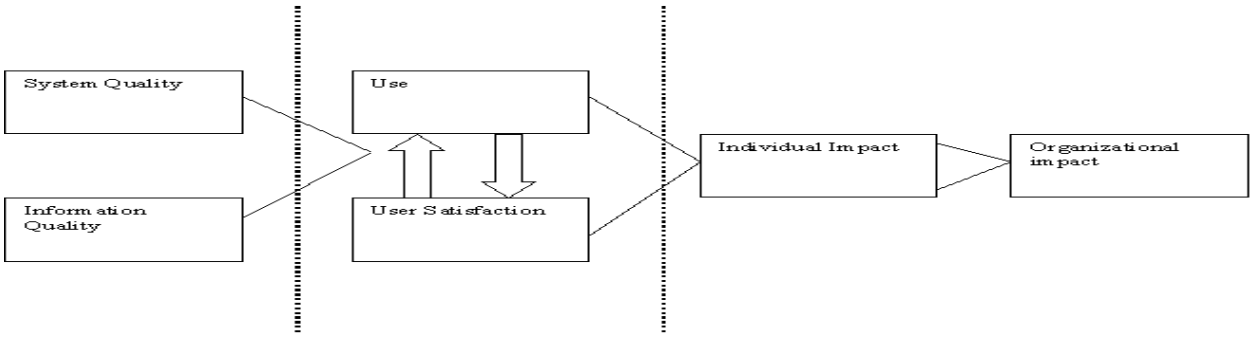

Figure 3 I/S Success Model Adapted from DeLone and McLean (1992)

The model above was developed so that the authors (DeLone and McLean 1992) could *'predict'* future IS success and organise the diverse research previously conducted on IS success and show the relationships. *System quality* concerns the desired characteristics of the system itself, which produces the information, while *information quality* stresses characteristics of the information and its desired form. *Use* and *user satisfaction* was found relevant from studies that attempted to analyse and measure the interaction of the information product with its recipients. The *individual impact* factor relates to what influence the information product has on management decisions. Finally, the *organisational impact* factor derives from research that has investigated the effect of the information product on organisational performance.

The relationships between system quality and information quality is that they singularly and jointly affect both use and user satisfaction. The amount of use can influence the degree of user satisfaction and vice versa. Use and user satisfaction offers the background to the individual impact and this individual impact was found to eventually have some organisational impact (DeLone and McLean 1992). It is worthwhile to note that DeLone and McLean's I/S model (1992) shows the actual dependencies between the relationships of the different success factors as well as recognising and grouping the factors into categories as described above.

This model has been found to be very relevant to IS researchers (Bowtell et al. 1999) and with a selected mix of ERP success factors (see section 2.2 below), this I/S

success model will be a basis for the theoretical framework explained in section 3 of this chapter.

2.2. Existing ERP Critical Success Frameworks and Theories

As discussed in section 4.2 ERP Cases: Failures and Success in Chapter Two - Literature Review, a number of ERP implementation projects have been reported as 'failed' because of reportedly substantial economical difficulties (Donovan 2000; Mearian 2000; Stedman 2000; Coffin and G. 2001). Within the ERP research field, a number of researchers have looked at ERP success and how to ensure ERP implementation success (Brown and Vessey 1999; Bonner 2000; Smyth 2001a). Following this, the field has focused specifically on critical success factors in trade press and research publications and a number of non-industry specific CSF's have been introduced as an aid to assist these ERP project failures and future ERP projects to come (Bingi et al. 1999; Holland and Light 1999; Markus and Tanis 1999; Sumner 1999; Wee 1999; Robinson 2000; Trimble 2000; Al-Mudimigh et al. 2001; Gable et al. 2001a; Kuang et al. 2001; Smyth 2001b; Gunasekaran et al. 2002; IIIT n.d.).

Consequently, a few of the newest CSF's established have focused on more specific issues, such as vendors/related ERP system types (Clegg et al. 2001; Esteves 2002) and country specific differences (Corbitt et al. 2000). Recent publications has also focused on measuring and attempting to predict the *return of investment* (ROI) that the ERP system will bring (Dinn 1999; Rosemann and Wiese 1999; Donovan 2000; Gable et al. 2001b; Stensrud 2001; Sommer 2002).

One of the most extensive reviews of critical success factors in ERP implementations that currently exists to date (2002) is Nelson and Somers (2001) paper. This paper describes and ranks 22 critical success factors for ERP implementations according to the stages of implementation.

A shortcoming of Nelson and Somers' (2001) research is that only 3 out of 86 'companies' (≈3.5%) in the industry surveyed belong in the education sector, thus it is

hard to judge whether all these CSF's are relevant to the HES in Australia (the research described above had a focus on US based companies).

2.2.1 Holland and Light's Critical Success Factors Model

Holland and Light's model (1999), as shown in Figure 4 below, was chosen to display the strategic and tactical factors that exist within an ERP implementation process. This model was derived from Pinto and Slevin's (1987) earlier work on strategy and tactics. This model can be seen as important as it focuses on the actual organisation, strategic and tactical processes that can exist in an ERP implementation process from a management perspective.

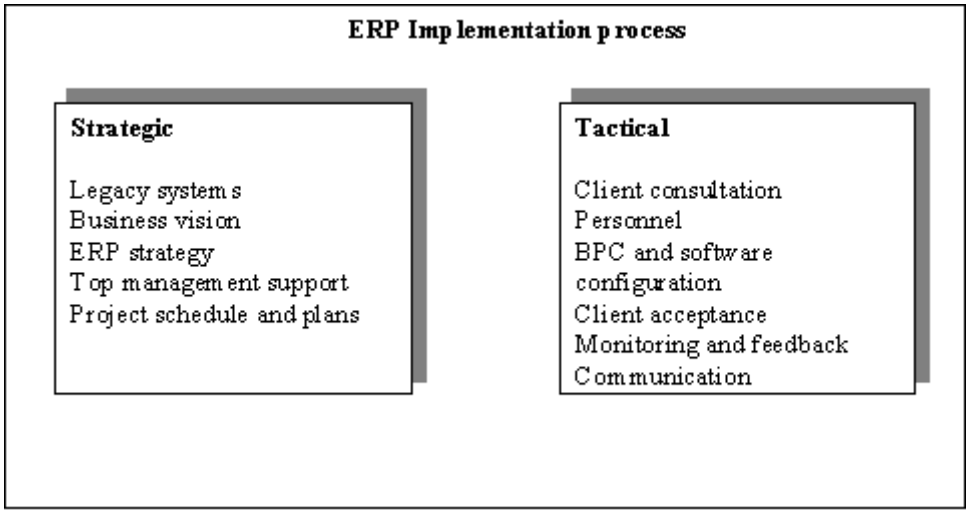

Figure 4 A Critical Success Factor Model with Strategic and Tactical Factors Adopted from Holland and Light (1999)

2.2.2 Brown and Vessey's ERP Implementation Framework

Brown and Vessey (1999) focused on existing IS research literature and ERP cases to develop a model able to identify variables that might be critical to successful implementation of ERP systems. The authors derived this model (see Figure 5 below) from existing literature and found that three factors could be found to influence the actual ERP implementation approach and these factors where grouped under *organisational context*, *ERP package capabilities sought* and *ERP package choice and project scope*.

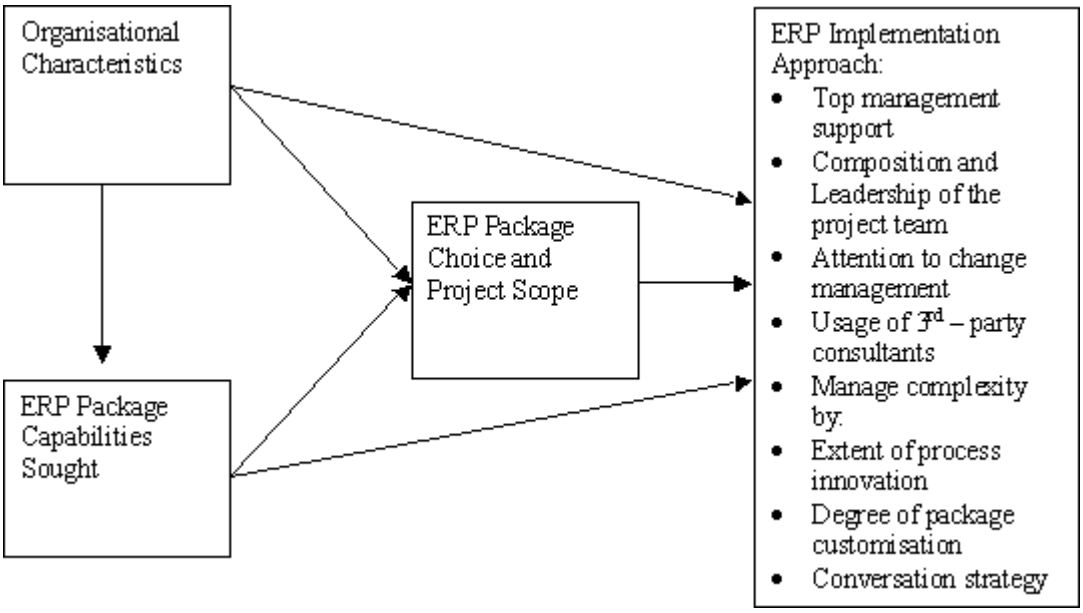

Figure 5 Contingency Framework for ERP Implementation Approach Adapted from Brown and Vessey (1999)

3. Theoretical Framework

Huberman and Miles (1994) argue that a theoretical framework should be used to explain the main issues to be studied. Walsham (1995b, p. 76), expressed the following "the motivation for the use of theory in the earlier stages of interpretive cases studies which takes account of previous knowledge and which creates a sensible theoretical basis to inform the topics and approach of the early empirical work". As briefly mentioned in Chapter One - Introduction, section 2, this research project will follow an interpretive research approach, this will be further discussed in Chapter Four - Research Method, section 3. With this in mind, the framework below (Figure 6) has been developed. The framework is based on the existing literature on information systems success, implementation of information systems and ERP systems and previous studies conducted on ERP critical success factors. The development of a theoretical framework is part of the research strategy that the researcher has adopted (see Research Strategy in Chapter Four - Research Method for more information relating to the research strategy of the research project).

The framework (Figure 6) is represented by six factors, namely the strategic factor, organisational context, ERP system quality, ERP information quality, ERP project scope and user satisfaction and use. The strategic factors are represented as influencing the whole ERP implementation approach and thus it is represented with an arrow leading into the defined boundary that the reminding five factors are grouped in. Within the ERP implementation boundary (represented as a circle in the figure), the ERP implementation project phase, the five remaining factors are suggested. The author chooses to view a *boundary* in this context in the same meaning as Reynolds and Star (2001), where the boundary concerns a limitation from the reset of the environment that the resarcher will focus on. The theoretical framwork offers the possibility to group complex issues of investigation together in a more manageable research overview for the researcher. The theoretical framwork assited in the use of the Nvivo software utilised to analyse the research data, more on this in the next chapter in section 4.6.

The arrows in the framework refers to the how DeLone and McLean (1992) viewed the different factors to influence each other. The CSF's interdependency will not be covered in depth here, however, the researcher still find it important to be aware of the relationship between the factors, thus the proposed arrows (interdependencies) are shown. Critical success factors are represented at 'the underside' of the framework, representing that all of the factors will be considered when evaluating the success factors. The figure below (Figure 6) outlines the theoretical framework developed for this research project:

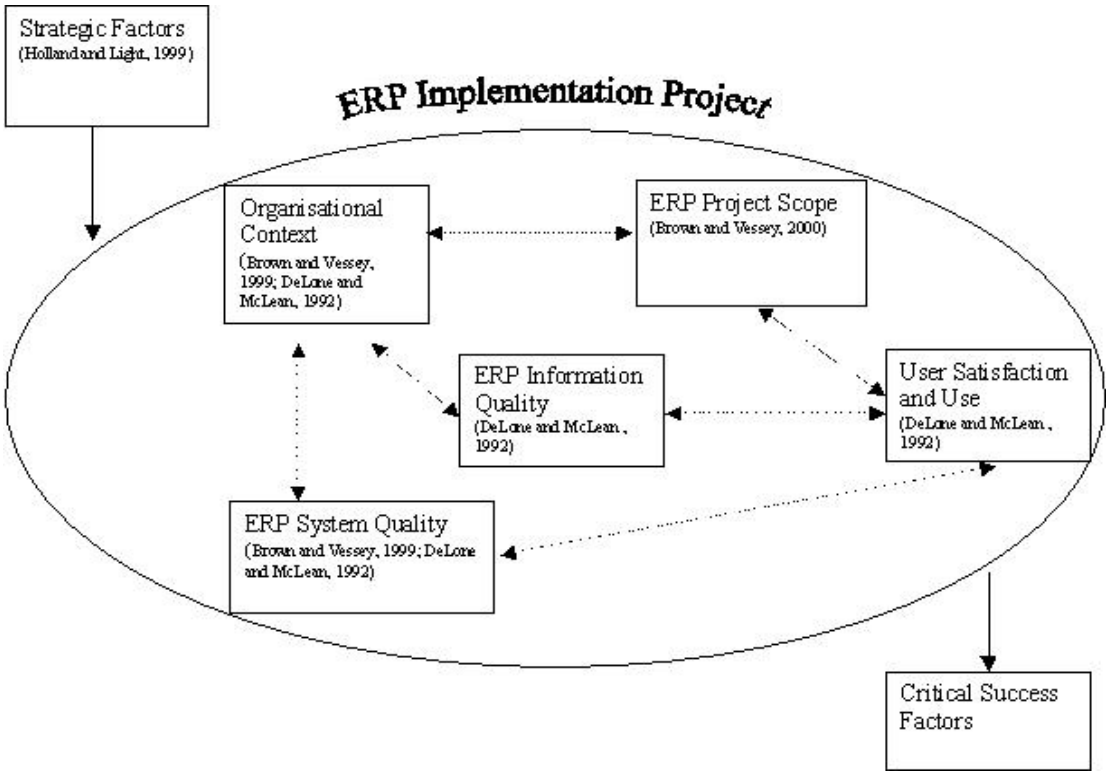

Figure 6 Theoretical Framework

The next section involves a discussion of the different factors that are chosen in the theoretical framework. For a list of questions derived from this framework to the interviewees, please see Appendix L: Interview Questions. The theoretical framework also help to identify the areas of interest depending on the interviewees role and responsibility in the ERP implementation project. This will be further discussed in Chapter Four - Research Method in section 5.7. The linkage between the interviews and the theoretical framework is also shown in Figure 15 found in Appendix K: Interview Schedule: People v. Theoretical Framework.

3.1. Strategic Factors

This factor was chosen based on Holland and Light's (1999) framework, as identified in section 2.2.1 above, that focused on the classification of ERP implementation processes and the diverse factors that affects an ERP implementation project. The word *strategy* in this context concerns the adjustment of a plan to the anticipated reactions of those who will be affected by the plans, such as competitors, customers and the actual organisation. Often plans can differ in structure, but a strategy commonly contain a mission, vision, values, strategic directions, objectives, key strategies, performance outcomes, operational plans and accountabilities (Chandler 1962; Drucker 1990). The plan should be developed after consultation with all levels of the organisation (Anthony 1965; Anderson et al. 1999). Naturally in strategic factors, it will be relevant to investigate the strategic use of information systems to gain or improve competitive advantage for the organisation (Porter 1985a; Kearns and Lederer 2000). An ERP has been reported to improve an organisations' competitiveness in a given market, while also improving the organisational value (economical gains) (Soh and Markus 1995). And can be seen as a strategic choice for organisations (Holland et al. 1999).

Within the HES in Australia, questions that will be asked concern finding out key characteristics of the organisation, including industry and competitive strategy and if the organisation is actually viewing the ERP implementation project as a strategic solution (Jenson and Johnson 1999). Within this factor, it is important to categorise whether an organisation views the strategic IT/IS approaches as an outsourced or partly outsourced activity or not (Pinnington and Woolcock 1995; Kern and Willcocks 2000) and to what extent there can be knowledge sharing between the outsourcing partner and the organisation that receives the service (Lee 2001). This factors is modelled in the theoretical framework (Figure 6 Theoretical Framework) as it is believed that it will affect the whole implementation project and the different factors in the ERP implementation project.

3.2. Organisational Context

Within the IS field it was reported by Ervasti and Iivari (1993), that existing studies with regarding IS acquisitions were close to zero. Hirschheim and Smithson (1998) found that managers should include a return on investments (ROI) while evaluating the possibilities of an IS and also other authors have found that management should state benefits from expected information system developments (Ahituv et al. 2000). Previous studies conducted on CSF's have focused on organisational issues concerning the changes that will occur during an ERP implementation project and how best to evaluate these changes and care for these changes in an optimal way (Edwards and Panagiotidis 2000; Aladwani 2001). This factor is necessary to include in a framework when evaluating factors for success for implementing an IS in a university setting as ERP systems are large systems that are difficult to implement in a university environment (McConachie 2001). DeLone and McLean (1992) argued that it was important to evaluate the effects the information system had on organisational performance. Brown and Vessey (1999) found this to be true for ERP implementation projects as they included this factor when looking at their model for ERP implementation. As described in section 4.3, ERP and Organisational Change, in the previous chapter on literature review, ERP implementation influences the organisation in a number of ways and these changes will be questioned in order to derive CSF's for an ERP implementation project in a university environment. Specifically, this factor will investigate how the ERP system and the ERP implementation team perceive existing and future roles and responsibilities in the university when an ERP system is introduced. The factor will look at issues concerning 'how things are done around here', as expressed by Earl (1996). In the theoretical framework above (Figure 6), the organisational context is modelled as influencing the system quality and the system quality is modelled as influencing the user satisfaction and use.

3.3. ERP System Quality

It has been seen that IS quality has a broader perspective than other quality ideas represented within the IT industry (such as software quality (Andersson and von Hellens 1997)). Also different factors of quality may be of importance to different groups of individuals (Eriksson and Törn 1991).

Another interesting point of view is that presented by Dahlberg and Järvinen (1997) who claim that too much focus has been placed on technical aspects when focusing on quality issues. However, the importance of information system quality (ISQ) and management of this (Total Quality Management TQM) has been identified as important by a number of researchers (Braa 1995; Eriksson and Törn 1997). Basically, the improved 'desired characteristics' of an information system (an information system definition is described in section 2.1.1 above), the more improved implementation, maintenance, cost in different terms, training and ease of upgrading be of the ERP implementation in the long.

An ERP, by nature, is a one-system-only information system that models all the business processes (Rosemann and Wiese 1999) in one, the management of this is seen to be crucial for the success of the organisation. This is evidently a fact as information technology and the utilisation of IT by using information systems are factors that lead to competitive advantage in today's world (Earl 1990). The questions that this factor will address concern the functionality of the system and how the users' perceive this. Also technical issues such as security and versions of the ERP system, will to some extent also be addressed.

3.4. ERP Information Quality

DeLone and McLean (1992) found that researchers had focused on the system ability to produce desired information. The ERP information quality concerns the actual information produced by the ERP system. An ERP system's main selling points is it's ability to streamline the information flow in the organisation (Laberis 1999), thus this should be investigated also in a university environment.

The organisational context is influencing the actual information quality, while the user satisfaction and use will be influenced by the quality of the information that the ERP system produces.

3.5. ERP Project Scope

The existing IS literature has focused on top management support (Kaiser and Srinivasan 1987; Jarvenpaa and Ives 1991; Raman et al. 1993) and the actual risk of developing and implementing systems (Barki et al. 1993). Top management support can be categorised as the actual commitment of senior executives to support the implementation project of any system. In the IS implementation field, there has also been a focus on having the information technology or project champion. Where project champions are more than ordinary leaders, they could be characterised as transformational leaders who inspire others to transcend self interest for a higher collective purpose (Beath 1991).

ERP implementation projects have been found in the literature to different than 'normal' IT projects and should be treated differently in how they are managed and organised (Austin and Nolan 1998) and it is this management and scope that this factor will address. No research has been previously conducted on this factor with a view on how to introduce and implement an ERP system into a university environment (except for research already conducted at the research site that has focused on different users (Mayer 2000) and cultural issues (Beekhuyzen 2001)). The ERP project scope will in this research project concern how the actual project team was run, information given to people and users affected by changes and how the business changes were chosen. The ERP implementation approach and how the implementation team operates are also of an interest. The ERP project scope is modelled as influenced by the organisational context and in the same way influence the organisational context and the user satisfaction and use of the ERP system.

3.6. User Satisfaction and Use

DeLone and McLean (1992) focused on the user satisfaction and the use of the information system. This factor was viewed as a potential factor for evaluating a systems success. Within the IS research field, a number of papers have focused on user satisfaction (Bailey and Pearson 1983; Baroudi et al. 1983; Etezadi-Amoll and Farhoomand 1991; Lawrence and Low 1993). Some research has also focused on the outcome user involvement and participation can have on the end user satisfaction of the system (Lawrence and Low 1993; Barki and Harwick 1994; Beeler and Hunton 1997). Beck et al (2000) investigated the different stages of an ERP systems use and how the ERP system was utilised in the organisation but no real research exists with the use of an ERP system in an Australian university environment. The closest connection can be found in McConachie's (2001) paper where she finds that the users of the PeopleSoft system at Central Queensland University (CQU) in Australia where found to be 'change weary'. McConachie also reported on differences in academic users and administrative staff users of the system and reported that the users had no real shared value of the system (McConachie 2001).

User satisfaction, can be defined as the extent of which users believe the information system available to them meets their information and system requirements (Baroudi et al. 1983). DeLone and McLean (1992) found that the use and user satisfaction was related to the system and information quality (in this theoretical framework they will be called ERP information quality and ERP system quality). Brown and Vessey (1999) found the ERP project scope to affect the user satisfaction and use of the ERP system. Within this context, it will be valuable to see how the users of this system (academics, staff and staff, see Appendix S: NABS and ARPP System Functionality) perceive the ERP system and how useful they find it. It has been reported in IS research that the users of systems can choose not to use systems and try to work around the system (Orlikowski 1992). As an ERP system offer the organisation predefined operational *business best practices* (Taylor 1998), questions of interests then are whether the users believe that the actual system captures their knowledge and truly models the users knowledge and the actual business processes they performed before the system was implemented.

Other related concepts with this factor involves training the users of the systems receive, conflicts between users, system ownership and if the users feel that they have been able to express their views if they have felt dissatisfied during implementation or during the use of the system.

4. Conclusion

Measuring information system success is a key problem for IS researchers (Mathieson 1993). Some authors describe success based on meeting the budget, while others classify a successful ERP implementation as meeting the deadline for the project. Success can look different when examined at different points in time, on different dimensions or from different views (Larsen and Myers 1997; Markus and Tanis 2000). Within this chapter a theoretical framework is proposed in order to establish key factors for investigation what the success factors comprise of implementing an ERP system in a university environment and not particularly on the measurement of those factors. The theoretical framework was developed after a through an extensive literature review on existing quality frameworks and existing critical success factor models for ERP implementations. The theoretical framwork developed compromises six different factors. These six factors will be used in the research project, and they are found to be: *strategy*, *organisational context*, *ERP system quality*, *ERP information quality*, *ERP project scope* and *user satisfaction and use*.

The next chapter will describe in detail the selected research methodology and research approach selected for the research project.

Chapter Four - Research Method

1. Introduction

This chapter discusses the research methodology that has been chosen for this project. An information system research classification overview will be presented to illustrate where this research method fits in. The methodological assumptions are explored, focusing on theories of ontology, epistemology and the view of humans and ethics of research – all related to the theoretical frameworks and research questions developed for this research project. Potential research methods are then described and evaluated for usefulness regarding the research project and it's nature. Following this, all the data collection techniques used within this research are discussed. Research in information systems field stems from the management information systems (MIS) field (Alavi et al. 1990) and has investigated research concept such as analysis, effective design, delivery, technical implementation (construction), evolution (enhancement maintenance) and use of information systems and information technology in organisations (Davis et al. 1980; Keen 1980; Boynton and Zmud 1991; Iivari 1991).

There have been noted demands evident in the literature from IS academia and practitioners to include behavioural and organisational considerations when researching information systems (Galliers and Land 1987), which later has been followed up in the IS literature. The dominant research methodology remain to be survey methods, constituting 32% of published studies in a study of 2098 articles published between 1985-96 in the top-rated journals published in the information systems area (Drury and Farhoomand 1999). This quantitative focus has been a debated area within the IS field, as critics found it to neglect aspects of cultural environment and social interaction that could affect the systems development outcomes (Falconer and Mackay 1999). Thus, in the IS research area there has been a shift towards more use of qualitative research methods and it has been acknowledged research approach alongside quantitative research (Myers 1999b; Trauth 2000).

2. IS Research Paradigms

There is a consistent philosophical world view that underlies much of the activity constituting information systems research and that binds IS researchers together (Baroudi and Orlikowski 1989). A paradigm is the broadest unit of consensus within a science and serves to differentiate one scientific community (or sub community) from another (Banville and Landry 1989; Guba and Lincoln 1994). Typically, a paradigm consists of assumptions about knowledge and how to acquire it and about the physical and social world (Hirschheim and Klein 1989). A number of different paradigms exist in the IS field (Fitzgerald and Howcroft 2000; O'Donovan and Roode 2002). Iivari's notion of paradigms (1991), which is based on Burrell and Morgan's work (1979), distinguishes four major research assumptions, namely, *ontology*, *epistemology*, *methodology*, and *ethics of research* (Hirschheim and Iivari 1992) as shown in Figure 14 found in Appendix J: Iivari's Paradigm Framework.

Epistemological assumptions are assumptions made about knowledge, specifically concerning the 'grounds of knowledge'. Grounds of knowledge relates to how knowledge can be obtained (Burrell and Morgan 1979). Ivari (1991) classified epistemological assumptions into two opposites, *positivism* and *anti-positivism*. Positivism is the approach of the natural sciences (Neuman 1997). Varieties of positivism go by such names as logical empiricism, the accepted or conventional view, post-positivism, naturalism, the covering law model, and behaviourism. The positivism stand is often equated with empiricism (Trauth 2000).

Positivists believe that a final truth, even about social phenomena, can be reached through the methods of science, where science is understood as expressed in measurements. The term positivism derives from the belief that society will become ever more perfect as a result of advances in science, including the social sciences. The positivist stand argue that the social-science research should emulate how research is done in the natural sciences (Lee 1999) and assumes language to correspond to an objective reality, that is, meaning is assumed to be objective – researchers merely need to find it.

A positivist stand continues with regarding the researcher to be viewed as an outsider who can readily interpret a text from semantics (Janson and Lacity 1994).

According to Ivari's (1991) classification, the opposite of positivism is anti-positivism. Anti-positivist is said to be understood by the point of view of the individuals who are directly involved in the activities which are to be studied and the researcher is participating in action (Burrell and Morgan 1979; Iivari 1991).

Ontological assumptions is connected to assumptions made about the phenomena to be investigated, basically the nature of science and it has been referred to as the *subjective-objective* dimension (Burrell and Morgan 1979). Subjective-reality perceives reality as a social construction while the objective-reality dimension defines reality as a concrete structure (Morgan and Smircich 1980; Hirschheim and Klein 1989).

According to Ivari (1991), the 'view of humans' evolves around the assumptions about the view of human beings. Humans can either have a 'free-will' (*volunteerism*) or they are shaped by their surroundings (*determinism*) (Morgan and Smircich 1980). Within the ontological assumptions, there are also assumptions to be stated about the view of information/data, the view of information systems, the view of technology and the view of organisations and society (Iivari 1991). The next section will outline the author's specific research assumptions. These research assumptions are important to classify due to the fact that they might influence the research project and the research questions to some extent.

2.1. Research Assumptions

The following section relates the researcher's assumptions based on Ivari's notion of paradigms (1991) (For a full representation of Iivari' (1991) research paradigm, see Figure 14, in Appendix J: Iivari's Paradigm Framework. This appendix includes a figure that represents Iivari's (1991) framework for paradigmatic analysis).

2.1.1 Ontological Assumptions

Ontology studies the assumptions made about the 'phenomena to be investigated' (Hirschheim and Iivari 1992), as described above. According to Iivari (1991), ontological research assumptions are concerned with five major areas as identified below. The researcher's views on these assumptions are as follows:

Information/data

Two different viewpoints here are whether one believes that a data model 'reflects' reality or consists of subjective meanings and thereby constructs reality (Burrell and Morgan 1979). For this research, it will be the assumption that information consists of subjective meanings and thereby constructs reality.

Information/data systems

The classifications in this area are either 'technical systems with social implications or social systems only technically implemented' (Hirschheim and Iivari 1992). This research investigates critical success factors for an ERP implementation and as seen in Chapter Three - Theoretical Framework, the research area includes the organisation and the users of the system. When users and the organisation is part of the research, it is clear that an emphasis will be on the social nature of information systems.

Human beings in their different roles in IS development and use

Iivari and Hirschheim (1992) state that humans can be classified from a voluntaristic or deterministic outlook, depending on the freedom of the actions they have in a given situation. The researcher adopts the view that that 'a person is completely autonomous and free-willed' (Burrell and Morgan 1979; Hirschheim et al. 1998).

This view is taken rather than the deterministic view, a view that places a person's and his/hers activities to be completely determined by the situation or the environment that he/she is in. Although an ERP implementation might be regarded as 'forced upon' by some users (Askenäs and Westelius 2000) as no real user participation can be claimed to not have occurred in the ERP implementation project (Guimaraes et al. 1994), the researcher will still regard human beings in a voluntaristic view with some freedom of action.

View on Technology

This view, according to Iivari and Hirschheim (1992), makes a distinction between technological determinism and human choice. Technological determinism develops according to its own laws and it is found to be inflexible. The view of human choice will be adopted, as this view emphasises the flexibility of technology and the possibility of human control and human responsibility for technological development. Such a viewpoint is of high interest when a focus has been placed on ERP and implementation success, as a great number of ERP implementations within a university environment are reported over budget (Lawnham 2001).

View of Organisations and Society

This assumption involves the view of organisation and society upon the research. Burrell and Morgan (1979) use the 'dimension of realism versus nominalism' to describe ontological assumptions concerning the social reality.

For this research, a nominalistic view will be adopted as it relates to how people in the organisation see the problem (Hirschheim and Iivari 1992), as opposed to a realistic view that maintains the social world external to individual cognition, is a real world made up of hard, tangible and relatively immutable structures (Hirschheim and Iivari 1992).

2.1.2 Epistemological Assumptions

Epistemological assumptions are assumptions based upon the nature of the information the research is attempting to discover (Hirschheim and Klein 1989). Thus epistemological assumptions relates to how one goes about acquiring knowledge (Hirschheim et al. 1998).

There are two main views of epistemological assumptions seen in the history of information systems research (Hirschheim 1992), positivist and anti-positivist. As described above, positivism seeks to explain and predict what happens in the social world by searching for regularities, casual relationships between elements (Hirschheim 1995). While, anti-positivism maintains that the social world can only be understood from the point of view of the individuals who are directly involved in the activities which are to be studied (Hirschheim and Iivari 1992).

This research concerns the critical success factors for implementing an information system and the author suggests that these factors will not be gathered from casual relationships between elements such as the positivist view entails (Hirschheim and Klein 1989). The researcher would rather take an anti-positivist view and assume that one can only understand by researching into the individuals who are directly involved in the activities to be studied (Burrell and Morgan 1979).

2.1.3 Ethics of Research

The ethics of research concern the responsibility of a scientist (the researcher) for the consequences of their research and its results (Iivari 1991; Visala 1992). This research is interpretive in nature, as it is assumed that our knowledge of reality is gained only thorough social constructions such as language, consciousness, shared meanings, documents, tools and other artifacts (Klein and Myers 1999). As a result of the interpretive view taken, the ethical consequence of this research will be to make an effort to ‘enrich people’s understanding of their action’ (Hirschheim and Iivari 1992). The researcher also adopts the view that a researcher’s moral code is the strongest defence against unethical behaviour (Neuman 1997).

The main ethical issues related to this research will be to adhere to privacy and protection for the interviewees (Frey and Fontana 1994). As described in the introduction of this research project, section 1.1 in Chapter One, all interviews identification will be hidden and pseudonyms will be used.

2.2. IS Research Method Classification

Research methodologies (Järvinen 1999) can be classified in a number of different ways and a short overview of the different IS research classification schemes can be found in the section below.

2.2.1 Empirical v. Non-empirical

"Empirical research involves observation", according to Schwandt (1997, p. 36) or the research involves direct fact-finding about issues (Kling 1991) and a range of approaches of this research method exist (Galliers 1992). According to Alavi et al (1990), non-empirical methods are those that focuses on ideas, frameworks and speculation rather than on observation. The data utilised within this method classification is almost always of a secondary nature.

The fact that empirical research methods have now been accepted by the IS research field and practitioners (Benbasat et al. 1987; Alavi et al. 1990; Trauth 2000), is one reason to adopt an empirical research method. As this research investigates critical success factors for an information systems implementation, a non-empirical research method based on ideas and speculations are not regarded as valid research approaches. As identified in Chapter Two - Literature Review, there have been a number of empirical research papers published with a focus on ERP implementation efforts, thus the empirical line is a valid direction for this research project. This research relies heavily on theory (see Chapter Three - Theoretical Framework), therefore the theory-creating approach (Järvinen 1991) will be adopted (see also Appendix H: Järvinen's Research Classification for the classification on the different research methods, that Järvinen call research approaches).

2.2.2 Qualitative v. Quantitative

Qualitative research has a history from the social sciences, and it has been found particular useful for studying social and cultural phenomena. Within the qualitative research tradition a number of different research methods are available (Baskerville and Wood-Harper 1998). In the last ten years, qualitative research has gained acceptance in the academic IS discipline in US, Europe and USA (Trauth 2000).

Qualitative research in the information systems field has become relevant for IS researchers for the purpose of understanding the user (Trauth 2000). Qualitative research methods are classified as either:

- Action research (Mumford 2000)
- Ethnographic research (Klein and Myers 1999)
- Grounded theory (Järvinen 1999)

or

- Case study research (Yin 1994)

(The above list is list adopted from Myers (1999b)).

Quantitative research on the other hand is derived from the natural sciences (Huff et al. 1998), where the research data is usually in the form of precise numbers that have been collected in clear defined steps (Neuman 1997).

Quantitative research methods include:

- Survey methods (Huff et al. 1998).
- Laboratory experiments (Galliers and Land 1987)
- Formal methods (e.g. econometrics) (Kitchenham et al. 1995)
- Numerical methods (e.g. mathematical modelling)

The above list is list is adopted from Myers (1999b).

Quantitative methods are usually used for testing hypothesis and they include of defined processes that often employees numbers and statistics in order to derive a research result (Neuman 1997). The quantitative focus has been said to neglect cultural environment and social interaction (Falconer and Mackay, 1999), while the qualitative focus has been said to be time consuming (Mason 1994) and requires the researcher to grasp a wide area of concepts and meanings that will be related to the data collected (Neuman 1997). Quantitative research has been known for studying *hard* and *fixed* issues and variables, while the qualitative approach focuses on *soft* and *flexible* issues (Myers 1997b; Neuman 1997; Silverman 1998).

It is important to understand that the nature of what is attempted to be studied should guide the research approach (Shaw 1999; Silverman 2000). The research approach selected is derived from literature on typical research methods for this specific discipline (Marshall and Rossman 1989), namely ERP implementation success (see Chapter Two - Literature Review, section 2.2). Therefore, the author has chosen to focus on a qualitative research method, as the research will investigate ERP implementation over a period of time, focusing on social issues and qualitative research methods are known for *"being powerful for studying any process…and for relating peoples meanings to the world around them"* (Huberman and Miles 1994, p. 10).

2.3. Qualitative Approaches Available

The following section describes the various research methods available for the researcher within the qualitative research field.

2.3.1 Action Research

Action research aims to contribute to both the practical concerns of people in an immediate problematic situation and to the goals of social science by joint collaboration within a mutually acceptable ethical framework (Rapoport 1970).

The research method is committed to the production of new knowledge through the seeking of solutions or improvements to real life practical problem situations and is

regarded as a valid research method in the IS field (Baskerville and Wood-Harper 1998). The action researcher is viewed as a key participant in the research process, working collaboratively with other concerned and/or affected actors to bring about change in the problem context (Marshall and McKay 1999). The method is strongly anchored to post-positivist philosophy (Baskerville 1999). The key assumptions concerning an action researcher are twofold. Firstly, the social settings cannot be reduced for study and secondly that action brings understanding (Baskerville 1999).

2.3.2 Ethnographic Research

Ethnographic research comes from the discipline of social and cultural anthropology where an ethnographer is required to spend a significant amount of time in the field and is similar to the case study method. The goal is to improve our understanding of human thought and action through interpretation of human actions in context (Myers 1997a). Because the researcher is present for an extended period, the ethnographer sees what people are doing as well as what they say they are doing. Ethnographic research has been claimed to be the most in-depth and intensive research method possible (Myers 1997a).

The ethnographic school of thought compromises the following sub types:

- Holistic
- Semiotic – (thick description and ethno science)
- Behaviouristic
- Critical ethnography

Each of the different ethnographic school of thought approach the conduction of ethnography studies differently (Myers 1999a).

2.3.3 Grounded Theory

This qualitative research method attempts to approach the research issues with no preconceived ideas in an attempt to allow the framework emerge from the data (Cunningham 1997). Grounded theory builds a theory that is faithful to the evidence and thus is a method widely used for discovering new theory (Järvinen 1991).

2.3.4 Case Study

A case study examines a phenomenon in its natural setting, employing multiple methods of data collection to gather information from one of a few entities (people, groups or organisations) (Benbasat et al. 1987). According to Hamilton and Ives (1982), case study research is the most commonly employed research strategy in the IS field.

The quality of the case study is dependent on the sensitivity and integrity of the researcher. The researcher's primary data collection method is said to be interviews, according to Winegardner (1999). There are typically three methods for case study process, namely interpretational, structural, and reflective analysis (Yin 1994). A case study can be either a single-case study or a multiple-case study (Yin 1994). The typical case study would generate three types of verbal data: interview transcripts, observer notes, and field documents (Winegardner 1999). Data collection for a case study research can be time-consuming (Broadbent et al. 1998) and can often result in a large collection of data to be analysed (Yin 1994).

3. Research Method Selection and Justification

The section below gives a justification for selecting a case study research method for the research project.

3.1. Case Study

There have been numerous situations where a *case study* has been brought into an ERP research situation (Martin 1998; Gibson et al. 1999; Holland et al. 1999; Brown et al. 2000; Sarker and Lee 2000; Scott and Vessey 2000; Cata et al. 2001; Cline and Guymes 2001; Katz 2001; Mandal 2001; Ng 2001; Scott and Wagner 2001; Scott and Wagner 2002). According to Yin (1994), case studies are preferred research methods when the investigator has little control over the events and when focusing on a contemporary phenomenon within some real-life context. This is precisely what this research will be undertaking, to find critical success factors for the implementation of the ERP project.

Yin (1994, p. 9) found some examples of "poor research results with case studies" and that they "take a long time to complete". Another potential limitation when selecting a case study method, is that the research can have inadequate resources to gather data in order to select a research site to conduct the case study, something that can affect the quality of the research site selection process (Marshall and Rossman 1989).

A case study research method is however preferred over a field study research, because a field study is usually a research approach that is considerably time consuming, according Myers (1999).

Action research has not been adopted, as the researcher is not part of the implementation team or in any way has any connection or influence with the implementation project. Ethnographic research is similar to a case study (Myers, 1999), but again the time factor is a limiting factor of the research approach.

Overall, a case study approach has been selected due to the fact that it will be the most appropriate research method based on the fixed timeline of the project and the nature of the research question. In addition, a case study method is a well-known research method in the field of study and has been used before during similar research projects. The appropriateness of a case study method is shown in the table below (Table 4). The table outlines the key characteristics of a case study (Benbasat et al. 1987) and maps key characteristics to the proposed research. The table shows the usefulness of adopting a case study research method for this research project and the questions the research attempts to address. For ease of reference, this table can also be found in Appendix I: Key Characteristics of a Case Study.

Phenomenon is examined in a natural setting	**This Research?**
Phenomenon is examined in a natural setting	√
Data are collected by multiple means	√
One or few entities (person, group or organisation) are examined	√
The complexity of the unit is studied intensively	√
Case studies are more suitable for the exploration, classification and hypothesis development stages of the knowledge building process; the investigator should have receptive attitude towards exploration.	√
No experimental controls or manipulation are involved	√
The investigator may not specify the set of independent and dependent variables in advance	√
The results derived depend heavily on the integrate powers of the investigator	√
Changes in the site selection and data collection methods could take place as the investigator develops new hypotheses	√
Case research is useful in the study of why and how questions because these deal with operational links to be traced over time rather than with frequency or incidence.	√
The focus in on contemporary events	√

Table 4 Key Characterestics of a Case Study linked to the Research Project

4. Research Strategy and Data Collection Techniques

This section discusses the research strategy and details the data collection techniques planned for the research project.

4.1. Research Strategy

This research uses an interpretive case study research method approach, as acknowledged above. The researcher, in a case study research, usually utilises specialised techniques and uses, according to Neuman (1997), the data to support or reject theories. The importance of theories within this research project is great. This is due to the motivation for the use of theory in the early stages of an interpretive case study is typically related to a motivation to create an initial theoretical framework.

This theoretical framework thus take account of previous knowledge and creates a sensible theoretical basis to inform the topics and approach of the early empirical work (Han and Walsham 1990; Walsham 1995b) (see also Chapter Three - Theoretical Framework). Walsham (1995b; 1995a) argues that in interpretive case studies, interviews are the primary data source and this view will be adopted as interviews are one of the most common data collection techniques (Järvinen 1999). The techniques of triangulation will be used in order to reduce the likelihood of misinterpretation (Stake 1994) (triangulation is further discussed below in section 4.5).

4.2. Secondary Data Review

A number of authors list resources such as time, money and effort spent as some of the benefits of using *secondary data review* as a research data collection technique (Gurbaxani and Mendelson 1991; Jarvenpaa 1991). The shortcomings of secondary data review are data availability, the lack of possibilities to check data for correctness and the inhibition of creativity (Kiecolt and Nathan 1986).

Secondary data review will be performed to investigate documents, reports and previous research that have been conducted on the research site.

4.3. Observation

The researcher will try to *observe* parts of the implementation tasks in action and adopt the role as an "outside observer", rather than an involved researcher (Walsham 1995b, p. 77). There are limitations to how much one can learn from what people conveys (Patton 1990) but this data collection will still be included as it is believed that pure interviews are not adequate as the solemn source of data collection. Some observations have been included because they can aid the researcher to pinpoint further research questions to ask during the interviews. A disadvantage of observations as a data collection method is that it can lack validity and reliability (Adler and Adler 1994) but this is only true if observations are used as a single method of data collection.

The advantages of adopting an outsider observation role, as the researcher has adopted, is that the researcher is not seen as one of the organisation, but an outsider, and in some cases the interviewees can be quite frank (Walsham 1995b). Observations makes it easy for the researcher to can gain entry and it is not a very structured method, thus allowing for creativity of the researcher (Adler and Adler 1994). Another reason for adopting an observation is the fact that it works well when combined with other methods and it is regarded as an ethical research approach by the researcher - as observers neither manipulate nor stimulate their subjects in any way (Adler and Adler 1994).

4.4. Interviews

The "quality of the interviews" will largely depend on the author's ability to perform interviews (Patton 1990, p. 277). A *standardised open-ended* interview and a *general interview guide* – approach will be followed when conducting interviews with interviewees (Patton 1990). This approach was chosen for a number of reasons.

Firstly, the interviewees are likely to be busy people and this approach keeps the interview highly focused and secondly, the variation between interviews can be minimised (depending on answers and which one of the two types being used). The researcher will have the possibility to receive guidance from academic staff at the university and authorities from interview objects that are employed on the implementation project (Patton 1990).

Frey and Fontana (1994) argue that *semi-structured interviews*, which basically is the standardised open-ended approach interview, does not make it easier to manipulate the respondents answers. A drawback approach for the standardised open-ended approach is lack of flexibility and a possible fault in the general interview type is the time it will take to collect and summarise the data. This type of interview has been chosen as it gives the interviewees the possibility to elaborate on issues they feel are important to discuss, rather than force the interviewees to respond to certain specific issues.

Depending on the different roles and responsibilities that the interviewees had in the implementation project (see section 4 below in Chapter Five - Research Site) different interviewees were sought depending on what the researcher wanted them to discuss, as shown in Figure 15 Interview Schedule in Appendix K: Interview Schedule: People v. Theoretical Framework. It has chosen to conduct two sorts of interviews, initial interviews (as described in section 5.4 below in the next chapter) and post implementation interviews (also described below in section 5.7).

During the post implementation interviews, a ‘questionnaire’ (Järvinen 1999) was developed and was distributed to the interviewees to complete before the interviews. This questionnaire formed a sub-part of the post implementation interviews that were scheduled (as described in Table 6 Academic Requirements Pilot Project Events and Activities in section 5.1 in Chapter Five - Research Site). The actual questionnaire that interviewees completed is listed in Appendix M: Interview Questionnaire.

4.5. Triangulation

One important way to strengthen a research study is through triangulation. Triangulation is recognised as a combination of methodologies in the study of the same phenomena (Patton 1990; Cunningham 1997). A shortcoming to this approach is the fact that triangulation is reportedly very difficult to perform and qualitative methods are particularly problematic to combine (Jick 1979). However the effectiveness of triangulation rests on the premise that the weaknesses in each of the single data collection methods will be compensated by the counter-balancing strengths of another, according to Jick (1979). Triangulation will be used by the researcher so that the chances of errors and misinterpretations will be reduced (Duchon and Kaplan 1988; Stake 1994). It is hoped that the researcher will identify wrongly interpreted issues in for example an observation with either the documentation review or the findings of interviews performed. Triangulation will be performed within the qualitative research method, that is triangulation will be performed on the research data derived from the different research collection techniques used, such as interviews, secondary data review and observations.

4.6. NVivo: Qualitative Research Analysis Tool

The qualitative research analysis software NVivo, developed by Qualitative Solutions & Research (QSR) (2002) has been utilised to construct and manage the data collected from all the interviews (initial interviews and post implementation interviews). NVivo was selected as it supports the researcher in the possibility to link data towards theory in an efficient way (Richards and Richards 1994; Bazeley and Richards 2000). Computer systems (CS) offers assistance in managing large amounts of data and this research specific software made it possible for the researcher to group and code the data and relate it to theories (theory creating approach as specified according to Järvinen (1999)). For a graphical layout of how the interviewees' responses were grouped into NVivo, please see Figure 16 NVivo Coding Structure Detailed List in Appendix N: NVivo Coding Structure. How the NVivo software was actually utilised can be found in section 5.8 NVivo in Chapter Five - Research Site.

5. Expected Research Outcomes and Constraints

This section discusses the expected research outcomes, while also introducing some research constraints that have been identified for the research project.

5.1. Practical Outcomes

The practical outcomes of the research involve an improved understanding for the Higher Education Sector on how to implement large information systems in an organisational structure such as a university. The university that has implemented this ERP package could learn from this research for future IT and IS projects and upgrades of the existing ERP system. ERP projects have been found to be complex undertaking based on previous research identified earlier in this dissertation, this project can help to establish some key areas that need attention for future IT projects that will be undertaken in the future within the University research site but also in the wider Australian HES.

5.2. Theoretical Outcomes

Research, compromising of a thorough literature review, into critical success factors for implementing an ERP system have been conducted prior to this research project, however no research has to date focused on CSF's in a university environment within the Higher Education Sector in Australia. This research will thus add to the growing body of knowledge on ERP implementations, critical success factors for implementing such systems and to research with a focus on the adoption of technology within the HES in Australia. (See also section 3 Project Justification in Chapter One - Introduction (page 5) for more on the practical and theoretical expected outcomes of the research project).

5.3. Research Constraints

There were a few research constraints initially identified with this research:

- Possibility to access documentation made for this project as the researcher is not part of the implementation project
- Availability of staff (administration and academic) for interviews as the participation of the research was voluntary
- Possibility to get access to implementation project user acceptance testing
- Limited time frame of research – the time frame is set and needs to follow both the project time and also due dates for the research project
- Lack of earlier research conducted with regards to CSF's for a university ERP implementation

See section 6 in Chapter Seven Conclusion, for details on how these constraints were managed.

6. Evaluation of the Research

Klein and Myers (1999) suggest seven principles in order to evaluate interpretive case studies in information systems research. This research is found to follow the interpretive style and thus the research will be evaluated against Klein and Myers' (1999) seven principles and this has been done in Chapter Seven Conclusion.

7. Conclusion

This chapter outlined the research approach that will be adopted for this research project. The research approach was naturally influenced by the nature of the research topic (refer section 2.1, Research Questions in Chapter One - Introduction). ERP systems research is part of the IS research field and this chapter found that the researchers' research assumption will reflect the research method and the approach of the research project.

A number of different research approaches and methods have been used within the IS research community, however a qualitative approach has been selected for this research problem. A case study has been selected as the most appropriate research method. The main data collection techniques will include secondary data analysis, observation and interviews. This chapter placed the research along and amongst the growing number of IS research projects. The next chapter gives a presentation of the research site of the actual ERP implementation project that the University conducted.

Chapter Five - Research Site

1. Introduction

This chapter provides details about the research site that was chosen for the research project. A strong emphasis has been placed on a description of the research site, the history behind the selection of an ERP system within the University, users of the system and the organisational context that impacts on the implementation of the system. This description is compiled from the primary and secondary data collected from a review of the relevant literature of ERP implementations and related literature. As the research site is an Australian university, the Higher Education Sector in Australia is also discussed with references to related literature. The figure below (Figure 7) shows the contents of this chapter and how the focus ends with a discussion of the NABS system implementation, specifically focusing on the pilot project termed Academic Requirements Pilot Project (ARPP) - a trial project for the academic advisement function in the Student Module of the ERP system PeopleSoft.

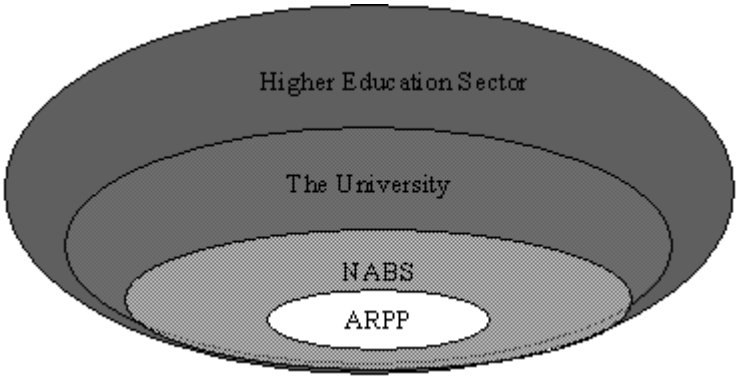

Figure 7 Chapter Five Contents - ERP in an Australian University

2. The Higher Education Sector

"The policy changes announced in the 1996-97 Budget and subsequently are leading to a more competitive environment and increased opportunity for Australia's universities to diversify funding sources. In this environment, it is becoming increasingly important that universities have in place robust arrangements for fully and accurately measuring the costs associated with their various activities" (Applebee et al. 1998, p. 4). The Australian government argues that universities have not previously had as much funding as they do presently (AVCC 2001b), according to the education minister Brendan Nelson (Moodie 2002a), there will be no increase in university funding within 2002. Newspaper articles report on the possibility of even additional reforms in order for the government to save money in the Higher Education Sector (Illing 2002). However, the AVCC (Australian Vice Chancellors Committee) argue that *"From the start of 1996, the government has not indexed its grants to universities to reflect actual cost increases"*(2001b, p. 1). The lack of government funding compared to the increase in students and more demand for staff, was the actual situation for the research site university (termed in this dissertation as *the University*) and other universities in the Australian Higher Education Sector from 1996 and to now (2002).

2.1.1 Sources of Income

The government in Australia have made universities attempt to behave more like businesses (Siracusa 2002) and pressure has been placed on structuring, lowering costs and achieving greater administrative efficiency (Coaldrake 2001; Guthrie and Neumann 2001; Sarros and Winter 2001).*"Government policy seeks to encourage higher education institutions to multiply their sources of revenue and thereby widen the range of opportunities available to students, and the responsiveness of institutions to demand"* (Kemp 1998, p. 12). More recently, Australian universities have targeted full paying international students, as there has been a pressure to find different sources of income (DEETYA 1998; AVCC 2001a).

2.1.2 Staff

Australian universities consist broadly speaking of two different categories of staff, that is to say the academic staff and the administrative type of staff. It was found that

until 1996, there was a higher growth number in the number of academic staff, rather than administrative staff (DEETYA 1997). However, in recent years the level of academic staff has decreased nationally (AVCC 2001c) and within the University (Annual Report 1999, 1998, unpublished documents).

2.1.3 Strategic Planning

Almost all universities in Australia now utilize the concept of strategic planning to guide the future plans of universities, however up until 1980s the concept of strategic planning was not widely used (Anderson et al. 1999). Even though the concept of strategic planning is now of use in the Higher Education Sector, hardly any universities carry out an identification and assessment of risks about their plans for utilisation of information technology (Anderson et al. 1999). A report on strategic planning in Australian universities found that effective change in a university was inherently more difficult than in most other institutions, public or private (Anderson et al. 1999) and that one should attempt to incorporate ownership with the strategic plans of the university from academic staff. It is likely then to attract *"intelligent and critical interest"* (Anderson et al. 1999, p. 17). The University has a strategic plan (Strategic Plan, 2000, unpublished document) for 2001 – 2005 and also an information strategic plan (1999, unpublished document) for 1999-2003, which identifies the strategies, the performance indicators, the target and who is responsible for achieving the target. However, no risk assessment is identified in the plan.

2.1.4 Information Technology Possibilities

Currently, many universities are engaging in multimillion dollar re-engineering of academic management and administrative processes because of a needed upgrade of information systems and technology in the HES in Australia (AVCC 1996a).

These changes are part of ERP implementation project estimated to have total costs to the institutions (the single university that implements the solution) of between $20 million and $60 million (Chipman 2001) and also this University in question chose to

implement an ERP solution. The changes in the Australian Higher Education Sector was discussed in greater detail in section 0 in Chapter Two - Literature Review.

According to the annual report published by the University in 1998, it was found that the major corporate information systems were all due for replacements and it was claimed, "*The University cannot escape significant costs in this area if it is to have good quality information systems underpinning its operations"*(Annual Report, 1998, unpublished document, p. 51).

3. Research Site – the University

The research site that was selected is a large Australian university. The University was founded in 1975 and consists of six campuses. The university has a reputation as being placed among the top ten universities in Australia. In 1994 the University had 1024 Academic Staff, while in 2001 the University had 1169, even though the students enrolled had increased from 14 048 in 1995 to 20 218 in 2001 (Unistats 2001). Throughout the University campuses the University has currently approximately 24 000 students and close to 3 000 academic and administrative staff in total. Of the total number of students, there has been a steady increase in the enrolment of international students from 810 in 1994 to 3176 in 2001, clearly illustrating that the University has a focus on international students.

3.1. Structure

The University underwent a major restructuring process in mid-1997, changing from a decentralised structure to a more centralised organisation. On completion of this restructure, the University at present consist of four major academic groups in Arts, Business, Science and Health, where each group compromises a number of schools (Annual Report 1997, unpublished document).

This restructure came as a response to the government report, the so-called 'West Report', which called for major shifts in the way universities in Australia operate (West 1998).

3.2. Selection of the Research Site

In 1998, the University chose to implement the ERP system PeopleSoft to replace outdated information systems (see the next section, section 4, for more information on the NABS system).

The research site was chosen to be the research site for this research project for a number of reasons. The University provided an environment where the researcher could have easy access to the implementation efforts and the project implementation team. This research site also fitted in with the researcher's idea to carry out a case study analysis with observations and interviews, making it possible to fulfil the case study research objectives. During the research project, the researcher was a student at the University and the research site offered personal domain knowledge as a result of being within the research site environment for the last three years. The researcher was also involved in the school committee of the computing school the researcher conducted his study in, as well as being a sessional staff member employed at the University during 2001-2002 in one of the schools that one of the implementation pilot projects was conducted in. This offered some possibilities for easier access to information and to potential people to interview. A clearer understanding of the systems intension could be made and it was possible for the researcher to investigate the history of the research site as well as get a better understanding of the school. As the researcher had undertaken an undergraduate degree within the school, it was possible to look at the implementation from a student perspective giving the researcher background knowledge of the University and the people involved.

4. The NABS System

The New Age Business Services (NABS) project has been a joint initiative in order to implement the PeopleSoft ERP system into all sites of the University (NABS 2000a).

The University chose to implement three modules of the ERP package. These modules were the Finance module (which was implemented in October 2000), the Human Resource/Payroll module (HRM) (which was implemented in April 2001) and the Student Administration module (which major components were implemented on the twenty-ninth of October 2001, with some time delays of the implementation) (NABS 2000a,) (see also Appendix R: NABS Project History). The NABS project implementation team chose to have a phased ERP implementation (Brown and Vessey 2000), as is a common approach found in most ERP implementations in Australia and worldwide as was identified in section 4.1 Implementation Strategies in Chapter Two - Literature Review with little customisation done to the ERP software.

Within the University context, the proposed users of the NABS system are:

- Academic staff
- Administrative staff
- Students

See also Appendix S: NABS and ARPP System Functionality for more detail on the system and the system users and also Appendix R: NABS Project History for a chronological history presentation of the NABS project.

Prior to undertaking the case study, the author reviewed documentation regarding the NABS system initiation (Nielsen 2001). The documentation review involved secondary data analysis of existing NABS documentation, such as reports, emails and previous studies on the project. According to some of the University information, systems were considered outdated. The NABS project first planned to replace the current Finance, Payroll and Human Resource Management (HRM) systems with a new system.

The NABS project was taking place because it was found that the University's current systems 'lacked the possibility for ongoing maintenance and support for the existing Lattice Human Resource and Payroll system' (Taylor 2000, unpublished document, p. 1). The following list rationale for the NABS project was derived from the available resources as reasons for updating the system:

- Replacing the paper-based system was seen as important.
- The impending introduction of GST (it was assumed to be too expensive to change the current systems to cater for GST, gave an incentive to change the "outdated" system altogether).
- Growing University and growing business needs gave the University a general need to update outdated systems to be able to cope with the business demands of a growing organisation.
- The changing nature of business in the Higher Education Sector means that the University also have to follow (Taylor 2000, unpublished document).

In 1998, the University conducted a 'functional and technical evaluation' of the different software packages that were available (Thompson 1999, unpublished document) and the different implementation partners. The table below (Table 5) shows a listing of the possible partners and vendors the University had short-listed after their initial *request for tenders* (RFT).

ERP Vendor		Consulting Partner
PeopleSoft		Ernst & Young
SAP		Deloitte Consulting
Oracle		Andersen Consulting
Financia1/CHRIS		
PeopleSoft	**Chosen solution**	**Andersen Consulting**[4]

Table 5 ERP Vendor and Consulting Partner Selection Possibility List[5]

There is evidence that Deloitte Consulting wished to have a discussion group with the then current (1999) Human Resource Management users to gauge the level of change readiness for the new proposed system that was going to be in place, making it clear

[4] Andersen Consulting changed its name in 2000 to Accenture and will from here onwards be termed Accenture Taylor (2000).

[5] The layout of this table does not represent any relationship between the ERP vendor and the different and not related consultation partners.

that some issues were identified with regards to radical changes being proposed in the University.

Accenture (formerly Andersen Consulting) identified the following objectives for the NABS implementation project:

- Deliver improved services to academic, general staff and students.
- Deliver timely and relevant management information.
- Design set of processes and system tools and controls that support the data.
- Release transaction processing.
- Provide effective change management and training to all client groups.
- Deliver and develop employer and student web applications.
- Deliver client services, which are intuitive and have a consistent look and feel.

(Andersen Consulting 2000, unpublished document).

From the NABS project point of view, the objectives of the project was to:

- Deliver improved services to academic and general staff through the development and implementation of efficient, consistent and effective processes.
- Deliver timely and relevant management information.
- Deliver user interfaces that are intuitive and have a consistent look and feel.
- Develop and deliver web service applications.
- Design and deliver a set of process, system tools and controls that support data integrity and accountability.
- Release resources from transaction processing through automation of processes.
- Further embed the University strategic directions in business systems and processes.
- Provide effective change management and training to all client groups.

(NABS 2001b)

The University termed the NABS system implementation as a 'strategic shift' for the University and it was, to date, the largest project the University has conducted. It was found that during the Finance Module implementation, the University administrative staff concluded that the University was beginning to realise the benefits of offering administration services via the web and reducing the burden of paper based processes (York 2000, unpublished document). Accenture expected resistance to change among the potential users of the system. It was expected of staff to contribute to the project without getting extra money, making funding and allocation of resources a question for the different schools at the University. Appendix R: NABS Project History provides a timeline history for the NABS.

4.1. Student Administration Module

As described above, the University has already completed the implementation of the Finance and the HR/Payroll modules when the researcher started this research project. Therefore, this research project focuses on the implementation efforts of the Students Administration module that was the last module of the PeopleSoft package to be implemented during the NABS project (see also Appendix S: NABS and ARPP System Functionality for a description of the proposed functionality of the NABS and the ARPP system). The major module implementation was completed on 29th October 2001 as a so-called *'Go live date'*.

On the 20th March 2002, the NABS Project implemented the RHD (Scholarships) functionality of the PeopleSoft Student Administration module, making the research higher degrees (RHD functionality, scholarships) the last functionality to be implemented and officially closed the New Age Business Services Project implementation at the University (Fransman 2002; Williams 2002; unpublished document). In Appendix R: NABS Project History, a history of the NABS project is presented.

4.2. Academic Requirements Pilot Project

Within the NABS project implementation of the Student Administration module, it was chosen by the NABS project team to run a pilot project called Academic Requirements Pilot Project (ARPP).

According to the manager for the ARPP, Rita, the goals of the ARPP were to attempt to *"trial the functionality of the system within a few selected schools to see if it was feasible to implement it throughout the University"*.

The old student information system (SIS) had no automatic functionality to check a course structure rules against a student's progression (Academic Requirements Implementation Strategy, 2001, unpublished document), the PeopleSoft system however has the possibility to automate this process through an academic advisement function. This function will be used to track whether a student meets degree rules (Academic Requirements Implementation Strategy, 2001, unpublished document). For more detail on the functionality of the NABS and the ARPP system, please see Appendix S: NABS and ARPP System Functionality.

The implementation of this function was regarded as risky by the NABS implementation project team, it was chosen to pilot the academic advisement function within two faculties in the University, namely the:

- faculty of Engineering & Information Technology (EIT)

and the

- faculty of Commerce & Management (CAM)

The researcher focused on a specific faculty - Engineering & Information Technology (EIT) that includes four schools. The researcher chose to focus on one school, the

school of computing and information technology (CIT), however one interview was also conducted with a participant from the school of microelectronic engineering (MEE) in order to collate opinions and perspectives on the system outside of the school of CIT.

5. Data Collection

The following section outlines the data collection that has been completed in order to answer the research questions (see Chapter One - Introduction, section 2.1). Firstly, an identification of the events and the activities that took place during the research data collection process is presented, the table also outlines the different users involved within the NABS project that were contacted for information, interviews and observations. Following this, the research plan and proposal is introduced, followed by an explanation of the usefulness of utilising a field book to keep field notes in. The data collection techniques are then presented, including how secondary data review was performed, followed by a description of the analytical software tool called NVivo that has been utilised to group the data collected from the interviews.

5.1. Events and Activities

Date	NABS Phase	Participants	Role	Relevance to research project
25.07.01	ARPP Start	Suzann Linda Erin Anita Rita Tim	Maintainer Maintainer Maintainer Maintainer Manager ARPP Accenture	
08.08.01		Kate Joan	School executive support officer (SESO) School administrative officer (SAO)	Initial Interviews
16.08.01		Rita	Manager ARPP	Initial Interview
17.08.01	User acceptance testing	Rita Suzann Kate Joan	Manager ARPP Maintainer SESO SAO	Observation
24.08.01	Pilot project freezes/ (Ends)	Rita Suzann Linda Erin Anita Tim	Manager ARPP Maintainer Maintainer Maintainer Maintainer Accenture	Other NABS All updating the course catalogue to fit PeopleSoft terminology Other NABS
29.10.01	Go live Student Admin. module			Observing 'go live' of the Student Admin. module
12.11-21.11.01	Post pilot project	Suzann Erin Kate Joan Sally Rita Jason Dino Bill	Maintainer Maintainer SESO SAO SAO Manager ARPP Software developer Academic NABS project director	Post pilot project interviews

Table 6 Academic Requirements Pilot Project Events and Activities

The table above (Table 6) shows the dates and project phases of the ARPP. The participants and their role and responsibilities in the ARPP are also listed (these participants will be further introduced in Chapter Six - Research Findings where the research findings are presented). Finally, the research project phases are presented in the column to the right called *Relevance to research project*.

5.2. Research Plan and Proposal

A research schedule (a plan containing important activities and dates) (refer Appendix G: Proposed Research Schedule, were the schedule is included) was developed. A research plan was also developed according to Orna and Stevens' (1995) paper and communicated to the University, the Faculty and the NABS implementation team, in order to state what the research was concerning, while also including necessary contact details and confidentiality arrangements.

5.3. Field Book

The researcher started a *field book,* with numbered pages that contain every meeting with the researcher's supervisor, containing detailed observations and specific information about the interviewees and the conduction of interviews. This was done in order to manage the data that was collected for this research project. The field book has been found to be a "valuable tool in order to plan, manage, categorise and keep order in field notes and what happens during the research project" (Orna and Stevens 1995, p. 12). *Data reduction*, which is the process of simplifying, abstracting and transforming the data collected in the field book and transcriptions (Huberman and Miles 1994), was performed. The researcher emphasised the importance of obtaining field notes, as recognised as important by Hughes (1994).

5.4. Initial Interview

During August 2001, two initial interviews were conducted with Kate and Joan from the school of computing and information technology (CIT). Kate has the role of school executive support officer (SESO) and Joan has the role of a school administrative officer (SAO).

These people were interviewed as they were going to be part of a user acceptance test. The initial interview was conducted at the University and was conducted in a semi-structured fashion (Frey and Fontana 1994) with some topics that was marked down to be discussed. For a list of the interview questions, please refer to Appendix L: Interview Questions.

5.5. Observation

The Academic Requirements Pilot Project team conducted user acceptance testing for the school of computing and information technology on the 17th August, 2001. Kate and Joan from the CIT participated in the user acceptance testing. The user acceptance testing was conducted in the project team offices. Both Kate and Joan were given a computer with the academic advisement functionality within the ARPP to be tested, with a set of tests for the academic advisement functionality (Student Records Test Script, 2001, unpublished document). The observation took one hour and 45 minutes and was conducted by Suzann, a maintainer on the ARPP. The manager of the ARPP team had an introductory speech in the start of the user acceptance test. During the user acceptance testing, the researcher took notes of what the participants and Suzann (the maintainer that was in charge of the acceptance test) were doing. Some 18 test cases were given to the participants, they were explained and executed by the system one by one. Help was given to the participants when they where experiencing problems with executing the test cases.

The participants were also given exact academic advisement reports and transcripts (Acad Advismnt Rprt & transcrpt, 2001, unpublished document) with a total of 16 pages containing exact printed academic advisement report and transcripts printed in a report format of each of the conditions as they were presented in the Student Records Test Script (2001, unpublished document).

5.6. Secondary Data Review Performed

Secondary data, as mentioned in section 4.2, Secondary Data Review, in Chapter Four - Research Method was used in order to triangulate the data collected from interviews and observations with documentations of the NABS project.

If the researcher had interpreted the wrong perceptions that the interview participants expressed, then the secondary data review could in some instances aid the researcher's ability to analyse the data. As described in section 4.2, Secondary Data Review in the previous chapter, a number of internal reports and emails were reviewed during this project. Thus triangulation between data collection methods have been performed, as it was described in section 4.5 of the previous chapter. These documents were developed during the NABS and the ARPP project and the author had the possibility to get access to some of this documentation and emails regarding the project. For a list of referenced unpublished documents throughout this dissertation, please see Appendix Q: Unpublished Referenced Documents.

5.7. Post Implementation Interviews

The Student Administration module went live on the 29th October 2001. From the 12th November until 21st November 2001, the researcher conducted nine interviews in the form of *post implementation interviews*. The interviewees can be seen in the figure below (Figure 8):

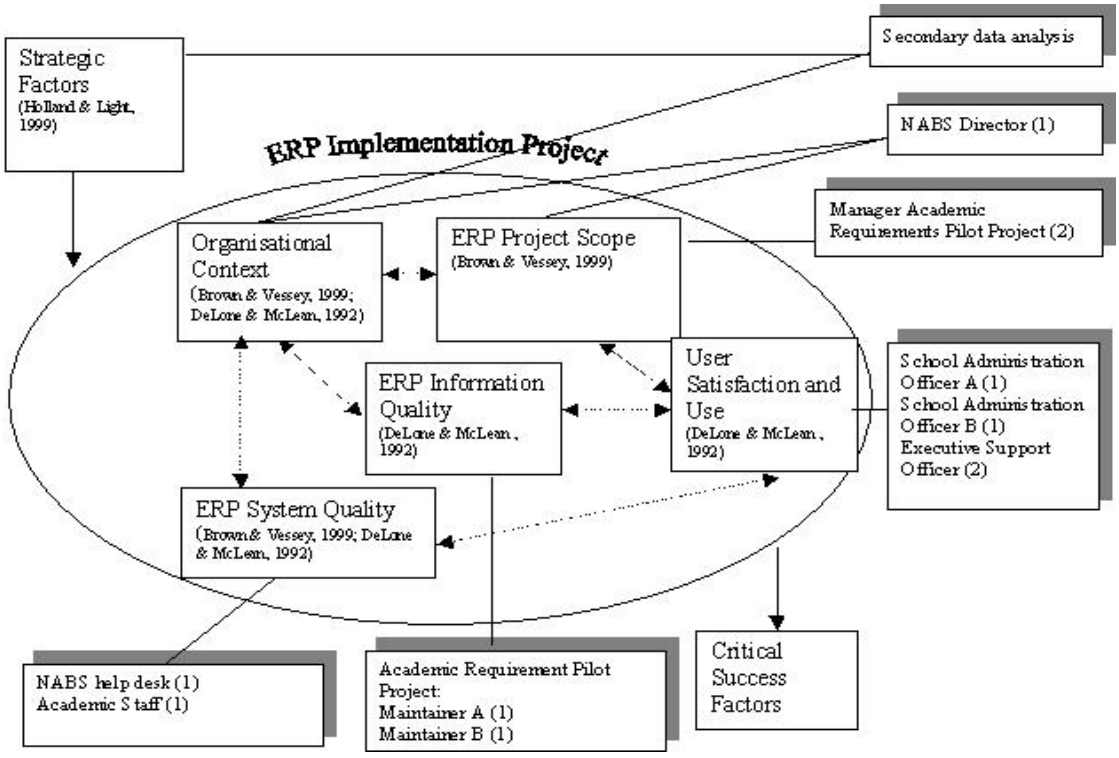

Figure 8 Post Implementation Interviewees v. Theoretical Framewrok

The figure above details how the people with their roles corresponded to what factor of the theoretical framework the researcher had planned to extract information about. (For ease of access, this figure can also be found in Appendix K: Interview Schedule: People v. Theoretical Framework). The nine interviews compromised of 415 minutes in total and each of the interviewees were given an interview information sheet containing information about the research, stating that the interviewees' identification would be kept secret. A small questionnaire with some initial *feeling* questions (as described in section 4.4 Interviews in Chapter Four - Research Method) were presented to the interviewees and completed by the interviewees. All the interviews were taped, while the researcher also took some notes during the interview process. Where possible, interviews were conducted outside of the participants' offices. This was done so that the interviewees could easily focus on the interviews rather than be concerned about work tasks that needed to be performed during the length of the interviews. These semi-structured interviews (Frey and Fontana 1994) were performed and all the data collected from the interviews was transcribed and entered into NVivo. The next section describes the use of NVivo for this research.

5.8. NVivo

The interview data was transcribed and then entered into the NVivo qualitative software tool (QSR 2002). This software was planned to be used for this project as discussed in section 4.6 of the previous chapter. The software provided the researcher with a straightforward method of grouping respondents answers into different topics depending on what they responded to the questions they were asked. The theoretical framework was used as a guide in order to group the different concepts and placing interviewees' responses according to topics. The figure below (Figure 9) demonstrates how the research concepts were modelled in NVivo. The (+) symbol as shown above represents how the concepts can be further broken down into the different 'nodes'.

Figure 9 Research Concepts as Represented in NVivo

The coding structure is represented as a selection of different nodes that have represented via nodes (the factors) for investigation according to the theoretical framework. See Appendix N: NVivo Coding Structure for research concepts and details graphical display that represents all of the nodes for the research concepts in the NVivo qualitative research software. It is important to be aware that the researcher emphasised on representing the theoretical framework in the NVivo software, that the software was just a tool and could not do the analysis for the researcher, but aided in a way to establish links and relationships.

6. Conclusion

This chapter has provided an overview of the research site that the case study has been conducted in. The research site selected is a large Australian university that consists of academic, administrative staff and a number of students. Due to government pressures and an outdated IT infrastructure, the University chose to implement the ERP package PeopleSoft in 1998 through a project termed New Age Business System (NABS). The implementation has been completed and all of the three modules, (Finance, Human Resources/Payroll and Student) have been implemented. The Student Module implementation consisted of several pilot projects throughout the University. The Academic Requirements Pilot Project was one of these pilot projects and the researcher focused on this pilot for the research project. During the case study, interviews, literature review and observations were performed and the interview transcripts were entered into the qualitative data analysis software called NVivo. The next chapter reports on the findings from the research project.

Chapter Six - Research Findings

1. Introduction

This chapter applies the theoretical framework, as described in Chapter Three - Theoretical Framework, to the research site and presents the findings from the research project. The research findings are interpreted from interviews and observations (the detail of this process was described in Chapter Four - Research Method) and from the initial research questions established in Chapter One - Introduction. The findings in this chapter focus on critical success factors for the ERP project derived from the theoretical framework in chapter three and each of these factors will be discussed in turn, that is: strategic factors, organisational context, ERP system quality, ERP information quality, ERP project scope and user satisfaction and use.

The research project focused on the Academic Requirements Pilot Project (ARPP) of the NABS project implementation of the Student Administration module of the ERP package PeopleSoft. The factors identified apply to the whole NABS project and are listed as CSF's for the whole NABS project. It is possible to make an effort into distinguishing the CSF's for the ARPP and the whole NABS project, however it has not been done in this research project. When the interviews were conducted, it was difficult to push a focus on the interviewees to specifically discuss ARPP related issues without talking about the whole NABS project interchangeably.

The findings presented below attempts to distinguish between user's perceptions (the actual interviewees' responses), findings from the documentation review on secondary data that the researcher has conducted and the observation conducted by the researcher. The unpublished documents can be found in Appendix Q: Unpublished Referenced Documents.

Each of the CSF's are summarised in a table with links from the literature (represented with a CSF number from the list of CSF's identified in the literature in section 4.4 in Chapter Two - Literature Review) and a short description that is derived from people's perceptions. See also section 5.1 in the previous chapter for a list of events and activities (represented in Table 6). Where no link has been found in the literature on CSF's, the CSF is represented with a (*) symbol.

2. Strategic Factors

From the theoretical framework (as discussed in Chapter Three - Theoretical Framework, section 3.1), the strategic factors concern the high level decisions taken in order to select an ERP system as a solution to the information systems needs of the University and as a tool to solve strategic issues identified for the University. This section will depict interviewees' perceptions on strategic factors as discussed in section 3.1 of Chapter Three - Theoretical Framework.

As seen in section 2, The Higher Education Sector in Chapter Five - Research Site, it is shown how the HES in Australia has undergone massive changes since the mid 1990s. There has been government pressure to make universities operate more like businesses - to cut their expenses, make them become more efficient and generate a greater income on their own accord, rather than from government funding. This concern was also raised by a long serving academic within the School of CIT, Dino: *"The federal government seems to want to push us into a model which is more like a business which focuses us on more of those aspects of accountability for funding, rather than accountability for education".*

The NABS project director had the following to say when he was asked whether or not this system would give the University competitive advantage: *"Competitive advantage comes not from the fact that we have put an ERP system in, because that is what every other major University in Australia has done. It is how we now interface that system with our clients. And our main client group is the students. How they perceive it.*

And, in doing that, because we then drag students into being online with us in a bigger way that they have been. And then what other services we add around that so we start to really bring them into that self-service, that interaction scenario that they have with us. I think that is where the difference will start to come out between the Universities. But there is a lot more to come I believe as we get to know the system and accept it".

Dino, the academic staff member in CIT, argued that the new system would not give the University competitive advantage: *"No, because most of them, half of the Universities in this country will be using the same system so what he hell does that give us? Nah.... Because the other aspect of the process, we will compete for students not on a basis of our business efficiency, but on the basis of their perception of our ability to give them a valuable education".*

A majority of the interviewees expressed an agreement that it was not the ERP system itself that lead to a competitive advantage for the University, it was how the system will be utilised that will differentiate the Universities in the Australian Higher Education Sector. Sally (school administrative officer (SAO) from the school of MEE), Joan (SAO from the school of CIT) and the ARPP manager Rita, all expressed that the University was lagging behind other major university competitors in the Queensland region with regard to information system development and utilisation of effective and efficient IT and IS systems. Suzann expressed her feelings with regard to the system and how a student might perceive the information system in a university: *"If I were a student, I would not come to a University because of a computer system".*

The University pulled out of the development of another enterprise-wide system that was going to be implemented throughout the University (see section 5, Literature on the University Sector in Australia in Chapter Two - Literature Review) after spending a great deal of money on the development of that system. Therefore, there is a concern among the people within the University that also the NABS system will eventually be a "bad system" for the University according to Rita, the ARPP project manager and Kate, the SESO from CIT.

Joan, the SAO from CIT, had her doubts as to whether the system would work for the University or not: "*I do not think it has worked in many other areas, if any, especially in educational institutes. So I have my doubts about that"*. Sally, the SAO from MEE said she was quite happy with the old system, while Jason (software developer), Rita (ARPP manager) and Kate (the SESO from the school of CIT) uttered opinions that some sort of system had to replace the old systems because they were not efficient enough.

The NABS director felt that both Accenture and PeopleSoft had delivered on what they were contracted to do. However, one of the administrative users of the systems in the school environment, the school executive support officer (SESO) Kate, said: *"Probably knowing what I know now about PeopleSoft, if I knew that then, maybe I would not have, but I believe that this was the best option available at the time given that they had invested a lot of money in what was done previously and then had to drop that. That is a hard question to answer, because it is such a large system"*. While Dino, an academic user of the system, thought the University were under the impression that all problems would disappear, when in fact they might be contracted to a bad system that would not solve anything.

2.1. CSF for Strategy

The table below (Table 7) summarises strategic factors that can lead to a successful implementation of an ERP system and they are based on interviewees' interpretations. They are cross-linked to CSF's found in literature (this list can be found in Appendix C: ERP Critical Success Factors and in section 4.4 in Chapter Two - Literature Review). The number in the bracket (e.g. (1)) refers to an individual CSF out of the 29 in the list. Where findings relate to more than one of the factors discussed in literature, all related are shown.

Where a new CSF is found based on the interviewees' responses and from secondary data analysis, a (*) symbol is used.

Area: Strategy	
Factor	**Explanation**
Competitive edge (*)	An ERP system in itself does not offer competitive advantage in a University environment.
Service for students (*)	Service for students should be a major priority with a computerised system implemented within the university
External expertise (use of consultants) (4)	A rigorous selection process should be conducted. A contract agreement with both the software package vendor and a possible third party consultant is crucial.
Management of expectations (22)	Increased service for all employees should be a major priority when selecting a solution for business problems within a university environment.

Table 7 Strategic Factors CSF

3. Organisational Context

The organisational context factors involve how the organisation will need information and how the actual ERP system can operate in the University and within a university environment compromising of students, academics and administrative staff (see also Appendix S: NABS and ARPP System Functionality).

When the ARPP started, five administrative people from the University were taken out of their regular work environment and formed together with one Accenture staff, a pilot project group that were going to test, modify and develop the academic advisement function within the PeopleSoft ERP package module Student Administration (as seen in Table 6 Academic Requirements Pilot Project Events and Activities).

The five University staff were chosen because of their great knowledge in the business requirements, as the implementation of the academic requirements function in the Student Administration module of PeopleSoft has been termed as the most challenging part of system configuration in the Student Administration Module (Academic Requirements Implementation Strategy, 2001, unpublished document).

The ARPP team members needed to know how the system had to perform and they were chosen to participate in the project because of their extensive business knowledge of the process they were attempting to automate. Both Erin and Suzann, two of the four maintainers on the ARPP mentioned that they were actually taken out of their normal roles within he University and their positions were backfilled by other staff.

One academic user of the system that has been with the University in the school of CIT, Dino, expressed a sincere dissatisfaction that no academics were consulted during the NABS project: *"I think that is a bit of a defect because we have an awful lot of people within the school and a large experience in groups that are attached to that. I am surprised that various people within the school were not talked to or asked for opinions and those things should have been incorporated into the scheme of things"*.

3.1. CSF for Organisational Context

The table below (Table 8) focuses on factors perceived as critical for implementing an ERP in a university environment. Again, factors are linked to the CSF identified in Appendix C: ERP Critical Success Factors.

Area: Organisational Context	
Factor	**Explanation**
Best people full-time planning (17)	Plan and budget refill existing roles when key staff are working on the ERP implementation elsewhere than usual role in the organisation
Business process reengineering (14) Technical and business knowledge (18)	Consult the people within the organisational environment (staff and academics) with the best possible knowledge and experience for expertise on how the processes should be done.

Table 8 Organisational context CSF

4. ERP System Quality

The ERP system quality factor derived from the theoretical framework in Chapter Three - Theoretical Framework, concerns issues such as functionality and technical issues with the system, that are according to DeLone and McLean (1992) seen as 'desired characteristics' of the system quality.

The three out of the five University staff that were interviewed from the ARPP were content with the functionality of the part of the Student Administration module that they developed during the ARPP, although they had some technical problems to overcome initially. Erin, a maintainer on the ARPP discussed the technical issues in the following way *"I probably felt a great deal of curiosity more than anything else. It was totally unknown when we started it. It was not too difficult to come to grasp with what it was all about and actually sitting down and constructing the requirements and do the coding in the system"*. The ARPP system has been termed 'something extra' and 'not something we can't live without', said Suzann, another of the maintainers on the ARPP.

The actually users of the system wanted some more features in the system, as one of the SESO, Kate said: *"It would have been nice to have a few other features on it, but I do not think it would happen. It is a matter of working around those limitations"*.

Most of the users tend to perceive the quality of the information system on how easy it is for them to access information, evidenced by Joan: *"I thought as you would think, with improved technology you were going to get a system that was quicker and you would be able to get information quicker. From what I can see that is not the case"*. The users have problems with changing from existing work practices to new practices in order to fit the system and most often technical problems are actually *"processing issues"*, thought Jason, who was one of the NABS software developers who also had the role as a support team member. During his time as a support team member in the NABS project, Jason had to deal with a number of users calling up and requesting information or help related to using the system.

Jason expressed the importance of security of the system, as a majority of the Student Module functionality was going to have some functionality over the web. "*You have to make sure it won't fall over. They have spent a fair bit of money making sure it will work"*, Jason said.

4.1. CSF for ERP System Quality

The table below (Table 9) lists key system quality factors that participants expressed concern about, these must be taken into consideration for implementing the ERP system, based on interview participant's perceptions.

Area: ERP System Quality	
Factor	**Explanation**
Change management (9)	Cater for as many users as possible, inform the people who will be affected by technical changes.
Minimal customisation (13) Vendor package selection (25) Research (6)	The University must be able to upgrade the ERP package when the vendor releases new versions. This ties into selecting an optimal solution that fits as close as possible to the organisation that will implement it.
Information and access security (28)	Security needs to be of high importance in an environment where everyone can access and share information over a web interface.

Table 9 ERP System Quality CSF

5. ERP Information Quality

ERP information quality (as described in section 3.4 of Chapter Three - Theoretical Framework) relates to how suitable is the information that the system produces and its form (as discussed in section 3.4 in Chapter Three - Theoretical Framework). The researcher had the possibility to participate in the user acceptance testing of the ARPP (refer to Table 6 Academic Requirements Pilot Project Events and Activities) and observed some of the information produced by the system (this approach was planned as outlined in section 4.3 in Chapter Four - Research Method). Kate and Joan, the two administrative staff that participated in the specific user acceptance testing seemed surprised that they were given fixed user acceptance test cases to check and test.

Kate expressed some concerns with the fact that some of the fields on the student records screen were shaded and it was not possible to enter any data into it. Both participants expressed concerns that it was hard to get to the right menu options.

A statement by Sally, another SAO, also supported this as she said, "*As far to draw out certain reports, information about, just even a listing to see who is in what course, I would not have a clue on where to start. And that has not really been told to use either"*.

The administrative academic users of the system (as described above) all report on differences in work practices because of the new system, which affects the speed of their work routines. The NABS system makes the users change their normal work processes and some of the users are aware that it will take time before they learn these new processes, as Joan put it: *"I would not really rate* (it) *that much different from SIS* [previous student information student at the University] *though, not that much differently. Just a bit different in the start with the set-up, I am sure that is just getting used to the system"*.

The developers of the NABS system, below expressed by Jason, seemed satisfied with the reporting functions the system provides: "*I personally think that we give them a lot of reporting, information and tools that allow them to extract their own information. The information that we provide is pretty good. Whether or not they use it that is another issue, that is perhaps a change management issue maybe they need to learn or be thought more about it"*. The manager of the ARPP, Rita, expressed concerns that the users have not been consulted enough: *"There has been a little bit of dissatisfaction….because of the lack of consultation, or of say broader consultation which felt they needed…"*

The NABS director, Bill, argued that that users have to learn the system and it's functionality and that next year new front-end tools will make it easier for the users to extract information, as he puts it: *"An ERP system in its own right, is a transaction processing system, it is all it its. It brings data together, but it does not make it exceptionally easy to extract that data. While it is quite reasonable good at this stage, we still have steps to go*".

5.1. CSF for ERP Information Quality

The interviews and observation derived the following CSF's with regard to the ERP information quality. The CSF's are shown in the table below (Table 10).

Area: ERP Information Quality	
Factor	**Explanation**
User participation (10) Clear goals, focus and scope (7)	Consultation with the end users on defined and agreed upon business processes. The processes must fit the system as well as the users as far as possible. Users must be made aware and given the possibility to understand why certain new processes are needed.
Business process reengineering (14)	Reliable and fast information for all users (as far as possible).

Table 10 ERP Information Quality CSF

6. ERP Project Scope

The ERP project scope concerns factors regarding how the NABS project was conducted and how the system was implemented. The conduct of the NABS project team will also be assessed based on interviewees' perceptions. (The ERP project scope is discussed in detail in section 3.5 of Chapter Three - Theoretical Framework). Again, the interviewees' perceptions of issues relating to the ERP project scope are represented in the section below.

The two maintainers on the ARPP interviewed, Erin and Suzann and the ARPP manager Rita, all felt that the ARPP fulfilled its purpose, as Erin puts it: *"[The ARPP was] essentially to see if it was feasible to actually implement that functionality. Which I think is something we did establish, but at the same time it will be very labour intensive to do the coding of the requirements for all the degrees across the university".* The administrative academic users of the ARPP functionality seemed satisfied with the development team for the pilot project with regard to what they had accomplished. They expressed concerns however that it will be up to the University to code the requirements across the *whole* University and not just the two faculties that were piloted. Sally said, *"I was pretty impressed with what they had done there".*

This fact was also outlined in the Academic Requirements Implementation Strategy report (2001, unpublished document).

The ARPP team members expressed a satisfaction in working in the team environment for the 10-week duration of the pilot project. Kate, the SESO knew the ARPP manager before the pilot project started and she feels along with the two maintainers Erin and Suzann that the good work environment in the ARPP was fostered by the presence of the ARPP manager Rita who has tremendous business knowledge in work processes SAO and SESO need to perform. Another beneficial circumstance for the team members was the fact that they all knew each other and their roles quite well before the project started, claimed Suzann, as she felt it was easy for the project members to communicate and solve the problems together.

With regard to the communication channels in and out of the entire NABS project team, Sally expressed dissatisfaction, as she said: *"It is more the lack of the right information to the right people at the right time"*. There were reports that the overall change manager was replaced halfway through the project (Rita), because the change manager could not work with some of the other people on the project. Sally, who had the role as a transition manager (TM), reported that the different people that were given the transition manager role (a role placed on people in various positions throughout the University during the NABS project, see Appendix S: NABS and ARPP System Functionality and its Users for further detail), either did not know their responsibilities or did not care if they followed the instructions given. Communication and information flow from and too the NABS project team seemed to fail too a certain degree. Jason, one of the developers on the NABS project felt that the information was a bit of a *"production line"*. Sally said, *"It was just too much"*. Dino, the academic, was not satisfied with the level of unrelated emails he received every week with regards to the NABS project and felt that to much irrelevant information was distributed around via email "*I have already got thousands [of] emails about the same things"*.

The author noted 23 emails in total from the NABS project director of the NABS system alone, from mid September 2001 to mid March 2002 (See Appendix Q: Unpublished Referenced Documents). At one stage, there was close up to 150 people working on the NABS project (according to the NABS project director, Bill). The people that came from the University were chosen to work on the project based on their understanding of the business requirements and the business processes. Some new technical staff were hired and trained in the development and use of PeopleSoft.

The third party consultant company, Accenture, the third foundation of the project team, seemed to deliver on the reasons to why they were employed and most of the developers seemed satisfied with their technical experience and knowledge, however they were expensive and Jason, one of the developers on the NABS project felt that the University should *"spend the money a bit more wisely, as some of the contractors cost a couple of thousands each day just to have there, maybe train some of the University staff for the job instead of constantly relying on contractors"*.

This leads into another key factor when implementing an ERP system – keeping the knowledge of conducting a large project in the organisation that implements the ERP system. Some staff were kept at the University and placed in other roles of IT support (NABS support), however the NABS director, Bill, is sure that there would be parts of the NABS project knowledge was lost, but he claims that the University can invest more to get that knowledge back *"Even in the areas were are not sure we can invest some more in that"*.

The implementation of the three modules (The Finance, HR/Payroll and the Student, see Appendix R: NABS Project History) should have been more spread out as it was clear that the users had too much 'change' to deal with, expressed by three of the users Kate, Joan and Sally. "*When we came around to it the impact changes was just too much to handle and we had to take it a bit slower"*, said Bill and the 'go live' dates for the last two implementation efforts with the project were extended because of *"the impact on the University*". The implementation partner Accenture identified the *"resistance to change"* (NABS Implementation 2000) and further claimed in the report that the NABS project had *"current strategies in place to iron these out"*.

Bill, the project director, was very satisfied with the amount of documentation and the right documentation of processes and changes that had been conducted. Rita, the ARPP project manager also expressed a satisfaction with the level of documentation. Jason, the software developer, was also satisfied with the level of documentation of processes, changes and implementation issues.

The University detailed that the restructure of the information systems in the University would be a costly matter (Annual Report 1998, unpublished report). Bill, the NABS project director, claimed that the budgeting of the NABS project had been fine and '*on budget.* Meanwhile Jason, one of the developers on the NABS project, expressed some concerns that the University was a bit over budget on the NABS project and that the project director constantly had to ask the University for more funding of the NABS project in order to finish the project.

The NABS project ability to conduct requirements gathering was an issue that was raised during interviews with end-users (Kate, Joan, Dino and Sally) and NABS project team members on the ARPP. The NABS project team conducted some meetings where they presented the NABS prototype for the academic user and one of the academic users (Dino) felt that when he expressed his views about the system, the NABS team did not take it onboard. "*The kinds of responses were the kind of responses you expect from people who really don't want to hear what you have to say, almost insulting responses, that people will get used to it and in somehow I was an idiot for suggesting certain things",* Dino said. The question of how the requirements were gathered or to what level the NABS project team wanted to get input from the end users could be derived from how much customisation one can or should actually do when implementing an ERP system. The implementation approach adopted by the NABS implementation was of a Vanilla implementation approach (Holland et al. 1999), where a gradual radical change was introduced into the University. The current business requirements (how someone business processes University) will have to be modelled by the system or changed in order to fit the system, because cost increases when you are customising the ERP system a great deal (Light 2001a).

As Rita, the ARPP manager said after the user acceptance testing: *"you can customise the ERP system as much as you want, as long as you have got the money to cover the cost for it"*.

6.1. CSF for ERP Project Scope

The table below (Table 11) shows perceptions of critical success factors for the ERP project scope factors, found while conducting interviews and through secondary data analysis.

Area: ERP Project Scope	
Factor	**Explanation**
Appropriate decision making framework (1)	Define the business processes clearly and correctly, while also let all the affected users share and express views about the goals of the proposed system solution.
Interdepartmental cooperation and communication (26)	There must be cooperation and communication between the potential users before system implementation and after. When and if business processes change, the users must be made aware of changes and how it will affect users elsewhere in the system.
Technical and business knowledge (18)	The team member should have necessary skills and experience to understand the business requirements that the system is to solve. Training in using and modifying the ERP package is also essential.
Effective communications (16)	Appropriate communication channels needs to be established. If people are assigned responsibility for communication responsibilities, there must be a mechanism in place that will ensure that the right information is being processed through the organisation.
External expertise (use of consultants) (4) Balanced project team (5)	Choose a consultation partner with the desired skills, location, status and experience for the problem at hand. Select the different staff from the consultation partner that has the required background experience and knowledge.
Knowledge management (*)	Appropriate documentation of every process is in the implementation project is essential for future knowledge. Key technical knowledge of the new and old system must be kept in the organisation. It is important to keep key staff and their knowledge of business requirements and technical issues concerning the system, in order to make it possible to maintain the system and upgrade it with future versions when applicable.

Area: ERP Project Scope	
Factor	**Explanation**
Project management (8) Change management (9) Culture (19)	The implementation efforts needs to fit the major university timelines and key dates in a university environment. There must be enough time between each Module implementation so that the users can experience the changes gradually and not all at once. Maintenance must not be forgotten, but be an essential part of the ERP implementation effort.
Presence of champion (12)	Implementation efforts must be lead by a person with strong skills and knowledge in the business processes.
Top management support (3)	The university must carefully plan and budget the implementation project and be aware of the changes of unexpected costs and delays.
User participation (10) Business process reengineering (14)	A crucial step in the ERP implementation effort in a University environment is to acquire the correct business requirements the first time, this includes asking enough of the right people in the organisation the right kind of questions in order to model the business process as best as possible.
Discipline and standardisation (15) Minimal customisation (13)	The customisation of the ERP package must have a balance between optimal business processes being modelled, cost of customisation of the ERP package, change for users work practices and ease of future version upgrades of the ERP package.

Table 11 ERP Project Scope CSF

7. User Satisfaction and Use

The user satisfaction and the use of the information system was categorised as a potential factor for information system implementation success by DeLone and McLean (1992) as described in section of 3.6 Chapter Three - Theoretical Framework. Training of the users is important in order for the users to be able to use the new system and become equipped to use new routines and procedures.

Rita, the ARPP manager, claimed, *"90 percent of the people have been quite happy with the training, the user's guides were well written and an essential aid for everybody to have close to them on their desk"*. The user acceptance testing observed by the researcher gave evidence of a well-written user manual (Student Records Test Script, 2001, unpublished document) with examples of printed student transcripts (Acad Advsiemtn Rprt & Transcript, 2001, unpublished document),

However the users were not given any chances to experiment much with the system. *"I think they went a bit overkill with the training…we really did not have the opportunity to do it live and it is different between practicing and doing it live"*, said Kate, one of the users of the system that participated in the user acceptance testing. Sally, the SAO of the school of MEE expressed the same concern: *"I had all of these questions that I would like to deal with and things to try, but they never got around to it. I was a big question mark. What we could do in the old system we can not do in the new system and how it translates to the new system, it is not clear to see."*

Suzann, the maintainer on the ARPP, wanted more people to be able to try and test the system: *"What would have been even better is that if more people from different schools actually could test the function."* Jason, the software developer, expressed concerns that the NABS project had pulled out of the idea of offering online help with a repository of frequently asked questions (FAQ) and topic related issues that people had with the systems.

Jason thought it would provide the users more help if they needed it: *"Online help was one of the selling points to the end users. They were going to make an online library, a repository with whatever you needed to know about the system. It was halfway through development when it was chosen that things were falling behind, and they wanted go get back on schedule again, and they threw all resources back onto other things. They never got back to it more than a year later"*.

Rita, the ARPP manager, felt that the NABS project team had forced some unnecessary functions into roles that people had within the University, new business processes that were unsuited to existing roles. In some cases it had worked, in other cases not. Jason, the developer on the NABS project articulated that a number of people had complained about the training offered to the users of the system, that they were not detailed enough.

Furthermore, expressing views about the system, the inability to provide input, was another issue that was mentioned. Kate, the SESO in the school of CIT, said: *"We can say whatever we like, [but] I do not think it will have any impact"*.

Dino, an academic, said: *"I do not think they care"*, when he and others had spoken about negative issues with the proposed system in a user consultation session conducted by the NABS project.

Dino continued: *"They just expect that this is going to happen. That we* [academics] *are just workers and we are simply going to be told what to do"*. No end users felt that they could express their views and that the project team would later incorporate those views into the system. The ERP system had defined processes and functionlity that guided the University in how it should be operated and the users had to adapt to those roles and processes defined.

The ARPP project team (interviewed participations included Erin, Suzann and Rita) seem pleased with the technical functionality of PeopleSoft, while users (Dino, Joan, Kate and Sally) expressed negative issues with the technical possibilities with the package.

Bill, the project director of NABS and Jason, one of the developers of the system were under the impression that the users would get used to using the system. This view was also enforced by Accenture who reported on the fear, uncertainty and doubt (FUD) factor that was present throughout all spheres of the University (NABS Implementation, 2000, unpublished document). Dino, an academic, expressed *"Going right back to the business about the names. This convinces me that this system is probably incapable of extension and modifications as the University life and needs change. And so we will probably have a life for this system of some few years before we start having problems. At that stage we will probably be faced with some pretty high expenses to modify, extend and upgrade the system and so on."*

There seemed to be a lack of consultation between users and the developers (expressed by Dino, Rita, Joan and Kate) and a real gap between initial requirements gathering and the prototype being shown to the academic community (Dino). Dino put it this way: *"People do get used to bad systems and they use them effectively. But that does not guarantee the success of this system. I am sure that people will try"*. Software developers made many changes compared to what was initially planned and users were not made aware of these changes (according to Jason).

According to Rita, the way people do their work in the NABS system is defined by the role that you have. The users were not certain that the system modelled what the users actually know (Kate, Erin, Joan and Rita all stated this). According to Kate, the school administrative staff interviewed thought that they had to work around the system, rather than the system giving them possibilities to innovate their work practices. Rita, Joan, Kate and Sally felt limited to their access and what their defined roles were.

Sally thought that the users of the NABS system should have been merged better together, meaning that people in the organisation needed to be aware of new processes and how they would influence other areas of the organisation. Sally expressed *"I think it is quite important to get an understanding of the whole process, even though you might not be involved in the whole process. The staff could then be*

aware of the pathway, which does that and who to contact, I think that has been something that has been missed".

Jason, the system developer who also had a role as a support person, expressed similar problems between user groups when he talked about people calling up and complaining about work processes: *"…then you have to explain to them that if it was not there, then these people wont be able to do their job…".* Dino, an academic, expressed the following view: *"The power base will be shifted…more heavily towards the centre of the thing; because that is the way the University has been moving that way for a while anyway. That leads to conflict between what goes on in places like this school and what goes on in the centre and that already is a very difficult relationship".* Administrative staff (Joan, Kate, Erin, and Suzann) only knew about major problems for their users and academic staff mostly knew about their own problems and issues (Dino). Erin expressed the relationship in the following way: *"academics are a totally foreign lot to me…"*

In relation to system ownership, the project director, Bill, said the following: "*I think we have generated a fair bit [of] ownership within the business side. I do not think we have generated and engaged the academics as much as we should have had. We have tried to some extent, maybe we should have tried a bit harder….something that maybe could have been made more use of, that we could use any expertise within the schools within our academic areas.*

That again is not usually done in the other implementations around Australia….there are a lot of people out there we can not just reach."

7.1. CSF for User Satisfaction and Use

The table below (Table 12) outlines the perceived CSF's for the user satisfaction and success factor identified as described in section 3.6 of Chapter Three - Theoretical Framework.

Area: User Satisfaction and Use	
Factor	**Explanation**
System ownership (*)	The users of the system should be given a possibility to get a sense of ownership of the system, not just a system that they will have to use.
Change management (9) Culture (19)	In order to ensure user satisfaction and the use of the system, users must be made aware of changes to requirements and system processes.
User participation (10)	User participation is a key factor to ensure that users use the system.
Knowledge management (*)	The system must allow the users to innovate their work practices.
Interdepartmental cooperation and communication (26) Management structure (2)	Changes of business processes must be made aware to all users. The business processes must be made aware also between departments and how one user might affect the results of the work for another user in the university.
Education and training (11)	Training of the users must care for all users' questions and allow them to test the systems advantages and disadvantages. Users must be given a chance to ask questions and to get a reasonable respond.

Table 12 User Satisfaction and Use CSF

8. Summary of CSF Findings

The table below (Table 13) represents a summary of the key factors that interview participants reported on during the interviews. The number of times these factors occurred (depending on which CSF's were discussed from the theoretical framework) and are in this table represented as the relevant importance based on interviewee's perceptions. Also noteworthy, is that four other factors were found during the interviews that the author could not link to existing literature (as represented in the table below (Table 13), for a full list, again refer to Appendix C: ERP Critical Success Factors). In the research findings tables, these factors were identified with a *-symbol. The factor not identified in the literature on CSF for implementing an ERP system, included:

- Competitive edge
- Service for students
- Knowledge management
- System ownership

It is also worth noting, that 22 of the 29 identified CSF's from literature were found from interviewees' responses. Seven CSF's from the literature review were not found discussed during the interviews. These CSF's were:

- Monitoring and evaluating of performance (20)
- Software development testing and troubleshooting (21)
- Vendor/customer partnerships (23)
- Use of vendors' development tools (24)
- Hardware issues (27)
- Implementation approach (29)

The table below (Table 13) reports on the CSF's that are found in literature and how applicable they were to the interviewee's perceptions of the issues discussed during interviews triangulated with observation and secondary data review.

A √-symbol represents the frequency the factors occurred during discussions of the six factors discussed from the theoretical framework (organisational context, ERP system quality, ERP information quality, ERP project scope and user satisfaction and use).

CSF No.	Critical Success Factors	Relative Importance from Interviewee's Perceptions
1	Appropriate decision making framework	√
2	Management structure	√
3	Top management support	√
4	External expertise (use of consultants)	√√
5	Balanced project team	√
6	Research	√
7	Clear goals, focus and scope	√
8	Project management	√
9	Change management	√√√
10	User participation	√√√
11	Education and training	√
12	Presence of a champion	√
13	Minimal customisation	√√
14	Business process reengineering	√√√
15	Discipline and standardisation	√
16	Effective communications	√
17	Best people full-time – planning of this	√
18	Technical and business knowledge	√√
19	Culture	√√
20	Monitoring and evaluating of performance	
21	Software development testing and troubleshooting	
22	Management of expectations	√
23	Vendor/customer partnerships	
24	Use of vendors' development tools	
25	Vendor package selection	√
26	Interdepartmental cooperation and communication	√√
27	Hardware issues	
28	Information and access security	√
29	Implementation approach	

Table 13 CSF's Revisited According to Importance

The questionnaire results derived from the questionnaires distributed during the interviews (although termed questionnaires here, these questions were in reality a few questions to get the interviewee participants focused on the interview at hand) can be found in Appendix O: Interview Questionnaire Findings. The questionnaire findings does not contradict any of the findings represented above. 78 percent of the interviews reported that they *strongly agreed* to "it is important for me to have access to information in my work".

45 percent were neutral to the way the NABS project had been run. 22 percent *disagreed to* being satisfied with the NABS system and their experiences with it. The author chooses not to analyse the questionnaire findings further, but acknowledges that there are different variations of how the interviewees feel about the NABS system, why it was implemented and its use.

The implications for finding the interviewees' perceived CSF's will be further discussed and summarised in the next chapter, Chapter Seven - Conclusions in section 4, Theoretical Framework Use and Usefulness. This section will link the CSF's found to the initial theoretical framework.

9. Conclusion

This chapter presented the findings of the research project. The findings were derived from feeding the research questions into the developed theoretical framework. The critical success factors for implementing an ERP system in a university were identified according to strategic factors, the organisational context, ERP system and information quality, ERP project scope and user satisfaction and use of the ERP system. It was found based on interviewees' perceptions that a number of the CSF's identified from the literature also existed within the ERP implementation at the University. However, four non-identified factors also arose. These were found to be competitive edge, service for students, knowledge management and system ownership. The next chapter will conclude this research project.

Chapter Seven - Conclusions

1. Introduction

This chapter completes the research project by summarising the key findings of the project along with an evaluation of the research project. The research question and the sub-research questions are addressed in section 3. This research used a theoretical framework as a research tool and the TF usefulness and use will be discussed in section 4. The case study research method and the use of the different data collection methods are discussed in section 5. Following this, section 6 outlines an evaluation of the research project in accordance with Klein and Myers (1999) principles for evaluating interpretive studies in information systems research. Section 7 includes recommendations that have been drawn from the research project conducted, while section 8 lists a few research limitations. Finally, this dissertation finishes with section 9 that involves future research directions for ERP systems and the implementation of such systems.

2. Key Findings

This research focused on critical success factors for implementing an ERP system in a university environment. Key findings of this interpretive study were derived from interviewees' perceptions, literature review and secondary data review conducted on unpublished documents from the research site (data triangulation was performed as discussed in section 4.5 of Chapter Four - Research Method).

The literature review conducted on the research area of interest (refer Figure 1 Areas of Research Interest) gave evidence of a lack of research on ERP implementations within an Australian university environment. No previous research conducted had focused on CSF's for an ERP implementation in a university environment.

This research developed a theoretical framework based on the literature reviewed (the TF was derived from existing ERP and information systems literature). A research site was selected and interviews along with a secondary data review were conducted. It was found that 22 of 29 identified CSF's from literature (as shown in Appendix C: ERP Critical Success Factors) were mentioned and of importance with regards to the interviewees' perceptions. User participation, minimal customisation, business process reengineering, culture, technical and business knowledge and interdepartmental cooperation and communication seemed of particularly high importance based on secondary data review, observation and interviews performed. Four additional CSF's were found to be competitive edge, service for students, knowledge management and system ownership as discussed in section 8 of the previous chapter.

Different people have different opinions on whether the ERP implementation project had been a success or not. When interviewing people within a university environment with different roles in the organisation, the researcher received a number of different viewpoints, based on the interviewees' background and relation to the ERP project and the university itself. This research was not about the quality of the ERP package itself (as explicitly explained in Chapter One - Introduction) but on people's interpretations of success factors for implementing an ERP system in a university environment.

More specifically, each of the sub-research questions will now be answered in the next section.

3. Research Questions Addressed

This section attempts to answer the different sub-research questions that were raised in section 2.1, Research Questions in Chapter One - Introduction. The answers in this section are naturally derived from the research findings from Chapter Six - Research Findings and from the literature review conducted, as shown in Chapter Two - Literature Review.

- What are critical success factors for implementing an ERP system in a university?

This question relates to the actual findings of the interpretive case study. Interviewees reported on a number of different factors that were relevant to be addressed to ensure the success of an ERP implementation project. Four new factors were found to relate to CSF's for ERP implementations in a University environment, along with the 22 out of the 29 factors identified from literature (see Appendix C: ERP Critical Success Factors). The theoretical framework developed identified the theory in six distinctive factors. During interviews, interviews perceptions were linked to this theoretical framework as shown in Chapter Six - Research Findings. From these findings, it was clear that some of the factors found in literature were more frequently mentioned than others, as shown in Table 13 CSF's Revisited According to Importance.

- Are CSF's for an ERP implementation in a university setting different from ERP projects in other environments?

Based on the interviewee's perceptions, literature review, one observation and secondary data review performed, an ERP implementation project is not overly different from ERP implementations found in the existing literature on CSF's. When discussing the CSF's for an ERP implementation, it was found that four CSF's were not identified in literature (as described in section 8 in Chapter Six - Research Findings), namely the competitive edge, service for students, knowledge management and system ownership.

Factors that the interviewees did not discuss were monitoring and evaluating of performance (20), software development testing and troubleshooting (21), vendor/customer relationship (23), use of vendor's development tools (24), hardware issues (27) and the implementation approach factor (29).

The numbers represent the CSF number given to each of the factors as identified from literature. A table of the complete list of CSF's from literature is shown in literature Appendix C: ERP Critical Success Factors.

- To what extent can the user and the user satisfaction impact on the accomplishment of a successful ERP implementation in a university?

When answering this question, two issues can be of importance. Firstly, the author can relate the question in considering the theoretical framework developed for this research project (see also section 4 below where the TF is revisited) and secondly, the question can also look at issues interviewee participants discussed during interviews. From the findings, it was clear that the users emphasised the importance of a number of factors that involved the actual users being *part* of the ERP implementation and having some sort of involvement. In some cases this was achieved, as shown in ARPP where the NABS project made use of existing knowledge in the organisation (refer CSF 18 technical and business knowledge) with a focus on user participation (CSF 10). It was found that the perceived importance of user participation was high and an important factor in order for the ERP implementation to have the possibility to be successful.

- In what ways can the ERP project scope affect the implementation success?

The theoretical framework that focused on the ERP project scope and the CSF's derived from the literature review conducted as outlined in section 3 in Chapter Two - Literature Review is important to remember when assessing this question. The ERP project scope factor is connected to how the project team was operated, and this is further discussed in section 6 of the previous chapter.

Interview participants reported on issues that need to be taken into consideration and were in most cases consistent with CSF's found in other literature (a focus on change management (9), best people full time- planning of this (17) and education and training (11).

- Will an ERP system provide the users with enhanced information and an improved quality system?

This question can be regarded as too early to answer. In terms of the interviewee's responses initially after system go live date, a majority of the users felt that the system did not offer any improvement in the quality of the information system compared to the old systems in place within the university environment.

- Can the identification of critical success factors for an ERP system assist the development of an enhanced quality information system?

ERP implementation projects are large-scale projects that in most cases involve a phased implementation of different modules with new functionality, processes and change being brought into the organisation that implements the ERP system. This research project stated clearly in the initial pages that it did not concern the actual quality of the ERP system itself, but the researcher believes that the actual implementation effort of such a system can be relevant to the perceived quality of the information system. It was found that special consideration is needed to a few of the factors concerning the ERP system quality factor as shown in section 4.1 of the previous chapter. This question is hard to answer without testing the factors in a new case study (a new ERP implementation project within a university). That being said, the researcher believes that establishing these factors will aid and give assistance to implementation projects. It will raise awareness of issues that obviously have been neglected within the ERP research community and in practice due to the many failures and the lack of research papers on the topic.

4. Theoretical Framework Use and Usefulness

In section 3 of Chapter Three - Theoretical Framework, a theoretical framework was introduced. This framework was developed based on existing knowledge in the IS development and implementation literature as well as literature on ERP systems. The theoretical model was useful in that it gave the researcher a possibility to group research that had been done previously in the IS implementation and development area (DeLone and McLean 1992) and link it with existing knowledge from the ERP research field (Brown and Vessey 1999; Holland and Light 1999). A common issue that arose during the development of the theoretical framework was the continuous reduction of areas to explore. The researcher is aware that the final version of the TF presented here may be regarded as too large in scope for the purpose of this study.

The theoretical framework is now presented (Figure 10) after interpreting the findings in the previous chapter. It includes the findings and includes specific links for focus between user satisfaction and use factor and the ERP project scope factor as this was asked for in the sub-research questions in section 2.1 in Chapter One - Introduction.

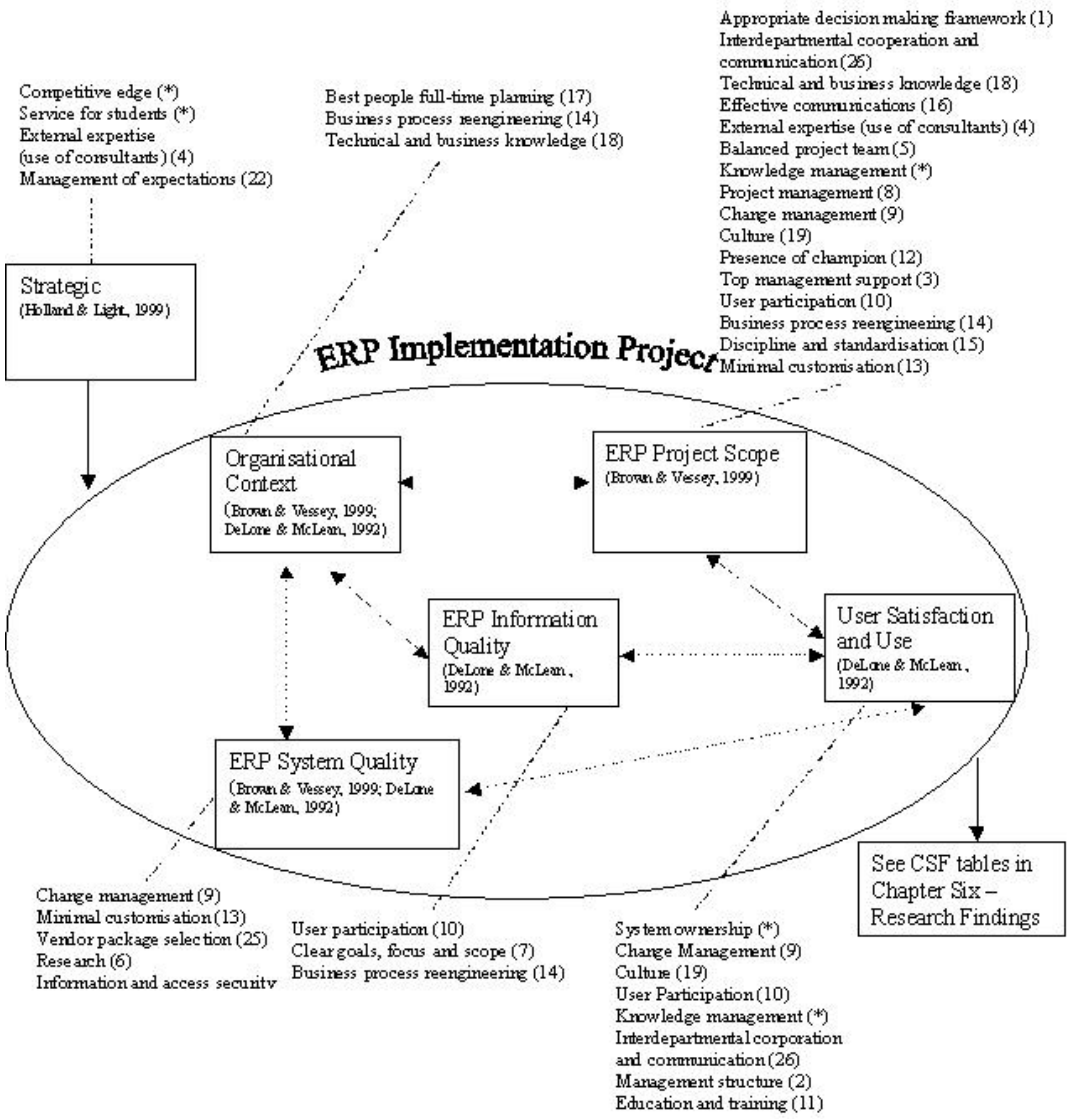

Figure 10 Theoretical Framework Revisited with Research Findings

The figure above relates all the identified CSF from the research findings to each of the factors from the author's developed theoretical framework. As shown in the figure, the ERP implementation project has several CSF's related to each of the factors to investigate (Strategic, organisational context, ERP system quality, ERP information quality, ERP project scope and finally the user satisfaction and use factor).

Where appropriate, some of the CSF's found in the literature was found to be evident of more than one of the factors from the theoretical framework. All of the identified CSF were linked to the theoretical framework based on interviewees' perceptions.

The fact that some of the CSF's were found in more than one concept of the theoretical framework, might be an identification to the fact that the theoretical framework needed more detail. However, the researcher feel that the theoretical model guided the research and made it easier to clearly identify a semi-structured approach to conducting interviews whilst also relying on previous research conducted in the IS and ERP research field, as discussed in Chapter Three - Theoretical Framework.

5. Research Method Revisited

The research method chosen for this research project has been of a qualitative nature (Myers 1997b). As described in Chapter Four - Research Method, an interpretive case study has been conducted that focused on identifying CSF's for implementing an ERP system in a university. A quantitative research method was not selected due to its lack of possibility to investigate social interaction that could affect systems development (Falconer and Mackay 1999). The interpretive qualitative research case study method is a method that is of rapid growth within the Australian IS research field (Cecez-Kecmoanovic and Pervan 2001), and thus the selected research method continues the *popular* trend. Within an ERP context, this research follows a list of many other ERP case studies conducted, as was shown in Chapter Four - Research Method, section 3.1. The research method and the data collection techniques were chosen due to their practicality and because the researcher believed that they were the most appropriate methods available in order to answer the research questions. Secondary data analysis was performed in this case study as one of the data collection techniques performed. One of the shortcomings of this data collection technique, as described in section 4.2 of Chapter Four - Research Method, the data availability, actually occurred within this research project. The researcher strived to access more documentation of the actual NABS project documentation, but the author was denied access by the NABS project team.

The nature of this research followed the evolution style of information systems research as explained by Banville and Landry (1989). The introduction of "technological developments" (Drury and Farhoomand 1999, p. 20; Lee 2000), such as ERP systems, into the HES in Australia has provided the IS field with an opportunity for more research into the use and implementation of information systems. Various research topics and research methods exist in the ERP field, as identified by Esteves and Pastor (2001), where a major focus has been on implementation phase. This research however has shown the link between the IS implementation school of thought as expressed by Iivari (1991) and an ERP implementation in a university environment, specifically focusing on CSF's.

6. Evaluation of the Research

The research has been evaluated using some of Klein and Myers' (1999) principles for evaluating IS research. Section 6 in Chapter Four - Research Method called for this evaluation of the research using commonly known *principles* for evaluating IS research projects. The principles that will be followed are those of the *hermeneutic circle*, *contextualisation*, *interaction between the researcher and the subject*, *abstraction and generalisation*, *dialogical reasoning* and *multiple interpretations* (Klein and Myers 1999). The seventh principle (the principle of suspicion) will not be covered in this evaluation as it is outside the scope of the research project. It is important to be aware of the fact that these principles are not a set of guidelines, they are rather a set of principles derived from the philosophical base of previous interpretive research (Klein and Myers 1999) and thus the researcher has found it worthwhile to evaluate his research against philosophical principles that most other interpretive studies follow.

The fundamental principle of the hermeneutic circle "*The principle suggests that all human understanding is achieved by iterating between considering the interdependent meaning of the parts and the whole that they form. This principle of*

human understanding is fundamental to all the other principles" (Klein and Myers 1999, p. 72).

This research developed a theoretical framework (as outlined in Chapter Three - Theoretical Framework) based on the researcher's understanding of the literature that this research project concerned. Throughout the literature review process, a number of versions of this theoretical framework were developed and the researcher attempted to look at the different '*parts*' that lead to the '*whole*' picture (Klein and Myers 1999). A case study was undertaken that fed the research questions into the theoretical framework and based on people perceptions of issues (during interviews) a few critical success factors for implementing an ERP system in a university setting were derived.

The circle was completed when the theoretical model again was revisited after the case research analysis (see Chapter Six - Research Findings) had been performed.

The principle of contextualisation "*Requires critical reflection of the social and historical background of the research setting, so that the intended audience can see how the current situation under investigation emerged*" (Klein and Myers 1999, p. 72).

This research attempted to form a thorough understanding of both the Higher Education Sector in Australia (in Chapter Two - Literature Review), but also the specific research site (in Chapter Five - Research Site) and how it was shaped and constructed. The author tried also to look at a historical perspective of research site and a historical representation of the system development initiative in the organisation. The author can be said to have had an advantage because of the closeness to the research site and the fact that earlier research had been conducted with regards to other topics and other parts of the system.

The principle of iteration between the researchers and the subjects "*Requires critical reflection on how the research materials (or data) were socially constructed*

through the interaction between the researchers and participants" (Klein and Myers 1999, p. 72).

During this interpretive case study, an emphasis was placed on interviews which is the most common data collection technique in interpretive case study research (Walsham 1995b). The researcher had the opportunity to interact with the interviewees during face-to face interview sessions and an observation (see Chapter Four - Research Method). It was possible for the researcher to some extent to get the interviewees out of their office environment to conduct interviews and to create a social interaction between the researcher and the participants in order to ascertain the facts (Klein and Myers 1999).

The principle of abstraction and generalisation "*Requires relating the idiographic details revealed by the data interpretation through the application of principles one and two to theoretical, general concepts that describe the nature of human understanding and social action*" (Klein and Myers 1999, p. 72).

The researcher has attempted to link the perceptions interviewees have had with actual theoretical general concepts in the literature. To some extent, this generalisation was limited to the given time frame of the research project and could have gone over a longer period of time. Arguably, criticism can be raised in relation to the lack of follow-up interviews conducted in order to clarify issues. The author regarded this as to be outside the scope of the project due to time constraints.

The principle of dialogical reasoning "*Requires sensitivity to possible contradictions between the theoretical preconceptions guiding the research using and actual findings ("the story which the data tell") with subsequent cycles of revision*" (Klein and Myers 1999, p. 72).

The research assumptions have been clearly stated in section 2.1 Research Assumptions in Chapter Four - Research Method and the researcher has to the best of his knowledge attempted to be cautious about contradictive issues concerning actual research findings and the researcher's existing, underlying assumptions.

The principle of multiple interpretations "*Requires sensitivity to possible differences in interpretations among the participants as are typically expressed in multiple narratives or stories of the same sequence of vents under study. Similar to multiple witness accounts even if all tell it as they saw it*" (Klein and Myers 1999, p. 72).

Where the interviewees responses are presented in the research findings in Chapter Six - Research Findings, the researcher has attempted to make the distinctive differences between the user role and his/her position in both the NABS project as well as in the University.

Klein and Myers (1999) seventh principle, namely the principle of suspicion, has been found to be outside the scope of this research project to evaluate.

7. Recommendations

This section discusses the relevance of the research project and its recommendations for future ERP implementation efforts at the University as well as ERP implementations elsewhere. Possible new insight into ERP implementations focusing on CSF's would be to identify and manage the four CSF's identified within this case study (competitive edge, service for students, system ownership and knowledge management) along with the 22 other CSF's linked from the literature review to the case study findings. Specifically, the author would recommend that an emphasis should be placed on informing the users of changes, getting user participation in the development and the implementation of the ERP system, thus ensuring that users will get and share technical and business knowledge through business process reengineering activities.

If new processes are derived, it is important that all affected users of the system must be made aware of these changes and why they will have to occur. How the ERP system is implemented and used is of the essence with the HES in Australia today, not if the university should implement an ERP or not, since a majority of the universities have selected an ERP system approach to solve information needs within the organisation.

8. Research Limitations

A number of factors have limited this research project. This research had to be completed within the timeframe given (12 months) and even though a more extensive examination could easily have been conducted, the researcher was limited and constrained by the time factor.

This research was only concerned with one case study and thus it is hard to establish whether the CSF's also occur in other ERP implementations (although this was attempted checked with the extensive literature review conducted on CSF's in literature cross linked with CSF's found for this case study).

When people's perceptions are being interpreted (which is a core element in interpretive research (Walsham 1995b; Klein and Myers 1999)), the most common data collection method available is the conduction of interviews. The interviews conducted in this research were semi-structured open ended interviews (Patton 1990) (as described in section 4.4 of Chapter Four - Research Method). Selecting these types of interviews made it straightforward for the respondents to relay about issues that *they* felt comfortable to discuss. In some ways, the researcher could have attempted to guide and force the interviewees into a more structured interview form. In that sense, the interview and thus the research data collected were limited to how well the interviewees could discuss the topics the researcher intended for them to raise.

Another limitation, might be the fact that it is difficult for the interviewees to actually comprehend the major change the University has conducted when implementing an ERP system and the time it takes to view the actual benefits of an ERP implementation (Gable et al. 2001b). One might say it is too soon to be able to interpret whether the ERP implementation project has been a success or not and thus too early to examine and identify the success factors.

The concept of CSF's are found to be quite complex and consist of a wider scope than the researcher had planned and hope for. Even though the area for investigation was *critical* success factors, the author derived 29 factors from the literature. To comprehend what these factors fully involve is to be considered a more complex and difficult undertaking than first thought of.

9. Future Research Directions

The author identifies several research directions for the area of research that this project concerned. One of these areas have been attempted followed up by the researcher with a forthcoming paper focusing on IS quality frameworks and ERP implementations (Nielsen forthcoming) and a paper focusing on knowledge management activities during an ERP implementation in a university environment (Nielsen 2002).

With regard to current literature on critical success factors for implementing an ERP system, a call has been made for an investigation into the relationships between the different factors and how they relate to each other (Akkermans and van Helden 2002). As argued in section 8 above, a more in-depth study with multiple cases for consideration could be adopted in order to check whether the CSF's that were identified in this study actually are consistent with what is actually occurring in other university institutions in Australia. The CSF's could also be linked to a more tangible function matrix (Bacon 1993) where the individual CSF could be linked to a function and thus be better controlled.

Following this, an international comparison between Australian CSF's for implementing an ERP system in a university environment could be compared with an overseas university. This sort of research could be plausible and relevant due to a number of reasons.

Firstly, the ERP research field is moving in a direction that focuses on country specific ERP implementations (Steenkamp et al. 2000; Huang and Palvia 2001; Gregor et al. 2002; Kumar et al. 2002), and secondly, the ERP research community has also focused on differences between ERP implementation efforts in one country compared to another (Corbitt et al. 2000).

Although it has not happened to that great extent yet, ERP research groups have started to be formed at universities elsewhere in the world, making it possible to draw on other universities research work and compare it or share research experiences with an Australian case study as the one presented in this research. The extent of research into ERP implementations in a university environment is still extremely low compared to how much finance is invested in these implementations and how frequently the ERP implementations in a university environment occur and has occurred (as discussed in section 4 in Chapter Two - Literature Review). These projects are long term strategic IT/IS investments (Holland et al. 1999) that will shape the HES for quite a number of years and thus have the potential for great research sites for future investigation. It gives the advantages of complex organisation structures such as universities are, as well as offering close research sites for the researcher. A focus on ERP implementations in Australia and overseas HES organisations would also be beneficial to the ERP vendors who could learn lessons for future implementations and maintenances efforts in different cultures and organisations around the world. It is the author's feeling that future directions with regards to ERP implementations.

Another connection linked to future research is the actual benefits of implementing an ERP system in a university environment. The measurements of the return of the investment (ROI) have been a keen topic for research in the ERP literature in later years (Dinn 1999; Seddon and Shang 2000; Murphy and Simon 2001; Stensrud 2001) and the author sees a future into ROI studies that focuses on the university environment. A contentious issue for debate could also be whether an ERP system works in a university environment or not, as discussed by Cornford and Pollock (2001). This is naturally a question that should be addressed because of the number of costly ERP *failures* identified in the HES today (2002) (as shown in Appendix D: ERP Failures) and the impact an ERP system has on the organisation that implements it and its users.

10. Conclusion

This research project was intended to provide both theoretical and practical new insights into the implementation of an ERP system into a university environment. An ERP implementation is a large information system implementation project with a vast impact on a number of different areas regarding the organisation that implements it and its stakeholders. Identifying *one* key success factor is impossible and ambiguous due to the complexity of an ERP implementation project, but this research found several factors, specifically focused on an Australian university environment, that can all contribute to the success of an ERP implementation project. It is hoped that the theory and research findings presented in this dissertation can aid the development of the ERP and the IS research field.

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Appendix A: Abbreviations and Acronyms

A&T	– Great Atlantic & Pacific Tea Co
Admin.	– Administration
ACM	– Association for Computing Machinery
ANU	– Australian National University
ARPP	– Academic Requirements Pilot Project
ARG	– Academic Reference Group
ARM	– Academic Requirements Maintainer
AUD	– Australian Dollar
AVCC	– Australian Vice Chancellors Committee
BBP	– Business Best Practices
BPR	– Business Process Reengineering
CA	– California (USA)
CAM	– Faculty of Commerce & Management
CASMAC	– Core Australian Specification for Management and Administrative Computing
CAUDIT	- Council of the Australian University Directors of Information Technology
CEO	– Chief Executive Officer
CIO	– Chief Information Officer
CIT	– School of Computing and Information Technology
Corp.	– Corporation
CRM	– Customer Relationship Management
CS	– Computer Systems
CSF	– Critical Success Factors
DEETYA	– Department of Employment, Education, Training & Youth Affairs Higher Education Division
E.g.	– *Exempli gratia* (for instance)
EIT	– Faculty of Engineering and Information Technology
ERP	– Enterprise Resource Planning
ERPII	– Enterprise Resource Planning II
Et al.	– *et alii* (and others)
ETH	– Eidenössische Technishe Hochscule (Zurich, Switzerland)
FMG	– Functional Management Group
FUD	– Fear, Uncertainty and Doubt
GITM	– Global Information Technology Management
GST	– Goods and Services Tax
HES	– Higher Education Sector
HR	– Human Resource
HRM	– Human Resource Management
IEEE	– Institute of Electrical and Electronics Engineers
IFIB	– International Federation for Information Processing
IIIT	– Indian Institute of Information Technology
Inc.	– Inncorporated
IS	– Information System
ISD	– Information Systems Development

ISQ	– Information Systems Quality
KM	– Knowledge Management
MA	– Massachusetts (USA)
MEE	– School of Microelectronic and Engineering
MIS	– Management Information System
MISQ	– Management Information Systems Quality
MRP	– Material Requirements Planning
MRPII	– Manufacturing Resource Planning
NABS	– New Age Business System
No.	– Number
NSW	– New South Wales (Australia)
Org.	– Organisation
QSR	– Qualitative Solutions & Research
Ph.D	– *Philosophiae Doctor* (Doctor of Philosophy)
Qld	– (Queensland, Australia)
RFT	– Request for tenders
RHD	– Research Higher Degrees
RMIT	– Royal Melbourne Institute of Technology
ROI	– Return of Investment
SAO	– School Administrative Officer
SAP	– Systeme, Anwendungen und Produkte (Systems, Applications, and Products)
SCM	– Supply Chain Management
SESO	– School Executive Support Officer
SIS	– Student Information System
SIGCPR	– Special Interest Group on Computer Personnel Research
SMU	– Southern Methodist University
TF	– Theoretical Framework
TM	– Transition Managers
TQM	– Total Quality Management
UK	– United Kingdome
UMIST	– University of Manchester Institute of Science and Technology
UNSW	– University of New South Wales
USA	– United States of America
USP	– University Synergy Program
V.	– *Versus* (against)
Vol.	– Volume
WI	– Wisconsin (USA)

Appendix B: Alter's IS Viewpoints

The figure below (Figure 11) represents different viewpoints in viewing information based on Alter's model (1996). The figure represents three viewpoints Alter believes one can have when viewing information systems, a managerial viewpoint of IS, organisational and finally a technical view. The focus of the model involves business goals and client orientation, work practices and business processes, IT, information and people participants (Alter 1996).

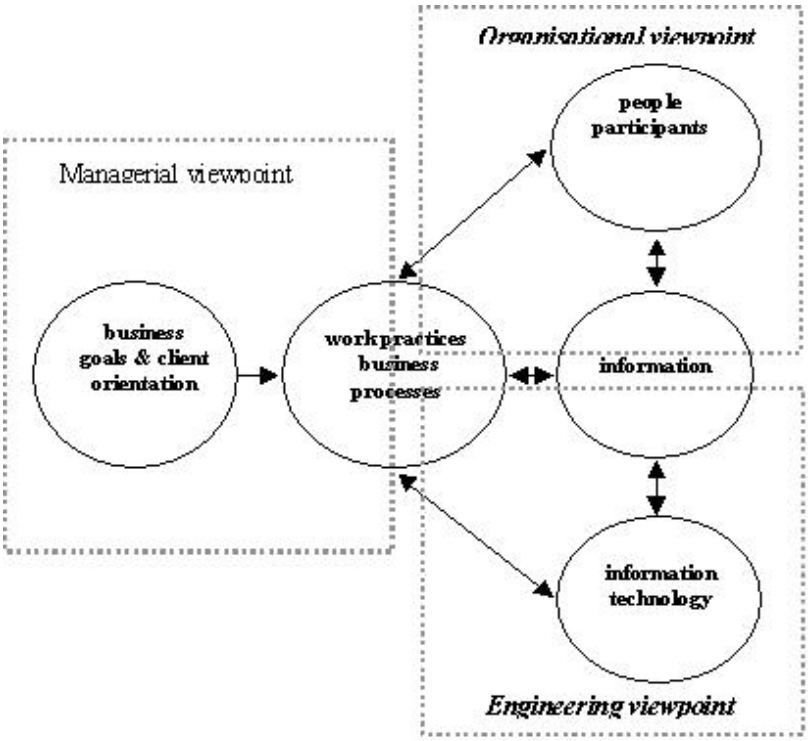


Figure 11 Alter's IS Viewpoints

Figure 11 is adopted from Alter (1996).

Appendix C: ERP Critical Success Factors

The table below (Table 14 CSF for ERP Implementations from Literature Review) exhibits the results of an extensive literature review that the author conducted. The table represents a list of 29 identified critical success factors (CSF) found in the ERP literature. The *key authors* are represented in the column to the right (Key Authors).

The critical success factors have been taken from papers in the ERP field and represented as what the authors have previously found to be important factors for successfully implementing an ERP system into an organisation. The CSF's are listed in no particular order in the table below and each CSF has been given an identification number ranging from 1 to 29.

CSF No.	Critical Success Factors	Key Authors
1	Appropriate decision making framework	(McCredie and Updegrove 1999)
2	Management structure	(Sumner 1999) (Nelson and Somers 2001)
3	Top management support	(Bingi et al. 1999; Buckhout et al. 1999; Holland and Light 1999; Sumner 1999; Wee 1999; O'Leary 2000b; Trimble 2000; Gable et al. 2001a; Kuang et al. 2001; Nelson and Somers 2001)
4	External expertise (use of consultants)	(McCredie and Updegrove 1999; Sumner 1999; Nelson and Somers 2001)
5	Balanced project team	(Wee 1999; Kuang et al. 2001)
6	Research	(McCredie and Updegrove 1999)
7	Clear goals, focus and scope	(Holland and Light 1999; Wee 1999; Markus and Tanis 2000; Kuang et al. 2001)
8	Project management	(Holland and Light 1999; McCredie and Updegrove 1999; Wee 1999; Markus and Tanis 2000; Trimble 2000; Gable et al. 2001a; Kuang et al. 2001; Nelson and Somers 2001)
9	Change management	(Holland and Light 1999; McCredie and Updegrove 1999; Kuang et al. 2001; Nelson and Somers 2001)

CSF	Critical Success Factors	Key Authors
10	User participation	(McCredie and Updegrove 1999; Gable et al. 2001a)
11	Education and training	(McCredie and Updegrove 1999; Sumner 1999; Wee 1999; Trimble 2000; Gable et al. 2001a; Nelson and Somers 2001)
12	Presence of a champion	(Sumner 1999; Gable et al. 2001a; Kuang et al. 2001; Nelson and Somers 2001)
13	Minimal customisation	(Trimble 2000; Kuang et al. 2001; Nelson and Somers 2001)
14	Business process reengineering	(Kuang et al. 2001; Nelson and Somers 2001)
15	Discipline and standardisation	(Sumner 1999)
16	Effective communications	(Sumner 1999; Wee 1999; Gable et al. 2001a; Kuang et al. 2001)
17	Best people full-time – planning of this	(McCredie and Updegrove 1999)
18	Technical and business knowledge	(Sumner 1999)
19	Culture	(Kuang et al. 2001)
20	Monitoring and evaluating of performance	(Kuang et al. 2001)
21	Software development testing and troubleshooting	(Kuang et al. 2001)
22	Management of expectations	(Nelson and Somers 2001)
23	Vendor/customer partnerships	(Nelson and Somers 2001)
24	Use of vendors' development tools	(Nelson and Somers 2001)
25	Vendor package selection	(Brown and Vessey 1999; Nelson and Somers 2001)
26	Interdepartmental cooperation and communication	(McCredie and Updegrove 1999; Nelson and Somers 2001; Akkermans and van Helden 2002)
27	Hardware issues	(McCredie and Updegrove 1999)
28	Information and access security	(McCredie and Updegrove 1999)
29	Implementation approach	(McCredie and Updegrove 1999)

Table 14 CSF for ERP Implementations from Literature Review

Appendix D: ERP Failures

The table below (Table 15) provides an outline of organisations that were found in literature to report on problems when implementing the ERP system into the organisation. The table was created through an extensive literature review on ERP failures reported in academic journals, trade press and newspapers. An implementation scope that represents the ERP package and the cost (if it is given) of the ERP project is given. A short description of why the author perceived the ERP implementation to be a failure is also provided in the table below.

Author	Org.	Industry	Imp. scope	Why a Failure[6]?
(Brown 2002)	Adelaide University	Higher Education Sector - Australia	PeopleSoft	Functionality – staff had problems accessing financial information.
(Brown 2002)	ANU	Higher Education Sector - Australia	PeopleSoft	Functionality issues – staff reported that it was hard to get information.
(Madden 2002) (Moodie 2002b)	RMIT	Higher Education Sector - Australia	PeopleSoft – 25-30 million (AUS)	Functionality problems with the system. The university had to take funding from money that was aimed for other research areas to support the implementation project.
(Lawnham 2001)	UNSW	Higher Education Sector - Australia	PeopleSoft	Cost over runs. It was expensive for the university to take people out of normal positions and backfill with other staff – this had not been budgeted for. 20 million (AUS) reportedly over budget (40 million total).

[6] The term *Failure* here can be debated. It is the researcher's collection of cases where negative publications exist on the implementation cases.

				Fist university to implement all three modules of PeopleSoft in Australia. Staff not happy with the benefits of the systems v. the cost.
(SMU 2001)	SMU	Higher Education Section - USA	PeopleSoft	Over budget because of unexpected costs
(Martin 1998)	Kodak	Photos	SAP $500 (US) million (1st time)	Reason not given
(Martin 1998)	Dell	Computer		Changes needs to be able to be made quickly in ordering, manufacturing and other systems, it cannot be done in a highly integrated system.
(Mearian 2000)	Petsmart	Pets and animals	SAP Retail	Hard to incorporate ERP to existing systems
(Marion 1999b)	Boeing The Kellogg's Company	Aircraft manufacturing Food producer	Baan (some modules) Oracle	Can not predict or help with resource planning - economic evidence in almost no growth Economical and low growth, no reduction in business costs (but wrote off $70 million in streamline initiatives)
(Patton 2001)	Nash Finch Co. Corporacion de Sumermaercados Unidos	Supermarket chain Supermarket chain	SAP - $70 million (US) SAP - $7 million (US)	Pulled out of the project Reported to be late and significantly over budget
(Pender 2000)	Siemens Power Transmission	Telecommunications	Baan - $12 million (US)	Not enough funding to continue project.

(Stedman 1998)	Purina Mills	Unknown	SAP	Hired in new SAP trainers (other than those on project to save costs), the consultants did not know background information about the business
(Stedman 2000)	W. W. Grainger Hershey Foods Corp. Whirlpool Corp.	Manufacturing, supplies Food Industry Electric Machines	SAP SAP SAP	Inefficient tracking mechanism Problems when Distribution tracking is important Reason not given
(Hirt and Swanson 2001)	A-dec Inc.	Dental Equipment Manufacturer	Baan	Baan training is seen upon as too expensive
(Holland et al. 2001) (Stedman 1999b)	Reebok	Sports equipment	SAP	ERP system does not fit with organisational processes
(Karpinski 2001)	Nike	Sports equipment	i2 Technologies - $400 mill (US)	i2 Technologies demand and supply planning module where implemented, however Nike reported on losses due to poor performance of the software system

Table 15 ERP Implementation Failures

Appendix E: ERP Successes

The table below (Table 16) gives a presentation of organisations and the industry that it is competing in. An implementation scope that represents the ERP package and the cost (if it is given along with the module) of the ERP project is given along with a short description of why the author perceived the ERP implementation to be a success.

Author	Org.	Industry	Imp. scope	Why a success[7]?
(Davenport 2000a)	Earth grains	Bakery Products (USA)	SAP's R/3	Clear strategy Each department had an analyst reporting issues to management Change compensation system to employees after implementation (more rewards) Interpersonal skills for training Strong knowledge of their industry Rethought important business processes
(Martin 1998)	Compaq Computers	Computers		Can run an ERP system because they keep the ERP software out of areas like product forecasting

[7] The term *Success* here can be debated. It is the researcher's collection of ERP implementation cases which have been termed a success that are represented here.

Author	Org.	Industry	Imp.	Why a success[7]?
(Grygo 2000) (Diehl 2000)	U.S. Mint	Coin Production	PeopleSoft - $40 million	Start with a business requirement. People received training in the use of the system Employers were able to see how everything needs to be coordinated. Vendor on the project Senior management involvement Organisation needs to understand that it will be painful and expensive. Expected to provide savings of $80 million over the next seven years.
(Marion 1999a)	McDonalds	Fast Food	Lawson Software	Mature software Fined tuned methodologies
(Stedman 1999c)	Dirona SA Moore Corp. Phillip Morris USA	Truck supply producer Manufact. Industry Tobacco	Thru-Prut Tech. SynQuest Inc Aspen Technologies Inc	Reduce inventories Filling orders on time - improved from 85% to 100% in some cases. Synchronised the steps in the manufacturing process better, helped to schedule production runs down to the minute. Reduced inventory costs.

Table 16 ERP Implementation Successes

Appendix F: System Development from CASMAC

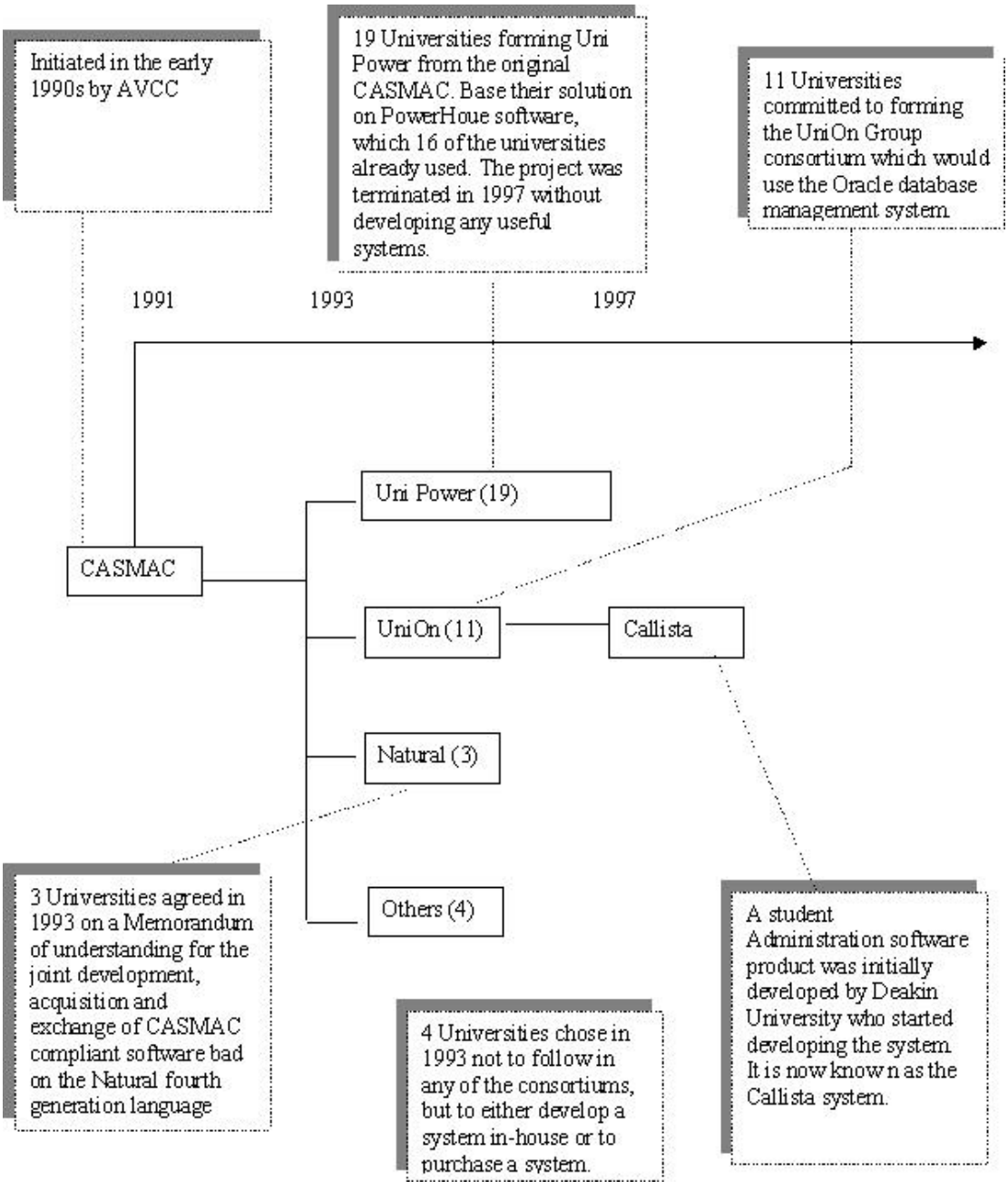


Figure 12 System Development from CASMAC

Created with information from Oliver and Romm (2000a). CASMAC is an acronym for *Core Australian Specification for Management and Administrative Computing*.

Appendix G: Proposed Research Schedule

The table below (Table 17) lists the proposed schedule for that was developed initially for this research project.

Month	Activity	Results and planned outcome
March 2001	Topic Investigation Documentation Review	Understanding of basic theory behind ERP systems Purposing research questions
April – May	Research Methodologies IS Implementation School of thought readings Identifying Research Site	Understanding of Research Methodologies and ½ Research Methodologies Chapter done. Develop a theoretical framework model to be used in analysing the data.
May – Mid	Research Strategy Defined Making of Interviews agendas	Research strategy been incorporated into my research Initial contact with Interview objects An initial plan of how to perform interviews Reworking of the research questions
June – Early August	Pilot Study	Pilot Study of NABS earlier documentation.
August – September	Data Collection	Qualitative data, performing interviews and observations
September – October	Triangulation Performed	Qualitative data – comparing data between the Pilot Study and the Case Study – what has changed, old v. new?
October –	Data Collection –	Qualitative data, performing interviews

November	revised and check-up. Possibility to interview others if not possible at their first interview time.	and observations. Check hypothesis and assumptions made.
November – December	Data Analysis	Performing analyses on the data collected
January – March 2002	Writing Results	Writing the finalised dissertation Redo theoretical framework if needed – justify findings
April	Conclusion and wrap up	Conclude and see what I have learnt Practical applications justification Theoretical applications justification
May	Final Honours Presentation	Present and publish the research data

Table 17 Proposed Research Project Timeline

Appendix H: Järvinen's Research Classification

The figure below (Figure 13) represents Järvinen's representation of the different research classifications possible. The research approaches that this researcher has focused on are represented with a shade in the figure below. The researcher has focused on approaches that are studying reality – a theory creating approach.

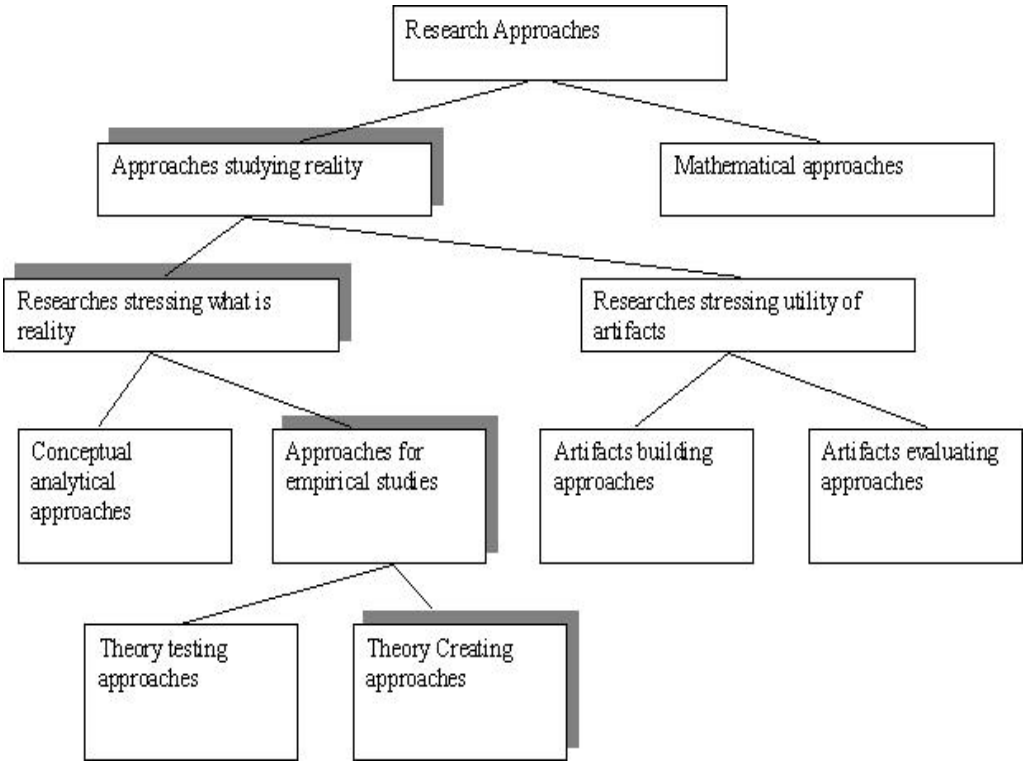


Figure 13 Järvinen's Research Classification

Figure 13 is adopted from Järvinen (1999, p. 8).

Appendix I: Key Characteristics of a Case Study

The table below (Table 18) shows a link between the key characteristics of the case study research method and the proposed research project. This table made it easier for the researcher to see clearly that a case study research method was appropriate for the research project to be undertaken. The table shows clearly that the objectives and the requirements set for the research project fitted with the nature of a case study research method. A √-symbol represents the link between the research and the actual characteristics of a case study.

Phenomenon is examined in a natural setting	**This Research?**
Phenomenon is examined in a natural setting	√
Data are collected by multiple means	√
One or few entities (person, group or organisation) are examined	√
The complexity of the unit is studied intensively	√
Case studies are more suitable for the exploration, classification and hypothesis development stages of the knowledge building process; the investigator should have receptive attitude towards exploration.	√
No experimental controls or manipulation are involved	√
The investigator may not specify the set of independent and dependent variables in advance	√
The results derived depend heavily on the integrate powers of the investigator	√
Changes in the site selection and data collection methods could take place as the investigator develops new hypotheses	√
Case research is useful in the study of why and how questions because these deal with operational links to be traced over time rather than with frequency or incidence.	√
The focus in on contemporary events	√

Table 18 Key Characteristics of a Case Study

Left column adopted from Benbasat et al (1987, p. 371).

Appendix J: Iivari's Paradigm Framework

The figure below (Figure 14) represents an overview of research paradigms suggested by Iivari (1991). The researcher's ontological and epistemological assumptions along with the methodology and the ethics of research is clearly stated Chapter Four - Research Method.

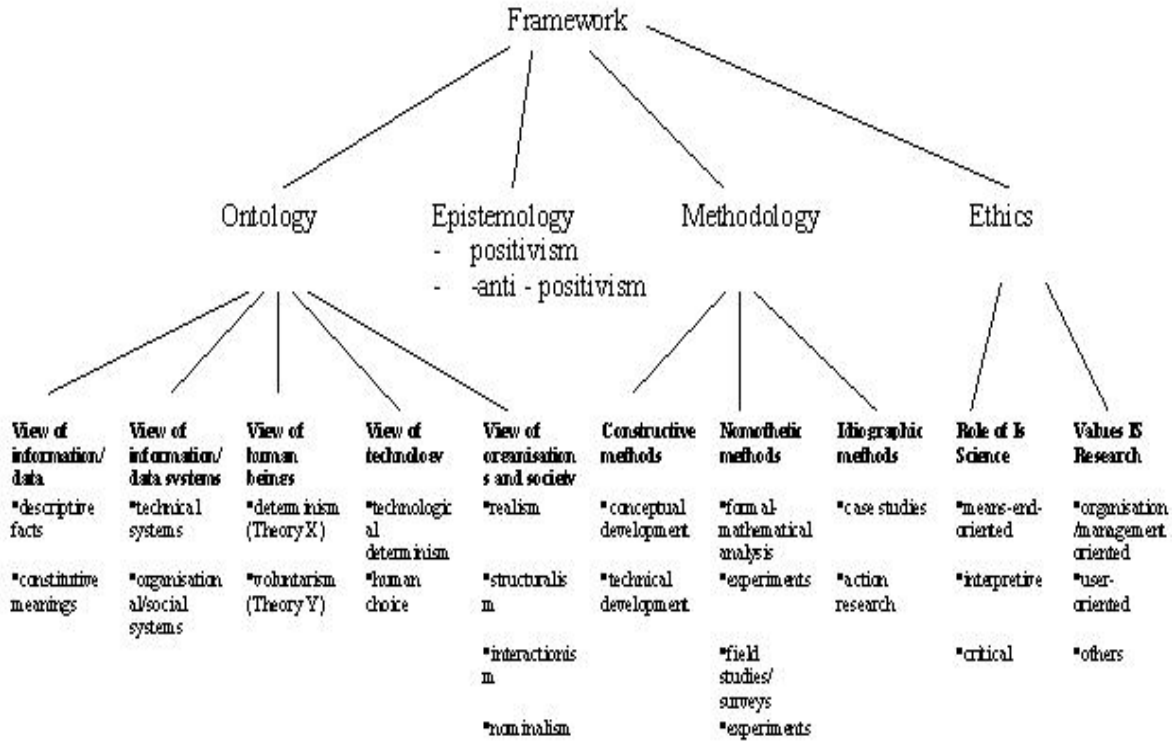


Figure 14 Iivari's Paradigm Framework

Figure 14 above is adopted from Iivari (1991, p. 117).

Appendix K: Interview Schedule: People v. Theoretical Framework

The figure below (Figure 15) shows the link between interview participants and the theoretical framework developed that have been used in order to be able to answer the research questions.

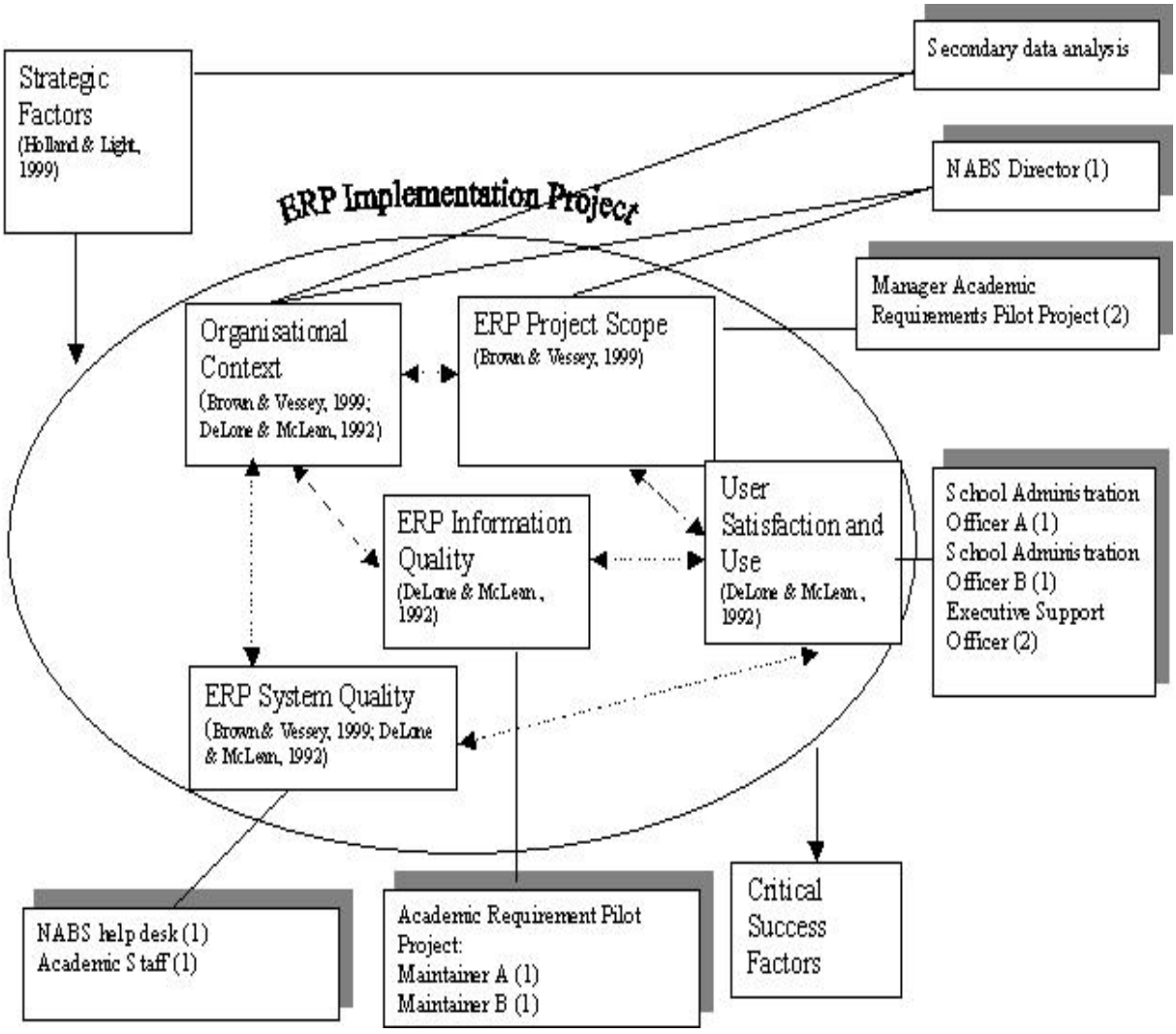


Figure 15 Interview Schedule

Maintainer A and Maintainer B is not the same persons and they have been given those letters (A and B) to distinguish and show that two different interviews were conducted. The same applies for the two different people here represented as SAO A and SAO B.

Appendix L: Interview Questions

[8]File Location:

FileName:

Printed:

Transcript filename:

Checklist: Before the interview:

Date:

Interview object (s):

Role:

In relation to Project:

Interviewer:

Start:

Finish:

Location:

Test recording device, state day, who, filename, start and location.

Interview:

Hand out Interview Information Sheet.

Hand out background questionnaire and ask the person to fill in the questions.

May I have the permission to tape?

General System Background

Within this interview I will ask you a few question regarding the NABS System, which is the implementation of the ERP package PeopleSoft and it's modules into the University.	
Has your involvement with the NABS project interfered with your normal work commitments? In what ways?	
Currently, what is your role with regards to the NABS implementation Project?	
Briefly, what sort of responsibilities have you had with regards to the NABS project?	

[8] The file information was used for me to be able to store the different versions of the interview questionnaires developed along with the different filenames to be used in NVivo.

ERP System Quality - general

An Information System can be seen upon as a collection of subsystems defined by functional or organisational boundaries (Iivari 1991), that support decision-making and control in an organisation (Lucas 1981)". I am after things like: Business goals, People, IT, Work and business processes Not after: Hardware, Software, Network	
Do you see the NABS System as a quality System?	
With regards to your daily use of the NABS System, do you believe its function and its use is of a high quality standard?	
In your words, what is an Information System?	
In your opinion, what constitutes a good Information System?	

ERP System Quality - Academic Requirements Project Pilot

What do you believe the goals of the Academic Requirements Pilot Project were?										
To what extent do you feel that the Academic Requirements Pilot Project fulfilled its purpose?										
How much do you have to change your work with regards to the academic advisement function? In what ways?										
Were you satisfied with the possible functions of the System, that the Academic Requirements Pilot Project described?										
How well does the Academic Requirement Pilot Project functions fit into your old working procedures?										
If you were to rank the quality of the System implemented during the Academic Requirement Pilot Project, from 1 to 10, what would you give it and why?	1	2	3	4	5	6	7	8	9	10

ERP System Quality - NABS System

Do you feel that you could perform the same level of service without the new NABS System?										
When you first used/heard about the NABS System, what were your initial thoughts?										
Have you experienced a lot of technical problems with the NABS System?										
What would you have changed with the new NABS System? What irritates you the most?										
How much, in your opinion, will the NABS system affect your work, will it make your work easier?										
To what extent do you have to change your work practices because of the new NABS System?										
If you were to rank the entire NABS System from 1 to 10, what would you give it and why?	1	2	3	4	5	6	7	8	9	10

ERP Information Quality

I want to discuss the importance of Information quality and having a System that gives the user quality information. When discussing this, I want you to try to think of Information System processes and delivery of information that ensures efficient deliver and maintenance, how the IS can be used and how useful the information can be from a business perspective	
How do you rate the functions the NABS System provides to you in order to access information?	
How important is access to information in your daily work? Is it important to get accurate and fast data?	
Is it easier for you now to get specific information compared to before the NABS System was implemented?	
In your opinion, what is quality?	
How would you characterise Information Quality?	

Use and satisfaction - Academic Requirements Pilot Project

Are you satisfied with the academic advisement Pilot Project in general?	
Why do you think this function was implemented within the University? Do you see a need for it?	
Will the academic advisement function make your work easier?	
Who do you feel will benefit from having the possibility to access this function?	

Use and satisfaction

Are you satisfied with the NABS System now? Can you see yourself being satisfied by it in the future?		
What technical problems have you encountered with the System?		
What frustrates you most about the System and what are you most satisfied with?		
Are you satisfied with the following about the NABS project:		
- Training in using the System	YES	NO
- Information about the System	YES	NO
- Change of your work processes	YES	NO
- Help with technical difficulties	YES	NO
- Information about change of processes	YES	NO
- Possibility to express your views about how your work should be optimised with an Information System	YES	NO
- Possibility to express your views about the System	YES	NO
- Your views being heard and incorporated into the solution	YES	NO
- The technical possibilities of the System	YES	NO
- Possibility to contact implementation project	YES	NO
- Communications channels in and out of the NABS project team	YES	NO
When you think about your feelings toward the System, do you experience or identify with:		
- Satisfaction?	YES	NO
- Irritation?	YES	NO
- Resentment?	YES	NO
- Calmness?	YES	NO
- Gratitude?	YES	NO
- Happiness?	YES	NO
- Pressure?	YES	NO
- Aggression?	YES	NO
- Not affected	YES	NO
Can you grow to like the System, or (not like the System)?	YES	NO

Knowledge

Do you feel that your "know-how" has been captured by the System?	
Who reviews your work practices and work processes?	
If you left the University now, do you feel that the NABS System can model your knowledge?	
How would you describe your work, is it easy to describe?	
Imagine that you had to train a new person to do your job, does the NABS System make it easier to explain your job?	
Do you feel that the NABS System makes it possible for you to innovate your work practices? Does it cater for your new ideas on how to do your work?	

ERP Implementation project scope

I want to ask a few questions regarding the NABS implementation project. I am focusing on the level of information you have been given, the possibility of gaining information and sharing your views of how to model your work practices in an Information System. What do you think an ERP implementation involves? What had you expected when the University decided to implement an ERP System?	
To what level have you been affected by the implementation of the NABS System?	
Have you been updated with what happens and when things happen during the entire NABS project?	
What information have you been given about the NABS project? How often?	
Do you feel that the implementation team has been doing what they can?	
How do you feel about the NABS project team? How do you feel planning and information has been dealt with?	

Strategy and tactics - Organisational context

I want to discuss more about why the University chose to implement an ERP System at the University. With relation to other Universities, students, money, competition and government.	
Do you believe that an ERP System implementation is strategically right for the University?	
What do you think strategy is?	
What do you think tactics is?	
Why did the University choose to implement an ERP System?	

Do you believe that an ERP System implementation is strategically right for the University?		
Do you believe this ERP System will increase the competitive advantage for the University with relation to:		
- Costs?	YES	NO
- Employee satisfaction?	YES	NO
- Availability of information to students?	YES	NO
- Student satisfaction?	YES	NO
- Other Universities in Australia?	YES	NO
- Other Universities world-wide?	YES	NO
- Government funding?	YES	NO
Do you believe the university benefits for having an ERP System? Why?	YES	NO
Do you evaluate the NABS System different from other users of the System? Why?	YES	NO
What kind of conflicts are there between the different users of the System?		
What different types of users will use the NABS System?		
If you were the person that had to decide whether to implement an ERP System at the University in 1998, what would you have chosen? Why?		

All in all, do you believe the NABS project has been a success?	YES	NO

Thank you very much for you participation

Interview Information

First, thanks for letting me interview you. Your comments and your participation in this interview are highly appreciated. The interview in itself should not take longer than 30 minutes.

The research that this interview is part of involves researching in critical success factors for an ERP implementation. It is hoped that future researchers and implementation efforts could benefit from my study. I will be investigating the implementation project at the University, thus trying to fill a gap in the existing literature where little or no interest so far has been on critical success factors within an ERP implementation project in a University setting. The University may also find it relevant to have research on how they have conducted the project, as the NABS project is the biggest project the University has ever conducted.

I want to make it clear that any names that will be gathered from this interview will be changed and all information gathered throughout the interview will be kept confidential.

Again, your participation is highly appreciated. Please read and sign the statement below.

I_____, agree to take part of this interview, to have read the information above and agree to its contents.

Date:

Place:

Appendix M: Interview Questionnaire

Background Information

Name:

Position:

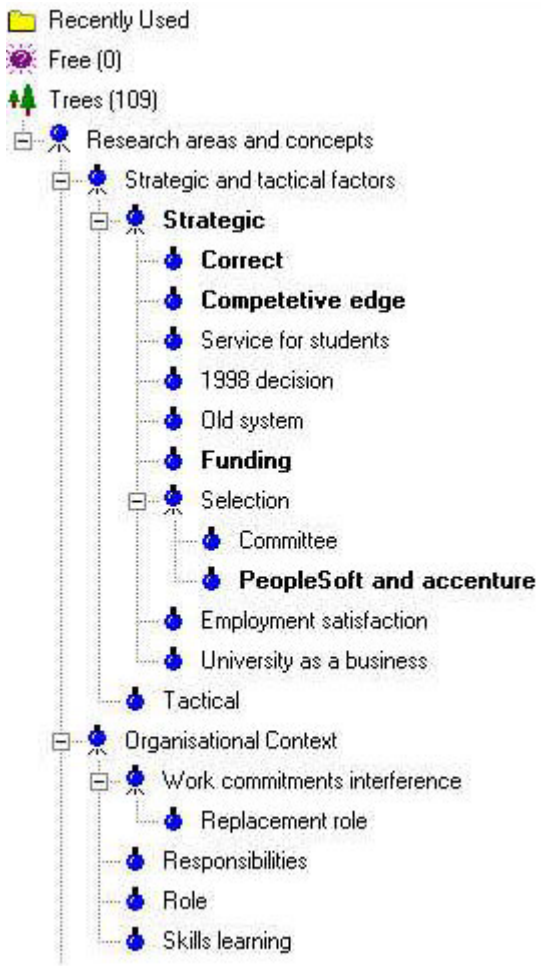
What is your education (what degree(s) do you have)?										
What is your previous work experience and roles?										
How long have you been with the University?										
How long have you had your current position within the University?										
Please rate the below:										
In general, how do you believe the NABS System will affect how people do their work and work processes?	*Little*			*Medium*			*A Lot*			
How confident are you with using a computer in your daily work routines?	1	2	3	4	5	6	7	8	9	10
How important is a computer in your work?	1	2	3	4	5	6	7	8	9	10
I consider myself an experienced computer user.	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree	
Believe it was right of the university to conduct the NABS project.	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree	
It is important for me to have access to information in my work.	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree	
Satisfied with the NABS project - the way it has been conducted.	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree	
Satisfied with the NABS System and my experiences with it.	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree	
[9]Satisfied with PeopleSoft as the ERP vendor	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree	
Satisfied with Accenture as an implementation partner	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree	
Satisfied with the University administration and its support for the system	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree	
Satisfied with the University academics and their support for the system	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree	

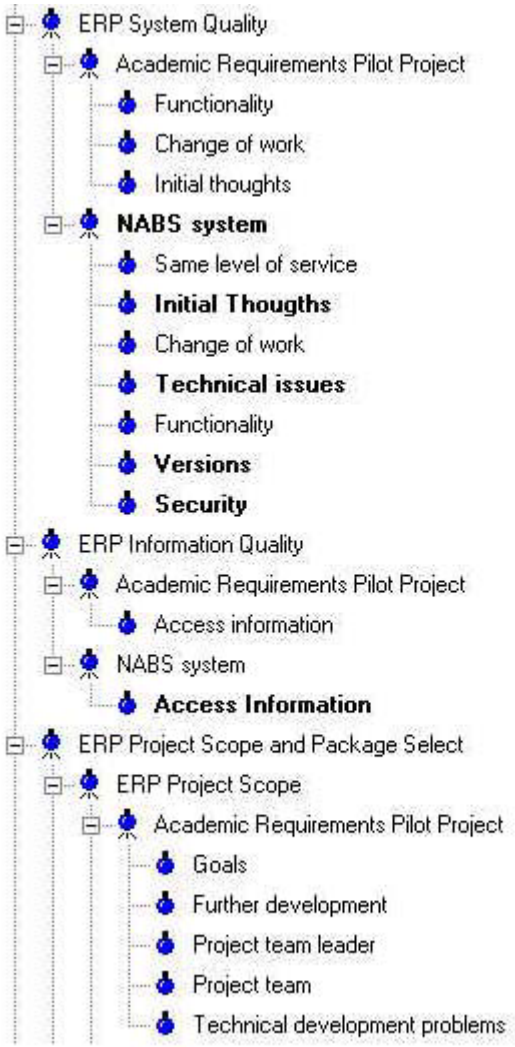
Thank you very much for your comments and participation!

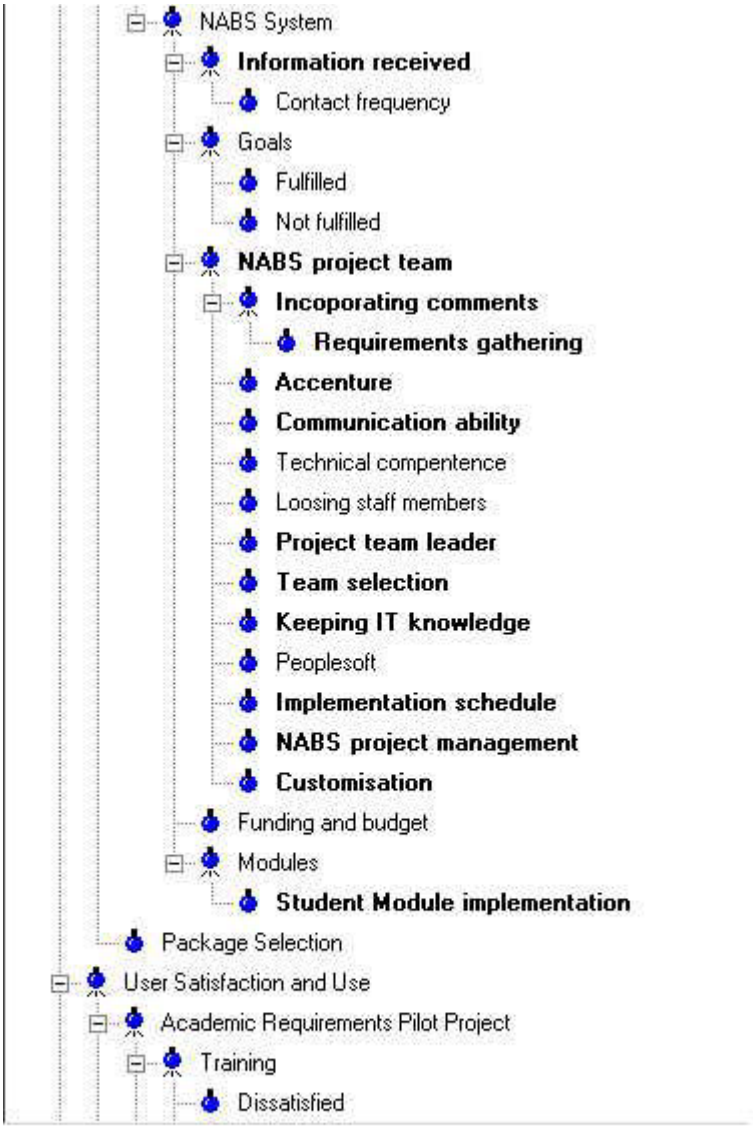
[9] The following questions was only distributed to the NABS project Director.

Appendix N: NVivo Coding Structure

The figure below (Figure 16) demonstrates the NVivo coding structure used for this research project. Each of the broad areas for investigation was represented in the software system as *nodes*. Note the level of detail used in the tree structure. For more information about the use of the NVivo software, please see section 4.6 in Chapter Four - Research Method. See also section 5.8 in Chapter Five - Research Site for the researcher's view on how the software can be utilised during a research project of a qualitative nature and the actual use of the software during this research project.




ERP System Quality
Academic Requirements Pilot Project
Functionality
Change of work
Initial thoughts
NABS system
Same level of service
Initial Thougths
Change of work
Technical issues
Functionality
Versions
Security
ERP Information Quality
Academic Requirements Pilot Project
Access information
NABS system
Access Information
ERP Project Scope and Package Select
ERP Project Scope
Academic Requirements Pilot Project
Goals
Further development
Project team leader
Project team
Technical development problems


NABS System
Information received
Contact frequency
Goals
Fulfilled
Not fulfilled
NABS project team
Incoporating comments
Requirements gathering
Accenture
Communication ability
Technical compentence
Loosing staff members
Project team leader
Team selection
Keeping IT knowledge
Peoplesoft
Implementation schedule
NABS project management
Customisation
Funding and budget
Modules
Student Module implementation
Package Selection
User Satisfaction and Use
Academic Requirements Pilot Project
Training
Dissatisfied

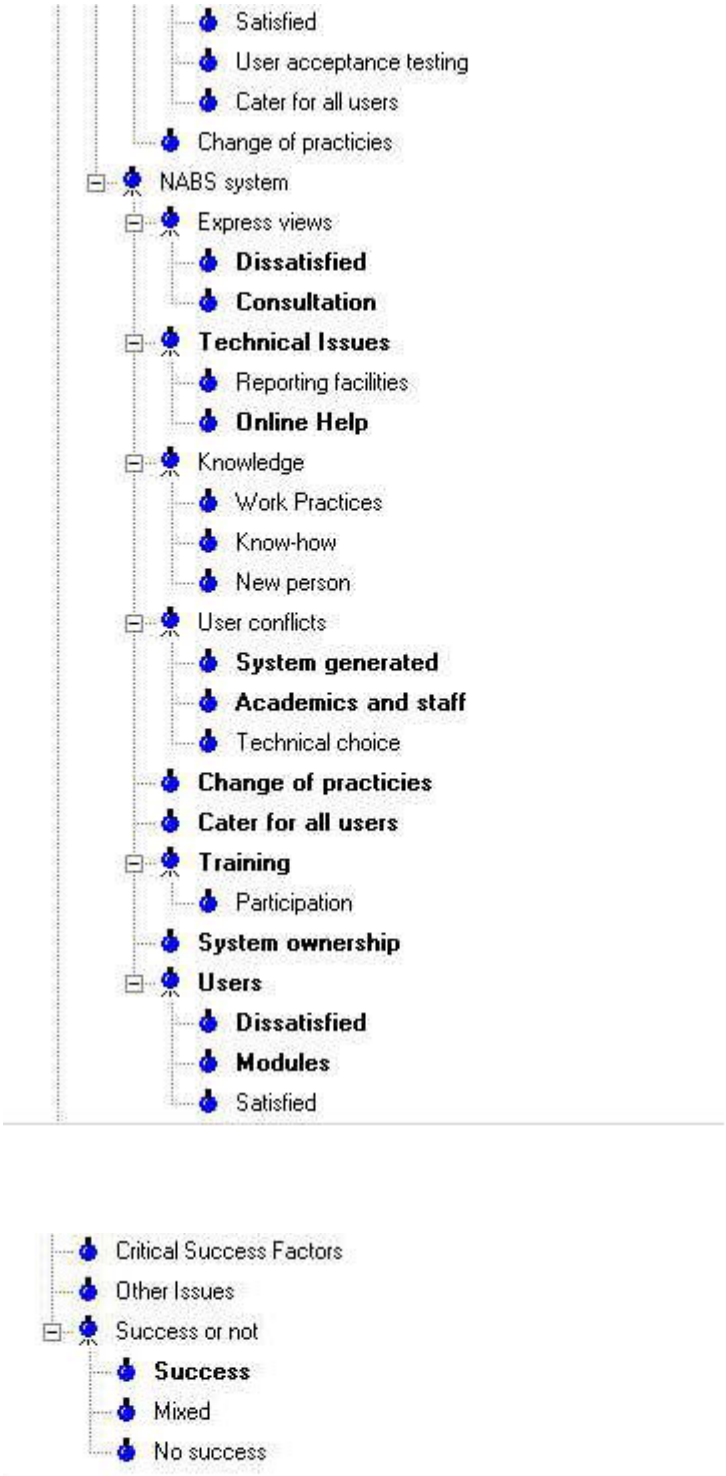


Figure 16 NVivo Coding Structure Detailed List

Appendix O: Interview Questionnaire Findings

Number of interview participants during post project implementation interviews: 9
Female: 6
Male: 3

What is your education (what degree(s) do you have)?***	√	√	√	√ √	√	√	√	√	√ √	Mid.
How long have you been with the University?	3	2	2.5	27	1.5	1.8	6	10	23	76.8= **8.5**
How long have you had your current position within the University?	3	2	2.5	19	0.8	1.8	1.5	0.5	8	39.1= **4.3**
Areas:										
In general, how do you believe the NABS System will affect how people do their work and work processes?	*Little*			*Medium*			*A Lot*			
				33			**67**			
How confident are you with using a computer in your daily work routines?	1	2	3	4	5	6	7	8	9	10
								22	**11**	**67**
How important is a computer in your work?	1	2	3	4	5	6	7	8	9	10
									22	**78**
I consider myself an experienced computer user.	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree	
							33		**67**	
Believe it was right of the university to conduct the NABS project*	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree	
			11		**33****		**33**		**22**	
It is important for me to have access to information in my work.	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree	
							22		**78**	
Satisfied with the NABS project - the way it has been conducted.	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree	
			11		**45**		**33**		**11**	
Satisfied with the NABS System and my experiences with it.	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree	
			22		**45**		**33**			

Table 19 Questionnaire Findings

* Because of the nature of the number nine (number of interview participants) this number does not add up to 100% because of rounding of the numbers

** One participant changed her view from Agree to Neutral after the interview had been conducted.

*** A '√' indicates that the person has a degree.

NOTE: The questionnaire findings were derived from the nine post implementation interviews conducted, as outlined in Table 6 Academic Requirements Pilot Project Events and Activities and section 5.7, Post Implementation Interviews in Chapter Five - Research Site.

Appendix P: NABS Objectives v. Actual Findings

The table below (Table 20) represent objectives of the NABS project (as outlined in Academic Reference Group Resource Materials, 2000, unpublished documents) compared to the actual findings from the case study that this research project conducted. The actual findings are derived from secondary data analysis and the interviews performed for this research project that focused on the ARPP and the functionality it gave. It must be noted that to see the real benefits and improvements an ERP system can offer for the organisation that implements it, several months may pass (O'Leary 2000a).

NABS Objectives	Actual Findings
Deliver improved service to academic and general staff.	There are some users who felt that the service has not been improved with the new system being offered to them.
Deliver timely and relevant management information.	Users have problems with accessing information. Developers of the system are satisfied with the possible information opportunities the users have.
Deliver client services, which are intuitive and have a consistent "look and feel".	Users complain about new procedures and new terminology.
Design and deliver a set of processes and system tools and controls that support the data integrity and accountability.	This has been achieved to some extent. Reduced some data duplication, cut down drastically on the number of different systems operating in the University.
Release resources from transaction processing.	Unable to answer.
Provide effective change management and training to all client groups.	Some criticism in how this has been conducted. Users feel that they were not given enough training possibilities and to 'play' with the system. Users in an academic environment are by nature not happy with changes, change management could have been performed better.
Develop and deliver employee web service applications.	Yes, this has been achieved.
Embed University strategic directions in business systems and processes.	Some new infrastructure is there, how it will be used is left to see.

Table 20 NABS Objectives v. Actual Findings

Appendix Q: Unpublished Referenced Documents

1. Reports

Title	Year	Producer	P
NABS Implementation	2000	Accenture	2
Academic Reference Group Resource Material	2000	NABS	25
Acad Advsiemtn Rprt & transcrpt	2001	NABS	16
Student Records Test Script 40.6 Test academic advisement Functionality	2001	NABS	14
Academic Requirements Implementation Strategy	2001	NABS	13
Information Strategic Plan 1999-2003: A Vision for the Knowledge Age	1999	The University	12
Strategic Plan 2001 - 2005	2000	The University	
Annual Report 1998	1998	The University	52
Annual Report 1997	1997	The University	52

2. Emails

Title	Date	Producer	Role	P
NABS	06.09.00	York		1
New HRIS	13.04.99	Thompson	HRIS Project Team Leader	1
Go Live of Research and Higher Degree (Scholarships) Functionality	20.03.02	Fransman	Director, Information & Communication Technology Services	1
Song of the March Hare	27.03.02	Williams	Vice Chancellor	6

The author collected and saved **23** emails from the NABS project team that were concerning issues regarding the NABS project. This information has not been referenced in this dissertation specifically and thus not in the list of unpublished documents. Authors of both reports and emails have been given pseudonyms.

Appendix R: NABS Project History

The NABS project was the largest project the University has undertaken to date (NABS 2001b). The following table (Table 21) attempts to capture some of the key events and dates during the NABS project history. For a specific outline of the actual events for this particular research project, see Table 6 Academic Requirements Pilot Project Events and Activities in Chapter Five - Research Site.

Start date	Event	Description
November, 1998	Phase One: Project initiation	Identify a business system solution as a fundamental enabler of process re-engineering.
March, 1999	Evaluation completed	Functional and technical evaluation of software and vendor complete
June, 1999	Implementation partner and vendor chosen	Accenture and PeopleSoft
September, 1999	Project Commences	Finance Module implementation starts
March, 1999	Academic Reference Group	Formal academic reference group
July	Finance: Release One (a) completed	General ledger Purchasing Accounts payable Supported by web and workflow
1 July, 2000	GST	GST
October, 2000	Release one (b)	Fixed assets
October, 2000	Release two: Revenue Management	Student Financials Accounts Receivable Billing Receipting
4 April, 2001	Human Resources/Payroll: Release one	Recruitment Hire Leave Workplace Health and Safety Employee Details Payroll Reporting Workforce planning Administer Training Performance Management Case Management
4 April, 2001	Student	Recruiting and marketing

Start date	Event	Description
	Administration: Release one	Admissions Advanced standing (credit for previous studies) Student web self-service Reporting
May, 2001	Web and Workflow	Web and workflow progressively rolled out in May 2001
October, 2001	Release Two: Student Records	Academic program structure Course offerings Publication of program and course information Student records Enrolments Academic advisement Advanced standing (credit for previous studies) Tutorial allocation Student web self-service Assessments Examination administration Assignment tracking Progression and exclusions Management of research studies Scholarships Prize administration Graduations Convocation, alumni Reporting
20 March, 2002	NABS project ends	NABS project is officially over

Table 21 NABS Project History

The above information derived from (NABS 2000a) and Academic Reference Group Resource Materials (2000, unpublished document).

It is important to take into consideration the due dates for events and pilot projects during the NABS project and key dates in the academic year such as exams and enrolment dates.

Appendix S: NABS and ARPP System Functionality and its Users

The following information contains details about the ERP vendor PeopleSoft, the consultant third party Accenture, the NABS system, the ARPP functionality, users of the system and the information needs that the system was going to provide.

1. PeopleSoft

“PeopleSoft has a history of innovating at technology shifts and bringing the benefits to our customers' desktops. It started in the mid-1980s when company founders Dave Duffield and Ken Morris built the first human resources application on a client-server platform instead of the traditional mainframe, adding needed flexibility and putting more power into the hands of users. While consumer applications on the internet have evolved to the mass adoption stage, changing the fabric of everyday life, businesses have just scratched the surface. In 1998, PeopleSoft recognized that Fortune 2000 corporate strategic plans were increasingly looking to the internet to increase profitability by making customer and vendor transactions faster and better. As a result, we retrenched our internal strategy, halting development of anything that wasn't a pure internet application. We directed the bulk of our resources—$500 million and 2,000 developers over two years—into our new pure-internet platform for the real-time enterprise. The result is PeopleSoft 8, with more than 150 pure-internet applications. All with no client software to maintain. All designed to build loyal customer relationships, enable better supplier communication, and make employee recruiting and retention more efficient.

PeopleSoft 8 makes better interactions possible by delivering both the relationship and analytic data you need to the employee in your organization who needs it, when they need it. Relationship data includes details of past transactions, from the size and status of a vendor's latest shipment to which sport a customer's kids play. Business analytic data indicates which customers are the most important based on the amount of product they are likely to buy and your cost of serving them, or which vendors

deliver the highest quality products, on time and at the best price. The sales force or customer service teams have that data available from any browser when the customer calls or when the vendor is ready to negotiate a price.

Optimizing interactions, managing real-time business processes, analyzing your business to anticipate opportunities, increasing revenue, and reducing costs. It all adds up to more profitable relationships. It's what you can expect from PeopleSoft: software and services for the real-time enterprise" (PeopleSoft 2002f). The University has implemented the Human Resource/payroll module, Finance module and the Student Administration module that the ERP vendor PeopleSoft offers.

1.1. PeopleSoft and the Higher Education Sector

"The internet is poised to change higher education like no other technology advancement. It opens new lines of communication among your constituents, letting them communicate and collaborate. This constituent network forms the foundation of a collaborative campus. PeopleSoft for Higher Education is pure internet software that enables that collaboration. Designed specifically for higher education institutions, it helps you manage your operations, from recruitment and records management, to fundraising and relationship management. That's why PeopleSoft applications are at work in more than 600 institutions worldwide" (PeopleSoft 2002c).

"PeopleSoft solutions help you achieve organizational goals by improving service level--enabling your employees to be a strategic asset, vendors your collaborative partners, and students and citizens your "customers." By providing quick access to clear information, PeopleSoft's eGovernment and internet solutions for higher education, public sector, and federal government organizations allow you to manage resources effectively, make well-informed decisions, and respond swiftly to your evolving needs" (PeopleSoft 2002a).

1.2. Finance

"PeopleSoft is the leader in financial performance management, with pure-internet solutions that provide you with real-time visibility into financial results, minute-by-minute control over expenditures, and guidance for better decisions. PeopleSoft Financial Management Solutions enables all your employees to act like CEOs, giving them the tools, information, and insights they need to detect problems earlier and take action faster" (PeopleSoft 2002b).

1.3. Human Resources/Payroll

"PeopleSoft Human Resources offers comprehensive HR solutions, from recruitment to compensation to workforce development. In addition, through integration with our collaborative applications, self-service transactions can extend this functionality to your employees and managers". Peoplesoft offers a range of applications to support HR functionalities according to their website (PeopleSoft 2002d). PeopleSoft also offers interfaces between their payroll system with other PeopleSoft applications or linking existing systems to PeopleSoft existing payroll functionality (PeopleSoft 2002e).

1.4. Student Administration

"Pure internet PeopleSoft Student Administration enables you to manage your student services and business operation, from recruiting, admissions, and student finances to academic advisement, financial aid, and student records. All transactions are built into common web pages, so you can access information anytime, anywhere, and from any browser. Only PeopleSoft offers pure internet software that connects the administrative, transactional, and academic aspects of your organization. It integrates and delivers role-based content to serve all of your constituents throughout every stage of the student lifecycle. Your learners, administration, and faculty will collaborate to improve service and efficiency so you can be more effective and support lifelong learning relationships" (PeopleSoft 2002g).

2. Accenture

"Accenture is the world's leading management and technology services organization. Through its network of businesses approach—in which the company enhances its consulting and outsourcing expertise through alliances, affiliated companies and other capabilities—Accenture delivers innovations that help clients across all industries quickly realize their visions" (Accenture 2002).

3. NABS

"The significant change experienced by the Higher Education sector, particularly in relation to sources of funding is changing the nature and composition of the sector. Other universities are now major competitors in fee-paying markets and moreover, students are now seen as clients who are more discerning in relation to services and the overall higher education experience. This new commercial environment continues to evolve. Failure to review and improve the business support systems in this environment could lead to an inability to take control of this new operating environment. The NABS project will provide support to the University in strategic and operational plans, and will enable a significant shift in how University Administration supports the University. Reasons for the new system to be implemented include:

- Increased competition in the Higher Education Sector requiring an enhanced commercial focus and capacity to operate in a global marketplace.

- Cessation of supplier support for the Lattice HR/Payroll system from June 1999.

- The many modifications and "add-on" solutions that have been developed for the Finance One system to enable it to meet the emerging requirements of the 1990s.

- An increased demand for administrative and businesses systems to provide better management and decision support, through the provision of targeted information

regarding costs, staffing profiles, commercial activities and performance measurements.

- A need for services that are efficient and focus on clients needs throughout the university.

- The demand for improved accountability and transparency of University operations and an increasing number of audit issues.

- The extra University expenditure that would otherwise be required to upgrade the existing finance system and process to meet GST requirements"

Above information derived from NABS (2000b).

3.1. Project Team Structures

The University had Accenture working with them on the team in order to implement the PeopleSoft modules Finance, HR/Payroll and Student into the organisation. The project structure included a mix of university and Accenture staff. During the life of the project, staffing numbers increased and decreased in different areas at different stages (NABS 2001a).

The NABS project was led by a mixed group of people from the University and Accenture on a team called the steering committee. The role of the steering committee was to oversee the project plan and provide high-level guidance and support for the project. Broadly, the steering committee had responsibility for approving changes in the budget, the project direction, major policy issues and ensuring wider university support (NABS 2001c). A functional management group (FMG) was created to ensure that the functional and technical issues, policies and procedures were resolved, referred and followed up so that project objectives were met and achieved within agreed timeframes and budget (NABS 2001c).

A project office provided overall program management and administrative support of the project. The role of this team was to ensure that the project delivered the agreed

outcomes in an effective working environment. The team was responsible for setting-up and maintaining project infrastructure such as project standards and procedures, and accommodation and equipment. The team was also responsible for tracking and monitoring project progress and providing reports and feedback internally and externally. Overall, the team was responsible for providing and environment conduce to excellent working relationships within and outside the NABS project (NABS 2001c). A change management team was set up to work across all NABS teams and with client groups to develop and coordinate the implementation of a change strategy. It has as its main objective to identify network for communication, developing and coordinating and delivering change management programs, assisting gin the development and coordination of the training of clients, liking with other university change management programs and working with project managers to ensure the successful implementation of the PeopleSoft system. The change management team was responsible for delivering effective change programs and outcomes, while it was also responsible for ensuring working relationships within and across NABS (NABS 2001c). Each of the major project implementations (Finance, HR/Payroll and Student) were all lead by a team which were responsible for design, redesign and delivery of new processes and systems that delivered efficient, effective and client-focused Finance, HR/Payroll and Student Administration services. The teams were formed to assist the transition from the old system to the new system and work with staff throughout the University to keep the informed, involved and positive about the project (NABS 2001c).

3.2. Training and support

Training was offered to users (academic, and staff at the University) before major ‘go live’ dates for each of the three different modules (Finance, HR/Payroll and Student Administration) (NABS 2001a). The different training sessions were given a subject name, a fixed duration, a medium and topics that each training session was going to cover. Including this, people participating in the training sessions needed in some cases to have done prerequisites training courses (NABS 2001d).

4. NABS Project Communication Networks

In order to ensure communication of changes and information to all affected stakeholders, the NABS project team decided on the following networks to be operated, consisting of transition managers and academic reference group.

4.1. Transition Managers

Transition managers (TM) were a nominated person that had the role to assist the element, school or faculty to manage the transition from the old systems to the new NABS system. The TMs were used on the project to "*help with any questions or queries people might have relating to NABS*" (NABS 2001a).

4.2. Academic Reference Group

The academic reference group (ARG) concentrated on project implementation issues within the broader business of the university. Specifically the reference group set out the following activities:

- assisted in the identification of ANBS change impacts on the academic community,
- provided a forum for general consultation and feedback on NABS implementation issues
- publicly endorsed activities relating to the project, and
- participated were appropriate and possible in communication activities.

(NABS 2001c).

5. ARPP

PeopleSoft provides an automatic audit of degrees through its academic advisement function. The function is used to track whether a student meets degree rules, and is consequently eligible to graduate. The old process of providing academic advice was conducted via a manual process of checking the course structure rules against a student progression. Graduation checking was also a manual process where eligibility to graduate was confirmed by comparing the course structure information to students record. The old student information system (SIS) had no facility for automatic degree auditing. The ARPP allows students, staff and academics to run the advising report of the web. The setup of the academic requirements was categorized as the most challenging part of system configuration in the Student Administration module (Academic Requirements Implementation Strategy, 2001, unpublished document). The project was a joint initiative between the NABS project team (who offered strategic direction and methodology), academic staff (offered deep knowledge of degree requirements) and academic requirements maintainer (ARM) (who was responsible for managing the maintenance and creation of new academic requirements). Two people were providing directions from the NABS student configuration team, an academic requirements manager, Rita, was selected because of her great knowledge of degree rules and long service within the University. School administrative officers (SAOs) were chosen due to their knowledge of degree requirements. Academic requirements maintainers were taken from the student administration unit within the University.

6. Users

The users of the new NABS system that the NABS project have implemented consist of:

- Students (Undergraduate, Postgraduate)

- Academics

- Administrative staff (all administrative staff within the central university structure, but also those administrative staff that access the system via the faculties and the different schools that exist within the University).

Students use the PeopleSoft systems in a number of ways. Relevant to the functionality tested within the ARPP (as described in section 4.2 of Chapter Five - Research Site) students will be able to get an academic advisement report from the website. As a result of this system, the students can see if they are following the degree requirements or not.

Academics and administrative staff in the student administration can use the academic advisement function in order to give advice to students querying about their degree future and past history, while also get specific information about a students performance. The use of the NABS system is above mainly focusing on the functionality the Academic Advisement functionality that the ARPP offer.