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Cork Institute of Technology

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Department of Accounting and Information Systems
School of Business

Submission for the Award of MBus

by

Maurice O’Brien

November 2014

Research Supervisor – Sylvia Dempsey
The author hereby declares that, except where duly acknowledged, this thesis is entirely his own work and has not been submitted for any other degree in any third level institute.

Maurice O’Brien (Student)  
Date

Sylvia Dempsey (Supervisor)  
Date
Dedication

I would like to dedicate this thesis to the memory of my late cousin Mark, missed and loved forever.

Thank you Neville
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Thank you all.
Abstract

**Title:** An empirical investigation of the development of Enterprise Resource Planning (ERP) systems education for third-level Business students

**Researcher:** Maurice O’Brien

This study is an empirical investigation of the development of Enterprise Resource Planning systems (ERP) education for Business students. It uses Cork Institute of Technology (CIT) as its case study to determine the benefits of practical ERP education, the challenges faced by third-level institutions and how ERP education should be provided to Business students. The researcher used observation, review of documentation, and semi-structured interviews of fifteen academics as the research techniques.

As well as being beneficial for students, employers and ERP vendors, this study finds that the provision of practical ERP education has reciprocal benefits for the third-level institution. By improving graduates skills, enhancing their employability and ensuring students are always up-to-date with new technology, the profile of the college enhanced and important links are built with industry.

The challenges facing the institution are personnel issues (such as inadequate training on ERP and inexperience in teaching in a lab setting), programme structure issues (such as the need to rewrite module descriptors and lack of space on the programme) and organisational issues (such as a lack of computer laboratories, cost of running laboratories and need for more technical assistance). However, all of these challenges should be weighed against the benefits that practical ERP education has to offer. This study suggests that in-house training of staff, inclusion of ERP education in the module descriptors, the provision of a dedicated technician, better links with other colleges and industry would all improve the provision of practical ERP education in third-level colleges.

The benefits of ERP education can be maximised if it is provided in a mix of theoretical and laboratory settings in a cross-modular fashion in the penultimate year of the degree programme. There is a lot of work to be done in maximising the utilisation of the University Alliance Programme (UAP), small steps have been taken in CIT, but it still has a long way to go. Other third-level institutions can learn from the steps CIT have taken and is taking.
Chapter 1  Introduction to this Research

1.1  Introduction

This chapter introduces this study by providing its background and then illustrating how the researcher arrived at a worthy research objective and the questions that need to be answered to fulfil this objective. The chapter then introduces the organisation to be used as the case study for this research and acknowledges the limitations of the research. This chapter concludes with the provision of the structure of the subsequent chapters of this study.

1.2  Background to the Study

Enterprise Resource Planning (ERP) systems are software solutions that can potentially integrate all of the functions of a business (Davenport, 1998a). They are one of the fastest growing segments of the software industry. Over the past two decades, organisations from all over the world have been implementing them. Their rise in popularity is due to their ability to enhance the effectiveness and efficiency of organisations and inevitably improves the organisations’ competitiveness (for example Asghari et al., 2011; Dezdar and Ainin, 2011).

The rise in the popularity of ERP systems has resulted in a skills shortfall in the market place. As there is not a sufficient supply of people with ERP experience, companies are now recruiting graduates with ERP education directly from third-level institutions. Companies do not need to spend as much time and money on training them as the can go straight onto working with these systems. Graduates with ERP on their CVs are seen as more employable. For this reason, third-level institutions are now under pressure to provide ERP education to their students. Third-level institutions need to decide on the best possible pedagogy to provide the relevant ERP education to their students.
1.3 Gaps in the Literature

With the rise in popularity of ERP systems, research at the end of the twentieth century, and again at the beginning of the twenty-first century, focused mainly on the advantages and disadvantages associated with implementing ERP systems, with a particular focus on the critical success factors (CSFs) necessary for its successful implementation (for example, Gable et al., 1988; Holsapple and Sena, 1999; Klaus et al., 2000; Denzar and Amin, 2009; Amid et al., 2012). The need for experienced staff is one of the CSFs mentioned in the extant literature. This type of literature was valuable in this time. But now that ERP systems are implemented, research has to turn to the successful use of ERP systems within organisations. One of the major challenges of the companies is a shortage in supply of experienced ERP staff. As stated above, companies are now wishing to hire graduates straight from college with ERP experience (Hawking et al., 2001; Abugabah and Sanzogni, 2010; Wilson and Lindoo, 2011).

Many researchers including Becerra-Fernandez et al. (2000), Selen (2001) and Joseph and George (2002) highlight the importance of ERP education but very little had been written on the provision of ERP education for third-level Business students. Many academics and practitioners have called for third-level institutions to incorporate ERP systems into the curriculum (for example, Boykin and Martz, 2004; Noguera and Watson, 2004). Leyh (2012) has stated that there are still very little empirical insights on ERP systems usage in academic.

Fedorowicz et al. (2004) calls for research in how best to teach students ERP systems:

“Little research has been published that measures the effects on students understanding of course material and their broader knowledge of business issues... other issues related to best practices in teaching methods and learning assessment are open to study” (p.241).

Chen et al. (2009b) also expresses concern that the literature is still scarce in assessing the different teaching pedagogies and how they relate back to student
learning. The researcher of this study felt that it is time for academics to turn their focus to the importance of providing ERP education for third-level students, in particular Business students, and commence a debate on how that education should be provided.

1.4 Research Objective

The objective of this study is to provide:


To fulfil this objective the researcher aims to answer the following questions:

1. What are the main benefits of providing practical ERP education to third-level Business students?

This question will explore the benefits of providing theoretical ERP education and the additional benefit of providing practical ERP education. The main stakeholders are of course the students, but then in answering this question, the benefits to the employers, ERP vendors and the third-level institution will also be examined.

2. What are the main challenges facing third-level institutions when introducing practical ERP education into the curriculum?

This question will discuss the main challenges third-level institutions face when introducing ERP education into the curriculum.

3. What is the best way to provide ERP education to third-level Business students?
This question will examine the teaching pedagogy suitable for the purpose of ERP education.

All of these questions will be answered in the context of the case study used by the researcher for this study.

1.5    **Case Study: Cork Institute of Technology (CIT)**

Cork Institute of Technology (CIT) is a third-level education institute offering a wide range of full-time and part-time higher education courses at mainly degree and masters levels. Theoretical ERP education has been provided to students in the School of Business for the last ten years in a classroom environment. In 2012, the School of Business invested in SAP’s University Alliance Programme (UAP) to facilitate the provision of practical ERP education. The researcher was just commencing his research Masters in CIT at the time and had started tutoring Business students. He deemed the initiation of practical ERP education a worthwhile area of research. He decided to investigate the benefits this investment would bring to CIT’s stakeholders and also to explore the best way to provide ERP education to its students. Along the course of the study, he also decided to document the challenges that CIT came across in the implementation of practical education. As the researcher was working in CIT, ready access to both information and interviewees, and knowledge of the way in which CIT operates, made this study feasible for research as fulfilment of a Masters in Business (Research).

1.6    **Limitations of the study**

Originally the researcher wished to complete a work similar to Jensen *et al*.’s (2005), in which he would have examined how the ERP education provided to Accounting students differs from the ERP education provided to BIS students. However, as practical ERP education is still quite new in CIT and as only three lecturers in CIT are providing practical ERP education, the methods of teaching
ERP are still very limited. This is an area that the researcher would like to review once practical ERP education is better established in CIT. Instead, the research viewed telling the story of what CIT believes are the benefits of ERP education, the challenges of introducing practical ERP education and the best method to provide ERP education as worthy of a research study and this is reflected in the research question.

This study is the first major piece of academic research undertaken by the researcher. Along with experience, time was another limiting factor for the researcher. This study explores the introduction of ERP education in one third-level institution. It is hoped that other institutions wishing to introduce ERP education would benefit from the reading of this study. The researcher has learned a lot from the whole process and is interested in pursuing more research in the future. He is particularly interested in comparing the experience of CIT with the experience of other third-level institutions. A comparison of the starting salaries of recent graduates with ERP education compared to their peers that graduated without any ERP education experience would also be an interesting area of future study for the researcher.

1.7 Structure of the Study

An in-depth synthesis of the existing literature relating to this research is provided in Chapters Two and Three of this dissertation. Chapter Two provides a definition of Enterprise Resource Planning (ERP) systems. It then discusses the advantages and disadvantages of such systems and the critical success factors (CSFs) for ERP systems implementation and use. The need for experienced staff is one of these CSF. However due to a shortage of experienced staff there is a calling for third-level institution to graduate Business students with ERP knowledge and skills. The main contributors in this area are Davenport (1998a), Chung and Synder (1999), Joseph and George (2002), Al-Mashari et al. (2003), Nah et al. (2003) and Bologa et al. (2009).
Chapter Three provides a review of the extant ERP education literature. It explores the literature that focuses on how a demand from both industry and students has put pressure on third-level institutions to provide practical ERP education. The main writers in this area are Ching and Synder (1999), Hawkings et al. (2001), Klaus et al. (2000), Jensen et al. (2002), Joseph and George (2002), Boyle and String (2006). The researcher, from the review of the literature, identifies five key challenges third-level institutions face when trying to successfully implement ERP education. This is illustrated in Figure 3.1 (produced by the researcher). This chapter then discusses the development of University Alliance Programmes (UAPs) to alleviate some of these challenges. It concludes with a description of the different teaching methods currently available in ERP education, and the appropriate mix of knowledge and skills required by different cohorts of graduates.

Chapter Four sets out the research philosophy, methodology and the tools employed by the researcher in this dissertation. The chapter begins with the definition of research and discusses the research objectives and the research questions for this dissertation. The choice of research methods available is considered. The appropriateness of using qualitative research over quantitative research along with the use of a single case study for this dissertation is justified. The chapter then focuses on the selection of interviewees and details of the interview process and the validation of findings through triangulation.

Chapter Five provides a profile of the case study organisation. It discusses the history of CIT, its staff and students. It then moves onto CIT’s mission statement and vision for the future, before discussing the different faculties within CIT. It concludes with the rationale behind focusing on the School of Business in this dissertation and an examination of the decision to invest in a UAP.

The findings of this research are described in Chapters Six and Seven. Chapter Six discusses the benefits for CIT and its stakeholders of providing ERP education to its Business students. Chapter Seven discusses the future of ERP education in CIT, including an investigation of the most appropriate way to teach ERP, the
appropriate year to introduce it and how CIT can fully maximise the benefits from the UAP in the future.

Finally, Chapter Eight presents the conclusion of this research by answering, in detail, each of the three research questions that were set out earlier in this chapter.

1.8 Conclusion

This chapter introduced the background to this research. It looked at how the implementation of ERP systems in companies has grown in popularity due to its ability to integrate all of an organisation’s business functions. This rise in implementation of ERP systems has led to a skills shortage, resulting in organisations recruiting directly from third-level institutions. The gap in the literature which this study attempts to fill is a provision of the benefits for third-level institution of providing practical ERP education, the challenges it faces in the provision of ERP education and a possible way in which ERP education can be provided to Business students. The organisation used as the case study, namely CIT, was introduced. This chapter outlined the nature of CIT’s business as a third-level institution. It also outlined the researcher’s relationship with the organisation as a student and a Tutor. Chapter One concluded with an outline of the structure of the remainder of the study, from the literature review, research methodology, to the case study, findings and conclusions.
Chapter 2  Review of Enterprise Resource Planning Literature

2.1  Introduction

This chapter examines the extant literature on Enterprise Resource Planning (ERP) systems (ERPs). It opens with a definition of ERP system, followed by an outline of how ERP systems have evolved from Material Requirements Planning (MRP) in the 1960’s and Manufacturing Resources Planning II (MRP II) systems in the 1980’s. It then describes the advantages and disadvantages of ERP systems for organisations. It debates how the high failure rate associated with ERP implementation can be avoided by employment of the nine most cited critical success factors (CSF) for a successful ERP implementation. This chapter then concludes that ERP education is necessary at third-level for Business students.

2.2  Definition of Enterprise Resource Planning (ERP) Systems

ERP systems are software solutions that integrate the complete range of processes and functions of a business in order to present a holistic view of the business (Klaus et al., 2000; Ebie and Madsen, 2005; Ghosh and Skibiewski, 2010; Kwahk and Ahn, 2010; Ansarinejad et al., 2011; Maditions et al., 2012; Nizamai et al., 2014). They achieve this by using a common database that offers data visibility and company information from different viewpoints (Stefanou, 2012). Koh et al. (2009) articulate this by stating that ERP systems:

“...attempt to integrate all departments and functions across a company onto a single computer system that can serve all those different departments’ particular needs” (p.241).

Khan and Shaikh (2014) have a similar definition of the capabilities of an ERP system:
“ERP is an integrated project/software/application which is used for connecting various departments, business functions and storing their data at central place for efficient access. This data is accessed by various departments for different business functions” (p.41).

The business functions that can be integrated include production, business process, sales, human resources, finance, operation planning, inventory/materials management, manufacturing, purchasing, accounting, customer relationship management, supply-chain systems and marketing (Chen, 2001; Bologa, 2007; Ngai et al., 2008; Sledgianowski et al., 2008; Koh, et al., 2009; Ghosh and Skibniewski, 2010; Asghari et al., 2011; Dezdar and Ainin, 2011; Dezdar, 2012; Duangkeanong, 2013; Havrlisan et al., 2013; Nizamani et al., 2014) with ERP vendors also offering “bolt-on” products such as product life cycle management and business intelligence (Khan and Shaikh, 2014).

Information is stored in a database, which gives the business a simplified view of how all their systems are running in sync with each other (Brooks, 2013). By using an ERP system to integrate many or all of these business functions, when a business makes a change in one department, it will be reflected across all other departments of the business immediately (Bernadas and Halingten, 2005; Woo, 2007; Koh et al., 2009; Asghari et al., 2011). Therefore integrating these activities enhances the effectiveness and efficiency of the organisation and inevitably improves competitiveness (Asghari et al., 2011; Dezdar and Ainin, 2011). Klaus et al. (2000) state that an ERP system is “the key element of an infrastructure that delivers a solution to business” (p.2). According to Shanks et al. (2000) ERPs are one of the fastest growing segments in the software industry, with the ability to provide automated support within the organisation.

2.3 Evolution of ERP systems

ERP systems evolved from Material Requirements Planning (MRP) and Manufacturing Resources Planning (MRPII) (Orlicky, 1975; Chung and Synder, 1999; Waston and Schneider, 1999; Jacobs and Weston, 2007; Chen et al., 2009a; Deng et al., 2010; Nizamani et al., 2014) as depicted in Figure 2.1 below.
MRP systems were created in the 1960’s as capacity management systems for plant managers and their supervisory staff to improve materials planning and control. They also helps control virtually all the firm’s resources, while providing improvements in customer service (Chung and Synder, 1999; Chen, 2001; Jacobs and Weston, 2007). Business Requirements Planning (BRP) emerged from MRP, but as this was already a registered trademark, the term Manufacturing Resource Planning II (MRPII) was coined to incorporate the application of information and manufacturing technology and help identify the newer systems capabilities (Chung and Synder, 1999; Chen, 2001; Jacobs and Weston, 2007).

Maskell (1993) stated that MRPs lacked technical capabilities in integration, flexibility, and accessibility. Citing that work, Chung and Synder (1999) agreed stating that companies needed to find a way to combine their business processes and information technology (IT). With the rise in market competition, companies were constantly on the lookout for ways to obtain a competitive advantage by improving their business processes (Klaus et al., 2000; Wei et al., 2005; Koh et al., 2009). In the early 1990’s MRPII further evolved into Enterprise Resource Planning (ERP) systems to fulfil this purpose.

ERP systems were developed to combine both business processes and IT into one integrated business solution (Chung and Synder, 1999; Koch, 2003; Botta-Genoulaz and Millet, 2005; Ghosh and Skibniewski, 2010). ERP systems
contributed to giving businesses a competitive advantage by enabling them to handle multiple currencies in all transactions, the ability to speed up the supply-chain process and provide a seamless access to information throughout the organisation (Gumaer, 1996; Osterle et al., 2000; Klaus et al., 2002). The need for ERP systems was further enhanced because of its ability to provide substantial improvement in customer relations and supply chain (Chung and Synder, 1999). They helped manage a production facility’s orders, production plans, inventories, and other functions such as accounting and sales management (Gumaer, 1996; Yusuf and Little, 1998; Chung and Synder, 1999; Gupta, 2000; Chen, 2001; Al-Mashari et al., 2002). ERP systems were also seen as a solution for companies facing the turn of the century who had to replace their aging legacy systems that would no longer be able to function (commonly known at the time as Y2K problem) (Davenport, 1998a; Bingi et al., 1999; Hawking et al., 2004: Woo, 2007).

In the 1970s, the German company SAP (System, Analysis and Products in Data Processing) introduced SAP R/1, which provided real-time data processing software for its customers. Sap went onto introduce SAP R/2 into the market in the 1980s. This software was designed to handle different languages and currencies (Global Cynex). SAP witnessed a major growth in sales when they introduced there next instalment, R/3, a next generation software solution as companies started to invest billions in ERP systems offered by SAP (Chen, 2001). SAP R/3 offered the end-user several additional applications including Financial, Human Resource and Logistics (Joseph and George, 2002). In the early 2000’s Joseph and George (2002) commented on how computer vendors were “designing computers that could work on a variety of operating systems and databases” (p. 53). This has inspired application providers to improve application products that are independent of hardware and software platforms (Joseph and George, 2002).

The term ERP is therefore a misnomer. ERP systems do comprise the enterprise and focus on resources; however, they go beyond planning to facilitate tasks such as financial control, operational management, routine decision support, analysis and reporting (Davenport, 1998b, Miranda, 1999; Klaus et al., 2000; Botta-Genoulaz and Millet, 2006; Rikhardsson and Kraemmergaard, 2006). With ERP
systems involving all areas of organisations, it is no surprise that it has increased significance to organisations around the world (Kumar and Van Hillegersberg, 2000; Roa, 2000; Joseph and George, 2002; Jensen et al., 2002; Chung and Synder, 1999). Initially large organisations quickly embraced this technology. Today most European organisations are using an ERP system (Klima et al., 2014; Pridmore et al., 2014). Al-Mashari (2003) describes the growing popularity of ERP system as follows:

“With the growing interest of many organizations in moving from functional to process-based IT infrastructure, ERP systems have become one of today’s most widespread IT solutions” (p.22).

The dominance of ERP in industry has been the motivation of many academics to document the benefits and downfalls of implementing ERP systems.

2.4 Advantages of ERP systems

The uptake of ERP systems in industry reflects the numerous benefits they offers. The main advantages are increased functionality and performance, better quality information, cost effectiveness and administrative efficiency.

2.4.1 Increased Functionality and Performance

The main feature differentiating ERP systems from other information systems (IS) software packages is their level of functionality. ERP systems aim to support all the businesses functions of an organisation (Klaus et al., 2000; Beatty and Willians, 2006; Ghosh and Skibniewski, 2010; Dezdar and Ainin, 2011), freeing up managers to concentrate on controlling the efficiency and operational situation of the organisation (Gable et al., 1998). For example, the ERP system’s accounting function allows organisations to determine the wages, salaries and pensions of workers with minimum input. Health First, Inc., an American medical organisation had trouble in managing and tracking their employees as they worked between over seventy different locations before they implemented an ERP
system (Shang and Seddon, 2002). Organisations can hold and maintain years of accounting information that can be used for audits or track the origin of a transaction (Exforsys Inc., 2007c). The ERP’s management function can provide administration and easy-to-use planning functions, which allow for better decision making. Klaus et al. (2000) also describes ERP systems as having the capability to play a major role throughout different service industries such as:

“...patient management in hospitals, student administration at universities and high volume warehousing transactions for retailers” (p.3).

ERP systems provide management with the functionality to create information that it needs to accelerate decision-making and take action (Gibson et al., 1999; Holsapple and Sena, 1999; Al-Mashari et al., 2003; Bologna, 2007) and makes this information available across the organisation globally in real-time (Calisir and Calisir, 2004; Kale et al., 2010). An ERP system has the ability to help companies reduce their cycle time, improve their production, quality and performance, improve their planning and decision making (Shang and Seddon, 2002). The investment by Health First, Inc. has helped the finance department “deliver more accurate and timely information in a fraction of the time that it took previously” (Shang and Seddon, 2002, pp.282-283).

2.4.2 Reduces Administration

One of the main reasons an organisation implements an ERP system is that it reduces the administration burden throughout the organisation (Holsapple and Sena, 1999; Davenport, 2000; Chen, 2001; Al-Mashari et al., 2003; Botta-Genoulaz et al., 2005; Bologna, 2007). Davenport (1998b) describes ERP systems as a “dream come true” when he sums up ERP systems as commercial software packages that:
“...promise seamless integration of all the information flowing through a company-financial and accounting information, human resource information, supply chain information, customer information” (p.121).

Monk and Wagner (2008) extol the ability of ERP systems to “coordinate information in every area of the business” (p.1) as their main virtue. It is because of their integration and this coordination of the different business processes of the organisation, that ERP systems can provide up-to-date, real-time information to their users (Davenport, 1998b; Miranda, 1999; Verville and Halingten, 2001; Scapens and Jazayeri, 2003; Newman and Westrup, 2005; Monk and Wagner, 2008). ERP systems will cut back on the number of duplications and will free up time by having each department better aligned (Brooks, 2013).

2.4.3 Cost Effective

The implementation of an ERP system helps reduce costs right through organisations from administrative and logistics costs to manufacturing and transport costs (Holsapple and Sena, 1999; Davenport, 2000; Klaus et al., 2000; Al- Mashari et al., 2003; Calisir and Calisir, 2004; Exforsys Inc., 2006a; Exforsys Inc., 2007b; Bologa, 2007). It enhances the speed of operations, which results in reducing wasteful costs of the organisations (Dezdar and Ainin, 2011). Its ability to reduce the amount of inventory an organisation holds is seen as one of the systems main financial benefits (Bingi et al., 1999; Shanks et al., 2000; Nah et al., 2001; Loh and Koh, 2004; Žabjek et al., 2009).

Bendoly and Jacobs (2004), Loh and Koh (2004), Siau (2004) Woo (2007), Kamhawi (2007) and Jones et al. (2008) have all argued that a successfully implemented ERP system can have the potential to reduce inventory levels, lower lead-times, and increase productivity which should in turn lead to reduced costs for the organisation. Kale et al. (2010) describe how the integration of organisations departments can provide “the right product at the right time at the lowest cost” (p.759).
Davenport (1998b) explains how ERP systems have benefited organisations from publishing results from one of his many business reviews. Autodesk, a leading maker of computer-aided design software, used to take an average of two weeks to deliver an order to a customer. Once it installed an ERP system, it ships 98% of its orders within twenty-four hours. IBM's Storage Systems division reduced the time required to reprise all of its products from five days to five minutes, the time to ship a replacement part from twenty-two days to three days, and the time to complete a credit check from twenty minutes to three seconds. Fujitsu Microelectronics reduced the cycle time for filling orders from eighteen days to a day and a half and cut the time required to close its financial books from eight days to four days.

2.4.4 Better Quality Information

The availability of quality information is one of the unique features of ERP systems. It contains consistent and accurate data and improved reporting. Once the data is entered into the database, it can then be used by all the employees within the company (Chung and Snyder, 2000; Bologa, 2007). The system uses a unique database, which has the ability to contain consistent and accurate data that will lead to improved reporting (Bologa, 2007). ERP systems take into account every business transaction that is entered into the system throughout the organisations records, and stores these transactions digitally (Minahan, 1998).

Simunovic et al. (2013) explain how information needs to be relevant and on time if companies what to stay competitive and in business and how ERP helps achieve this:

“Today’s business environments are extremely complex and the enterprises have recognised that providing the right information at the right time can help them to survive in the world of demanding business relationships. For this reason, the management of a particular enterprise needs an efficient information system in order to improve logistics, reduce costs and consequently, increase
To meet these demands, an increasing number of enterprises have decided to implement ERP” (p.711).

For example, the use of ERP systems to help manage Customer Relationship Management (CRM). CRM is a very important for companies as stated by Saunders (1999) and cited by Chen (2001):

“It is no secret that developing a long-term relationship with a customer is more profitable than acquiring a new customer. A recent survey also reveals that firms striving to improve customer loyalty are 60 percent more profitable than those who aren’t” (p.383).

This information helps an organisation reply effortlessly to questions or information requested by important customers or suppliers (Chen, 2001). This information allows a company to track and follow-up on a customer’s processes when needed (Exforsys Inc., 2007b) in an efficient manner. Forming tight links with customers can create a competitive advantage for companies (Vitale, 1986: Victor and Boynton, 1998). Therefore, by supplying relevant reliable information the company can improve its relationship with its customers and become more competitive.

The above benefits should improve an organisation’s performance resulting in it becoming more competitive in the market place. Some even believe that in the modern business world it is “impossible to do business without ERP systems and be competitive” (Havrlišan et al., 2012, p.717). The implementation of an ERP system is however not without its downfalls. These are discussed in the next section.

2.5 Disadvantages of ERP Systems

Gable et al. (1998) suggest that implementing ERP systems can be the largest project that many organisations undertake involving the “largest potential benefits and possibly the largest potential risks” (p.2). The main disadvantages
are the high cost, resistance to change during implementation and the level of data entry at implementation.

2.5.1 High Costs

The biggest drawback for a company deciding on whether or not to implement an ERP system is the cost involved (Brooks, 2013). According to Davenport (2000) the cost of the software and hardware for ERP systems is well over fifteen billion dollars annually worldwide. Al-Mashari et al. (2003) calculate that the cost can range from “hundreds of thousands of dollars to several million dollars” (p.355). Bingi et al. (1999) claim that the implementation of ERP systems has cost organisations billions of dollars. In a similar vein, Calisir and Calisir (2004) consider the cost to be millions of dollars for a medium-size company and over one hundred million dollars for “large international organisations” (p.506). Ahmad et al. (2012) summarise the cost of ERP system implementation as:

“...a complex, cumbersome and costly, and, very often, it exceeds the initial estimated resources” (p.1).

The escalating cost doesn’t stop just at the software itself, ERP vendors additional licence fees along with a significant investment in external consultancy fees can be as high as two or three percent of a company’s total revenue (Chen, 2001; Nah et al., 2001; Ehie and Madsen, 2003; Exforsys Inc., 2006b). This external consulting can cost at least what the software costs (Brooks, 2013) but can raise to three times the cost of the original ERP system (Al-Mashari et al., 2003). Ehie and Madsen (2003) break down the total costs associated with ERP systems to 40% on systems-based costs and the remaining 60% on training and professional services.

Al-Mashari (2003) lists among the other costs related to ERP systems the high human resources needed in the implementation process. The cost involved in training staff is a major stumbling block in implementing ERP systems as “employees must be continually trained on how to use it” (Exforsys Inc., 2006b, p.6), and it also requires employees to have a high computer self-efficiency (Sheng et al., 2003). According to Zhang et al. (2005) some ERP projects took
two-and-a-half times as long as planned and the costs were 178% over what was budgeted. Because so much of a company’s time and money have been invested in the implementation stage, the decision to “abandon their ERP strategy” is not considered a viable option (Murry and Coffin, 2001, p. 1012). The costs are much more of an obstacle in the developing countries, as they tend to have a limited amount of capital, a lack of resources needed and a shortage of experienced IT professionals (Huang and Palvia, 2000).

2.5.2 Resistance to Change

Perhaps one of the greater challenges a company faces with regards to their employees is the resistance to change that implementing an ERP system can bring (Joseph and George, 2002; Al-Mashari et al., 2003). Resistance to change can be expected no matter how big or small the change is for the employees involved. “The Flight of The Buffalo” by Belasco and Stayer (1999) explains people’s mentality to change as follows:

“Change is hard because people overestimate the value of what they have – and underestimate the value of what they might gain by giving that up” (p.87).

One of the main reasons for resistance to change in any organisation is the attitudes of employees working for the organisation and Havrlisan et al. (2013) see this as a key factor in determining the success of an ERP implementation. Al-Mashari et al. (2003) suggests that a need for a shared vision is critical and must not be underestimated. Companies need to monitor their staff training and change over very carefully as any increase in downtime and uncertainty can lead to unexpected profit loss (Joseph and George, 2002; Lacoma, 2012).

2.5.3 Accurate Data Entry

One of the main goals of an ERP system is to integrate data from all departments into a main computer system (Murray and Coffin, 2001). This process can be
problematic as according to Teittinen et al. (2012) data entry into ERP systems can provide challenges. In an interview conducted by Teittinen et al. (2012) a production planner in a factory emphasises the importance of recording correct data:

“This system requires that everything has to be done exactly, spot-on, as the system requires, or the system goes down. It does not tolerate mistakes” (pp.7-8).

Each phase must be recorded correctly into the system before the user can move onto the next stage because the “ERP system requires that items have to be in balance” (p.7). If data is inputted incorrectly at source then the whole company is accepting that figure as being correct.

2.6 High Failure Rate

Even though ERP systems can be beneficial to organisation, the failure rate of implementation is a major concern (Davenport, 1998a; Chen et al., 2009a; Amid et al., 2012; Kanaracus, 2012; Kapur et al., 2014). Despite years of experience in the selecting and implementation of ERP systems, considerable amounts of ERP projects have failed or they have exceeded the time and budget allocated (Kanaracus, 2012; Balyeat, 2013). Many research papers have mentioned staggering high failure rates. Buckout et al. (1999) reports that 70% of ERP projects have failed to deliver the anticipated benefits. Simon (2010) found that for large-scale implementations up to 60% of the projects have failed with Roa (2000) estimates that as high as 96.4% have failed. Zhang et al. (2005) state that ERP systems only deliver 30% of their planned benefits. Wang et al. (2008) suggest that up to 90% of ERP systems have been delayed and will require additional budget amounts. A successful ERP implementation can be seen an early success but end up being a failure later (Larsen and Myers, 1997). ERP success and failure can mean different things by different people involved:
“...people whose job it was to implement ERP systems (e.g. project managers and implementation consultants) often define success in terms of completing the project on time and within budget. However, people whose job it was to adopt ERP systems and use them in achieving business results tended to emphasise having a smooth transition to stable operations with the new system...” (Markus et al., 2000, pp.245-246).

The reasons for the high failure rate cited in the literature include poor project management, not achieving predetermined corporate goals, the lack of a balanced experienced team, overrun costs, delays and lack of management support (Summer, 2000; Al-Mashari et al., 2003; Yusuf et al., 2004; Ghosh and Skibniewski, 2010; Amid et al., 2012; Maditions et al., 2012). This has resulted in some organisations either abandoning the project or going bankrupt (Davenport, 1988b; Cotteleer, 2002; Kale et al., 2010; Amid et al., 2012). Mobile Europe spent hundreds of millions on ERP systems before abandoning the project, FoxMeyer Drugs blame the escalating cost of implementation for making them bankrupt and even Dell who are currently ranked number 44 in Fortune 500 (Fortune 500) had to give up on the system as it discovered it could not fit into its new decentralized management model (Davenport, 1998b). For this reason, the academic literature of the late 1990’s has many papers suggesting the critical success factors (CSFs) for the successful implementation of an ERP system.

2.7 Critical Success Factors for ERP Systems Implementation

In order to achieve a successful implementation, the extant literature offers lists of the necessary CSFs. Bullen and Rockart (1981) define CSFs as the limited number of areas in which “satisfactory results will ensure successful competitive performance” (p.7). Boynton and Zmud (1984) describe them as the things that must go well to ensure success for a manager or an organisation. Ngai et al. (2008) have a similar definition of critical success factors (CSF) when they describe them as the limited areas where “things must go right for the business to flourish and for the managers’ goals to be attained” (p.548). In relation to the successful implementation of ERP systems, Finney and Corbett (2007) state that CSFs are:
“... any condition or element that was deemed necessary in order for the ERP implementation to occur successfully” (p.331).

Dezdar and Amid (2009) agree stating they are the areas vital to the organisation if the implementation process is to be a success. Past and current researchers have comprehensively studied and listed several CSFs that are critical to the success of ERP implementations (Kapur et al., 2014). The next section examines the main CSFs cited in the existing literature for the successful implementation of an ERP system, namely top management commitment, shared vision, good communication, cross-functional team, experienced staff, vendor and consultant support, knowledge transfer, adequate training and business process re-engineering.

2.7.1 Top Management Commitment

Top management commitment and support has been identified by many researchers as one of the main critical success factor of ERP implementation (Davenport, 1988b; Bingi et al., 1999; Buckhout et al., 1999; Shanks et al., 2000; Murray and Coffin, 2001; Allen et al., 2002; Al-Mashari et al., 2003; Sarker and Lee, 2003; Woo, 2007; Bologa et al., 2009; Nah et al., 2003; Amid et al., 2012).

Top management must have strong leadership skills in order to show its commitment for the ERP implementation, be able to analyse the project and achieve overall success (Nizamani et al., 2014). Ngai et al. (2008) encapsulate the importance of top management commitment and support by marking out the ERP projects must:

“...receive approval and support from top management before it can be implemented. Top management must be willing to become involved and to allocate valuable resources to the implementation effort” (p.556).

If top-level managers lack awareness it could lead to a “major barrier” and can prevent the “successful implementation of ERP system” (Hakim and Hakim,
It is only with their support that an ERP implementation will achieve its objectives and be a success (Rabaa’i, 2009; Sumner, 1999). Therefore it is imperative that management view the implementation as a high priority project (Shanks et al., 2000; Dezdar, 2012). Senior management support is evidenced by showing strong leadership (Sarker and Lee, 2003; Rabaa’i, 2009; Venugopal and Rao, 2011; Maditinions et al., 2012) getting involved in the project (Davenport, 1998b; Holland and Light, 1999; Nah et al., 2003; Yusuf et al., 2004; Wang and Chen, 2006; Woo, 2006; Ngai et al., 2008; Dezdar, 2012), monitoring the progress and provide direction (Al-Mashari et al., 2003) and by allocating the right resources on time to the project (Ngai et al., 2008; Venugopal and Rao, 2011).

Top management commitment and support should not stop at the implementation stage. They should be involved up until the system is fully implemented into the company. As stated by Ewusi-Menson and Przanyski (1991) (cited by Somers and Nelson (2001)) the omission of top management support is a main reason of project failures, as many senior managers have delegated progress monitoring and decision making at critical stages. Top management must maintain the role of monitor and provider of direction to the relevant staff (Murray and Coffin, 2001; Al-Mashari et al., 2003; Dezdar, 2012).

### 2.7.2 Shared Vision

Not only must the project have top management support, for an organisation to successfully implement an ERP system it is imperative that a shared vision runs throughout the organisation and amongst all stakeholders (Buckhout et al., 1999; Holland et al., 1999; Cathon, 2000; Rasario, 2000; Nah et al., 2001; Joseph and George, 2001; Al-Mashari et al., 2002; Umble et al., 2003). The organisation’s vision must be broken down into well-define goals and strategic targets (Welti, 1999; Al-Mashari et al., 2003) that are clear and measurable (Al-Mashari et al., 2003). Al-Mashari et al. (2003) cites the work of Davenport (1998b) when they emphasise the importance of establishing a clear vision;
“If an organisation strives to install a system without establishing a clear vision and understanding of the business propositions, the integration efforts can quickly turn into a disaster, no matter how competent is the software package selected” (p.358).

Employees’ resistance to a new ERP system, resulting in lack of moral and motivation, is a factor in the failure of the new system (Amid et al., 2012). Social risk factors can also cause failure as the long hours and hard work involved will result in employees work patterns changing (Wu et al., 2008). A shared vision can help overcome employees’ resistance (Žabjek et al., 2009) and stimulate a good work environment (Mandal and Gunasekaran, 2003). Placing an emphasis on the importance of having shared goals and targets should result in positive employee attitude, moral and motivation towards the implementation of the system (Bingi et al., 1999; Holland and Light, 1999; Ross and Vitale, 2000; Shanks and Parr, 2000; Kumar et al., 2002; Trimmer et al., 2002; Finny and Corbett, 2007).

The organisation should ensure that all members of the organisation receive education and information about the benefits and needs for the ERP system (Aladwani, 2001; Somers and Nelson, 2001; Bajwa et al., 2004; Finny and Corbett, 2007; Žabjek et al., 2009). Teamwork (Joseph and George, 2002) and supervision (Harrington, 1991) will also contribute to the organisation sharing its vision throughout the organisation. Good communication is the foundation that will help share the organisations vision amongst all its members (Ross, 1999; Rosario, 2000; Wee, 2000; Nah et al., 2003; Loh and Koh, 2004; Ngai et al., 2008; Koh et al., 2009).

2.7.3 Communication

In order for a company to successfully implement an ERP system, once it has identify its expectations and goals (Falkowski et al., 1988; Wee, 2000; Nah et al., 2003), it needs to clearly and effectively communicate them throughout the organisation (Holland et al., 1999; Ross, 1999; Wee, 2000; Al-Mashari et al., 2003; Nah et al., 2003; Loh and Koh, 2004; Ngai et al., 2008; Koh et al., 2008).
Slevin and Pinto (1987) define communication in the implementation of an information system as:

“The provision of an appropriate network and necessary data to all key factors in the project implementation” (p.34).

Rohm and Berezny (1996) describe communication as the “oil that keeps everything working properly” (p.57). Clear communication should lead to improvements in the implementation process (Ross, 1999; Nah et al., 2003) as communicated goals have the ability to assist an organisation in recognising “milestones in ERP implementation” (Nah et al., 2003, p.11).

Clear, effective communication can be achieved by advertising, promoting and making announcements of the projects progress to the entire company (Falkowski et al., 1988; Holland et al., 1999; Nah et al., 2003; Ngai et al., 2008). This can be done by holding regular meetings (Sumner, 2000; Dezdar, 2012) sending out newsletters, holding focus groups, by emails and by giving employees access to web based archive (Rabaa’i, 2009). With these effective communication channels in place, the employees can find out what the organisation is doing (Dezdar, 2012). In a case study of Chinese companies that have implemented ERP systems, Woo (2007) highlighted the importance of communicating the companies’ goals to employees, as poor communication resulted in the employees not understanding the reasons for implementing an ERP system, how the ERP system would affect them personally and they had major concerns about their position in the company.

Communication is cited by many as one of the most challenging and difficult tasks in any ERP implementation project (Welti, 1999; Wee, 2000; Kumar et al., 2002; Nah et al., 2003; Al-Mashari et al., 2003; Loh and Koh, 2004; Finny and Corbett, 2007; Koh et al., 2009). Issues that can cause problems in the communication process can range from faulty communication between the different departments especially between the reengineering team and other organisation members (Somers and Nelson, 2001; Bologa et al., 2009), to unavoidable risks involved due to the “different languages or technical jargon
used” (Loh and Koh, 2004, p.3446). Management and the IT specialists tend to use a different terminology, which can lead to “communication complexity” (Bologa et al., 2009, p.31).

Communication should be treated with the same importance as any other aspect of the business and therefore a communication plan needs to be put in place from the outset (Bancroft et al., 1998; Kumar et al., 2002; Al-Mashari et al., 2002). The plan should be set out and deal with the following: an overview and the reasons behind the implementation of the ERP system, a briefing to any change in process management, the objectives and tasks of the project to employees, a demonstration of the software, establish contact points, set up a project team and the announcement of the projects progress along with periodic updates to employees (Bancroft et al., 1998; Holland et al., 1999; Sumner, 2000; Al-Mashari et al., 2003; Nah et al., 2003; Ngai et al., 2008). Educational workshops, clear instructions and messages and an open information policy should all be provided to employees to insure that there is no communication breakdown during the implementation stages (Welti, 1999; Loh and Koh 2004).

2.7.4 Cross-functional Team

Teamwork plays an important role in the implementation and maintenance of any information system (Bingi et al., 1999; Buckhout et al., 1999; Wee, 2000; Nah et al., 2001; Joseph and George, 2002). In order for an ERP system to be successfully integrated into an organisation, it needs to be implemented by cross-functional and multi-skilled teams (Sumner, 2000; Davenport, 2000; Wee, 2000; Joseph and George, 2002; Kumar et al., 2002; Jensen et al., 2005). According to Bingi et al. (1999) the team members should have some ERP technical know-how and an understanding of how the organisation business strategy works. Rasario (2000), Shanks et al. (2000) and Nah et al. (2003) emphasise the need for team members that are familiar with the business functions.

Along with having the best people from within the organisation, the team should also consist of a mix of consultants and internal staff (Sumner, 2000). Poor
teamwork will “slow the speed and reduce the efficiency while working with each other” (Loh and Koh, 2004, p.3446). Organisations should introduce incentives to help them overcome poor teamwork (Wee, 2000; Joseph and George, 2002; Loh and Koh, 2004).

2.7.5 Experienced End Users

Grover et al. (1995), Bingi et al. (1999), Cliffe (1999), Ross (1999), Shanks and Parr (2000), La Rock (2003), Finny and Corbett (2007), Koh et al. (2009) and Nah et al. (2003) are all in agreement that the participation of experienced end-users within the cross-functional implementation team is essential in the implementation of an ERP system. Nah et al. (2003) stress the importance of having experienced end users when he cites the results of a survey carried out by Jiang et al. (1996):

“...having competent members in the project team is the fourth most important success factor for IS implementation” (p.12).

Without experienced staff members, the implementation and maintenance of an ERP system will almost certainly fail (Grover et al., 1995). Therefore, the possibility of failure can be overcome by recruiting the best people in the organisation or those with valuable experience from the implementation of past information systems onto the ERP team (Jiang et al., 1996; Bingi et al., 1999; Cliff, 1999; Ross, 1999; Shanks et al., 2000; Wee, 2000; Finny and Corbett, 2007; Koh et al., 2009; Nah et al., 2010). These people need to be on-board right through implementation and maintenance (Nah et al., 2007; Dezdar and Ainin, 2011).
2.7.6 Vendor and Consultant Support

The support given by vendors is also of vital important to the success of the ERP project implementation (Stackploe, 1999; Davenport, 2000; Somers and Nelson, 2001; Dezdar, 2012). ERP vendors provide a wide range of services to their clients. The services cited in the literature include emergency assistance and maintenance, updates, special user training (Zhang et al., 2005; Somers and Nelson, 2007) user and operation guides, manuals and other documents that may be required for using the ERP system provided (Dezdar, 2012). Organisations need this comprehensive support because of the complexity of ERP systems and the difficulty involved in implementing such a project without the benefit of external knowledge (Sawah el al., 2008).

Organisations should check at the vendor selection stage the range services provided (Dezdar, 2012), as implementing an ERP system can be a lifelong commitment for many companies (Davenport, 2000; Somers and Nelson, 2001). The organisation, which is selecting the vendor, should also check if the vendor has knowledge and previous experience of the industry and should also check if they communicated well with past customers (Dezdar, 2012). This should be done to insure the success of the project, as poor vendor support can result in implementation failure (Amid et al., 2012). Once a suitable vendor is selected organisations may also acquire the additional and essential assistance of a consultant to facilitate in the implementation process (Somers and Nelson, 2001; Chang, 2004; Wang and Chen, 2006; Finny and Corbett, 2007; Maditinos et al., 2012; Rabaa’i, 2009).

Consultants are used because they have experience in the industry in question and have vast knowledge about certain modules (Piturro, 1999). Maditinos et al. (2012) see the assistance they can provide as being more “important than that provided by top managers” (p.72). Maditinos et al. (2012) cites research by Bingi et al. (1999), Al-Mashari et al. (2002), Willcocks and Stykes, (2000), Motwani et al. (2002), Trimmer et al. (2002), Skok and Legge, (2002), and Bajwa et al. (2004) when they describe the different roles ERP consultants play in the
implementation of ERP projects as being able to staff the project team, audit the project, serve as the prime contractor and by being the one source for everything. Ghosh and Skibniewski, (2010) state the importance of vendors and consultants working as one when they write:

“ERP vendors and ERP consultancy combine their efforts and resources to achieve mutually desirable goals” (p.537).

With consultants been given responsibilities and control over the implementation it is still the organisation that needs to take full control and responsibility for the projects lifecycle (Cooper and Zmud, 1990). Consultants should hold good communication skills in order to resolve any conflicts that may arise (McLachlin, 1999), and be able to transfer of knowledge from the consultant to the implementing organisation (Al-Mashari et al., 2003). This will reduce the dependency the organisation will have on the consultant in the long run (Skok and Legge, 2002).

2.7.7 Knowledge Transfer

ERP implementation is a “knowledge intensive process” (Wang et al., 2007, p.201) that will require plenty of experience from a vast range of stakeholders. These individuals need to interact and share this knowledge especially during the implementation stage. Davenport and Prusak (2000) describe knowledge as:

“Knowledge is a fluid mix of framed experience, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experiences and information. It originates and is applied in the minds of knowers. In organizations, it often becomes embedded not only in documents or repositories but also in organizational routines, processes, practices, and norms.” (p.4).

If an organisation lacks the knowledge needed for an ERP implementation, it may have to transfer the required knowledge from external sources such as a consulting firm (Timbrell and Gable, 2001). It is important that any knowledge about the ERP system that the organisation is implementing must flow from the
people responsible for implementing the system to the employees who will use and maintain the system once it is up and running. It is seen as the procedure of transferring knowledge from external consultants and vendors to the internal environment of the company (Wang et al., 2007). This information will be translated, adopted and combined with the knowledge of the organisations processes (Wang et al., 2007), thus resulting in a raised level of user knowledge (Davenport, 2000; Wang et al., 2007; Maditions et al., 2012).

Consultants are seen as being both a knowledge provider and facilitator during the implementation stage (Wang et al., 2007). The knowledge transfer is not always one-way traffic as consultants can learn from their own clients, even sometimes choosing what organisations to take on based on the opportunity to exchange knowledge (Sveiby, 1997). Organisations that are implementing an ERP system must build the necessary structures in order to enable the procedure of knowledge transfer (Maditions et al., 2012). Knowledge can be created and shared through formal training and knowledge creation activities (Bingi et al., 1999; Davenport and Prusak, 2000; Wang et al., 2007). Maditions et al. (2012) suggest that organisations should run some computer seminars to help consultants transfer knowledge to employees that might be computer illiterate.

2.7.8 Adequate Training

Poor training of end-users, limited knowledge and experience of the staff in-charge, and the difficulty some companies have in drawing new staff in the technology area are other major problems that companies have faced in the past (Hawking et al., 2001; Joseph and George, 2002; Al-Mashari et al., 2003; Jesen et al., 2005). Even if the company possesses the skilled and experienced user, they will still require rigorous training (Sumner, 1999; Bradford and Florin, 2003; Loh and Koh, 2004; Somers and Nelson, 2004). If the vital employees of the organisation are poorly trained, it can lead to problems and failures with ERP implementation (Grover et al., 1995; Wilder and Davis, 1998; Crowley, 1999; Vosburg and Kumar, 2001; Somner and Nelson, 2004). In a similar vein Beatty and Willians (2006) highlight the importance of adequate training:
“The true benefits of upgrading an ERP system cannot be realised if users are not using the system properly” (p.109).

Training ERP users is complex, costly and time-consuming (Bingi, et al., 1999; Murray and Coffin, 2001). Training material may be difficult for employees to understand (Woo, 2007) as employees may lack computer literacy resulting in resistance to change. To resolve such problems Holland and Light (1999), Kumar et al. (2002), Woo (2007), and Finny and Corbett (2007) are all in agreement that to support improvement in the training process, companies should try to build a positive attitude and user acceptance through communication. Top management should call a brief meeting to introduce, inform all users about the importance of the system, and explain any changes that the new system brings (Loh and Koh, 2004). Wee (2000) suggested establishing a training department. Training needs to be done in order to show employees how ERP works, why it is important and why it is implemented (Nizamani et al., 2014). Continuous training should be hands-on throughout the implementation process (Davenport 1998b; Bingi, 1999; Russo and Kremer, 1999; Wee, 2000; Aladwani, 2001; Dezdar, 2012). On-line user manuals, workshops and access to a help desk should be available to all relevant employees in order to give the support that is needed (Rabaa’i, 2009). The transfer and sharing of information amongst all users can help companies overcome problems that may arise during ERP training (Davenport, 1998b; Stefanou, 1999; Nah et al., 2010).

2.7.9 Business Process Re-Engineering

Davenport and Short (1990) defined Business Process Re-engineering (BPR) as the analysis and design of the work and processes within and between organisations. Talwar (1993) described it as a move towards the rethinking, restructuring and streamlining of the business structure, process, methods of working, management systems and external relationships through which value is created and delivered. Petrozzo and Stepper (1994) depict it as the parallel redesign of processes and organisations. Rouse (2009) also use the phrase redesign, stating that BPR is the redesign of workflow with and between
enterprises. Both Vantrappen (1992) and Chang (1994) agree that the primary aim of BPR is to redesign processes with regard to improving the customer’s perspective.

An organisation’s processes and structures may not be compatible with the processes of the ERP system it wishes to implement. There are two schools of thought on how to rectify this. One is that in order for an organisation to take full advantage of its ERP software, the processes and structures of the organisation must undergo BPR (Bingi et al., 1999; Mandal and Gunasekaran, 2002; Yusuf et al., 2004; Woo, 2007; Ngai et al., 2008). The implementation of its ERP system involves reengineering the existing business processes to meet that organisation best business process standard (Umble et al., 2003; Woo, 2007; Bingi et al., 2009) and “support the requirements of the ERP system” (Woo, 2007, p.437).

The other school of thought is that the ERP system can be reengineered to fit the existing business processes of the organisation (Robert and Barrar, 1992; Bingi et al., 1999; Holland et al., 1999; Watson and Schneider 1999; Murray and Coffin, 2001; Nah et al., 2001; Somers and Nelson, 2001; Loh and Koh 2004; Luo and Strong, 2004; Woo, 2007; Lacoma, 2012). Zach and Munkvold (2012) found that the organisations they interviewed wanted to keep their existing business processes in place as these were perceived as unique to those organisations operations In order for the organisation to successfully accommodate the reengineering of an ERP system it is necessary to highly customise the ERP system. Davenport (1988b) refers to how Compaq used a custom forecasting module to help them gain a competitive advantage over other companies in the personal computer industry, who all used the same ERP package. By tailoring the ERP package, it can increase the functionality of the ERP system resulting in increased competitive advantage (Brehm et al., 2001; O’Mahony and Doran, 2008).

According to Exforsys Inc., (2006b) customisation is one of the biggest problems associated with ERP systems. Dittrich and Vancouleur (2008) describe customisation as the changes that are made:
“...to the base program itself that becomes necessary when the flexibility provided for by configuration facilities is not sufficient” (p.37).

Extant literature suggest keeping customisations to a minimum (Robert and Barrar, 1992; Holland et al., 1999; Holland and Light, 1999; Sumner, 2000; Harris, 2000; Nah et al., 2001; Somers and Nelson, 2001; Loh and Koh, 2004; Vervillee et al., 2005; Finny and Corbett, 2007), the most propelling reason being the spiralling cost of implementing (Bingi et al., 1999; Sumner and Nelson, 2001). Along with the cost associated with customisation, it can also consume extra internal resources (Beatty and Williams, 2006). Swan et al. (1999) and Markus et al. (2000) all agree that many organisations that customise the ERP software exceed their budgets because of the need to customise more than what they had originally planned. Other reasons cited in the literature are the more a company customises the original ERP system the more at risk that company is of errors occurring (Rosario, 2000) and customisation tends to prolong the implementation process (Bingi et al., 1999). Bingi et al. (1999) summarise their reasons for minimise customisation as follows:

“The extent of customisation determines the length of the implementation. The more customisation needed, the longer it will take to roll the software out and the more it will cost to keep it up-to-date” (p.5).

Davis (1998) surveyed the Fortune 1000 companies finding that 41% of the companies reengineer their business to fit the applications, 37% choose applications that fit their business and perform minor customisations and only 5% customise the application to fit their business. This would indicate that most companies are aware of the limitations involved in of highly customising the ERP system. They should keep their systems as is as much as possible to reduce the costs of customisation and future maintenance and upgrade expenses (Bingi et al., 1999).

### 2.8 Need for ERP Education

The fact that all of the organisations that are implementing and using ERP systems are looking for staff with ERP experience, has caused a shortage of ERP
experienced personnel in the marketplace. As a result, businesses are going directly to third-level institutions looking for graduates with ERP education (Hawking et al., 2001; Abugabah and Sanzogni, 2010; Wilson and Lindoo, 2011).

“There are many consulting firms recruit from graduate and undergraduate programs at universities around the world to fill sizable gaps in their ERP consulting staff” (Abugabah and Sanzogni, 2010, p.49).

These graduates will not resist the implementation of an ERP system, they will bring their knowledge and experience to the company and they will not need as much training as someone unfamiliar with an ERP system. Industry is therefore calling on third-level institutes to provide ERP education to its Business students. (Kanthawongs, 2010; Pridmore et al., 2014)

2.9 Conclusion

This chapter used the extant literature to define Enterprise Resource Planning (ERP) systems and examine how ERP systems have evolved over time. ERP originated from Material Requirements Planning (MRP) and Manufacturing Resources Planning (MRPII), which are both defined and explained. The advantages of having an ERP system successfully implemented into an organisation were then broken down into four headings; increased functionality, cost effective, better quality information and reduced administration. Implementing an ERP system can also have its drawbacks for organisations such as growing costs, resistance to change and problems with achieving accurate data entry. These disadvantages have led to high failure rates. As a result, much has been written on the critical success factors (CSFs) necessary in the implementation of an ERP system. The chapter then examined each of the nine most cited critical success factors necessary successful implementation of an ERP system. These factors include top management commitment, a shared vision, good communication, cross-functional implementation team, experienced staff, vendor and consultant support, knowledge transfer, adequate training and business process re-engineering. ERP education can alleviate some of these factors.
Among the CSFs the terms “training”, “knowledge” and “experienced” are used, however ERP education is not included. This dissertation aims to determine how ERP education can be incorporated in the third-level Business curriculum to help improve the CSFs in the implementation and use of ERP systems. The next chapter will examine the existing literature on ERP education.
Chapter 3  Review of ERP Education Literature

3.1  Introduction

This chapter examines the extant literature on Enterprise Resource Planning (ERP) systems education. It begins with a discussion of the reasons why third-level institutions wish to include ERP education in their Business curriculum and the challenges these institutions face in doing this. The chapter continues by examining the type of skills industry is looking for in Business graduates and considers how University Alliance Programs (UAP) developed by ERP vendors helps bridge the skills shortage that exists. The benefits these UAPs bring to the third-level institutes, the students and to the ERP vendors are then discussed.

This chapter then discusses the various teaching methods that can be used by third-level institutes to incorporate practical ERP skills into the curriculum. The chapter concludes with a discussion of the need for third-level institutes to get the right balance between conceptual ERP knowledge and system-specific functionality depending on the type of graduates it wishes to have.

3.2  Why Integrate ERP Systems into Curriculum

ERP systems are taking the business community by storm (Boyle and String, 2006), the main reason being that ERP systems involve most, if not all, functions of organisations (Klaus et al., 2000; Egie and Madsen, 2005; Ghosh and Skibiewski, 2010; Kwahk and Ahn, 2010; Ansarinejad et al., 2011; Maditions et al., 2012). With organisations using ERP systems to “optimise their resources and keep themselves afloat in this era of competition” third-level institutions cannot be left behind (Khan and Shaikh, 2014, p.40). It is therefore no surprise that this increased in significance to organisations around the world has led to its inclusion and increased importance in educating future business people (Kumar and Van Hillegersberg, 2000; Roa, 2000; Joseph and George, 2002; Jensen et al., 2002;
Chung and Synder, 1999). Third-level institutes are responding to this industry demand by including ERP education on their business curriculum.

### 3.2.1 Industry Demand

The need for experienced staff combined with the high cost associated with training staff (Exforys Inc., 2006b; Sheng et al., 2003) has resulted in companies seeking to employ individuals with prior ERP systems experience (Becerra-Fernandez et al., 2000; Hawkings et al., 2001; Bradford et al., 2003; Byrne and Flood, 2003; Boykin and Martz, 2004; Fedorowicz et al., 2004; McCarthy and Stein, 2004; Strong et al., 2006; Abugabah and Sanzogni, 2010; Deng et al., 2010; Alshare and Lane, 2011). While prior experience can come from work experience with ERP systems, organisations are now hiring students with ERP experience directly from third-level institutes, if applicants with appropriate work experience are not available (Hawking et al., 2001; Abugabah and Sanzogni, 2010; Wilson and Lindoo, 2011). They are looking for Business graduates with experience of working on a ERP system and the ability to understand how ERP systems integrate business processes (Pridmore et al., 2014).

Due to this demand from industry, academics and practitioners have written about attempts made by third-level institutes to include ERP education into their Business curriculum (Kumar and Van Hillegersberg, 2000; Shtub, 2001; Antonucci et al., 2004; Fedorowicz et al., 2004; Hawkings et al., 2004; McCarthy and Stein, 2004; Boyle and String, 2006; Seethamraju, 2007; Barnes and Ferguson, 2008; Cameron, 2008; Mohamed and McLaren, 2009; Winkelmann and Matzner, 2009; Winkelmann and Leyh, 2010; Kathawongs and Kathawonga, 2011; Rienzo and Han, 2011; Leyh, 2012; Pridmore et al., 2014). Third-level institutes are now attempting to integrate ERP into their educational settings to both improve student’s practical skills and to make students understand the integrated nature of business processes (Antonucci et al., 2004).
3.2.2 Third-Level Institutes Response

Watson and Schneider (1999), Becerra-Fernandez et al. (2000) and Kirkham and Seymour (2005) see ERP as a tool, to change the focus of business education away from a functional focus towards an integrated business process oriented focus. For institutions to better serve business needs Becerra-Fernandez et al. (2000) see ERP as:

“...a vehicle that will enable the change in educational delivery from functionally oriented to business process oriented, with the ultimate goal of integration of the curriculum across functions” (p.39).

The practical use of an ERP system gives students a more holistic view of the organisation by forcing them to visualise how all of the functions of the business work together for the good of the organisation as a whole.

“After a few years of a traditional stove-pipe business education, students still have trouble understanding how all the components of an integrated system fit together. The ERP system provides this perspective” (Watson and Schneider, 1999, p.10).

Joseph and George (2002) concur with this, suggesting that ERP forms the basis for a new education approach that will help address the “pedagogical and epistemological challenges facing education” (p.51).

Lecturers must stay abreast of new advances in information technology and incorporate the current concepts and tools into curricula (Bradford et al., 2003), bring the relevant industry practices into the classroom (Antonucci et al., 2004), take a more proactive role in the development of up-to-date learning processes (Selen, 2001) and develop graduates with skills and experience of how an integrated business works (Bingi et al., 1999; Byrne and Flood, 2003; Fedorowicz et al., 2004; Hawking et al., 2004; Johnson et al., 2004; Peslak, 2005). Davis and Comeau (2004) express a concern that the hands-on experience in ERP may shift some importance away from business concepts and management principles. But most researchers believe that, by including ERP education in the curriculum,
students are given the advantage of having an opportunity to work with real world business information systems (Hawkings et al., 2004; Fedorowiaz et al., 2004; Kirkham and Seymour, 2005; Jensen et al., 2005; Kanthawongs and Kanthawongs, 2010, 2011; Cronon and Douglas, 2012). Chen et al. (2001) state that by introducing ERP software into the curriculum, students can familiarise themselves with integrated business processes software, demonstrate the different relationships between the logistics and gain the ERP skills required by employers. Watson and Schneider (1999) explain that ERP education provides “real-world exposure” allowing students an opportunity to “look inside and see how it is built...students can take it for a test run” (p.10).

Third-level institutes, by including ERP education, will improve their credibility “in the eyes of industry”, instead of being “criticized for their ignorance of and isolation from industry” (Watson and Schneider, 1999, p.10). They can also use it as a “marketing tool to attract potential student” (Bradford et al., 2003, p.439). Indeed, academics claim that having ERP systems integrated into the curriculum helps institutions attract high quality students (Byrne and Flood, 2003) as it is not a system that students would get to work with during the course of their normal studies (Hawking et al., 2001).

3.2.3 Student Demand

Along with third-level institutes recognising the industry demands to provide ERP experienced graduates education, the students themselves will at some stage demand this service if it is being offered by other institutions (Vluggen and Bollen, 2005; Zornada and Velkavrh, 2005). Student demand is increasing as:

“Many business students realise the demand for these skills and the importance of exposure to ERP systems” (Bradford et al., 2003, p.439).

The demand by students is also increasing as students are making career decisions earlier, sometimes even before finishing their second level education (Nelson and Deines, 1995; Nelson and Vendrzyk, 1996; Byrne and Flood, 2003).
Students have begun to realise that there is a lucrative job market available to them if they have ERP systems experience (Hawking et al., 2001; Bradford et al., 2003; Boykin and Matrz, 2004; Davis and Comeau, 2004; Fedorowicz et al., 2004; Hawking et al., 2004; Boyle and String, 2006; Abugabah and Sanzogni, 2010; Alshare and Lane, 2011) and will obtain higher starting salaries than students without these skills (Corbitt and Mensching, 2000; Sager et al., 2006; Kanthawongs and Kanthawongs, 2010; Alshare and Lane, 2011; Cronan and Douglas, 2012). Andrea et al. (2008) state that on average the starting salary of graduates with ERP training is $4,056 more than that of their peers who had no ERP training. The higher starting salaries are backed up by research carried out by Cronan and Douglas (2012) that compared the salaries of students who enrolled in ERP classes against all other business graduates who lacked ERP experience. The starting salaries of those with ERP education were 20% higher in 2008 and 11% greater in 2010 (salaries were similar in 2009 which was credited to the downturn in the economy).

Third-level institutes must begin to recognise that they are running a business and the students are one of their customers (Bologa et al., 2009) and companies hiring their graduates are another. Because of the demand by student and industry to integrate ERP software into curriculum, if third-level institutes do not respond quickly they may encounter trouble in retaining their market share of students (Zornada and Velkavrh, 2005). Having practical ERP education in the curriculum is beneficial to industry, third-level institutes and students. The next section will discuss how traditional teaching methods are not adequate for the provision of ERP education.

3.3 Traditional Teaching Methods

In traditional teachings methods the lecturer is in control of the learning environment, examples include lecturing, drill and teacher-led discussions followed by an explanation (Chamunorwa, 2010). A lecture is the earliest form of delivering information from a lecturer to the students (Baker, 1998). Lecturers talk to the students during the class, and the students are expected to learn
everything they need through these lectures (www.Arzelonline.com). Lectures are seen as being appropriate for teaching large groups and for presenting factual material (Chamunorwa, 2010). The fact that they have been used, and survived, for thousands of years is evidence “that the method possesses some unique strength” (Chamunorwa, 2010, p.1). Lecture-based instructions can also be beneficial to third-level institutions as they are efficient and economical (www.Arzelonline.com), however, they may not be the ideal way to teach ERP education. This traditional method of teaching can make it hard for students to “understand and appreciate cross-functional and integrated business processes” (Pridmore et al., 2014, p.2). In particular, traditional methods do not provide students with the “adequate training” they require to “apply knowledge, skill and abilities in ERP based business settings” (www.aaahq.org). It lacks participation, adaptability and creativity from the students (Chamunorwa, 2010).

The use of a textbook in ERP education is also criticised as it does not giving students hands-on experience, resulting in a poor knowledge of business concepts and functions or processes (Peslak, 2005) and tends to make students passive learners (Bok, 1986). Gupta and Ruppel (2007) reviewed many ERP books, concluding that none of the books was sufficient for third-level institutions to use in the classroom for a full semester without the aid of computer laboratory classes (labs) or extra teaching material. Hands-on, real-life experience cannot be gained by students using these traditional methods. In order for third-level institutions to improve the learning effectiveness and learning of ERP concepts and skills, it is essential to introduce “innovative teaching and learning models” (Sweethamraju, 2006, p.19).

The current literature does suggest a combination of traditional teaching methods and hands-on experience with ERP systems (Pridmore et al., 2014: Johansson et al., 2014). This approach is suggested because the:
“...integration of hands-on ERP exercises and case studies help teach ERP concepts and the integration of business processes. By presenting and having students complete hands-on cross-functional process exercises, educators could possibly teach more effectively cross-functional business process knowledge” (Pridmore et al., 2014, p.2).

However, introducing practical ERP education does not come without their challenges.

3.4 Challenges Introducing ERP Education

Even though demand for, and the benefits from, incorporating practical ERP system education in the third-level Business degree programmes is growing, it does not come without overwhelming challenges for the institute (Still and Petty, 2000; Walker and Black, 2000; Hawking et al., 2001). The main challenges faced by third-level institutes in the implementation of ERP practical education are the excessive cost, in terms of money and time, the complexity of ERP systems, the shortage of experienced academics, the lack of teaching materials and the level of business and IT knowledge required by students (as depicted in Figure 3.1 below, produced by the researcher).

3.4.1 Cost of Practical ERP Education

From an examination of the extant literature, one of the main stumbling blocks associated with integrating practical ERP systems education into third-level education is the initial cost (Waston and Schneider, 1999; Walker and Black, 2000; Hawking and McCarthy, 2000; Allen et al., 2002; Joseph and George, 2002; Bradford et al., 2003; Davis and Comeau, 2004; Everard et al., 2005; Kirkham and Seymour, 2005; Vluggen and Bollen, 2005; Gupta and Ruppel, 2007; Cameron, 2008; Kanthawongs and Kanthawongs, 2010, 2011). The initial costs, including hardware, software and installation costs (Watson and Schneider, 1999; Bradford et al., 2003; Cameron, 2008; Kanthawongs and Kanthawongs,
2010), are seen as the “first hurdle that business schools must overcome” (Bradford et al., 2003, p.440).

Then, the cost associated with training faculty to teach ERP systems in the classroom can also be quite significant (Walker and Black, 2000). As well as the training fees, there are other costs such as travel and accommodation expenses for faculty that need to attend workshops (Kanthawongs and Kathawongs, 2010). Becerra-Fernandez et al. (2000) estimate the cost of the hardware and software, excluding the cost of training faculty, at $50,000, Corbitt and Mensching (2000) quote a cost of investing in hardware, software and training at $200,000. According to Gupta and Ruppel (2007) third-level institutions typically do not have the financial resources needed to incorporate these systems into their curriculum.

The opportunity cost is another category of cost that must be considered. Watson and Schneider (1999) are of the opinion that opportunity costs could be the largest cost associated with integrating ERP systems into third-level institutes. They believe that institutes see the time and effort required for integrating, learning, and developing a curriculum could perhaps be better used elsewhere. Hawking and McCarthy (2000), Joseph and George (2002), Webster (2003) and Cameron (2008) agree stating that this investment in time is a major challenge for institutes. Bradford et al. (2003) is in agreement citing the work of Webster (2003) when he describes time as being a major investment:

“A successful ERP implementation, even for academic users, involves a significant investment in time...” (p.440).

It is for these reasons that third-level institutions should not underestimate the cost and time it will take them to implement ERP software into the business school curriculum for teaching purposes (Scott and Gable, 1997).
3.4.2 Complexity of ERP System

Third-level institutes deciding to introduce an ERP system into education should be aware of the complexity of implementing such a system and the complexity of integrating ERP education into the curriculum. The purchase and implementation
of ERP systems for educational purposes means that the "technical capabilities and resources of the institution will be strained" (Barnes and Ferguson, 2008, p.109). The complexity of the maintenance of such a system must also be considered. If the institute does not have previous experience the:

"...installation of the software and teaching database is challenging and system maintenance and support also demand the development of specific skills" (Barnes and Ferguson, 2008, p.109).

Not only is the physical installation and maintenance of an ERP system a complex issue for institutes, many institutions perceive integrating ERP education into the curriculum as being far too complex (Stevens, 2000; Nelson, 2002; Bradford et al., 2003; Pridmore et al., 2014).

Third-level institutions also face the common problem of faculty resisting change (Walker and Black, 2000; Vluggen and Bollen, 2005; Sager et al., 2006). Vluggen and Bollen (2005) feel that academics tend to resist the introduction of new software packages into the curriculum. The main resistance to change, as suggested by Sager et al. (2006), is that most faculties will have been trained in one specialised or functional area and will lack the interdisciplinary knowledge needed for ERP education.

3.4.3 Shortage of Experienced Academics

In order to incorporate ERP in their curriculum, third-level institutes need to have staff with knowledge and experience of ERP in place before they introduce ERP modules into the curriculum (Gable et al., 1997; Waston and Schneider, 1999; Becerra-Fernandez et al., 2000; Bradford et al., 2003; Hawking et al., 2004; Davis and Comeau, 2004). Finding this high level of academic staff both internally and externally can be problematic due to the high demand for staff in this area (Becerra-Fernandez et al., 2000; Bradford et al., 2003) and the shortages in supply of academic professionals with ERP skills (Everard et al., 2005). Research carried out by Meta Group confirms that ERP trained employees will continue to be one of the highest earners going into the future (Stones, 2004).
Third-level institutes wishing to hire people with the ERP experience needed will find it difficult to match the salaries provided to these people in industry (Waston and Schneider, 1999; Cameron, 2008; Kanthawongs and Kanthawongs, 2010). Cameron (2008) suggests the necessity for “significant salaries” to coax people “away from industry” making “the switch to academia appealing” (p.121). Waston and Schneider (1999), Becerra-Fernandez et al. (2000), Rosemann and Watson (2002) and Bradford et al. (2003) are all in agreement that in order to attract and keep the academic staff required, they must offer them attractive incentives.

An alternative would be to train current staff through the support of an external consultant with ERP experience (Bradford et al., 2002), perhaps through in-house training (Becerra-Fernandez et al., 2000). Bradford et al. (2003) suggests that academic staff should be offered curriculum development grants, granted course releases to provide them time to develop or change their curriculum in order to include ERP systems; and incorporate goals or points of evaluation related to ERP integration into faculty assessment practices and procedures. This may be appealing to academics because as well as teaching ERP to students, academics may also benefit by increasing their opportunities for development (Davis and Comeau, 2004) and opportunities for integrative research across different disciplines (Joseph and George, 2002).

Institutes need to be aware though that if they do decide to put time and money into training their current staff, these people could subsequently move to another institute or into industry to avail of higher salaries (Waston and Schneider, 1999; Kanthawongs and Kanthawongs, 2010). Hawkings et al. (2007) feel staff will be tempted to “seek employment in industry” where their remuneration would be “far greater than that offered by the university” (p.904).

3.4.4 Lack of Teaching Material

The development of appropriate teaching material is seen by Bradford et al. (2003) and more recently by Kanthawongs and Kathawongs (2010) as a
shortcomings of implementing an ERP course into the curriculum. This lack of teaching materials suitable for classroom use is a problem for the academics (Still and Petty, 2000; Morrison and Morrison, 2001; Bradford et al., 2003; Johnson et al., 2004; Deng et al., 2010), as only a limited amount of teaching material is provided by ERP vendors (Morrison and Morrison, 2001). This problem has resulted in some institutes having to tell the students how some operations in the software work without actually being able to demonstrate it to them (Deng et al., 2010).

Strong et al. (2006) suggest that third-level institutes need to design their own teaching material and not rely on the training material that the ERP vendors provide. Some of the training material used in industry may not be suitable at third-level but could be altered to meet the needs of students.

“Traditional ERP educational material, generally geared toward an end-user audience, must be reworked in order to consider it University level educational material” (Watson and Schneider, 1999, p.10).

If third-level institutes go ahead and decided to develop their own teaching material, they will need plenty of time and require an “intimate knowledge of a complex programme” (Bradford et al., 2003, p.440). To do this, staff proficient in the use ERP systems is required. Knowledge sharing among faculty, who are developing their own material would help because the same ideas are regularly re-invented and faculty will all have different methods of teaching and ideas (Bradford et al., 2003).

3.4.5 Students’ Limited Business and IT Knowledge by Students

Seethamraju (2004) and Rudra et al. (2009) also stress the complexity of ERP systems for students. Vluggen and Bollen (2005) argue that using ERP software can be “very difficult for students to grasp” (p. 50). The extent of any ERP system can easily overwhelm students (Davis and Cameau, 2004; Kanthawongs and Kanthawongs, 2011).
Third-level students might not have the understanding of the business processes and how these processes are integrated with the functional areas of a business (Becerra-Fernandez et al., 2000; Nelson, 2002; Ledger, 2006; Barnes and Ferguson, 2008) necessary to appreciate the working of an EPR system. Along with not having an understanding of the business process, the lack of terminology associated with these business processes is seen as an obstacle for students (Barnes and Ferguson, 2008). Students may have a limited knowledge and experience of the operational aspects of the system (Ledger, 2006) and have trouble grasping how the business processes of an organisation integrate (Nelson, 2002). Many business students may also lack the IT experience required (Davis and Comeau, 2004; Ledger, 2006). According to Davis and Comeau (2004):

“MIS students are sometimes exposed to ERP technology but business students in other functional areas are usually not” (p.288).

Moon and Kim (2001) have found that students’ lack of knowledge and experience in using technology could influence their intention to use it. This could in turn contribute to the attitude of the students during class (Kanthawongs and Kanthawongs, 2011; Alshare and Lane, 2011). The preconception by students that ERP systems are still hard to learn (Davis and Comeau, 2004) can also lead to a diminished attitude by the students resulting in destructive behaviours and dissatisfaction with the course (Alshare and Lane, 2011). Davis and Comeau (2004) see ERP system as notoriously hard for students to learn and use.

All of these factors make the introduction of ERP education in third-level institutes a major challenge. However some of the major ERP vendors have made an attempt to alleviate these challenges by developing University Alliance Programmes (UAP), which are ERP education systems aimed at providing third-level institutes with solutions as to how to incorporate ERP systems into their curriculum (Becerra-Fernandez et al., 2000; Hawking and McCarthy, 2000; Rosemann and Watson, 2002; Sager et al., 2006; Seethamraju, 2006; Kanthawongs and Kanthawongs, 2010, 2011).
3.5 University Alliance Programme (UAP)

The recognition of ERP related knowledge and skills shortage made ERP vendors, such as Oracle, Microsoft and SAP, aware of the new market opportunities third-level institutions brought (Zornasa and Velkavrh, 2005). As a result, they developed University Alliance Programmes (UAPs) to provide third-level institutes with a means of incorporate ERP systems into their curriculum (Becerra-Fernandez et al., 2000; Hawking and McCarthy, 2000; Rosemann and Watson, 2002; Sager et al., 2006; Seethamraju, 2006; Kanthawongs and Kanthawongs, 2010, 2011) and thus reduce the gap between the skills students are graduating with and those required by industry (Barnes and Ferguson, 2008).

The German company SAP is the biggest vendor of ERP solution for organisations with over fourteen million users worldwide (Sager, 2013) and is seen as the leader when it comes to supplying software solutions for business management (Hwang and Park, 2014). Along with being the largest vendor worldwide, SAP is also the most well-known (Wilson and Lindoo, 2011).

“SAP is the market leading ERP suit, with a worldwide customer base that dwarfs those of competitors such as Oracle and PeopleSoft” (Langley, 2013, p.1).

SAP was the first ERP vendor to offer universities an alliance programme for use in the classroom (Bradford et al., 2003; Grenci and Hull, 2004; Sager et al., 2006: Mohamed and McLaren, 2009). It created its UAP, called SAP Alliance, in 1996. SAP offers its members over $2.5 million worth of its software, technical and professional support (Hawking et al., 2001). In 1996, California State University was the first university selected by SAP to form an alliance (Boykin and Matrz, 2004; Barnes and Ferguson, 2008). SAP now (at the time of writing) has 1,344 universities worldwide incorporating its UAP into their business curriculum (www.SAP.com), a significant increase from just over one hundred members back in 2004 (Sager et al., 2006).
SAP Alliance is now the most widely used ERP system in study courses (Hawkings et al., 2004; Pellerin and Hadaya, 2008) and the main facilitator of software usage for educational purposes (Vluggen and Bollen, 2005). The enormous growth of SAP Alliance members is down to the lower barriers to entry that had been in place since the year of launch (Sager et al., 2006) and the benefits to students in the form of real examples and an opportunity to gain hands-on experience with ERP systems (Wilson and Lindoo, 2011).

Entering into an alliance with an ERP vendor can have its fair share of problems (Seethamraju, 2004). The alliance will still require a sizeable amount of resources including hardware, operating systems and database software (Scott and Gable, 1997). Institutes have to consider the size of the project and the effort required to make it work (Barnes and Ferguson, 2008).

### 3.5.1 Benefits to Institutes

An UAP provides academic institutions with a functional ERP system, at a reasonable cost, to use for the purpose of teaching and research (Waston and Schneider, 1999). Third-level institutes can benefit from investing in an UAP by being able to avoid the high hardware costs and costs involved in supporting the ERP system (Becerra-Fernandez et al., 2000) while increasing their marketability to current and future students (Hawking and McCarthy, 2000; Bradford et al., 2003; Byrne and Flood, 2003). To solve some of the challenges faced by third-level institutions, UAP allows participating universities access to online documentation, tutorials and business conferences (Waston and Schneider, 1999), establish knowledge links with other participating universities (Hawkings et al., 2004) and share developed pedagogical material with other alliance members (Bradford et al., 2003).

Becerra-Fernandez et al. (2000) summarises the benefits for institutes of having such an alliance in place as follows:
“This capability will open the opportunity for universities with limited resources to become users of ERP services in the classroom, avoiding the expense of purchasing hardware, supporting the system, and gaining the required expertise. Institutions will be able to decide on their level of involvement with ERP vendors and systems, but at every level of participation the future promises to have ERP in the curriculum” (Becerra-Fernandez et al., 2000, p.41).

SAP has developed University Alliances Community (UAC) to foster connections between the universities, the students, other customers and SAP’s own internal experts (Diem Lam, 2013), thereby alleviating some of the complexities felt by institutions in implementing ERP. To further enhance the UAP experience and to aid in the training of academics and the supply of teaching material, it provides data centre support, training seminars (Wilson and Lindoo, 2011) and provides curricular material (Sager et al., 2006). SAP also developed Innovation Watch, an education and research portal, which includes “a range of plug and play curriculum material” (Hawking et al., 2004, p.1003). The use of UAPs give third-level institutes the opportunities to expand beyond traditional teaching methods and use alternative teaching methods. Therefore third-level institutes benefit from the materials supplied, academic staff training and on-going support from SAP (Hawking and McCarthy, 2000; Sager et al., 2006; Barnes and Ferguson, 2008; Leyh, 2012).

3.5.2 Benefits to Students

UAP programmes enable students the opportunity to access a real ERP system (Waston and Schneider, 1999: Becerra-Fernandez et al., 2000; Selen, 2001; Barnes and Ferguson, 2008). This giving them valuable hands-on experience (Waston and Schneider, 1999; Rudra et al., 2009; Kanthawongs and Kanthawongs, 2010). This places emphasis on active learning (Mykytyn et al., 2008; Pridmore et al., 2010;) giving students valuable hands-on experience with an ERP system (Pridmore et al., 2014). They can work through real business transactions, which will enable them to get an enhanced understanding of the system (Rudra et al., 2009). Students are:
“...trained to do various activities in SAP, including creation of master data, performing transaction cycles that take students through various application modules such as sales and distribution, production, materials management, accounting, and configuration” (Seethamraju, 2006, p.20).

UAP can provide students with an active environment for learning and give them some responsibility for their own education (Hawking and McCarthy, 2000). This experience makes them more attractive to potential employers that have, or intend to implement, an ERP system. Kanthawongs (2010) summarise the benefits to students who sign up to the SAP UAP as:

“…employability, hands-on experience in globalized context, visualization of business process view, training and research opportunities” (p.112).

SAP Alliance is of great benefit to the students as due to SAP’s high market share “it is probable that they will be working with SAP systems in their professional life” (Winkelmann and Leyh, 2010, p.234). Students can access SAP on-line, enabling them to have the choice to learn SAP from anywhere with access to the internet (Barnes and Ferguson, 2008).

By working with SAP students complete hands-on ERP activities and acquire the relevant ERP skills required by industry and get to see how the business processes work, as explained by Pridmore et al. (2014):

“Hands-on experiential learning gets students actively involved in the learning process. By completing hands-on WEP activities in SAP, students can not only develop SAP skills but also better understand ERP systems and business process integration. Incorporating hands-on ERP exercises in SAP after lecturing on enterprise systems seems to be an effective teaching approach that allows business students to acquire solid ERP knowledge, business process knowledge and SAP skills...emphasises the importance of incorporating hands-on ERP exercises in the teaching of ERP systems and business processes so that students understand how ERP systems actually work to streamline business processes and facilitate cross-departmental communication and information sharing” (p.5).
There seems to be no doubt in the extant literature but that practical UAP systems provide numerous benefits to third-level Business students.

3.5.3 Benefit to ERP Vendors

ERP vendors make their ERP systems available to university at a reasonable rate because it allows the students to learn how to use their product. As graduates will be familiar with a particular system, they may select it as their particular system of choice in the workplace (Winkelmann and Leyh, 2010). ERP vendors believed that with some practical ERP experience, graduates could benefit the future development of their products (Sager et al., 2006) by hiring students that have been working with these systems from an early stage (Leyh 2012) and have a more experienced recruitment pool to choose from (Fedorowicz et al., 2004).

3.6 Alternative ERP Teaching Methods

As a result of the changing technology, the introduction of University Alliance Programs (UAP) and industry demand, many third-level institutions have moved away from the traditional teaching methods and have developed different methods of teaching ERP systems. The most popular of these methods used are case studies, operations trainer, simulation games, practical teaching system approaches and industry-based projects.

3.6.1 Case Study Approach

Some business schools now use case studies (Shtub, 2001; Venkatesh, 2006; Cameron, 2008; Pellerin and Hadaya, 2008; Pridmore et al., 2010; Conan and Douglas, 2012) to help teach the underlying business concepts of ERP systems (Venkatesh, 2006; Conan and Douglas, 2012). These case studies show the students a snapshot of the business processes involved (Shtub, 2001) and leads to more process-oriented thinking by the students (Pellerin and Hadaya, 2008). The case study approach is beneficial to the students as it offers:
“...context to a real-life problem and afford the student an insider perspective on the subject” (Cameron, 2008, p.121).

Using the case study approach as a mean of delivering an ERP module is not without its faults. Students miss the opportunities to interact with a real system (Morrell et al., 1993; Pridmore et al., 2010) as case studies only represent a “snapshot” of the business processes (Shtub, 2001). Case studies can become easily outdated and difficult to create (Cameron, 2008).

3.6.2 The Operations Trainer

Shtub (2001) proposed using an operations trainer approach to teaching ERP systems. This approach integrates case studies with the modelling approach to form “a dynamic teaching environment” (p.569). The operations trainer:

“...simulates the entire order fulfilment process from customer orders to the purchasing of raw material. Four interconnected functional areas are presented. These are finance and accounting, purchasing, production and marketing. Each functional area has a special module within the OT where information derived from the database is presented, policies can be set and actions taken” (pp.569-570).

The students have access to real-time information and can keep track of any work order or product. They must analyse a case study and traverse through it in the most appropriate way. Students are able to see the relationship that exists between the different business processes. This method of teaching ERP systems helps the students implement polices along with letting them replicate what they have learned (Shtub, 2001).

3.6.3 Simulation Games

Swiss psychologist Jean Piaget emphasises the importance of students getting hands-on experience when he proposed that the brain constructs knowledge as it
adapts to its environment and uses constructive internalisation in his learning (Rienzo and Han, 2011). Constructive internalisation states that:

“...humans construct increasingly autonomous mechanisms of functioning by interacting with objects” (Rienzo and Han, 2011, p.179).

Adelsberger et al. (1999), Davis and Comeau (2004), Draijer and Schenk (2004), Hajnal and Riordan (2004), Boyle and Strong (2006), Ledger (2006), Pridmore et al. (2010) and Winklemann and Leyh (2010) all suggest that the use of a simulation game is as an innovated pedagogical approach to teaching ERP concepts in the classroom. An ERP simulation game demonstrates a real life business environment which will allow the students to develop the computer and business skills they need. It is an innovative approach that teaches students the concepts and competencies of ERP in a learning-by-doing and a problem-based way (Leger et al., 2010). The ERP simulation game guides:

“...students through processing steps with a concentration on explaining how ERP systems allow processing to flow across organizational functions, insuring communications between involved departments, and allowing processing to be completed efficiently, timely and with fewer errors, as compared to manual processing” (Wilson and Lindoo, 2011, p.223).

Using a simulation game as a method of teaching ERP systems, students will:

“...replicate, in a simplified manner, the complexity of a real-life environment, giving the participants experience with a particular phenomenon” (Ledger, 2006, p.441).

Rienzo and Han (2011) found that 85% of students following a program of systematic hands-on exercises to teach the purchases and sales modules of ERP systems in the classroom felt that the use of hands-on ERP assignments did in fact help them in understanding how the purchasing and sales process worked. One of the student’s responses to this method was:
“*It has really broken down the exact purpose for every aspect of sales and purchasing, I feel I also have a better understanding of the differences between each*” (p.192).

Another student said that it helped him:

“*…realise the steps that need to occur, and the different ways of making the orders. Before this I had no clue to the order of steps that needed to occur other than what common sense said*” (p.192).

This method will not only enable the students to experience business transactions and to see how all the business processes are interconnected (Barnes and Ferguson, 2008) but also provides them with valuable hands-on experience (Adelsberger *et al.*, 1999; Grenci and Hull, 2004; Peslak, 2005; Seethamraju, 2006; Kanthawongs and Kanthawongs, 2010a; Foster and Hopkins, 2011; Leger *et al.*, 2011; Rienzo and Han, 2011; Wilson and Lindoo, 2011; Conan and Douglas, 2012). Hands-on experience allows students to learn the ERP systems user interface (Leger, 2006; Conan and Douglas, 2012), it facilitates the learning of business concepts (Davis and Comeau, 2004; Wilson and Lindoo, 2011; Conan and Douglas, 2012), it gives students experience with relevant business scenarios (Harman, 2001) and helps the students understand how a business works in a real enterprise setting (Deng *et al*., 2010).

A simulation game gives students the “*opportunity to understand process flows*” and thereby “*appreciate the benefits*” that an ERP system can bring to a business (Wilson and Lindoo, 2011, p.233). It gives them an understanding of what is in store for them if they move into a company that is using this integrated system (Leger *et al*., 2011).

One of the major challenges facing a third-level institution that has decided to use the simulation approach is that each student taking the class will be required to have his own computer assigned to him/her in the computer lab. If students have to share a computer, they tend to lose interest and start being disruptive if they are not the one in control of the mouse (Kirkham and Seymour, 2005). More than one hundred business simulations games are in existence today, with as many as eleven thousand business faculties using one during an academic year (Conan and
Three examples of simulation games that are being used in third-level institutions are petPRO, MURSH-Bikes and ERPsim.

### 3.6.3.1 petPRO

The Sprott School of Business, Carleton University integrated the teaching of ERP systems into the school curriculum by introducing petPRO (a manufacturing company that produces and sells pet food and products) to undergraduate business degree students. This innovative method of teaching focuses on enterprise integration and enterprise systems. The course was introduced at first through lectures and later the students would work in groups as employees of the petPRO company to “simulate the concepts they have learned” (Hanjnal and Riordan, 2004). Through this approach, the students start to appreciate;

“...what all the business functions are, and they experience some of the challenges a firm goes through on the road to becoming an integrated, e-business enterprise” (Hanjnal and Riordan, 2004, p. 267).

Each groups receiving a copy of the petPRO company structure and other background information about the company, for example the types of products it produces. Half of the three-hour class each week is used to study the textbook and the second half is used to work in groups on the “activity at hand”. All group discussions are logged online and can be viewed by the other group members. This is done in order to;

“...provide a mechanism to demonstrate how its understanding of its own functions has progresses or changes over the course of the semester.” (Hanjnal and Riordan, 2004, p.270).

During the semester, the students are presented with additional information. They are asked to explore the impact of these changes on decisions for all of the functions of the organisation. The idea behind this is to expose the students to the complexity of making business decisions and the difficulties of data sharing between the functional areas of a large company (Hanjnal and Riordan, 2004).
3.6.3.2 MURSH-Bikes

In the MURSH-Bikes simulation game Adelsberger et al. (1999) set-up a factory (MURSH-Bikes) to provide the students with practice-oriented training. The factory contains the relevant business functions such as billing, financial accounting, order-entry and financial analysis. Different departments are set up including production planning, production control, sales, distribution, purchasing and financial accounting.

This course starts with the students receiving an introduction into the system through presentations. They then move onto the SAP R/3 software and discuss the ERP concepts they have encountered (Adelsberger et al., 1999). Each team then works on case studies related to the different departments. The case studies are:

“...simple isolated tasks that have to be solved to become familiar with the system and its structure” (Adelsberger et al., 1999, p.4).

This method presents a mix of theoretical and practical sessions for students.

3.6.3.3 ERPsim

The faculty at HEC Montreal have also developed an innovated SAP simulation game called ERPsim. This simulation game is now being used by many other universities of the SAP University Alliance Programme (Leger et al., 2011; Conan and Douglas, 2012). This simulation game is run in real-time (Leget et al., 2011) through a SAP client. Each team manages the company’s “entire cash-to-cash cycle” and are required to “interact with suppliers and customers by sending and receiving orders” (Conan and Douglas, 2012, p.4). During the game, the students are required to implement the decisions they have made directly into the SAP system. The students are then required to make some key business decisions during the simulation, which include product formulation, target markets, product pricing, sales forecasting manufacturing resource planning and production, investment in production efficiencies, advertising and debt management. In
making these decisions, the students are set the objective of maximising the virtual company’s profits. This according to Leger et al. (2011) creates:

“...a unique learning environment where participants can experience the value of an integrated business system hands-on”

(p.40).

Participating students of the simulation game have seen their business process knowledge increased and have enhanced their ERP and SAP related skills (Conan and Douglas, 2012). Along with gaining a hands-on understanding of the system and enhancing there ERP technical skills, students also gain an experience of integration and how to adapt to a real life business environment (Leger et al., 2011).

3.6.4 Practical Teaching System

To allow students to experience a deep understanding on ERP systems and to improve the students’ practical ability, Jiangxi University of Finance and Economics (JUFE) designed a practical teaching system which is composed of three parts including experiments in labs, extracurricular activities and internship in real software company (Deng et al., 2010). In the lab sessions, the students run business scenarios through simulations by simulating some of the company’s main business scenarios, which include the human, material production, cash, supply and sales of the business. These lab sessions give the participating students hands-on experience with an ERP system that should reinforce the “theory and principles from the textbook” (Johansson et al., 2014, p.1). In order for the students to gain an understanding of these processes, they run some processes experiments under the supervision of a teacher. Students are then split into groups to “examine the implementation complexity originated from roles collaboration” (Deng et al., 2010, p.343). The groups are then sub-divided into departments and were provided with roles in a virtual enterprise (Deng et al., 2010).

In the extracurricular sections, the students were provided with three different groups to choose from (i) management of enterprise (ii) system development and
testing and (iii) implementation consultant. Students can pick the group that they were most interested in (Deng et al., 2010). JUFÉ have developed a good working relationship with Asia’s largest provider of ERP software UFIDA to provide the students with an industry that they can work in. The interns will receive talks from experienced engineers working for UFIDA and are then classified into the extracurricular sections that they had previously chosen. Finally, they are presented with a post and assigned an engineer to work with. This teaching approach should train the students “efficiently” and “effectively” (Deng et al., 2010, p.343).

3.6.5 Industry-Based Projects

Victoria University has developed a unique way of teaching ERP systems through the use of industry-based projects that focus on ERP systems. These projects allow the students to learn through a dynamic learning environment as well as providing the students with an invaluable learning experience (Hawking and McCarthy, 2000). An industry-based project places students into real life situations by exposing them to new technologies and gives them an idea of the kind of problems they may encounter when working in industry (Cameron, 2008). Within the project the students work for clients that need them to develop software, for example students had to “investigate techniques to interface SAP R/3 with the web, display and write the data and write the data back to SAP R/3” (Hawking and McCarthy, 2000, p.131).

Toyota became the first company to take part in the project. In order to test the skills of the participating students they were given a program that ceased to work. New tasks were delivered to the students, which had to be completed and documented. From the feedback that the university received from Toyota the project was seen as a success and helped build closer relationships with industry (Hawking and McCarthy, 2000). The students also deemed the project to be a worthwhile experience and one student described his experience:
“We have learnt a lot about business processes, including the
 generation of user request, the process of obtaining them,
 consulting with various divisions, getting feedback, and creating
 transports and filling out change request forms. We have also
 learnt about company specific policies relating to coding and
 reporting requirements and the process of interacting with business
 unit leaders to fulfil request requirements. We understand the
 interaction between the Basis, Development, Quality assurance,
 and Production divisions and the process involved in getting a user
 request from the Basis team... implemented in Production. I feel we
 have gained a lot from our experience” (Hawking and McCarthy,
 2000, p.132).

According to Deng et al. (2010) this type of approach is a suitable way of
teaching ERP systems as it helps align the teaching material with the requirements
of industry and offers the students the opportunity to work in industry. Deng et al.
(2010) states that business schools and companies adopting this approach should
work, develop the teaching system and material together, and provide an
internship environment for the participating students.

Research has shown that graduates with practical ERP experience have obtained a
certain level of the relevant skills and knowledge demanded by the workplace,
and is more employable than those without ERP experience. (Lee et al., 1995;
Stewart and Rosemann, 2001; Hawkinings et al., 2004; Jensen et al., 2005; Peslak
2005; Boyle and Strong, 2006; Seethamraju, 2006; Mohamed and McLaren, 2009;
Deng et al., 2010; Leyh, 2012). Indeed, Boykin and Matrz (2004) states that:

“The more a student knows about the complex interactions inherent
in a business and how to capture those interactions in an ERP, the
more employable that student becomes” (Boykin and Matrz, 2004,
p.48).

The possession of relevant, up-to-date knowledge and skills will help students get
good jobs and “hit the ground running” when they enter the workplace
(Fedorowicz et al., 2004, p.235). It would appear from the literature that even
knowing what ERP skills and knowledge are required by the industry from
graduates, the supply of students graduating with the above skills has not kept up
with the demand (Wailgum, 2008). Third-level institutes must now rise to this
challenge and modify their business curriculum in order to produce students that
graduate with the necessary skills and knowledge (Hawking et al., 2001) that will bridge the gap “between the skills of university graduates and those required by industry” (Barnes and Ferguson, 2008, p.109).

All of these methods add to the debate of the correct balance of theoretical and practical elements in the ERP education of Business students. The next section divides this balance in the level of knowledge and skills required.

3.7 ERP Knowledge versus ERP Skills

The growth of the ERP market has created a demand for employees with ERP skills and knowledge (Bingi et al., 1999; Boykin and Matrz, 2004; Hawking et al., 2004). Even though the extant literature agrees on the benefits of ERP education, it has differing view of the types of ERP systems skill or knowledge required by industry of graduates. To add to the difficulty, is the fact that this area is continuously changing and the skills and knowledge requirements will change continuously (Everear et al., 2005).

In relation to ERP knowledge, students need to be graduating with a knowledge of finance, information technology and management software (Deng et al., 2010), business process knowledge (Jensen et al., 2005; Ebrahimi et al., 2013), the ability to understand cross-functional business processes (Fedorowicz et al., 2004; Boyle and Strong, 2006; Seethamraju, 2006; Murali, 2011), knowledge of ERP applications (Peslak, 2005), knowledge of the technology involved and how the businesses functions work (Lee et al., 1995; Stewart and Rosemann, 2001; Byrne and Flood, 2003; Fedorowicz et al., 2004; Murali, 2011), the ability to understand the business data base structure (Hawkings et al., 2004), and, of course, ERP theory.

Companies will also require graduates to have ERP related skills. Examples of such skills are communication skills (Lee et al., 1995; Jensen et al., 2005; Deng et al., 2010; Ebrahimi et al., 2013), both personal and interpersonal skills (Hawking and McCarthy, 2000; Stewart and Rosemann, 2001) and leadership attributes
(Jensen et al., 2005). Others stress the ability to work alongside a consultant as a key skill. Boyle and Strong (2006) feel this skill of end-user to work with consultants as missing from the existing ERP degree programs. They feel this is a skill that is often overlooked, but it is a vital skill as no matter whether it is a new system being implemented or the upgrade of an existing system, the end-users should be able to work with consultants and ERP vendors:

“…an ERP implementation typically involves a large number of consultants. Students must understand the role of the consultant, the process of knowledge transfer, how to ensure that effective knowledge transfer takes place between consultants and employees, and remedies if such transfer is not taking place.” (p.410).

Boyle and Strong (2006) carried out extensive research into the area of what knowledge and skills are required by ERP graduates. They categorised the knowledge and skills involved into five groups: ERP technical knowledge, technology management knowledge, business functional knowledge, interpersonal skills and team skills. These skills were then tabulated by Mohamed and McLaren (2009) and reproduced in Table 3.1 below.

3.8 What should be taught?

The questions now for third-level institutes are what concepts should be taught, in what priority they should be thought and how these concepts should be taught (Jensen et al., 2005). Third-level institutions need to get the teaching balance between the knowledge of general concepts with the knowledge of system-specific functionalities correct. Figure 3.2 below is a reproduction of the depiction from Jensen et al. (2005) of the balance required between a focus on conceptual knowledge and a focus on systems-specific functionality based on the type of graduate. If third-level institutions wish to graduate students better suited to “manage and govern the ERP systems of present day business organizations” then they should communicate knowledge about ERP systems. If these institutions chose to graduate students with the ability to manage all “the aspects of an ERP system’s life cycle” then they will have to concentrate more on education focused primarily on ERP systems (Jensen et al., 2005, p.135).
The vertical dimension (conceptual ERP knowledge) of the diagram measures elements from the general business management curricula such as business process knowledge, change management, organisational theory, project management, business strategy and management of information technology (IT). Business warehouse, supply chain management, customer relation management, business intelligence and integration issues are also included in the vertical dimension (Jensen et al., 2005). The horizontal dimension (systems-specific functionality) of the diagram measures the functionality and operational details of the ERP systems.

The framework has four “generic types of graduates” where each “type of graduate represents different trade-offs between the proposed dimensions” (Jensen et al., 2005, p.170). The four graduate types are Superuser, ERP-capable Business Graduate, CIO and Head of ERP. If third-level institute want to offer students this approach then institute must have in place at least one working ERP system. This will offer the students the hands-on training that they will require (Jensen et al., 2005).
**Table 3.1: Skills Required of Graduates**

<table>
<thead>
<tr>
<th>Skills Category</th>
<th>Required Skills for ERP Education</th>
</tr>
</thead>
</table>
| ERP Technical Knowledge | ERP Administration  
| | Networks  
| | Operating systems  
| | Systems Analysis  
| | Systems Design/Integration  
| | Systems Life Cycle Management  
| | Relational Databases  
| | ERP related programming language  
| | Data Management  
| | Decision Support Systems |
| Technology Management Knowledge | Knowledge of ERP Concepts  
| | Ability to learn new technologies  
| | Ability to focus on technology as a means, not an end  
| | Ability to understand technological trends |
| Business Functional Knowledge | Knowledge of Business Functions  
| | Willingness to learn in detail a specific business functional area  
| | Ability to quickly understand the needs of customers  
| | Ability to understand the business environment  
| | Ability to interpret business problems  
| | Ability to develop appropriate technical solutions to business problems |
| Interpersonal Skills | Ability to deal with uncertainty  
| | Ability to accomplish assignments  
| | Ability to write coherently  
| | Ability to learn  
| | Ability to deliver effective presentations  
| | Ability to be proactive  
| | Ability to be sensitive to organizational culture  
| | Ability to teach others |
| Team Skill | Ability to work cooperatively in a team environment  
| | Understanding of group dynamics  
| | Ability to plan projects  
| | Ability to lead projects |

*Reproduced from Mohamed and McLaren (2009)*
3.8.1 The Superuser

The superuser must be apprehensive with the practical use of ERP systems. He/she is educated on the application of ERP systems functions and on common business issues. This type of graduate should be taught how to navigate the system and how transactions are performed. The superusers main role in the company will be to support the rest of the ERP users. The institute will need to form a close working relationship with the ERP vendors that provide these systems in order to gain an understanding on how these ERP systems operate. (Jensen et al., 2005). The characteristics demanded of the superuser are not usually common in ERP graduates as they have no insight into the “strategic nature of ERP systems, they are not well suited to act as an executive with regard to such systems” (Jensen et al., 2005, p.171).

![Figure 3.2: Conceptual Knowledge versus Systems-specific Functionality](Reproduced from Jensen et al. (2005))

3.8.2 ERP-capable Business Graduate

The ERP-capable business graduate does not have the same education and ERP knowledge as an independent element. This type of graduate will be familiar with the general concept of an ERP system but will not have any in depth education. It
uses a more traditional teaching approach that uses the systems as a medium to “facilitate the visualisation of important concepts” including business process knowledge (Jensen et al., 2005, p.171).

3.8.3 The CIO

This type of ERP graduate is normally the profile of CIOs in larger companies. The CIOs does not focus on the details of each specific system but “on managing and governing the entirety of information system required to support the business” (Jensen et al., 2005, p.171). The CIO would need to be educated on the conceptual ERP knowledge, as he would normally work in the information system department of the company where the ERP system would be traditionally housed (Jensen et al., 2005).

3.8.4 The Head of ERP

This type of graduate is a combination of the CIO and specific ERP knowledge of the system. This type of graduate is not very common with students graduating with ERP experience. Head of ERP graduates are usually CIOs who have developed the knowledge of ERP through “activities outside the scope of their education” (Jensen et al., 2005, p.171). The head of ERP could have been an original superuser who has gained the conceptual and strategic knowledge required be it through training courses or through relevant working experience.

In order to produce this type of graduate Jensen et al. (2005) suggest that thorough conceptual understanding of ERP issues (through a Masters level education) and a focus in combining detailed system-specific knowledge along with operational skills are necessary for the students to receive the highest benefits from using the ERP systems. Jensen et al. (2005) argue that:
“The Head of ERP profile is the best preparation possible for graduated who at some point in their career must manage the entire life cycle of these increasingly important systems and successfully navigate organisations through the second wave” (Jensen et al., 2005, p.172).

This type of profile fits best for an executive level ERP manager as it is a combination of conceptual ERP knowledge and an understanding of the specific system employed (Jensen et al., 2005).

Jensen et al. (2005) concludes that both existing and would be educations must carefully consider the balancing of knowledge and skills in the composition of their ERP education, namely the level of focus attributed to the conceptual knowledge regarding ERP and the system-specific functionality of the ERP system used (p.172). What is interesting for this study is that all four graduate types need some mix of conceptual knowledge and system-specific functionality; it is the emphasis on each that differs.

3.9 Research Questions

Third-level institutes have now realised that there is a discrepancy between the type of student they have graduating and the type of graduate that industry are demanding. To overcome this problem institutes are “establishing educations” to try to “produce the best combination of the dimensions mentioned” (Jensen et al., 2005, p.171). This has led to the three research questions asked in this piece of research.

1. What are the main benefits of providing practical ERP education to third-level Business degree students?

2. What are the main challenges facing third-level institutions when introducing practical ERP education into the curriculum?

3. What is the best way to provide ERP education to third-level Business students?
3.10 Conclusion

Industrial demand and student demand have motivated third-level institutions to integrate Enterprise Resource Planning (ERP) education into their Business curriculum. The traditional teaching method, based on classroom teaching supplemented by textbooks, is not adequate ERP education. Third-level institutes instead have to incorporate practical usage of these systems in their curriculum. However this raises many challenges for the institutes; namely the costs and time involved, the complexity of ERP systems to implement and run, the shortage of experienced academics, the lack of teaching material and the limited business and IT knowledge of students.

To overcome some of these challenges, ERP vendors have developed University Alliance Programmes (UAP) offering third-level institutions an ERP system for use in the classroom at a reduced cost, along with support, training and educational material. These UAPs reduce the challenges that third-level institute’s face when attempting to introduce practical ERP education. This results in alternative ERP teaching methods such as case studies, operations trainer approach, simulation games practical teaching and industry-based projects.

By improving the ERP skills and knowledge of third-level students, institutes are bridging the gap between the knowledge and skills of the graduates and that required by industry. Third-level institute must attempt to get the balance between conceptual ERP knowledge and system-specific functionality that produces a graduate demanded by employers. This chapter concludes by stating the research questions of this piece of research; benefits and challenges of incorporating ERP education in CIT and how to provide ERP education in CIT.
Chapter 4  Research Methodology

4.1  Introduction

This chapter commences with a definition of research. It describes how the researcher formed the research objective of this study and goes on to list the research questions that need to be answered to achieve at this objective. The researcher was interested in completing a dissertation on Enterprise Resource Planning (ERP) education in third-level education. This chapter describes how the researcher arrived at the research objective, by finding a gap in the existing literature in this area. It then debates whether qualitative or quantitative research methods should be used. As this is exploratory, descriptive research, this chapter then discusses the appropriateness of the use of a single case study as the research methodology. This chapter concludes by discussing how interviews, observation and documentary review can be used as a form of triangulation to verify findings.

4.2  Research Definition

Research refers to a search for knowledge (Kothari and Gaurav, 2014). The aim of a researcher is to find out, describe, explain and understand what is happening and the reasons behind why it is happening (Thomas, 2004). Saunders et al. (2003), Barrachina et al. (2004) and Kumar (2005) all see research as the work or activities that people undertake in a systematic way to find new information. As far back as 1933, Redman and Mory defined research as “a systematised effort to gain new knowledge” (p.10). In a similar vein Saunders et al. (2009) describe research as:

“...something that people undertake in order to find out things in a systematic way, thereby increasing their knowledge” (p.5).

Systematic implies that “the procedures used “to undertake an investigation following a certain logical sequence” (Kumar, 2005, p.8). Zikmund et al. (2012)
see research as a scientific method where a researcher uses the knowledge and evidence they have found to form an objective conclusion. It can be used to benefit an organisation, the market or the economy (Zikmund et al. 2012). It is therefore a method used to find the answers to worthwhile questions through a "systematic and scientific approach" (Alzheimer-europe.org).

Research is a voyage of discovery from the known into the unknown (Kothari and Gaurav, 2014). The purpose of any research is for the researcher to find answers to questions that have not yet been discovered (Kothari and Gaurav, 2014). Therefore, the first, and most important, step of the research process is the formulation of the research objective and research questions (Saunders et al., 2003; Kumar, 2005).

4.3 Formulation of Research Objective of this Study

The research objective should clearly state what the research is expected to accomplish (Liamputtong and Ezzy 2005). The objectives set out what knowledge is needed by the researcher to close the existing gaps in information:

"Research objectives are set to gather the specific bits of knowledge that need to be gathered, in order to close the information gaps" (Burns and Bush, 2008, p.9).

The researcher of this study had just completed a Bachelor of Business (Honours) in Accounting from Cork Institute of Technology (CIT) in 2011 and was accepted for a Masters in Research. He was initially interested in researching the investment by organisations in Enterprise Resource Planning (ERP) systems. Tutoring students in the School of Business was an integral part of the Master’s program and it was through tutoring that the researcher developed an interest in third-level education. The researcher discovered that CIT had just made a major investment in SAP’s University Alliance Programme (UAP). This presented an ideal opportunity to investigate the benefits from the academics’ perspective of ERP education for Business students. To formulate the research objective, and the
resultant research questions, the researcher first completed an extensive review of extant ERP education literature.

4.3.1 Literature Review

A literature review can be described as the process of reading, analysing, evaluating and then summarising material about a specific topic (Nordquist, 2013). Anderson (1998) defines the literature review process as a:

“...summary, analysis and interpretation of the theoretical, conceptual and research literature related to a topic or theme” (p.76).

It is seen by Yin (2003) as a means to an end and a method used by researchers in formulating additional questions about a topic. It should not be seen as a collection of other people's views but a qualitative analysis of the work performed by others (McCracken, 1998). It gives a theoretical basis for the research being carried out and supports the researcher in determining the nature of their research (Boote and Beile, 2005). It should not be seen as a collection of other people’s views but a qualitative analysis of the work performed by others (McCracken, 1998). Reviewing the literature allows the researcher to familiarise themselves with their chosen area (sagepub.com). Once the literature review is finished, the researcher should have a list of areas from which he/she can form questions (McCracken, 1998).

The literature review process for this dissertation involved examining academic journals, books, online databases, the internet and conference papers. The keywords used in the search were “ERP” or “enterprise resource planning” and “education”. As a result of this review, the researcher recognised a gap in the literature which has not yet been adequately covered.
4.3.2  Gap in the Literature

Much has been written about the implementation of ERP systems in industry. The critical success factors (CSFs) necessary for the successful implementation of ERP systems are widely cited in the extant literature, with the need for experienced staff as one of the CSFs. Due to a shortage of staff with ERP experience, employers have started to look for graduates with ERP education. However very little had been written on the provision of ERP systems education for third-level Business students. The researcher decided that this would be a worthy area of research and went about forming a clear research objective.

4.3.3  Research Objective

The objective of this research is to conduct:


The research questions posed in an attempt to achieve this objective are as follows:

1. What are the main benefits of providing practical ERP education to third-level Business degree students?

The first research question looks at the benefits to the relevant stakeholders in incorporating ERP education into third-level institutions. The literature review shows that ERP education will benefit the students’ employability by providing them with a skill set that is in-demand by industry, benefit industry as it now has a pool of work-ready graduates to choose from, benefits the institutions by attracting more students into the courses and benefit the ERP vendors by promoting their brand. The researched wished to validate these beliefs in this case study.
2. What are the main challenges facing third-level institutions when introducing practical ERP education into the curriculum?

The second research question explores the challenges third-level institutions face when introducing practical ERP education into the curriculum. The literature reviewed cited the cost involved (initial hardware, software and installation costs, the cost of staff training, a lack of teaching material and opportunity costs), the complexity of ERP systems, a shortage of experienced academic staff, a lack of teaching material and the limited business and IT knowledge of students, as the main challenges third-level institutions face when implementing ERP systems into a curriculum. The researcher will examine if these are the challenges present in this case study.

3. What is the best way to provide ERP education to third-level Business students?

This research question examines the most appropriate ways to teach ERP education to students. The literature review looked at the different teaching methods that are currently being used to teach ERP systems. These included using case studies, an operations trainer, simulation games, practical teaching and using industry-based projects. The researcher wants to discover which one of the methods mentioned in the literature review would be most appropriate.

4.4 Research Strategy

Saunders et al. (2009) define research strategy as “the general plan of how the researcher will go about answering the research question” (p. 600). A research strategy provides direction and the “process by which the research is conducted” (Remenyi et al., 2003). It provides the means of getting from the questions to conclusions (Rowley, 2002). This general plan should help a researcher stay focused, reduce being frustrated and overall help him/her save time (lib.unca.edu). Wedawata et al. (2011) cites the work of Yin (2003) when they recommend a research strategy has three conditions that selection must be based on:
“...the type of research question, the extent of control an investigator has over actual behavioural events, and the degree of focus on contemporary or historical events” (p.2).

The type of research strategy that is chosen will depend on what research question is being asked, what level of control the researcher has over actual behavioural events and the “focus on contemporary as opposed to historical phenomena” (Yin, 2003, p.1). Merriam (1998) and Kumar (2005) are in agreement with this statement as they both agree that the type of strategy selection chosen will depend on how the researcher will find the answers to his/her research question(s) and what type of end product is desired.

4.5 Qualitative and Quantitative Research Methods

When conducting research there are two general research strategies methods: qualitative and quantitative methods (Rhodes, 2013; Adam and Healy, 2000). A Qualitative research method is used to gain an understanding of options, reasons and motivations whereas quantitative research is used to quantify the problem by a way of producing numerical data that can be converted into working statistics (Wyse, 2011). The difference characteristics of qualitative and quantitative research methods are summarised by Anderson (2005) as follows:

“Qualitative research is collecting, analysing and interpreting data by observing what people do and say. Whereas, quantitative research refers to counts and measures of things, qualitative research refers to the meaning, concepts, definitions, characteristics, metaphors, symbols and description of things” (Anderson, 2005, p.1).

The main difference between the two is that the qualitative research method aims to explain how all the components of a process work together, whereas the quantitative research method takes apart the components of a process to understand them (Merriam, 1998). Therefore different data collection methods are used, different procedures of data processing and analysis are used and different styles of communicating the findings are used (Kumar, 2005). In summary
quantitative research is “objective” whereas qualitative research is “subjective” (Anderson, 2006, p.3).

4.5.1 Qualitative Research

Qualitative research methods, as defined by Van Maanen (1983) are an array of interpretative techniques, which seek to describe, decode, translate and otherwise come to terms with the meaning, not frequency, of certain more or less naturally occurring phenomena in the social world. It is the study of how things work (Stake, 2010). Qualitative research is:

“...a multifaceted approach that investigates culture, society and behaviour through an analysis and synthesis of people’s words and actions.... the data remains at the level of words, either the research participants’ own words, the words written in documents or the words used by the researcher herself / himself to describe the activities, images and environment observed” (Hogan et al., 2009, p.3).

It tries to probe into the exact reasons that led to a decision. Qualitative research has been suggested as exploratory and should be used when the variables and theory base are unknown (Creswell, 2003). As the researcher learns what and whom to ask, the research question may change and be redefined (Creswell, 2003).

Qualitative research includes case study research, action research and ethnography (Meyers, 1997). Qualitative data is collected by observation, interviews, documents, audio and visual material (Miles and Huberman, 1994; Meyers, 1997; Hogan, et al., 2009; Mora, 2010) or through focus groups (Anderson, 2006; Hogan et al., 2009; Rhodes, 2013). Advances in information technology have expanded the range of sources of qualitative date to include emails, social media, online chat, online forums and blogs (Hogan et al., 2009). The data collected is then used to pose, refine and answer the research question (Adams and Healy, 2000). Qualitative research, while being a more effective method of acquiring information (Anderson, 2006), is also less costly, but requires a lot more time and
the findings cannot be generalised to the whole population as only a few participants are used (Rhodes, 2013).

Qualitative research methodology will be used to explore the research objective of this piece of research, as it is an exploratory study. Exploratory research is a valuable means of finding out:

“...what is happening; to seek new insights; to ask questions and to assess phenomena in a new light” (Robson, 2002, p.59).

The aim of the research is to find complete detailed descriptions in order to answer the questions posed. The questions need to be answered in the form of words, not numbers or statistics, and the individual interpretation of the subjects of the research will be sought. It is only by doing this that the rich data required to answer these questions will be acquired by the researcher.

4.5.2 Quantitative Research

Quantitative research methods are achieved by surveying larger groups of people and applies “statistical techniques” to establish the overall patterns in the relations of processes (Rhobes, 2013). This type of research uses predetermined options, requires a large number of participants (Anderson, 2006), and is seen as a more structured approach (Kumar 2005). Carswell (2003) defines quantitative research as an approach that:

“...employs strategies of inquiry such as experiments and surveys, and collects data on predetermined instruments that yield statistical data” (p.18).

In general, quantitative research will generate dependable population based (Anderson, 2006) and generalizable data (Anderson, 2006; Rhodes, 2013). The research objectives, design, sample and questions are usually predetermined before the study is started and tend to rarely change (Kumar, 2005). Initially quantitative research methods were developed in the natural sciences to study natural phenomena (Meyers, 1997). This method emphasises that reality consists
of a world of objectivity-defined facts (Henwood, 1994). Quantitative researchers abstract from this world and seldom study it directly (Denzin and Lincoln, 1998).

Quantitative techniques include mathematical models, statistical tables and graphs (Denzin and Lincoln, 1998). The different methods used include surveys, experiments in laboratories, formal methods and mathematical methods such as modelling (Meyers, 1997). Examples of quantitative research methods include survey methods, laboratory experiments, formal methods, such as econometrics and mathematical methods such as modelling (Meyers, 1997).

4.5.3 Qualitative V Quantitative

The particular paradigm chosen for any study must be driven from the research questions being investigated (Guba and Lincoln, 1994). If the purpose of a study is to primarily describe a situation, phenomenon, problem or event that are not examined or measured in terms of quantity, amount, intensity or frequency then qualitative research applies (Denzin and Lincoln, 1998; Kumar, 2005). If the researcher wants to quantify the variation in a situation, phenomenon, problem or issue and the information is mainly gathered through quantitative variables and the analysis of casual relationships between variables is sought then quantitative research is suitable (Denzin and Lincoln, 1998; Kumar, 2005).

Quantitative data can appear very dry in comparison with the very rich data provided by qualitative studies (Adam and Healy, 2000). If the researcher solely uses quantitative methods some important information that researchers need to uncover can remain hidden (Tellis, 1997). Quantitative researchers are seldom able to capture the subject’s perspective because they have to rely on more remote, inferential empirical materials (Denzin and Lincoln, 1998). When textual data are quantified the researchers objective of understanding a phenomenon from the point of view of the participants and its particular social and institutional context is largely lost (Myers, 1997). Hopper et al., (2001) argued that quantitative research is too narrow, obsessively mathematical, and of little benefit to managerial problems that involve complex multiple factors and uncertainty.
Quantitative techniques pay too little attention to the issues of designing organisations as sustainable entities (Otley, 2001).

On the other hand qualitative research may be subject to considerable bias, and may be unreliable and impressionistic (Zikmund, 1997; Denzin and Lincoln, 1998). Research processes that include a qualitative approach can be very undefined and less objective than traditional analytical, survey and laboratory research (Kirk and Miller, 1998). Despite the fact that qualitative research permits the interpretation of results and allows a creative and in-depth analysis over the course of the study, this can result in the ideal of objective collection of purely descriptive ‘facts’ becoming blurred (Adam and Healy, 2000).

The skill of the researcher as an interviewer or observer in gathering data is crucial towards determining the value of the qualitative research methods, whereas the quantitative research methods place a great reliance upon instruments, such as experiments or questionnaires, employed to gather the data and analyse or measure it (Zikmund, 1997). It is a necessity in qualitative research that the researcher ensures that they remain objective (Merriam, 1998). The researcher should select methods appropriate to the research question being posed (Kumar, 2005).

The information needed to answer the research questions for this thesis was considered to be in the form of expert knowledge, knowledge specific opinions, feelings and beliefs, and therefore, it was decided not to use quantitative research method. The researcher will use a single case study. Semi-structured in-depth interviews observation and review of documentation will answer the research questions.

4.6  Case Study

Yin (1994) describes a case study as an empirical inquiry that:
“...investigates a contemporary phenomenon within its real life context, especially when the boundaries between the phenomenon and context are not clearly evident” (p.13).

A case study is an effective method use by researchers to analyse and solve practical business problems along with creating and testing theories (Jan et al., 2008). Case studies are a “valuable way of looking at the world around us” and don’t not require the researcher to “replicate the phenomenon in a laboratory or experimental setting” (Rowley, 2002, p.18). It is a traditional approach to the study of topics in social science and management and is the most prevalent approach being used in international business as a method of qualitative research (Pauwels and Mattyssens, 2004).

According to Merriam (1998) “the case study seeks holistic description and explanation” (p.10). Llewellyn (1992) agrees with this by claiming that case studies “seek to develop a holistic understanding” (p.28). The essential characteristic of the case study is that it strives towards a holistic understanding of “issues relating to an intervention from many perspectives: it seeks to view the performance of a program in its totality” (Kumar, 2005, p.294). Thus, the need for case study arises out of the desire to understand complex social phenomena. Yin (1989) summarizes this by saying:

“In brief, the case study allows an investigation to retain the holistic and meaningful characteristics of real-life events – such as individual life cycles, organizational and managerial processes, neighbourhood change, international relations, and the maturation of industries” (p.14).

A case study is generally the more favourable research strategy if how or why questions are being asked (Yin, 2003; Wedawatta et al., 2011) Saunders et al. (2003) state that a case study strategy is best used when ‘what’ questions are also being asked. Rowley (2002) also see using a case study as an appropriate strategy to adopt when asking “how” and “why” questions.

A wide range of evidence from dissimilar sources can be used when adopting the case study strategy, including articles, documents observation and interviews.
(Rowley, 2002). Case studies can also be historical (Rowley, 2002; Eisenhardt and Graebner, 2007) and can accommodate both qualitative and quantitative data (Yin, 2003). The depth and detail of qualitative data can be obtained only by “getting close”, physically and psychologically, “to the phenomenon under study” (Patton, 1980, p.43).

The case study is a rigorous coherent methodology that is based on justified philosophical positions (Perry, 1998). However, Marshall and Rossman (1989) approve the case study approach as the qualitative research features of understanding, describing and explaining are fulfilled in case study research. The quality of a case study can be enhanced if construct validity, internal validity, external validity and reliability are followed (Yin, 2003; Fellows and Liu, 2008; Wedawatta et al., 2011).

In spite of the advantages of the case study method, they have received plenty of criticism (Zainal, 2007), with many researchers avoiding the case study approach (Walker, 1985; Ryan et al., 1992; Yin, 1994). Case studies are mainly criticised in the literature because of its lack of rigour (Yin, 2003; Zainal, 2007) Researchers can have a biased view of the data being collected (Yin, 1984; Ryan et al., 1992; Zainal, 2007; Wedawatta et al., 2011).

“Case studies can oversimplify or exaggerate a situation, leading the reader to erroneous conclusions about the actual state of affairs” (Guba and Lincoln, 1982, p.377)

This claim is backed up by Yin (1994):

“...too many times, the case study investigator has been sloppy, and has allowed equivocal evidence or biased views to influence the direction of the findings and conclusions” (p.21).

As explained later, triangulation can be used to avoid bias. Also research strategies such as surveys and experiments can also show signs of bias (Ryan et al., 1992; Yin, 2003).
Another limitation of the case study is the difficulties to generalise (Yin, 1984; Tellis, 1997; Yin, 2003; Flyvberg, 2006; Zainal, 2007; Wedawatta et al., 2011). According to Merriam (1988) others argue that:

“...rather than applying statistical notions of generalizability to case studies, one should develop an understanding of generalization that is congruent with the basic philosophy of qualitative inquiry” (p.34).

Other limitations of the case study approach are that they can be too lengthy and too detailed (Merriam, 1998; Yin, 2003), very time consuming (Wedawatta et al., 2011), they produce a massive amount of documentation (Yin, 1984) and findings can only be compared to similar cases (Yin, 1984). To help a researcher avoid or reduce the above limitations Yin (2003) suggests they should learn from past experiences documented in past literature. Despite its limitations, researchers continue to use the case study method to study real-life situations and problems (Zainal, 2007).

The case study was chosen for this analysis as it provided a holistic study of the organisation that was required to answer the necessary research questions. This research uses what, why and how questions, a single case study strategy was deemed the most appropriate research strategy. Interviews will be the main method used to collect data, but observation and verification from internal and external data will also be used.

4.7 Single Case Study Method

The selection of cases is “purposeful and involves using replication logic and largely depends on the conceptual framework developed from prior theory” (Perry, 1998, p.793). The number of cases that should be developed is down to the researcher as “the literature recommending the use of case studies rarely specifies how many cases should be developed” (Romano, 1989, p.36). In a similar vein, Patton (1990) claim qualitative research has “no rules” for the sample size. They can be done on situations, events, process or organisations (Williams, 2011). Cavaye (1996) reminds researchers that the case study approach can be used in the
positivist and interpretivist traditions, for testing or building theory, with a single or multiple case study design, using qualitative or mixed methods.

Scapen (1990) describe a case study as a “single unit of analysis” (p.26). Both Kaplan (1986) and Merriam (2009) back this up by saying that case studies focus on a single entity. The single case study method is adopted when no other cases are available for replication (Zainal, 2007). The main disadvantage is its inability to provide a generalising conclusion (Tellis, 1997).

A single company was used for the purpose of this study. Selecting the unit of analysis, or the case is crucial as the site must be selected based on the research objective (Rowley, 2002). Limited time and accessibility are other reasons for selecting a single case study:

“...there will also be other constraints that impact on case selection. These include accessibility (whether the data needed can be collected from the case individual or organisation), resources (whether resources are available to support travel and other data collection and analysis costs), and time available” (Rowley, 2002, p.19).

McCracken (1988) believes that it is better to examine “longer and with greater care, with a few people than more superficially with many of them” (p.17). The case to select is that from which “we feel we can learn the most” and “many mean taking the one that we can spend the most time with” (Dezin and Lincoln, 1998b, p.101).

Using more organisations would have allowed the researcher perform cross unit comparisons. However, by focusing on one company, an in-depth view of the company is provided. CIT presented an appropriate case study as it has already invested in a UAP. In addition, the researcher had ready access to both information and interviewees, and knowledge of the way in which CIT operates, made this study feasible for research as fulfilment of a Master in Business (Research).
4.8 Triangulation

Triangulation in research is the use of numerous methods for collecting and handling data within a single study (Adami and Kiger, 2005). It is viewed by Rowley (2002) as one of:

“...the great strengths of case studies as compared with other methods is that evidence can be collected from multiple sources. Triangulation uses evidence from different sources to corroborate the same fact or finding” (p.23).

The use of more than one approach will enhance confidence in the researcher’s findings (Bryman, 2004). As it uses evidence that is collected from diverse sources allows validation of the same facts (Rowley, 2002) and the issue of bias by the researcher is partially overcome (Denzin, 1970; Tellis, 1997; Merriam; 1998). According to Merriam (1998):

“triangulation combines dissimilar methods such as interviews, observations, and physical evidence to study the same unit” (p.69).

The reason for using this strategy is that it helps to enhance the validity of the data collected because “the flaws of one method are often the strengths of another and by combining methods, observers can achieve the best of each, while overcoming their unique deficiencies” (Denzin, 1970, p308). This is further backed up by Webb et al. (1966):

“Once a proposition has been confirmed by two or more independent measurement processes, the uncertainty of its interpretation is greatly reduced. The most persuasive evidence comes through a triangulation of measurement processes (p.3).

As the approach to triangulation is flexible it can lead to a better fit between research problems and the methods chosen to investigate them (Brignall and Ballantine, 2003). The methods used in this study to achieve triangulation are interviews, observation and documentation review, in an attempt to validate and clarify all of the information obtained.
4.8.1 Interviews

Within qualitative research, the interview is one of the most effective methods (McCraken, 1988). Interviews are a way of providing a researcher with the chance to explore events and experiences that would be problematic and restrictive in more structured environment (Fultz and Herzog, 1996), giving the researcher an overall picture of an organisation. Patton (1980) sees interviews as an opportunity to gain an overall observation of different people’s perspective:

“We interview people to find out from them those things we cannot directly observe…. We cannot observe feelings, thoughts and intentions. We cannot observe behaviours that took place at some previous point in time. We cannot observe situations that preclude the presence of an observer. We cannot observe how people have organised the world and the meanings they attach to what goes on in the world- we have to ask people questions about those things. The purpose of interviewing, then, is to allow us to enter into other person’s perspective” (p.196).

In order for interviews to be a success, the researcher must be able to relate to the interviewees during the interview, particular those that require detailed probing of views (Chirban, 1996). The researcher must insure that the interviewee is comfortable to discuss the questions openly and gain the trust and confidence of the interviewee (Neale et al., 2005). Kvale (1996) consider interviews as an:

“...interchange of views between two or more people on a topic of mutual interest, sees the centrality of human interaction for knowledge production” (p.14).

The researcher prepared an Interview Protocol (Appendix A), that would be followed to put the interviewee at ease.

An interview guide is a list of questions, topic, and issues that the researcher wants to cover during the interview (Kajoenboon, 2005, p.3). Interviews can be structured, semi-structured or unstructured (Saunders et al., 2003; Kajornboon, 2005). Structured interviews have a predetermined and standardised list of questions (Merriam, 1998; Saunders et al., 2003; Kumar, 2005). The researcher
asks all of the interviewees the same questions (Kajoenboon, 2005). Gray (2004) goes as far as to suggest that the questions should even be read out in the same tone of voice. The researcher will have control over the “topics and the format of the interview” using this type of structure (Kajoenboon, 2005, p.5). The main disadvantage of structured interviews is that they stick too closely to the interview guide and don’t not probing for relevant information (Kajoenboon, 2005).

In semi-structured interviews, the interviewer has a list of themes and questions to be covered but neither the exact wording or order of questions is determined ahead of time (Merriam, 1998; Saunders et al., 2003). This gives the interviewer the freedom to ask additional questions that he or she did not anticipate and an opportunity to probe for views and opinions of the interviewee (Kajoenboon, 2005; DiCicco-Bloom and Crabtree, 2006). They are the most used interviewing method for qualitative research and can be performed with an individual or in a group (DiCicco-Bloom and Crabtree, 2006, p.315).

Unstructured interviews are non-directed, flexible and are more casual then structured and semi-structured interviews (Kajornboon, 2005). The interviewee can give their opinions, knowledge and can share their experience, as there is no restriction on the questions being asked (Kajornboon, 2005). Unstructured interviews are appropriate when the interviewer does not know a lot about the research topic and an in-depth interview is needed to obtain a clear idea about the area being explored (Saunders et al., 2003; Kumar, 2005).

The interview process includes advantages such as its usefulness in studying complex situations, collecting detailed information, the researcher is provided with instant feedback, his/her questions can be explained or changed if required and new questions can be formed from the answers provided (Kumar, 2005). According to Kumar (2005) the disadvantages are:

“interviewing is time consuming and expensive, the quality of data depends on the quality of interaction, the quality of data depends upon the quality of the interviewer, the quality of data may vary when many interviewers are used and the interviewer may introduce his/her bias” (p.132).
Despite these interview limitations, they allow the researcher to collect a rich and detailed set of data (Saunders et al., 2003). Multiple interviews and multiple interviewees allows for greater generalisation of results (Yin 1989).

In this study, the researcher used semi-structured in-depth interviews as they were considered the most suitable method available to the researcher. They allow a participant time to elaborate on their responses, and let the researcher probe and ask additional questions leading from the respondents’ original answers. The main aim of this research was to discover how the inclusion of ERP education in the School of Business adds value to the degree’s and to investigate the different teaching methods available to see what is the most beneficial approach to incorporating ERP education into a Business degree. An interview guide was constructed and used by the researcher of this piece of research during the interview process (Appendices B and C). While the interviewer tried to get answers for all the questions in the guide, he was not afraid to deviate from the list or change the order of the questions.

For this research, fifteen academics were interviewed from the School of Business in CIT (see Table 4.1). This included eleven lecturers, three Heads of Departments and the Head of School. The interviewees were initially contacted by email to establish if they were interested in taking part in the research. Once the academics agreed to take part in the research, a time and date was set and during the interviews, the questions were open-ended and were intended to lead to answers that the interviewer could probe further on.

The location chosen for the interviews to take place in is very important and Hart (1998) suggests that most interviewees will suggest a quiet office as the venue for the interview. As all of the interviewees are employees of Cork Institute of Technology (CIT) the interviewer used a mix of location on campus to conduct the interviews. These included booking conference rooms, free classrooms and the interviewees own office if it was free at the time of the interview.
Recording an interview will help the interviewer remember all parts of the interview and will add more value to the interview as less time is wasted writing down notes. Without the use of a recording device, the interviewer will have a difficult time responding appropriately to the answers and take the conversational and probing elements out of the interview (Bryman and Bell, 2003). Lofland (1971) agrees with recording an interview:

“One’s full attention must be focused on the interview. One must be thinking about probing for further explication or clarification of what he/she is now saying; formulating probes; linking up current talk with what has already been said; thinking ahead to putting in a new question that has now arisen... all of this is hard enough simply by itself. Add to the problem of writing it down- even if one takes shorthand in an expert fashion- and one can see that the process of note-taking in the interview decreases one’s interviewing capacity. Therefore, if conceivably possible, tape record” (p.89).

It was for the reasons mention above that fourteen of the fifteen interviewees for this research were recorded and later fully transcribed, allowing the researcher to include direct quotations in the findings. One of the academics did not wish to be recorded, so detailed notes were taken during the interview.

4.8.2 Observation and Documentation Review

According to Saunders et al. (2003) a documentary review includes the review of written documents such as “notices, correspondence, minutes of meetings, reports to shareholders, diaries, transcripts of speeches and administrative and public records” (p.87). A documentation review is a form of triangulation, which means that the company’s actors are not required to actively participate in this (Adams and Healy, 2000).

For this research, as a student and an employee of the case study company, the researcher had access to internal documents made available by CIT and attending meetings in CIT. The documentation types used were minutes of School and Department meetings and CIT’s Strategic Plan. These provided substantiation
confirmation of detail acquired from the interviews and they provide more rounded information.

**Table 4.1: The Interview Process**

<table>
<thead>
<tr>
<th>Date</th>
<th>Name</th>
<th>Job Title</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>10/12/13</td>
<td>Lecturer A</td>
<td>Casual Lecturer: Accounting and Information Systems</td>
<td>40 Minutes</td>
</tr>
<tr>
<td>19/12/13</td>
<td>Lecturer B</td>
<td>Lecturer: Accounting and Information Systems</td>
<td>40 Minutes</td>
</tr>
<tr>
<td>19/12/13</td>
<td>Lecturer C</td>
<td>Assistant Lecturer: Accounting and Information Systems</td>
<td>45 Minutes</td>
</tr>
<tr>
<td>20/12/13</td>
<td>Lecturer D</td>
<td>Assistant Lecturer: Accounting and Information Systems</td>
<td>50 Minutes</td>
</tr>
<tr>
<td>16/1/14</td>
<td>Lecturer E</td>
<td>Casual Lecturer: Accounting and Information Systems</td>
<td>35 Minutes</td>
</tr>
<tr>
<td>22/1/14</td>
<td>Lecturer F</td>
<td>Casual Lecturer: Accounting and Information Systems</td>
<td>45 Minutes</td>
</tr>
<tr>
<td>31/1/14</td>
<td>Lecturer G</td>
<td>Lecturer: Accounting and Information Systems</td>
<td>45 Minutes</td>
</tr>
<tr>
<td>4/2/14</td>
<td>Lecturer H</td>
<td>Lecturer: Accounting and Information Systems</td>
<td>55 Minutes</td>
</tr>
<tr>
<td>5/2/14</td>
<td>Lecturer I</td>
<td>Senior Lecturer: Accounting and Information Systems</td>
<td>50 Minutes</td>
</tr>
<tr>
<td>7/2/14</td>
<td>Lecturer J</td>
<td>Lecturer: Accounting and Information Systems</td>
<td>50 Minutes</td>
</tr>
<tr>
<td>11/2/14</td>
<td>Lecturer K</td>
<td>Lecturer: Accounting and Information Systems</td>
<td>55 Minutes</td>
</tr>
<tr>
<td>5/3/14</td>
<td>Head of Department A</td>
<td>Head of Department</td>
<td>60 Minutes</td>
</tr>
<tr>
<td>12/3/14</td>
<td>Head of Department B</td>
<td>Head of Department</td>
<td>65 Minutes</td>
</tr>
<tr>
<td>26/2/14</td>
<td>Head of Department C</td>
<td>Head of Department</td>
<td>55 Minutes</td>
</tr>
<tr>
<td>19/3/14</td>
<td>Head of School</td>
<td>Head of School</td>
<td>55 Minutes</td>
</tr>
</tbody>
</table>

*Produced by the Researcher for this Study*
The researcher appreciates the fact that the documents were prepared for a specific purpose rather than for the case study, so during the investigation of the case study the researcher was not misinformed by the detail contained within the documents that were reviewed.

4.9 Conclusion

This chapter outlined the research methods to be used in this study was conducted and the choice of research method was explained. The chapter justifies the use of a single case study strategy. To validate the data collected, the researcher examined data from multiple sources; the data was gathered through observation, semi-structured interviews and through a review of CITs documentation. This strategy, together with a review of academic literature, fulfilled the criteria of sourcing data from a wide array of sources.
Chapter 5  Cork Institute of Technology

5.1  Introduction

This chapter introduces the case study used in this dissertation; namely Cork Institute of Technology (CIT). It then sets-out the academic management structure in CIT, concentrating on the School of Business, which is the focus of this study. The chapter closes with a description of the decision by the School of Business to invest in a University Alliance Programme (UAP) developed by an Enterprise Resource Planning (ERP) vendor.

5.2  Overview of Cork Institute of Technology (CIT)

Cork Institute of Technology (CIT) is an Irish education provider that offers a wide range of full-time and part-time higher education courses on its campus in Cork. It operates under the terms of the Qualifications Act (1999) and therefore all courses lead to an award of a qualification, which is fully recognised and conforms with the National Framework of Qualifications (NFQ). The main qualifications awarded are Higher Certificates (NFQ Level 6), Bachelor Degrees (NFQ Level 7), Honours Bachelor Degrees (NFQ Level 8), postgraduate Masters Degrees (NFQ level 9) and PhD Degree (NFQ Level 10), in art and design, business, engineering, humanities, music, maritime studies, science and information technology.

CIT was founded in 1973 (formerly known as the Regional Technical College Cork). CIT takes pride in its role of providing higher education for the region and beyond. It currently has over 12,000 registered students with approximately 2,000 new entries each year. Of these approximately 6,000 are full-time and the remaining are part-time. The part-time student population consists of a wide variety of students including access, evening and continued professional development students as well as a significant number of students studying music and drama (CIT.com/Stategicplan).
At present, CIT has 1,425 staff members of which 824 are academic staff. The academic staffs consist of 455 permanent whole time, 136 pro-rata part-time and 233 hourly-paid part-time members. The non-academic staffs are composed of technical support, library, administrative and services staff. The non-academic staff members break down as follows: 187 management, clerical and library staff; 169 student services support, including exam invigilators; 86 technicians; 70 research staff; and 89 support staff including caretakers, attendants and cleaners.

CIT also has three constituent colleges; CIT Crawford College of Art and Design, the CIT Cork School of Music and the National Maritime College of Ireland. The CIT Crawford College of Art and Design and the CIT Cork School of Music are both located at campuses in Cork city centre. The National Maritime College of Ireland is located in Ringaskiddy (CIT Prospectus 2014). These are not the focus of this research.

CIT’s main campus is located in Bishopstown, Cork, Ireland. Here it runs courses in Business, Science, Informatics, Engineering and Humanities. The Student Services, The Student Centre, Administrations Office, CIT’s Library, Rubicon Centre and Industry Support Centres are also located in the Bishopstown Campus. The Student Centre includes services such as a common room, bistro, meeting rooms, Bank of Ireland and a shop. Students can also play pool, darts and video games in the centre. CIT’s library provides up to five hundred study places and has resources for both students and staff in the form of books, journals, audio-visual and electronic information resources appropriate to all subjects taught in the institute. The Rubicon Centre is a business incubation centre for young graduates. It provides them with support for starting up a business. CIT’s Information Technology Centre consists of computer labs, seminar rooms and open access computer desks for over one hundred students (CIT Prospectus 2014).

The most recent change in CIT has been the introduction of modularisation and semesterisation. This commenced for all CIT students enrolling from September 2007. This involved modifying all of the programmes and their assessment methodology. CIT is currently engaged in a process geared towards forming the
5.3 Mission Statement and Vision

CIT’s mission and strategy sets out the organisation’s values and aspirations, what it does and how it can best serve the interests of its students, staff and key stakeholders. CIT’s mission is:

“To provide student-centred, career-focused education and research for the personal, professional and intellectual development of the student and for the benefit of the broader society in the region and beyond”

This mission statement is inclusive of all the disciplines and levels at CIT. It sees students as the primary clients of the Institute and has made a commitment to serve local and national industries, social and cultural needs of the community and the region. CIT has the following commitments to its stakeholders:

- CIT develops and fosters the talents of its students in a supportive environment which challenges them to succeed and prepares them to make a positive contribution in their chosen careers and as members of society regionally, nationally and internationally.

- CIT is committed to respecting and protecting the dignity and rights of individuals through practices, which promote fairness and equal treatment for all.

- Through the delivery of career-focused education, training and professional development, CIT produces graduates who are professionals and practitioners, distinguished in their chosen career by their ability to effectively create and apply knowledge, engage in ongoing learning and act in entrepreneurial and innovative ways.
• Engagement with enterprise and the extension of the campus into the workplace (and the wider community) is a key defining characteristic of CIT.

• CIT engages in research in a manner that supports and enhances its core mission. Research is an essential core activity and it informs all the activities of the Institute including teaching and enterprise engagement.

• CIT provides education opportunities, which empower all motivated individuals to pursue personal, intellectual and professional enhancement.

• CIT provides education, research, innovation and other services which are aligned to regional, national and international needs and priorities.

• CIT makes a positive contribution to the academic, economic, industrial, social and cultural life of the region and beyond. Furthermore, its staff, students and graduates are aware of the importance of ethical behaviour and social responsibility across all economic, social and cultural domains. (CIT’s Strategic Plan 2012-2016).

CIT’s vision is as follows:

“CIT will be an internationally recognised centre of excellence in the provision of career focused education which produces effective, ethical professional capable entrepreneurship, innovation and creativity”

Achieving this vision requires the development of learners who are flexible thinkers capable of creativity and innovation, who by the time they graduate from CIT will already possess the attributes and aptitude required to be effective professionals and practitioners in their chosen field (CIT’s Strategic Plan 2012-2016).
5.4  Academic Management Structure

CIT has a faculty based academic management structure. There are two faculties (Engineering & Science and Business & Humanities). Each of these faculties is made up of a number of schools, which are made up of two or more academic departments.

5.4.1  Engineering and Science

The Faculty of Engineering & Science comprises of the School of Building and Civil Engineering, the School of Mechanical, Electrical and Process Engineering and the School of Science and Informatics. The School of Building and Civil Engineering contains the Department of Architecture, the Department of Civil, Structural and Environmental Engineering and the Department of Construction. The School of Mechanical, Electrical and Process Engineering contain the Department of Mechanical, Biomedical and Manufacturing Engineering, the Department of Process, Energy and Transport Engineering, the Department of Electrical and Electronic Engineering and the Centre of Craft Studies. The different departments under the School of Science and Informatics are the Department of Applied Physics and Instrumentation, the Department of Biological Science, the Department of Chemistry, the Department of Mathematics and the Department of Computing (CIT Prospectus, 2014).

5.4.2  Business and Humanities

The Faculty of Business & Humanities comprises of the School of Business and the School of Humanities. The School of Business comprises of four different departments: The Department of Marketing and International Business, the Department of Organisation and Professional Development, the Department of Accounting and Information Systems and the Department of Management and Enterprise. The Department of Applied Social Studies, the Department of Sport, Leisure and Childhood Studies, the Department of Tourism and Hospitality and
the Department of Education Development are the four departments of the School of Humanities (CIT Prospectus, 2014). For this dissertation, the researcher has focuses on the full-time degree programmes of the School of Business.

5.5 School of Business

The School of Business is one of the schools in the Faculty of Business and Humanities. It provides courses in areas such as Professional Accounting Practice, Banking, Computing, Insurance, Travel, Retailing, Manufacturing and General Management in multinational and indigenous companies in Ireland and around the world (Department of Accounting and Information Systems, Student Handbook, 2014). This study is focusing on the honours Bachelor of Business programmes throughout the School.

At the time of this study, the researcher was a student of the Masters of Business (Research) in the Department of Accounting and Information Systems and employed as a Tutor. In 2012, CIT invested in SAP’s University Alliance Programme (UAP) with the aim of using it in modules within the School of Business. The researcher saw this as the unique opportunity to investigate how Enterprise Resource Planning (ERP) education can be best provided to Business students. The views of eleven lecturers, three Heads of Departments and the Head of School was obtained through interviews and confirm using internal documentation and observation throughout the duration of the study.

5.6 Decision to Invest in an University Alliance Programme (UAP)

The School of Business in CIT has been providing theoretical ERP education to its Business students for over a decade now. Until recently, it was just taught in the classroom. The only time the student saw what an ERP system looked like, or the reports it could produce, was through screenshots:
“I taught ERP to students in the past and I found it very difficult to teach an ERP system without actually having the practical element. Prior to the investment, we were teaching it through screen shots and the students used a book to give them a theoretical underpinning or base, but there was no actual practical use of an ERP system” (Head of School).

Employers, lecturers and graduates all called for practical ERP education. Feedback from companies hiring CIT Business graduates argued that in today’s marketplace practical experience of an ERP system (and in particular SAP) was something they were interested in. Lecturers that were providing ERP education in the classroom felt that students could gain a lot more from hands-on experience of the system. Final year students were also becoming aware that ERP education is something that potential employers were actively looking for. As described by one of the Heads of Department:

“This decision to invest in SAP was driven by students and employer requirements. Graduates need a knowledge of SAP, that is the feedback we were getting from companies that had or were just about to implement it. It would have been driven as well by the lecturers in terms of saying “these are skills that we feel our students should have” and also feedback from students back from placement. Employers taking students on placements were telling us that if students have a particular insight into the system that would be of benefit to them” (Head of Department B).

The feedback from industry was accompanied by pressure from the academic staff and students in the School of Business to have a more practical focus. The Head of School was the champion of the investment as he had previous industrial experience using ERP systems and was an IT lecturer. It was his enthusiasm for the investment that expedited the investment decision:

“It was the Head of School that drove it, that commissioned it and that would have signed off on it” (Head of Department A).

“It would have been my idea, I signed the licence. It would have been in conjunction with (Head of Department B) and some other staff members who had suggested it in the past” (Head of School).
The Head of School weighing up the various vendors available, taking the views of the employers of graduates and the School of Business lecturers into considered, SAP was the ERP systems vendor chosen. Two of the major factors contributing to this decision were the fact that SAP is used by the majority of employers from whom CIT had received feedback and the fact that SAP had a University Alliance Programme (UAP) in place:

“I suppose there are a lot of ERP systems out there, SAP, Oracle, PeopleSoft and Microsoft Dynamics. SAP had a University Alliance Programme set-up, this is a programme where you can train staff and get a reduced rate with the licencing, but it is still a significant investment. After reviewing all the options, it was decided to bring SAP in. (Head of School).

All interviewees agreed CIT has made the correct decision in investing in SAP’s UAP and that it would benefit future graduates as they will have received practical ERP experience during their degree in college.

5.7 Conclusion

In this chapter, the researcher gave an overview of CIT, the case study organisation used for this dissertation. The chapter stated the mission and vision of CIT and outlined its academic management structure. It then focused on the School of Business and its decision to invest in a UAP. As the mission statement focuses on providing student-centred and career-focused education for the student, the investment in an ERP system for use by the students was seen as one of the ways the School of Business could achieve this mission. The decision stem for the needs of industry and was pushed by the academic staff and in particular the Head of School. The objective of the remainder of this study is to investigate the development of Enterprise Resource Planning (ERP) education for Business students in third-level education.
Chapter 6   Benefits of ERP Education in CIT

6.1   Introduction

This chapter examines the views of fifteen academics (eleven lecturers, three Heads of Departments and the Head of School) from the School of Business in Cork Institute of Technology (CIT) on the benefits of ERP education, and in particular practical ERP education, to the various stakeholders. Since 2004, ERP education has been taught in CIT in a lecture environment. In 2012, CIT invested in a University Alliance Programme (UAP) and now provides “practical” ERP education.

This chapter is divided into two sections. The first section looks at the benefits of providing students of Business degree programmes with knowledge of Enterprise Resource Planning (ERP) systems as CIT has been doing since 2004. The second section sets out the additional benefits of providing a ‘practical’ ERP education in CIT to the different stakeholders. The researcher produced Figure 6.1 summarising how providing practical ERP education benefits the students, potential employers and ERP vendors, but reciprocally benefits CIT as well.

6.2   Benefit of a Theoretical ERP Education

CIT has been providing ERP education for over ten years. Up to two years ago this consisting of lectures only, with no practical ERP element. Incorporating this ERP education into the Business curriculum has had many benefits for the stakeholders; students, potential employers and CIT.

6.2.1   Benefits for Students

ERP education in the classroom has made the students aware of what an ERP system is and its benefit to businesses. The main benefits for students of having
ERP education are that it enhances their employability prospects and their knowledge of how a business works.

6.2.1.1 Enhances Employability Prospects

As a result of ERP systems’ growing popularity most multinational companies (MNCs) and an increasing number of small-to-medium sized enterprises (SMEs) now have invested in ERP systems. Therefore, academics in CIT believe it is important to provide its Business degree students with some exposure to ERP systems. When asked to identify the main benefits of ERP education, the one advantage mentioned by all of the interviewees is having ERP education on the graduates’ curriculum vitae (CV) and how this enhances their employability once they graduate, as depicted by the following quotations:

“ERP is used by so many companies at the moment so it would add strongly to their [students’] CVs if they have knowledge of ERP systems from college” (Lecturer B).

“Employers are looking for ERP knowledge, so I think it is a very good thing for our students to have on their CVs” (Head of Department A).

Having ERP education as part of the Business degree gives the graduates the confidence to talk about it in their interview for a job and the interviewer will know that this person has knowledge of what ERP is and what it does:

“ERP education benefits them [the students] as they have an advantage going into an interview as they would show the employers that they know how what an ERP system is” (Lecturer C).

Not only will it make graduate confident in an interview situation, but also when they are faced with an ERP system in their first job:

“It will be good for the students if we were able to give them some exposure to an ERP system because they are now being used by a lot of MNCs especially in Cork” (Lecturer G).
“I think it would be of great benefit to the students as this is what the majority of students will encounter when they go out to work, especially as all the big MNC around Cork are using ERP system” (Lecturer E).

Many of the interviewees also spoke about how ERP experience, as part of an internship, would offer students additional practical ERP experience, this would be of great benefit to them once they graduate:

“If we have students going out and working with ERP on work placement and getting the opportunity to apply what they have learnt in the class or lab environment, it can be a positive for them... and of course used to positively promote the course” (Lecturer I).

Six of the interviewees felt that ERP work experience would be a great addition to the students’ CVs and be a major asset in securing employment after college:

“I suppose if they have worked in ERP it is another set of skills they can add to their CV... You are adding value from an employment point of view” (Head of Department B).

ERP education and experience helps graduates not only in securing their first job by giving them an “an edge over their counterparts” (Lecturer E) but also results in them “receiving higher starting salaries because they have the added value from having ERP education” (Lecturer E). So even though the interviewees all mentioned other benefits, the benefit of answering a calling from local, national and international employers for more graduates with ERP education thus increasing graduates employability, seems to be the overriding benefit to students of introducing ERP education.

6.2.1.2 Enhances Business Knowledge

ERP by its name is “an enterprise wide resource” (Lecturer I) integrating all areas of an organisation. ERP education gives students a holistic view of the business, showing them how all the different functions of a business work together. In college, the different modules of a degree programme are rarely studied in a cross-
modular fashion, however using an ERP system shows how they are all connected, giving students a more holistic view of how businesses operate, as illustrated by the following quotations:

“I think it would help bring all of their various modules together. Our accounting students will be thinking “we are accountants; we don’t need to be looking at supply chain or quality management systems”. I’d hope that ERP would help to knit some of those modules together for them and that it gives them a broader sense of the business” (Lecturer E).

“It demonstrates to them the whole business process or business integration. Students need to look at how all the different functional areas of a business are connected, you can see how an invoice comes in and how it goes through the different modules in ERP and comes out at the other end. It makes the students realise the impact of any decision they make on the whole organisation” (Head of School).

“It brings everything from their accounting, HR, management, marketing lecturers together for them. It make it all fit together like a big jigsaw where they were working on separate sections and now it’s one clearer picture” (Lecturer K).

It is interesting to note how the lecturers view the introduction of ERP education as enhancing the students’ knowledge of how businesses work and how the different functions of the business work together. These benefits for students of enhanced ERP and business knowledge are also of course benefits for their future employers also. The interviewees did however stress that these benefits are limited where students only have knowledge of ERP from a classroom environment and stressed the need for the students to also have hands-on practical experience. This is discussed in section 6.3 below and in chapter Seven where the methods of ERP education are discussed.

6.2.2 Benefits for Potential Employers

The academics interviewed were all aware that ERP education is one of the things sought by potential employers. They were made aware of this through feedback
from industry and from examination of criteria in employers’ advertisements for vacancy for graduates:

“This is because of the importance of the benefits of ERP in the workplace. The graduates with knowledge of ERP systems are more attractive to employers, as they are more confident when they start working on a system. They may need less training when hired, so this saves costs for the employer, and will be more ‘work-ready’, as demonstrated in the following quotations:

“These students should have a good knowledge of ERP systems as soon as they start in their first job, this will save the employer time and money on intensive training” (Lecturer A).

“Knowledge of how ERPs work will enable our graduates to hit the ground running when taken on by a company that has an ERP system. ” (Lecturer K).

“They [the employers] can see that the students not only can pass their exams but are trained to go straight into work. This saves time and money on training them” (Lecturer C).
Employers are calling for more ERP education. By answering this call, CIT is building its links industry, the potential employers of its graduate. Again here the interviewees highlighted the fact that the benefits to employers are limited if the students do not get access to practical ERP education.

6.2.3 Benefits for CIT

As well as having many benefits for the student and potential employers of these students, the introduction of ERP education also has had benefits for the college. The main benefits examined here are those of attracting potential student and building industry links.

6.2.3.1 Attracting Potential Students

When asked could the inclusion of ERP education in the Business degree be used by CIT as a marketing tool to attract a higher calibre of student or increase the number of students applying for the Business degree, all interviewees were of the same opinion, that students applying for an undergraduate programme would most likely not be aware of what an ERP system actually is. Lecturers commented that: “students filling out the CAO would not know what an ERP system is” (Lecture J) and “people applying at undergrad level would not really know what ERP is all about” (Lecturer F). The Heads of Department and Head of School agreed stating that:

“I don’t think that students applying for the Business courses after the Leaving Cert are worried if there is an ERP system being taught or not. At that stage they do not know what an ERP is or its importance in the modern business world” (Head of School).

“The words ERP system would mean nothing to Leaving Cert students coming into full-time education” (Head of Department B).
Even though students nowadays are more aware of their career paths, the interviewees in this case all agree that ERP education is not something that is yet to factor into their decision when choosing a college or a course:

“First of all students are becoming more aware of what they are going to do in college. In saying that, I have never really got the sense from students or their parents, that they would chose the course because we would be offering an ERP element in the course or not” (Lecturer I).

One of the Head of Departments believes that one of the reasons why students do not realise the importance of ERP systems is because they are not sure if guidance teachers are giving students any information on the growing demand for people with an ERP skill set:

“I don’t know if guidance teachers have any knowledge of what ERP systems are and therefore won’t be telling students that if they study business in CIT that they will graduate with some ERP education” (Head of Department A).

Therefore, theoretical ERP education was not seen as a means of attracting potential students.

6.2.3.2 Building Industry Links

All of the interviewees in this study were certain that the inclusion of ERP education in the CIT Business curriculum does attract more potential employers for graduates and builds better relationships with industry. During recruitment, employers are actively looking for students that have studied ERP as part of their degree. It insures that employers are hiring students who are aware of how an ERP system works, which will result in them spending less time and money on training them up and they can get them involved in projects at an earlier stage. Therefore, ERP education is adding value to the Business degree:

“If we could get a group of students who have the experience and skills in ERP and show this to employers this year, it would attract more employers in to CIT next year.” (Lecturer C).
“Employers are looking for ERP skills, so for attracting recruiters in to CIT ERP education could be something that you could talk to employers saying ‘this is a module that we are offering and by the time they graduate they will be able to use the ERP system’. Even if the company has a different ERP system in place, the skills are transferable” (Lecturer F).

“I think ERP education is an extra selling point for our degree to employers coming in to us” (Lecturer E).

CIT can also benefit from local companies who are looking for graduates with ERP knowledge by encouraging them to come into the college to give talks to the students (and lecturers) or by running competitions for the students:

“It makes sense if we could get someone who is using it actively to come in and do a session with a group and focus on particular element or particular module within the system, I think that would be very much an ideal prospect for us and them” (Head of Department C).

“Also from a business integration point of view showing them real life examples, this could be done by getting somebody from PepsiCo to come in and judge a competition, give them a case study to do, get them working on something, get industry people to judge it” (Head of School).

Building relationships with industry will not only increase the employability potential of the graduates of CIT, it will also in the longer-term result in improving the relevance of the Business programme to industry and encourage guest speakers to present to students.

6.3 Benefits of Practical ERP Education

According to all of the interviewees, the benefits of having ERP education, as mentioned above, are all accentuated by having practical ERP education. Having an alliance with the most popular ERP vendor on the market can bring great benefits to the students partaking in the practical ERP education, employers of graduates and it is also beneficial to ERP provider and CIT.
6.3.1 Benefits for Students

As stated in the previous section theoretical ERP education enhances students’ employability prospects and their knowledge of how businesses work. All of the interviewees stressed how practical use of an ERP system in college would provide further enhancement of these two benefits. The major benefit for students with experience working specifically with SAP during their time in third-level education is their increased employability due to SAP’s popularity and its dominance over the other major ERP systems being used today in industry:

“If students have access to SAP in college, they will be so much more qualified when they leave CIT and will be able to hit the ground running if they start working any of the companies that has SAP in place” (Lecturer E).

“Once they finish their degree in CIT, they could potentially move straight onto working with a SAP package” (Lecturer B).

“It is something that you can put down on your CV and make you unique from the competition” (Lecturer I).

Practical use of an ERP system like SAP can give the students valuable experience of what they can expect and what will be expected of them once they go out to work for the type of companies that their degree is aimed at:

“SAP experience is of benefit to the student because they can actually see what they will be doing when they go out to their first job and they decide if this is what they want to do” (Lecturer C).

If graduates are working on a system that will be part of their daily work routines, having ERP education will make their transition from college to the workplace that bit easier for them.

“If they know what the system is designed to do and especially if they know how the system can make their lives easier in the workplace. I think they will be more comfortable with it in the workplace. I think it will benefit our graduates immensely” (Lecturer A).
Working with SAP can also open doors for students to gain employment with companies that use another ERP system, as the skills they learn with SAP are transferrable:

“It will help them when they leave college to find a job as if you have the experience of one ERP system you have the experience to work with other systems on the market” (Lecturer J).

As well as improving students’ employability prospects and enhance their business knowledge, use of an UAP can improve both their technological and soft skills with regular exposure to a practical ERP system during their third-level education and they can also build networks with other UAP users in other colleges.

6.3.1.1 Enhanced Technology Skills

Business students in CIT use Microsoft Excel from first year right through to graduation. All the interviewees stated that it is important that all students are exposed to Excel so that they are comfortable with it and build-up a competency in analysing data. However, the feedback from employers of Business graduates is that they still do not have enough Excel experience. One of the lecturers interviewed feels it is because the students learn the different functions, but don’t know how and when to apply them in practical situations that third-level graduates are criticised for their poor level of Excel:

“Repeatedly the employers tell us that students should have a high level of Excel. We are teaching Excel constantly and every year the amount of IT is increasing. But they still don’t have enough when they go out into the workplace. The gap between the exercises that they do with them in class and what they are being asked to do during work are too big, the students don’t seem to be able to relate what they do in class to what is required in practical situations when they are in the job” (Lecturer B).

Four of the interviewees in this study suggested that by working with Excel alongside an ERP system to analyse results gives the students additional practical exposure to ERP systems and Excel. Exposure to Excel in first year will ensure
that students will be comfortable with it by the time they have to use it to analyse
data produced by the ERP system and be more at ease with both when the time
comes to use them in the workplace:

“I think it would be beneficial for the students to get exposure to Excel during the earlier years in their degree as this will make the transition a bit easier when they more onto working with an ERP system” (Lecturer K).

“They (students) would have worked with Excel earlier in their programme so they would be starting to get comfortable with data and managing data and how you can manipulate it. I suppose that would be a useful skill in terms of looking at an ERP” (Head of Department B).

Working with Excel and an ERP system simultaneously will surely improve this Excel skills shortfall and be beneficial in their ERP skill” (Lecturer B).

“I have been talking to people working in Kerry Group, they said that they are currently pumping out ten million lines of data every night and this is then transferred into Excel. Our graduates need technical skills in using Excel with ERP” (Lecturer D).

By giving students the opportunity to use their Excel skills with ERP systems it will ensure that graduates not only have ERP education but also a better level of Excel.

6.3.1.2 Enhanced Soft Skills

All of the academic staff interviewed cited teamwork and communication skills as vital skills in today’s market place. In the workplace, soft skills are just as important as knowledge and technology skills because there is no point knowing something if you cannot communicate that knowledge to others working with you. The importance of being able to work in a team and having good communication skills are stressed in the following quotes:
“Students need good communication and interpersonal skills as they will be working in groups constantly and will potentially be meeting with clients” (Lecturer C).

“I keep telling my students that no matter how strong and technically proficient they are, they will be less appealing if they cannot go out to a client or go into a room with a customer, a client or even a colleague and actually have a conversation and be comfortable in talking to them about their business, ask the right questions and actually build up a rapport with them” (Lecturer I).

“What I think is very important for a student is his/her reporting skills. With the information provided by an ERP system, people will need to write their own reports or their own inquiries into the database and that skill set means that you have thought a lot about the information you require, why you require it, how you want to see it and what it will potentially tell you” (Lecturer I).

“If you are working for a company who has an ERP system in place they would need to be able to articulate their needs around the information” (Lecturer D).

Those using an ERP system need to be able to communicate with all those involved and be mindful of how a decision made by one department can affect other departments in the company. To get the information needed from the diverse users of the ERP system, it is also important that Business graduates can work well with a diverse group of people:

“We need to be able to go down to the shop floor and talk to people in operations about things like the level of inventory they are holding, how that impacts on the accounts. They will need to communicate with the relevant people about costs of wages and salaries. If you are working with ERP you will be involved in the company as a whole, not just in an office.” (Lecturer E).

“This would mean that you would need to be able to communicate with the people involved and be able to work well in a team” (Lecturer E).

“As an accountant our graduates will be pulling information from all facets of the organisation, they will need to have access to reports and therefore will have to liaise with perhaps the operational and IT people to design the report that you require” (Lecturer I).
By working on an ERP system in college, students are given the opportunity to improve teamwork and communication skills as they work in groups and therefore will have to have meetings and “communicate more with each other” (lecturer B). Instead of leaving the development of soft skill to when Business graduates get their first jobs; third-level institutes should be incorporating it into their learning outcomes:

“The market is looking for people who are able to work in teams and solve problems in a collaborative manner. At the moment we are letting the employers shape this kind of skill. The employers are coming back to us and saying ‘Why aren’t your graduates coming equipped with this?’ So we need to bridge this gap” (Lecturer K).

By working on an ERP system, students will be able to enhance their knowledge of how businesses operate, their technology skills and their soft skills, thus making themselves more attractive to potential employers.

6.3.1.3 Building Networks

Students that are actively using SAP Alliance during their degree can build links and form relationships with other students who are using the same system in other third-level institutes be it locally or internationally:

“The students could create links with other students from other colleges who would be using a similar type of programme” (Lecturer E).

These links will help the students build networks that may be invaluable to them in their studies and in their future careers.

6.3.2 Benefits for Potential Employers

Employers know exactly what they are looking for it terms of students’ skill sets and ERP is something that they are showing an interest in. They are interested in hiring students who have work on the practical element of an ERP system:
“The employers are impressed when they hear that we have a SAP UAP in CIT. We must now get it imbedded into our courses so all our Business students are using it” (Lecturer I).

“Employers are very pragmatic people, and if they see that we have got the relevant skill sets in our courses they are very taken by those skills” (Lecturer I).

“It is offering skill sets to the students, certainly employers are going to be more receptive to taking students if they have this particular skill set” (Head of Department).

For both work placement and a job after graduation practical ERP experience is something that employers are currently looking for from graduates:

“Employers will recognise that the students have that hands-on experience before they go out into the workplace. I know that some of the students that go out on work placement would be actively sought after by employers because of the ERP experience” (Lecturer G).

“I think there is a huge potential. What you have got now is that you have got employers scanning the market getting 100’s and 100’s of CV’s and if someone has hands on ERP experience they are going to have the leading edge on someone who hasn’t seen an ERP system” (Lecturer A).

By taking on-board the skill sets industry recruiters are looking for in graduates and by trying to match these to the relevant modules, CIT can foster better relationships with companies they already have links with and build new relationships with other local industries as explained by the following quotation:

“Employers know what is down their pipelines and the skill sets they will need four or five years down the road. If we build a relationship with them now, they will be happy to advise us on what we should have on our programmes. If the get the feeling that (a) we are talking to them (b) we are listening to them and (c) we are actually implementing it, I think that makes us more accessible” (Lecturer I).
This relationship with industry can benefit CIT when it is examining the relevance of its programmes in the current business environment and maintaining employers for its graduates.

6.3.3 Benefits for ERP vendor

Not only will SAP’s UAP help benefit CIT’s students and potential employers of CIT’s graduates, the interviewees believe that it can also benefit SAP themselves. An alliance with third-level institutes will help build and promote the SAP brand:

“If people are coming out of college with SAP knowledge as opposed to one of their competitors then that’s all promoting their company, you know, and it is all helping them to become the Number One provider of ERP software” (Lecturer A).

“It makes sense for SAP to be in bed with the universities and that the students coming out with the SAP skills and further extend the use of SAP as well as expand and move across more companies” (Lecturer D).

An alliance can build the brand as more and more students will be graduating with SAP, meaning that if a company is deciding to implement an ERP system they will see that there is a “pool of graduates to pick from” (Lecturer G) with SAP experience. In addition, if a graduate with SAP experience in college is the person to choose an ERP system for his employing company, he may be inclined to pick SAP:

“If a company is deciding on what system to use and they are aware that students are using SAP in colleges and coming onto the market with SAP then that might help swayed there decision towards SAP” (Lecturer J).

“If we teach SAP to students, a lot more people are familiar with it and if someone in the company had a decision on what ERP system to introduce and this person is familiar with SAP then they would be leaning towards SAP” (Lecturer D).
SAP can also use the alliance with CIT as a testing centre to try out new ideas or packages, this could be done by getting a local MNC to come on board and carry out some tests:

“From a testing point of view SAP could possible see a university as an area where new modules and work packages could be tested in a semi-live environment with lots of different students. They could facilitate that by having MNCs coming in on site into CIT to do the testing” (Lecturer E).

This benefit to SAP would also benefit the college and its students as they would see first-hand how ERP systems are continuously improved to meet the needs of their users.

6.3.4 Benefits to CIT

The use of an UAP has many benefits for the college. Most lecturers mention that because of the availability of teaching material, it reduces the need to produce all the teaching material internally and because of the technical support provided, it reduces the need for in-house technicians:

“We can use the resources that they [SAP] have available, they are great at providing packages and materials such as instruction manuals and case studies” (Lecturer B).

“With technical support available to us and class material at hand it is a major benefit” (Lecturer F).

“One of the major challenges of ERP is the cost and the access to expertise, but SAP already has a precedent set ... a strategy-set up to work with colleges .... I think that this is something essential to getting this off the ground” (Lecturer A).

“It is beneficial that we have training material with it. I think makes our lives easier, it is cheaper for the college” (Lecturer J).

It must be noted here that even though teaching material and technical assistance is provided, it is quiet limited. This will be discussed in more detail in chapter
seven. Three of the lecturers further stated that SAP Alliance opens-up opportunities for CIT to learn, share ideas and materials with other third level institutes who have already embarked on this project:

“We could learn from other universities in terms of how their courses are structured and how their training of staff was implemented and in the longer term this knowledge base and access to it would benefit us a lot. It would be like having an online library on the whole area” (Lecturer E).

“Other colleges have already gone down this path, so there is huge amount we could learn from them. We don’t have to reinvent the wheel as it is already done somewhere else. We could add to this in the future and help them out with new case studies and new ideas” (Lecturer I).

Having SAP Alliance as part of the Business programmes should also improve the “prestige of CIT” to potential employers of the graduates, as they are gaining experience on a system that has worldwide recognition:

“SAP is a fantastic system that is used worldwide and is used in larger organisations. I would think having an alliance in place with SAP would give a lot of prestige to CIT if our students were doing it” (Lecturer C).

If companies know that CIT graduates have practical experience on SAP, this should draw them to being interested in coming into CIT to employ business graduates with no ERP experience. If second level students are made aware of the benefits associated with practical an ERP education then practical ERP education could be used as a marketing tool. One of the suggestions was that CIT staff could provide potential students with this information, in order to attract more students into the course, in two ways. The first way is by going into the secondary schools and talking to the students about ERP or by getting an industry expert to explain to the students that ERP is in demand at the moment:

“If we keep talking to students about the importance of ERP education, eventually it will sink in with second-level students and they will start asking about ERP and asking other colleges if it is on their courses” (Lecture K).
“You will nearly want people going out to the schools from the MNC saying ‘we want you to have ERP education because there are great jobs with us after your four year degree’. Then students will start to look for it in their third-level choices” (Lecture E).

In particular, interviewees state that one of the main criteria that students use when deciding which course to pursue in college is the remuneration package on offer when they complete the degree. Students who graduate with practical ERP experience tend to receive a higher starting salary and be more attractive to employers around the globe than those who don’t. If CIT can make potential students aware of this then it should attract more students into our programmes, as cited by two of the interviewees below:

“If students were made aware that graduates with an ERP qualification on average receive a higher starting salary then graduates who don’t have the same level of qualification, then they will choose programmes with ERP education” (Head of Department A).

“If students knew that more money is on offer to graduates with some ERP experience than to students don’t have this experience I think it would attract more students into our courses. I think we should also mention to them about opportunities they will have to travel as it is seen as a global qualification” (Lecturer D).

If students are aware of the importance of ERP education, then it could be used as a selling point to attract students who may not be too sure at the age of seventeen/eighteen what business area they want to pursue, as it is relevant in a number of different departments inside an organisation, as described by below:

“I would imagine a lot of secondary school students don’t know whether they want to study accounting or IT. It could be a useful way to cater to these two different interests. Just because you choose an accounting course no longer means that you don’t get to see how IT systems are built and how they work. And the same, from the point of view of someone that does enjoy IT but maybe would prefer to go down the accounting strand you’re bringing these 2 areas closer together and in reality, in industry, they work very closely side by side” (Lecturer A).
The second way to improve second-level students’ awareness of the importance of ERP education is to include it in the college’s promotional material:

“The use of testimonials in our brochures is one of our successful way of marketing our programs. By mapping where some of our students have gone and how they have used ERP while working in industry, I think it would be very easy to show students how ERP education gave these graduates a head start in industry” (Lecturer A).

By going out to the schools and including information in the promotional material, CIT can ensure that it communicates that having ERP education on its business program is one of the benefits of the business programme in CIT over its competitors:

“If we are offering ERP and it helps students gain employment and other colleges are not offering it, I suppose it’s bound to give us an edge on our competitors. I think once word did get out that we were offering ERP and that we were ahead of the game it might attract students” (Lecturer A).

Therefore, the interviewees believed that they could find ways to make secondary school students appreciate the benefits of having practical ERP education.

While not currently a marketing tool that can be used to attract undergraduates to CIT, the interviewees did believe that practical ERP education could be used to attract postgraduate students and people returning from the workplace to education or looking to ‘up-skill’. These are the people that know the benefits of having practical ERP experience. At this stage in their education or career, they are more aware what the market is looking for and how important having the “word ERP on their CV can be” (Lecturer I):

“I think what you might find is that if you ran or included a postgrad diploma in ERP systems... by that stage potential students will know what they want” (Lecturer E).
“I think it might be easier to market an ERP course at post-grad level or at continuing professional development for people who have gone out and worked for a year or two and want to get some qualification under their belt” (Lecturer E).

A further three interviewees suggested that there could be more demand for ERP education from mature students coming back into education from the workplace. They are familiar with ERP systems as perhaps they have worked with the systems or they can see how important ERP can be from their experience in searching for a job:

“Possibly if you had mature students who are returning to education who might have worked with ERP in the past and might want to get a formal qualification or even at masters level, they would like to see ERP education on the curriculum” (Lecturer G).

“It could be more beneficial to try target mature students coming back into education based on their employment experience” (Head of Department B).

One of the suggestions made is the interviews was to run a part-time course to accommodate both mature students and students who are still currently in employment and are looking to up-skill:

“Somebody that is working as a trainee accountant in a MNC or an organisation that sees ERP advertised could be interested. I think it would have more relevant for part-time students or somebody that has been out there and might want to transfer from a small company into a multinational and they could see do a course advertised with an ERP element” (Head of School).

Another suggestion was for the college to offer SAP certification to all students. Students in their penultimate or ultimate year would realise the importance of such a course for their employability.

“If you look at the core modules in SAP you can get a certification for each of the different modules. So if I’m an accountant in PepsiCo looking to hire someone and I can see that they have a SAP cert in the management accounting module then that would be an added bonus for me as we are using SAP on a daily basis” (Head of Department).
So even though practical ERP education may not currently be seen as a marketing tool in attracting potential undergraduate students straight from secondary school, it could be a marketing tool to attract mature students, part-time students and postgraduate students. Therefore not only will a UAP be of benefit to students, employers and the UAP vendor, it should also be reciprocally of benefit to CIT as it has the potential to attract future students (at part-time or postgraduate level), it will build its links with industry and with ERP vendors (see figure 6.1).

Figure 6.1: Benefits of ERP Education

Produced by the Researcher for this Study
6.4 Conclusion

This chapter presented data amassed from interviews conducted with eleven lecturers, three Heads of Departments and the Head of School from CIT’s School of Business on the benefits of theoretical ERP education and the additional benefits of practical ERP education to all of the stakeholders; students, employers, ERP vendors and third-level institutions.

The incorporation of ERP education into the Business curriculum benefits the students in many ways. Theoretical ERP education can improve students’ job opportunities as it is something employers are actively looking for in graduates and enhances students’ business knowledge by giving them a more holistic view of a business, demonstrating to them how all the different functions of a business work together. By also getting access to practical ERP education students can also enhance their technology and soft skills and allow them network with students on other colleges. It is the students’ ability to combine all of these benefits that will add value to their degree programme, as this is what employers are looking for. Employers will now have a pool of graduates with ERP education to choose from, as CIT will be graduating Business students with the theoretical and practical skill sets that are required by industry. Hiring ERP experienced graduates will mean less time, the employer on training spends money, and the graduates can be put to work with the systems almost immediately. SAP’s alliance with CIT will also benefit SAP by building and promoting the SAP brand. Local companies, who have employed CIT graduates, may be deciding to implement or upgrade their ERP system, these employees will be aware of SAP as they have used it in college. They will recommend SAP to their employer.

This chapter then deliberates how all of these benefits of ERP education (in particular practical ERP education) to the students, employers and ERP vendors have reciprocal benefits to the third-level institute. The benefit it will receive in the form of attracting potential students will mostly come from part-time, mature and postgraduate students, as they are the ones that are aware of the importance of having an ERP education. In order to improve second-level students awareness of
the importance of ERP education, third-level institutions need to directly target these students by going into the secondary schools and promoting to the students the importance and benefits of graduating from college with ERP education. Third-level institutions will also need to ensure that the career guidance counsellors and teachers in second-level schools are aware of the importance of having ERP experience and that they are articulating this to their students. Having ERP education incorporated into Business courses will also benefit third-level institutions by building closer links with industry. These new links will allow it to send more students on work placement, have industry experts come into the college to share their experience and knowledge with the students and lecturers involved in teaching ERP and provide a potential place of employment for the Business graduates.

All of these benefits will only be achieved if ERP education is provided properly. The next chapter discusses how the interviewees in this study feel practical ERP education should be included in the Business curriculum.
Chapter 7  ERP Education in Cork Institute of Technology

7.1  Introduction

This chapter opens with an examination of what the interviewees feel is the most appropriate way to provide ERP education to third-level business students. This chapter then deliberates why SAP is not currently being used in all of Cork Institute of Technology’s (CIT’s) the Business programmes. This chapter then concludes with suggestions on how CIT could fully maximise the benefits from SAP’s UAP in the future.

7.2  Appropriate Provision of ERP Education

This section reports what the interviewees think is the most appropriate way to provide ERP education to students. It discusses the interviewees’ views on whether it should be taught in a classroom (theory), in a computer laboratory (lab) (practical) or a combination of both. It then discusses if ERP education should be taught using a cross-modular approach or as a single standalone module and seeks out what the interviewees consider to be the most appropriate stage to introduce the students to ERP education.

7.2.1  Classroom V Labs

The interviewees were asked whether they thought ERP education should be taught in a classroom or a lab environment. Even though the majority of the lecturers interviewed only provide the theoretical aspect of ERP education, there was an overwhelming agreement for the need to provide practical lab classes to all Business students (as depicted in Figure 7.1). They all agreed that ERP systems should not be delivered entirely in a classroom setting. While three lecturers had suggested a “labs only” approach, the remaining eight lecturers, the three Heads of Departments and the Head of School emphasised a classroom element used in conjunction with lab-based teaching. They suggested that the class should be used
to provide the theory behind ERP systems and then subsequent labs to provide the practical element.

Figure 7.1: Classroom V Labs

![Pie chart showing 80% for Combination of Classroom and labs and 20% for Labs only.](image)

Produced by the Researcher for this Study

The interviewees acknowledged that the lab element has benefits for both the lecturer and the students. It allows the lecturer to establish if the students have taken in what they have learned in class and now have the ability to apply that learning in a practical setting. As lab groups are smaller than the lecture groups, the lecturer has more time to go around to each student individually to ascertain whether or not they have the ability to work through a practical example. More work can be done later on areas where the lecturer sees that the students are weak. They stated that:
“I would like to split it between a theory or a background course and then the actual hands-on lab approach to show the students what an ERP is, what its goals are, and its capabilities” (Lecturer A).

“What would work well is if you are lecturing on some element of ERP you can follow that straight away by working through it in a lab to get a good sense of whether they (students) understand what an ERP system does” (Lecturer E).

By providing students with “hands-on experience” of an ERP system, they can discover how the different functions of the organisation fit together and connect what they were taught in the classroom to the real world. Using SAP UAP students “click” how the different functions of a business work together (Lecturer C):

“Even though most of us provide the theoretical aspect of ERP education to our students, we should be giving them more time in the lab, working through it themselves. They would learn by doing” (Lecturer K).

In addition, working with an ERP system in a lab setting allows the student to gain first-hand experience of what the lecturer has done in class and can clarify the process for the student:

“Everything that I have done in class on the board, that seemed very complicated in the class, suddenly comes together for them when they work it out themselves on SAP” (Lecturer C).

The Head of School backs-up this view stating that because students are typically comfortable with technology, their learning is expedited if done in a lab setting rather than in a purely classroom setting:
“Looking now at graduates, or students that are coming through, they embrace technology. Anything that is technology-based they connect to it faster than they would with something that is theoretical. In that regards the learning should be a lot more fun for them by being more practical and will add value to their degree” (Head of School).

The lecturers also suggested that this practical element is in line with the student-centred ethos of CIT. By breaking the class down into smaller groups, the students benefit as they get more individual attention in the lab and are “allowed the time to work through what the lecturer has explained in class” (Lecturer F). Students are more inclined to ask questions and get points clarified, because “it is a smaller group setting and the lecturer is walking around to them all” (Lecturer K). A School of Business module containing a lab element would “typically have a two hour class [theory] and one hour in the lab [practical] per week” (Lecturer D). The interviewees felt that one-hour lab sessions would not be sufficient for the practical side of ERP education, as depicted in the following quotes:

“Getting people up and running and logged on uses up a lot of time during a lab session. It doesn’t leave much time in an hour lab session” (Lecturer D).

“One hour at a time would not give the lecturer enough time to take the class through examples and explain them step-by-step to the students” (Lecturer G).

The Interviewees suggest that practical ERP education should be taught in two-hour lab sessions:

“For a class to get a real understanding of SAP, I think they would want to be doing it in two hours in the lab a week” (Lecturer G).

“You are going to have to teach the practical side of ERP education in at least a two hour lab session. There is no point in students having an hour lab session here and there because by the time the students actually get logged on and ready to start you have lost at least twenty minutes of teaching time” (Lecturer C).
To overcome the problems of wasting class time with students setting up, the Head of School suggests moving towards a virtual desktop:

“We are moving more towards a virtual desktop so you do not have the start-up issues because it is up in the cloud. This would help overcome the problem of wasting time getting up and ready to start in the labs” (Head of School).

The practical element would improve CIT’s reputation with potential employers of its Business graduates by providing the students with the skills required by the work place. It is this practical element that “employers want and what students would just thrive on” (Lecturer K). To this end, the lecturers stressed the need for a heavy weighting of practical elements over the theory. The following quote from one of the lecturers summed up the feelings of the others:

“I would be trying to do it heavily lab based. I would suggest a 75/25 split in favour of practical work. I think that CIT has a very good reputation from employers for getting our graduates work ready and I think a practical lab element aligned with work placement could create a very strong skill set for our students” (Lecturer I).

By providing a mix of theory and practice ERP education the interviewees believe that CIT could provide benefits to the lecturers, students, potential employers and the college.

7.2.2 Cross-modular V Single Module Approach

When the lecturers were asked whether it would be best to teach an ERP system as a single module or using a cross-modular approach, seven of the eleven were in favour of adopting the cross-modular approach (as depicted in Figure 7.2 below). They stated that a cross-modular approach gives context to what the students are learning and allows them see first-hand how the functions of an organisation work together and how the different modules of the ERP system work together.

Quotes from the lecturers are as follows:
“What we find with the cross-modular approach is that students get the context much better. It is not just entering invoices from an accounting perspective; it also has issues from an MIS perspective, strategy perspective and quality of data. Students get the bigger picture much better in general with a cross-modular project” (Lecturer D).

“It is always good for students to see how it all works and how a number of subjects all come in together. It does help instead of seeing everything isolated” (Lecturer F).

“We should be using ERP labs in multiple modules to show the students how it all fits together” (Lecturer B).

“Absolutely cross-modular, there are endless opportunities for it in a cross-modular setting. ERP by its name is an enterprise wide resource, so for that reason if we are doing a cross-modular project with let us say the engineers who might be involved in designing first and perhaps costing a new product design. It would be a logically extension for accountants to then use it as a costing scenario for raw material costing and further financial planning. It has multiple applications” (Lecturer I).

Two lecturers are currently using a cross-modular approach by working together using SAP UAP to teach final year Business Administration students two separate modules: Business Analytics and Financial Shared Services. The first lecturer takes the group of students through a set of data from SAP and enters the data into an Excel spreadsheet. This set of data is then used by the second lecturer to demonstrate to the students how this data can be analysed in Excel. The process is described as follows:

“I teach business analytics in fourth years and I do a cross-modular project with a second lecturer, she takes the business administration students for Financial Shared Services. She uses SAP with them and the idea is to take a set of data from SAP and put it into Excel and then do the analysis of the data in Excel. At the moment we are setting up dummy data but the long term objective is that they will be able to take the data out of SAP and analyse it in Excel” (Lecturer G).

All of the Heads of Department were in agreement that a cross-module approach to teaching ERP systems is a more favourable approach than teaching it as a single module as illustrated by the following quotation:
“It is probably best as a cross-module project; the cross-module project will benefit the students as they could see how the activities work together in an organisation, how decisions are made and how one decision can influence another” (Head of Department B).

The Head of School could see the benefits of using a cross modular approach but was in favour of leaving it as a stand-alone module:

“I think there are a number of opportunities; I think you could have it stand alone. You could mix groups such as engineering students and computing students together to look at transactions and the impact they have, but certainly I think stand-alone works better because it is more focused and there is more time allocated to it” (Head of School).

Four of the lecturers interviewed are of the opinion that ERP systems are best taught as a stand-alone module. However, this was due to the difficulties with coordinating the various lecturers rather than any pedagogical argument:

“Trying to get everything lined up in a cross-module might be more difficult but perhaps a case study might be able to be done cross-module” (Lecturer E).

Cross-modular approaches to teaching do have many difficulties. Problems mentioned by those interviewed include the difficulties in getting “all the lecturers working together” (Lecturer E), a lack of technical support (Lecturer B and G) and the difficulties involved in “integrating the right modules” (Lecturer F). The problems that the Heads of Departments envision with a cross-module project would be that the “lecturers will have to work closely together” (Head of Department A), the problems with including a “cross-module project into the modular descriptor” (Head of Department C) and providing more lecturers to deliver the module.

7.2.3 Appropriate Stage to Introduce ERP Education

Lecturers were asked at what stage of a four-year Business degree programme they thought would it be most beneficial to introduce ERP education. Three of
the eleven lecturers made good arguments as to why ERP module should be introduced directly into the first year of the course. They believed that most students are already “IT savvy” (Lecturer I) by the time they start college and an early introduction to ERP systems would get the students “up and running with the basics in semester one” (Lecturer A) “by instilling the concepts of the system in their heads at an early stage which can be built on at latter stage” (Lecturer F).

An early exposure to the system will also build the students “confidence” and it is a far “more intuitively appealing than the older systems”. These sentiments are illustrated by the following representative quotations:

“I wouldn’t leave it as late as third or fourth year. I think maybe the sooner the better, maybe first year would be the perfect place to bring it in as it would serve no harm to get them up and running with the basics in semester one and then maybe in semester two or semester three you could start introducing ERP and just show them how it looks from a computer based point of view” (Lecturer A).

“I think it is a good idea to introduce it in first year. It is good for the students to have it in their heads and they could go a bit more in depth at a later stage” (Lecturer F).

I think if they can go into first year and look at a very old style black and green type screen like Take5, then I think that maybe an ERP system might actually be a bit more intuitively appealing because I think students are used to dealing with a web based system, they are used to filling in interactive forms from buying and selling on eBay. So I think that an ERP is far more intuitive way of teaching than a lot of the older systems. I think it is just another tool and another way of using a tool and I think it shouldn’t take them long to grasp it” (Lecturer I).

Although these three lecturers made some valid points, the remaining eight lecturers all felt that it would be of more benefit to the students if they were introduced to ERP education at a later stage in their degree, ideally in third year (as depicted in Figure 7.3).
“I think third year is the correct stage. In first and second year they are only getting to grips with systems in general and general operating systems. I suppose to some extent they would have experience of creating databases and working with data. I don’t think they would be able to understand the concept of bringing data into a system until they reach third year” (Lecturer C).

“No earlier than year three because I think students aren’t mature enough to take it on-board before then. I think they would have very little understanding of what it means in first year, where at least if they have done the modules of accounting and management they would have an idea of how things like supply chains fit into accounting or as an accountant or Business graduate they might have just that wider understanding of how the business actually fits together a bit more. Whether it is purchasing or all the other elements like CRM and procurements that they see how a business comes together as opposed to just one element of it” (Lecturer E).

“It needs to come in a little later as I don’t think they would get it in first year. I think third year would be ideal” (Lecturer D).
The Head of School and all three Heads of Departments agreed that it would be more beneficial for the students to be exposed to ERP systems in third year. This is because students:

“...would have to have a good fundamental grounding in business and business process. I don’t think that happens in the early years. So certainly ERP modules should be introduced at the later stages, notably in third year” (Head of School).

Figure 7.3 Appropriate Stage to Introduce ERP Education

So even though most students who enter into third-level are computer savvy, they still need to “form a good understanding of business before you get to grips with an ERP system” (Head of Department C). Therefore, it is still more beneficial for both the students and the lecturers to introduce them to the practical side of an ERP system at a later stage during the course.
7.3 Why SAP is not on all CIT Business Programmes

Although eleven lecturers interviewed were of the opinion that ERP education would have to include a practical element, only three of them currently use the UAP to give students the practical side of ERP education. The reasons given for this is that ERP education is not currently in the module descriptors, there is reluctance by lecturing staff to get involved with ERP education and CIT does not have sufficient technical staff to support practical ERP education and students might fear the complexity of the system.

7.3.1 Not in the Module Descriptor

Practical ERP education has not yet been included in the module descriptors for many of the School of Business courses. If something is not in the module descriptor then it cannot form part of the curriculum for that module, as the module descriptor is the legal requirement:

“The learning outcomes listed in the module descriptor have to be achieved. So if it is not written into the module or if it is not in the indicative content or it is not part of the assessment regime, then it is very difficult to bring it in” (Head of Department B).

“…modules that don’t have labs don’t have the lab resources at hand to allow the students to look at the software or to work with it” (Head of Department A).

If practical ERP education is to be taken seriously, it must be incorporated in some aspect of the module descriptor. It could be included in the learning outcomes, for examples ‘students should have the ability to use an ERP system’ or as part of the assessment methodology that the student is required to produce reports from an ERP system. The Head of Department B feels that the college has a “commitment to the students to roll it out across other programs” but it is only when a practical element of a module is included in the module descriptor that lecturers will treat it as a requirement of the programme.
7.3.2  Reluctance by Lecturing Staff

SAP provides training on its UAP to any of the staff of the School of Business interested in getting involved in teaching SAP modules. Three of the lecturers went to the training centre in Munich two years ago, however they were disappointed with the training they received. They found that too much time was spent on the history of SAP and then there wasn’t enough time to learn about the system. Their experiences are described below:

“I went on a week’s training course in Munich. The course wasn’t very well put together. The first couple of days were spent talking about SAP and its history. There wasn’t much time receiving the practical experience – that is what we wanted” (Lecturer G).

“My training was a week in Munich. Two of these days were spent on talks about the history of SAP, we were supposed to come back to CIT and be able to teach all the modules of SAP” (Lecturer B).

This experience has resulted in putting some of the other lecturers off this mode of training. However other lecturers interviewed were not even aware that this training facility is available, as they cited “lack of training” as the main reason why they do not provide practical ERP education to their students. There seems to be a need to find a better way to train staff and make all staff aware the training available.

7.3.3 Lack of Sufficient Technical Support

Some of the lecturers state that they are reluctant to provide ERP education due to lack of adequate technical support. To deliver the practical side of SAP there needs to be additional technical support on-hand for the staff involved in teaching it. For example, computers have to be set-up and any problems encountered must be resolved as soon as possible. Technical assistance will also remove some of the fear lecturers might still have with working with the system:
“I think technical resourcing is very important so the labs are up and running. There needs to be support in setting up things like user names and passwords, just making sure that everything is ready” (Lecturer I).

“I think we need to reassure staff that the support for the labs is available because it can be very stressful going into the labs and trying to teach something, especially for the first time and something breaks down and you wouldn’t be in a position to fix it yourself. I think this is a fear that people including myself would have with working with new technology” (Lecturer J).

One of the lecturers who is already using the UAP has had problems with the technical support that SAP offer and suggests that it is something that needs to improve:

“Technical support would be at the top of my list, it’s not there at the moment. It is proving a major task for us even simple things like, on Monday you could set-up the system to do some task or some job with the class on Tuesday but overnight SAP have done an update and you have lost everything that you have set-up and it’s all gone when you go to class. There needs to be a better level of support, technical assistance and better training” (Lecturer B).

If CIT can insure staff that this technical support will be in place then perhaps they will increase their interest levels and start to include ERP education into more Business courses after the next programmatic review.

7.3.4 Students Fear of Complexity of ERP Systems

Interviewees had mixed reactions when asked about student’s preconceptions about how hard and complex ERP education can be. One of the interviewees was surprised to hear that students have a fear of ERP systems, commenting that he lectured ERP and was “never informed of by students of a fear of ERP” (Head of Department B). He added that perhaps if a fear did exist, it could be due to ERP education being so different to everything else they do in college. One of the lecturers interviewed also made this point, stating that it is not necessarily a fear of ERP systems, but a fear of “the complexity of anything new” (Lecturer D). It
was also pointed out that students are much more comfortable with technology now than they would have been in the past:

“I wonder if students of this generation are less fearful of IT as perhaps they would have been in the past as they are a lot more mature and tech friendly” (Head of Department A).

On the other hand, the other interviewees did acknowledge that students fear ERP systems and one of the lecturers felt that the students are justified in having this fear:

“I think the students are right to be fearful of working with an ERP system because it is a huge undertaking especially if you have to learn all of the modules of. It is such a huge undertaking not to be fearful of” (Lecturer E).

A few recommendations were made as to how best to overcome students’ preconceptions of the complexity of working with ERP systems. Some of the interviews felt that students should be introduced to more information technology (IT) and information systems (IS) and in particular ERP systems in secondary school:

“I don’t think it is entirely down to CIT, I think some of the problem goes back to the secondary school system and how they expose their students to things like ERP” (Head of Department C).

Most of the interviewees felt that more time and lab space must be given to classes to ensure that the students are “comfortable with the system” (Lecturer K). This could be done by providing more small sized classes or tutorials and provide them with a manual. Two of the interviewees made the interesting suggestion that as well as the additional tutorials, ownership of the responsibility of being “comfortable” with the system could be given back to the students, by providing them with the resources (labs and manual) and encouraging them to go work on it themselves at their own pace.
“Everyone does have down time. They do have time to go into the labs and try work with the system. They must get used to taking ownership for their own learning” (Lecturer A).

“We could have a manual for them with plenty of exercises or clear case studies so that the students could go into the labs that are free and practise away on it themselves” (Head of School).

Overall, therefore the preconception of the complexity of ERP systems does not seem to be a major obstacle in CIT. Some did not believe that it existed and other believed that it is something that could be easily overcome.

7.4 Maximise the Benefits from SAPs UAP in the future

If CIT wishes to maximise the benefits of its investment in a UAP and provide practical ERP education to more business students it need to review the module descriptors, get more lecturing staff involved in the provision of practical ERP lab classes and build links with other SAP users.

7.4.1 Review Module Descriptors

The next programmatic review for CITs School of Business is commencing in the next academic year. During this review there will be an opportunity to discuss what courses the practical side of ERP education will need to be imbedded into:

“The module descriptors were written a few years ago when we had our last programmatic review. They should be updated in the next programmatic review which is starting next September. Once it is one the module descriptor then it will have to be taught” (Head of Department A).

“The questions will have to be asked at the next programmatic review. In which programmes do we need to see a practical element. There is also the cost involved in the practical side that will have to be look at” (Head of School).
The Head of School did stress the cost of providing practical ERP education. The costs and benefits of providing it will have to be weighed up for each course before it can be introduced. Once ERP education is in the module descriptor, then the college must provide it.

An interesting comment made by four of the lecturers is that the UAP could provide a more interesting way to teach their modules. So instead of introducing a new ERP module on the programme it could be used to teach and examine the content of an existing module. This would eliminate the problem of trying to find space on the programmes for an additional module:

“It is a new package, something different to teach, something new to come in and get rid of some of the boring ways that normally teach” (Lecturer B).

“We could link it in with a few of our modules and get the students to do a cross-modular project using SAP. It would get us lecturers working together on something interesting” (Lecturer K).

The Head of School also mentioned that he is looking into the possibility of gaining SAP certification for students that have successfully complete SAP modules:

“I suppose the reason that we brought in SAP, is SAP’s accreditation, so that eventually students will have a separate certification to say that they used SAP that would be a big plus for the mature, part-time or post grad candidate” (Head of Department B).

By having CIT’s ERP education certified by SAP, CIT could also offer the module to students outside of the School of Business, which could result in students from different disciples, enrolling in CIT.

7.4.2 Increase the Number of ERP Trained Staff

If practical ERP education is to be introduced in more of the Business programmes, then more staff needs to be encouraged to be trained to use the UAP.
The majority of the interviewees (including the Heads of Department and Head of School) felt that, with the proper training, existing staff would be able to provide practical ERP education.

“I think what we would need to do is to train up in-house staff. I think that is what needs to be done and it would be up to CIT to make training available” (Lecturer I).

“I think we already have the staff, we just need them to be trained up more on the systems” (Head of Department C).

In-house training could be provided by private operators or by existing CIT staff. There are many private operators in the UK and Ireland providing in-house training in the various different modules.

“There are a number of them [private training operators]. In London there are a few but it would depend on the module that you want to do. There are a lot of private operators that offer training located in Ireland. Training options are not an issue. CIT is always supportive in sending staff on training programmes” (Head of School).

The three staff that received training and have practical experience of providing ERP education could be used to provide in-house training to the rest of the staff. This in-house “training the trainer” is a tried and tested route for training trainers in CIT.

“Training staff from different departments with experts from within the School of Business has been a success in the past. I know we have sent three already to Germany to be trained, they are teaching SAP, they would be the ideal trainers for internal staff” (Head of Department A).

Most of the lecturers interviewed viewed in-house training as ideal for them, with training by the other staff members as the preferred option, as they would be more in tune with the needs of lecturers in CIT.

As an alternative to training existing staff, the interviewees suggested that the Institute could bring in some outside expert either as consultants, by setting-up a
partnership with a local multinational companies to supply experts to help with delivering the module, or by bringing in some adjunct staff from industry as they could be interested in passing on their knowledge to students on a part-time basis, as outlined by the following quotations:

“ERP experts would quite enjoy showing people how to use the systems ... maybe you could think about building a partnership with a lot of the big companies in Cork ... A lot of the pharmaceutical companies, a lot of the multi-national companies like EMC² and Apple might send in experts to give lectures and talks on ERP systems. It would benefit them, ultimately, in the long run as well as they would get a higher calibre student from college” (Lecturer A).

“I think adjunct faculty would benefit us, I would know some people who have worked with ERP who may be doing something else and would be expert users now and we could hire them to do x amount of hours. This could be a way of bridging the skills gap” (Head of School).

“There is a good argument to be made for people that have been using it in the workplace to be brought in maybe part-time hours to deliver it” (Head of Department C).

The three Heads of Departments and the Head of School all stressed however that due to the cuts in spending and an embargo on hiring new staff, that as desirable as having industry experts, this is not a realistic solution and they would be more incline to up-skill the current staff. Therefore, in the short-term the most realistic solution is to adopt the “training the trainer” in-house model.

Once the method of training has been decided the next step for CIT is to make sure that staff is aware that this training is available. The Heads of Department were confident that enough staff member would take up training to provide ERP education in the next few years:

“If I sent out an email to the School of Business staff that we would be introducing SAP and would provide the relevant training I would be fairly confident that we would have a good six to eight people who would take up the offer of training and be very interested in delivering the module” (Head of Department A).
“It wouldn’t be something everybody would be comfortable with teaching but I think you would get a mix of people who would be happy with teaching it or would feel strongly against teaching the systems. I think a certain number of them would be comfortable with it but it would depend on their perspectives and if they were comfortable with new technology and if they have had any previous experience in teaching in a lab environment” (Head of Department C).

Some of the lecturing staff was not as confident about the take-up of training. They stressed the need for the benefits of ERP education to be promoted further to staff and recognition given for the time and effort put into training for and delivery of practical ERP education:

“Well first of all the management needs to make a good case for why this is needed and why it is good for the college and the students” (Lecturer J).

“Along with a good structured training programme, communication is the key; communicate to staff with the direction of where it is going and the requirements for the staff to get involved” (Lecturer E).

Others however viewed ERP training as the opportunity to enhance their IT skills. In the following quotes, two of the lecturers exhibit an enthusiasm to keep up-to-date with new technology to protect their role as accounting lecturers in CIT:

“If you have more skills and you are able to teach more things, surely this is a good thing; you are more flexible you can change your course around and mix-up what and how you would teach each semester. As a lecturer I think if I only teach one thing in one way I could be more vulnerable in the future” (Lecturer J).

“When I started lecturing, straight from a business background, I felt I had something new and exciting in my lectures. Now I’m here over ten years and I feel I need something new in my modules for my own sake as well as for my students .... Including ERP education in my module would give me that edge again” (Lecturer K).
Training on SAP Alliance allows them develop “new up-to-date business and technology skills” (Lecturer K). This training could be used as part of their continuous professional development (CPD) where they members of accountancy bodies.

There seems to be reluctance to use SAP Alliance due to the level of effort required, but it is recognised that this effort is necessary to keep the programmes of the college relevant. The time involved in getting “up to speed” on the systems could be used in other areas for the lectures (Lecturer A), but most of the lecturers interviewed felt that enough of the lecturing staff in the School of Business would be willing to put in the effort as long as the effort was recognised:

“No I think staff in our department (Business) are very open to new packages, change and new ways of doing things, we know we have to stay current to help attract students in the long term” (Lecturer B).

“From the feedback and from conversations I have with fellow lecturers around the ERP topic, in my option I feel that staff are willing to get on board with the idea” (Lecturer H).

One suggestion was to reward staff by reducing the weekly contact hours as “there is a lot more preparation involved in getting an ERP class ready” (Lecturer C) than other classes. Many of the lecturers echoed this sentiment:

“I think these systems are complicated and there would be a lot of work involved. You know it is an additional workload, it's a module that is brand new and there would be very few people that have a level of expertise to be able to help with people so I think that is a significant challenge that would be faced” (Lecturer A).

You would have to do a lot more prep work for an ERP class than you would do for a theory class or to do an accounting question. (Lecturer C).

“When something is seen as sexy and new everybody wants to do it so it is a bit of a competition to get the good hours. But then when they see how much of a pain it is they will want to back away from it. You would be twenty-five times easier to teach an hour of excel than an hour of SAP” (Lecturer D).
Therefore with the provision of a clear statement on the purpose of including ERP education in the degree programmes, a structured in-house training process for the appropriate staff, promoting the benefits of ERP education and a recognition of the effort require, perhaps through a reduction in weekly teaching hour, there would be enough lecturing staff interested in taking on the challenge of teaching SAP Alliance. Once CIT increases the number of ERP trained staff they must look at other ways in which they can fully maximise the benefits from SAPs UAP in the future.

The extant literature examined for this research mentions that if lecturing staff are trained on ERP systems there is a fear that they would then leave for a higher remuneration package in industry. This does not seem to be a concern in CIT:

“It is not something that we would actively worry about because we don’t have any history of this happening here in CIT” (Head of Department B).

“I am in CIT for over thirteen years and I haven’t seen anyone leave academia to go to industry even though the money tends to be better in industry” (Head of Department A).

The lecturers feel that teaching ERP and working with ERP in industry appeal to different types of people, stating that they are “two very different roles” (Lecturer A) in two very “different environments” (Lecturer E). The level of competence required to teach an ERP system may not be enough to make the lecturer attractive to industry employers:

“I have worked in both [industry and academia], and from my experience, industry might not be necessarily very attractive to a lecturer and lecturing certainly would not be very attractive to a lot of people working in industry because they are two very different roles. It is not something I would worry too much about because the level of knowledge you would need to lecture and teach ERP and what staff will be trained on would not be enough to be an industry expert in any case” (Lecturer A).

Only one of the interviewees suggested that if CIT puts time and money into training their current academic staff, they could move-on to work in industry,
stating that having practical use of an ERP system on a person’s CV would be good if they were looking for a change of career from lecturing. Therefore, the temptation for staff trained in ERP to leave does not seem to be a major issue for CIT.

7.4.3 Additional Resources

If CIT is to include ERP education in more of the Business degrees in the future, it will need additional resources such as teaching material, technical support and appropriate labs. There is no problem with access to material to teach the theoretical side of ERP education. When it comes to teaching the practical side, CIT’s alliance with SAP has helped ease the initial problem of accessing material, as described by one of the lecturers who currently teaches the practical side of SAP:

“We use all their [SAP’s] resources at the moment, they have been great at providing packages and material including instructions and case studies for the modules we use in SAP” (Lecturer B).

The only problem with SAP’s practical material is that it is locked into the company that SAP provides as a case study, another company can’t be set up to use this material:

“They provide plenty of material but it is all locked into Global Bikes Company and you can’t set up another company to do something outside of Global Bikes” (Lecturer B).

Once there is no “competition involved” CIT could access material and advice by fostering links with other third-level institutions that have a SAP UAP in operation. CIT could see what has worked and what hasn’t work in those institutions. Along with sharing experiences and ideas CIT could use these links to acquire some material or even a guest lecturer. Also industrial links may have suggestions or training manuals they might be willing to share with the college:
“It would be a good idea for the college if they could link up with other third-level institutes to build links and access material” (Lecturer C).

“You have a pool of people out there that you could try to work with and see if there is an openness to develop some new material. A lot of companies would have training manuals and training courses in-house that they would have done already themselves, so you would be looking to see what material you could beg borrow or steal from these companies out there” (Lecturer E).

Identifying these links would be a great help to CIT as currently CIT lecturers who are involved in delivering SAP have found it difficult to contact SAPs Head Office when problems arise:

“Yeah, what I am finding is, it depends on the software with SAP, there isn’t the network supporting that, so yes we could learn, we could peer learn if you like, There is no local agent for SAP. There is no person you can pick up the phone and talk to. We are very limited in terms of peer learning at the moment, in terms of even figuring out who else has SAP” (Head of Department B).

CIT should avail of these potential links as “there is no point in reinventing the wheel” (Lecture K). In order to teach the practical side of ERP, CIT will need to have adequate technical support. The interviewees stated that an addition technician would be required to focus solely on ERP education:

“What we really need is a dedicated technician. Then I would be confident that if something went wrong in the lab class, I would have someone there to call on” (Lecturer K).

In addition, there must be adequate labs available. A major concern with only having one hour lab sessions is that valuable time is being lost getting all the students up and running, as explained by one of the lecturers:

“What you can get done in an hour is the problem. Getting students up and running and logged on wastes a lot of time during a lab class which means that you won’t be able to get a lot done in an hour” (Lecturer D).
CIT have an abundance of labs available in the School of Business to run ERP classes. The lab space will not be the problem for CIT:

“We have plenty of lab capacity. We are very lucky that way and that our labs are up-to-date so we don’t have a hardware issue” (Head of Department B).

“We have the physical infrastructure in terms of the labs, so we have the actual environment in place it would just be getting the licensing for each computer” (Head of Department C).

Four of the interviewees suggest that in order for the students to get a better understanding of ERP and to get the most of out of their times in the labs that instead of running the traditional one hour labs sessions that they would run the labs for two hour sessions to allow students “leave the session feeling that they have learnt something every time” (Lecturer I) and get the most out of the session:

“I think time would be the main challenge, the time spent in the lab. The way labs are organised in CIT is that you would normally have only one hour in the lab a week. For a class to get a real understanding of an ERP system, I think they would want to be doing it in two hours a week in the labs” (Lecturer G).

CIT will also need to provide students with access to the labs after normal timetable hours so that they can work on the system in their own time:

“There needs to be labs free so that students could come in to, perhaps into an open access lab, where students could come in and constantly practice. This will put the ownership back on the students, which I believe is a very important thing” (Lecturer A).

“We will probably need to get students access to the labs in the evenings when they are not having classes, it is important for the students to have access so that they can make best use of it” (Head of Department B).
“I think time would be the main challenge, the time spent in the lab. The way labs are organised in CIT is that you would normally have only one hour in the lab a week. For a class to get a real understanding of an ERP system, I think they would want to be doing it in two hours a week in the labs” (Lecturer G).

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“We will probably need to get students access to the labs in the evenings when they are not having classes, it is important for the students to have access so that they can make best use of it” (Head of Department B).

“It is important for the students to improve their IT skills and that is where the practical labs would come in and the students are able to work on it in their own time” (Head of School).

This will not cause a problem for CIT as students will already have access to labs after class hours and can also avail of computer stations in CIT’s open access lab. What CIT will have to insure is that the SAP licence is installed onto designated computers.

7.5 Conclusion

This chapter presented data collected from the lecturing staff and management of the School of Business in CIT. It examined the most appropriate way in which ERP education could be provided. There was overwhelming agreement for the need for practical “lab” classes accompanied by classroom teaching to provide the theoretical side of an ERP system. The use of a cross-modular approach to teaching ERP over a single module approach was favoured as it will give context to what the students are learning and allows them to see first-hand how the functions of an organisation work together and how the different modules of an
ERP system work together. However, it was acknowledged that there are many administrative complexities in running and assessing when a cross-modular approach is used. It was felt that ERP education should be introduced in third year of a four year degree programme. At this stage, students should have a good enough knowledge of business, accounting and information technology.

An insight into why, according to the interviewees SAP is not currently on all of CIT’s Business programmes is provided. The SAP is currently only being used by three of the lecturers interviewed. Three reasons were given for such a low uptake. First, ERP education is not included in the module descriptor. To ensure that a practical element of an ERP system is on each course, it has to be included in its module descriptor. The next programmatic review for the School of Business will be held in the next academic. This is an opportunity to weigh up the cost and benefits of providing practical ERP education in each of the different courses under the School of Business. Instead of introducing ERP education as a new module it was suggested that ERP education could be used to teach and examine the content of an existing module. If the inclusion of the practical side of ERP education is still not seen as a feasible option during the programmatic review for some of the courses, then CIT could look to linking the SAP module to a SAP certification. This would insure that the practical side of ERP education could be provided to any interested student.

Second, lecturing staff is reluctant to get involved due to lack of ERP experience. CIT will need to increase the number of SAP trained staff if it is to be introduced into more of the Business programmes. The current training was criticised and it was felt that if better in-house training was provided that plenty of lecturing staff would take it up. Another option is to hire ERP experts to deliver the modules but with the current cuts in spending and an embargo on hiring new staff it is a more realistic option for CIT to adopt the “train the trainer” in-house model. Once CIT has decided on the best training approach they must insure that they communicate its availability to the lecturers, the benefits of this training can have to them and provide the lecturers involved with recognition for the time and effort they will need to put in. If CIT can achieve all of this then there would be enough lecturing
staff available to teach and roll out ERP education into more of its Business courses.

Third, there is a lack of sufficient supports available for lecturers. Additional teaching material, technical support and appropriate labs are needed if CIT are to maximise the benefits of their investment with SAP. CIT’s alliance with SAP provides them with plenty material but this could be further improved by building links with other SAP UAP users. More technical support would be absolutely necessary if the rollout of ERP education was to happen. Currently CIT has the appropriate number of lab spaces available but will have to ensure that the SAP’s UAP licence is available on all of the computers and that students have enough during a class and outside of class time if they needed it, to experiment with the system.

This chapter presented the current situation with regard to ERP education in CIT and the ideal teaching environment for ERP education. It attempted to provide suggestions as to how to extend the use of the UAP to more of the Business courses in CIT in the future.
Chapter 8  Conclusion of this Study

8.1  Introduction

The rising popularity of implementing Enterprise Resource Planning (ERP) systems in organisations, coupled with the substantial investment involved, has resulted in a huge amount of research into the critical success factors associated with their successful implementation and use. Having staff with relevant ERP experience is one of the cited critical success factors. However, a shortage of experienced staff has resulted in organisations seeking to recruit graduates with practical ERP experience straight from college. The challenge for third-level institutions is to provide graduates with ERP experience.

This research attempts to answer callings for more research on ERP education in third-level institutions’ curriculums. The objective of this research is:


This study is an exploratory, descriptive case study. Cork Institute of Technology (CIT) is a suitable site for the case study as it has been providing theoretical ERP education to its Business students for over a decade and has recently invested in a University Alliance Programme (UAP) to facilitate the provision of practical ERP education. The researcher is a postgraduate student, and also a Business and Accounting Tutor, of CIT. Therefore, this provided an excellent opportunity to carry out an extensive investigation on the importance of practical ERP education and inquiry into how best it can be provided.

This chapter fulfils the research objective by using information obtained through interview, observation and verification from internal and external documents, to answer the questions posed. The questions the researcher will answer in this chapter to achieve the research objective are as follows:
**Question 1:** What are the main benefits of providing practical ERP education to third-level Business degree students?

**Question 2:** What are the main challenges facing third-level institutions when introducing practical ERP education into the curriculum?

**Question 3:** What is the best way to provide ERP education to third-level Business students?

This chapter also describes the limitations of this research and suggests possible related areas of future research. The following section analyses the case study and presents answers to each of the research questions in turn, comparing and contrasting the findings of this research to the extant literature.

### 8.2 Question 1: What are the main benefits of providing practical ERP education to third-level Business degree students?

Even though the investment by colleges in university alliance programmes (UAPs) is usually in response to a calling from employers for graduates with ERP education, it is not only the employers of Business graduates that benefit from ERP education. Incorporating practical ERP education into a third-level Business programme also brings benefits to students and the ERP vendors and reciprocally to the third-level institute.

#### 8.2.1 Benefits for Students

The extant literature states that ERP education, and in particular practical ERP education, enhances students’ business knowledge as they gain a more holistic view of how businesses work (Klaus *et al.*, 2000; Kwahk and Ahn, 2010; Maditions *et al.*, 2012) and gain an understanding of how all the different functions of a business work together (Pridmore *et al.*, 2014). There is a limited amount of literature criticising overemphasis on the practical element to ERP
education. Davis and Comeau (2004) expressed a concern that hands-on experience of ERP may shift some of the importance away from business concepts and management principles. However, most of the literature extols the virtue of the benefit of practical ERP education on the improved employability of Business graduates (Winkelmann and Leyh, 2010; Kanthawongs, 2010). The workplace values this experience with graduates receiving a starting salary of 11% higher than that of graduates without practical ERP experience (Cronan and Douglas, 2012).

This study agrees with the extant literature on the benefits to students of ERP education. It suggests that a mix of theoretical and practical ERP education provides the business and IT requirements of graduates going into the business world. Students need theoretical knowledge of “what an ERP system is” and “what an ERP system can do”, but also get practical ERP experience, that build their technology skills thus greatly enhancing their employability. Exposure to the main ERP vendor in the market (in this case SAP) benefits students in the interview process, as they can talk comfortably about their experience and projects they have completed and it will make the transition from third-level education to the workplace much easier for them, as they have already gained exposure to an ERP system that will now become part of their daily work routine. By working on case studies, the students not only build their ERP skills but also soft skills, such as teamwork and communication, which could also result in increased employability and gaining a higher starting salary as employers will recognise this higher level of skill. The academics interviewed in this study believe that all Business students, whether majoring in Accounting, Marketing, Management, Business Information Systems or Business Administration, should have some exposure to practical ERP education during their degree.

8.2.2 Benefits for Employers

Due to the high demand for staff with ERP experience and the high costs associated with training staff, organisations are looking for employees with previous ERP system experience (Becerra-Fernande et al., 2000; Byrne and
Flood, 2003; Alshare and Lane, 2011). In today’s market place, organisations are actively recruiting Business graduates who have had exposure to an ERP system in college (Pridmore et al., 2014). According to the interviewees in this study providing students with practical ERP experience is of great benefit to employers, as employers will have a bigger pool of experienced graduates from which to choose. Employers will be able to save time and money by hiring these graduates as they do not need as much training and should be able to start working on the system immediately.

8.2.3 Benefits for ERP Provider

The extant literature suggests that if graduates are familiar with a specific system, they may select it as their particular system of choice when they enter the workplace (Winkelmann and Leyh, 2010) and graduates could benefit the future development of the specific ERP brand (Sage et al., 2006). These are the main benefits of practical ERP education to the ERP vendor. The finding of this study concurred with these beliefs. The interviewees state that the use of SAP’s university alliance programme (UAP) will benefit SAP itself as it helps build and promote the brand. As more and more students graduate with SAP experience, companies will be aware that if they implement SAP they will have graduates with relevant SAP experience. An additional benefit to SAP found in this study is that the interviewees recommended that ERP vendor could also use the college as a testing centre to try out new ideas or packages.

8.2.4 Benefits for Third-Level Institutions

The main finding of this study is that the benefits to the student, employers and ERP providers all have reciprocal benefits for the third-level institution providing ERP education (as depicted earlier in Figure 6.1 produced by the researcher).

The extant literature suggests that the inclusion of ERP education in a Business curriculum will increase CIT’s marketability to current and future students while also attracting a higher calibre of student (Bradford et al., 2003; Byrne and Flood,
2003). The interviewees in this study believe that this is not necessarily the case for undergraduate degree programmes, as the majority of students applying for the full-time Business degrees come straight from second-level education. They do not have any knowledge of what ERP systems are or how important they are in today’s business world. If third-level institutes are to use ERP education as a marketing tool to attract these students, they must proactively promote the importance of ERP systems to them in school visits and promotion material. ERP education can however be used as a marketing tool to attract mature, part-time undergraduate students and postgraduate Business students. These cohorts of students have prior knowledge of the importance of ERP systems either by working with ERP systems before they return to education or by noticing the number of companies looking for ERP experience. It was felt that graduates’ employability prospects and starting salaries could be greatly enhanced by having this experience. This would be something that could be used to market the programmes to potential students. Also by graduating students with ERP education, more employers could be drawn to the college and this could enhance the prestige of the college and its course.

Wilson and Lindoo (2011) stated that university alliance programmes (UAP) aid the training of academics and provide teaching material and data centre support. The interviewees in this study acknowledge that training, teaching material and technical support are provided by UABs, but are not satisfied with the adequacy of these. They recommend in-house training to provide more relevant training, building links with other colleges and industry to acquire additional teaching material and hiring a dedicated technician to provide technical support. This study advises third-level institutions to build relationships with the ERP provider, in that way if the ERP provider wishes to test out new functions, it may come to the college to try them out. This would be interesting for the students and keep them up-to-date with new advances in ERP functionality.

Practical ERP experience can enhance the education of Business students with all the other stakeholders including the third-level institutions also benefiting.
8.3 Question 2: What are the main challenges facing third-level institutions introducing practical ERP education into the curriculum?

Introducing practical ERP education into a third-level curriculum is not without its challenges. According to the extant literature, third-level institutions have to deal with the substantial initial costs involved, the complexity of ERP systems, a shortage of experienced academics, a lack of teaching material and a lack of business and IT knowledge by the students (as depicted in Figure 3.1 produced by the researcher). It is acknowledged in the literature that a UAP can help alleviate some of these challenges.

8.3.1 Cost

The literature states the main challenge facing third-level institutions who are considering implementing ERP education into the curriculum are the initial costs, including hardware, software and installation costs (Watson and Schneider, 1999; Corbitt and Mensching, 2000; Walker and Black, 2000). By the time this study commenced, the college had already invested in a UAP, therefore the initial investment was no longer an issue. Further costs, such as SAP licensing needed for additional computers, additional staff training, high cost of running labs and providing technicians, were mentioned by the management team, along with the traveling costs associated with sending staff on training programmes and the opportunity costs involved. The researcher however never felt that “cost” was an overriding challenge in the provision of ERP education in this college. There was a feeling throughout the research that the benefits of providing practical ERP education outweighed any issues in relation to the cost involved.

8.3.2 Complexity of ERP Systems

The extant literature stresses that an ERP system is a complex system for the college to install and for lecturers and students to grasp (Vluggen and Bollen, 2005) often resulting in staff and students becoming overwhelmed with the system. Many third-level institutions consider the integration of ERP systems into
the curriculum as a complex issue (Nelson, 2002; Bradford et al., 2003; Pridmore et al., 2014). This is, again, not a major issue in this case study. Three staff member were eager to implement ERP education. The respondents in this study feel that developing ERP is a “huge undertaking” and can be an intimidating experience. Nevertheless, the majority of interviewees believe both the staff and students are now a lot more “IT savvy” than previously. Students are less fearful of an ERP system if it is explained to them in the classroom first and then they are allowed practical usage in a lab.

The main impediment to introducing practical ERP education is that it is not in the module descriptors. Steps need to be taken to ensure that practical ERP education is included in the module descriptors and thus an integral part of the degree programme. Space needs to be found in Business degree programme for practical ERP education; this can be achieved either by writing new modules or as suggested in this study as the method of teaching of assessing existing modules.

8.3.3 Shortage of Experienced Academics

The literature states that third-level institutions need staff with ERP knowledge and experience in place before they consider including it in the curriculum (Bradford et al., 2003; Hawkings et al., 2004). A shortage of personnel with the required ERP skills and experience could result in third-level institutions finding it difficult to have the appropriate level of staff experienced to deliver ERP education (Bradford et al., 2003). This is not a problem in this study as a number of the lecturing staff already have ERP experience and view the provision of ERP education as an exciting venture in the future. However, there still seems to be hesitancy with the rest of the staff in getting started and introducing practical sessions. Those currently not teaching the practical element used “lack of training” as a justification for not getting started. This is an issue that must be rectified. If relevant training was to be provided, there seems to be willingness by the lecturing staff that currently does not provide practical ERP classes to “try it out”. It is suggested in this research that third-level institutions should provide
and promote accessible practical ERP training for all relevant academic staff and this will identify the people that will go ahead to provide practical ERP education. The literature states that colleges may face resistance from existing staff who do not wish to make changes to the modules that they currently teach (Walker and Black, 2000). To overcome this concern it was suggested that third-level institutions could offer staff incentives to get more involved in teaching ERP education (Bradford et al., 2003). Hesitancy to change the way of teaching is always difficult to overcome. Some of the lecturing staff in this study seems to be genuinely eager to provide practical ERP education in the future. They did suggest that compensation, perhaps by allocation of hours off the current teaching load, could provide motivation to current staff to getting started in the provision of practical ERP education.

The extant literature suggests that once third-level institutions train their staff, there is the possibility that these members of staff could move to other institutions or into industry looking for people with ERP experience to avail of higher remuneration packages (Hawkings et al., 2007; Kanthawongs and Kanthawongs, 2010). This culture does not exist in this case study. The interviewees view working in academia and industry as two different occupations and even though they may have knowledge of ERP systems, they are happy to use that in the class or lab, rather than seeking employment in industry.

8.3.4 Lack of Teaching Material

Lack of access to adequate teaching material suitable for use in a third-level curriculum is another cited difficulty of practical ERP education (Still and Perry, 2000; Johnson et al., 2004; Deng et al., 2010). University Alliance programmes (UAPs) have gone some way to relieving this problem by providing member colleges with teaching material appropriate for third-level education (Hawkings et al., 2001). The lecturing staff, currently using the UAP in this study, noted that the vendor did provide teaching material but stated that it is locked into only one particular case study. This study suggests that lecturers in one college could build links with lecturers in other colleges that have the same UAP and build material
together. Also links could be built with potential employers of students, as they may be willing to provide educational material.

8.3.5 Lack of Business knowledge and IT skills by Students

Concerns that students tend to find it difficult to understand how the business processes of an organisation integrate (Nelson, 2002; Barnes and Ferguson, 2008) or lack the IT experience required (Davis and Comeau, 2004; Ledger, 2006) were voiced in the literature. A poor understanding of the terminology used when discussing ERP can also be a challenge for both the lecturer and the student (Barnes and Ferguson, 2008). The findings of this study do not concur with this. The interviewees feel that by the time students are in third-year, they have a sufficient knowledge of business processes and IT to be introduced to an ERP system. Indeed, if this knowledge did not exist at this stage, practical ERP education is seen as a means of helping the student acquire this understanding of business processes and IT.

In the short-term, this study suggests that third-level institutes should ask people familiar with the UAP, either internal staff members if available or external experts from industry, to provide as many of the labs as possible, or at the very lease to demonstration the EPR system to students in a classroom setting, showing students what an ERP looks like and what it can do. In the medium-term, these experts could provide in-house training to all relevant members of academic staff. This could be done at relatively low cost and effort. For example, in this case, study there are already three lecturers trained on the UAP, these could provide “train-the-trainer” courses to the other lecturers. In the longer-term, third-level institutions should formally incorporate a practical cross-modular project using ERP in their Business degree programmes. This will have significant cost implications (running lab sessions, more technical support etc.). By incorporating a cross-modular project (CMP), the college won’t have to change the content (or losing content) from the programme – doing this it would run the risk of losing exemptions in Accounting programmes by displace some other module. The CMP project would merely change the way modules are taught or assessed. For
example, the assessment of Management Accounting, Financial Accounting, Customer Relationship Management (CRM) and Management Information Systems (MIS) could be done on the UAP. Instead of teaching and examining each one separately, the lecturers would work together to find ways to integrate the assessment of the different modules. To achieve this, the School would need a dedicated technician and start building links with other colleges and industry to build a store of teaching material and best practices.

8.4 Question 3: What is the best way to provide ERP education to third-level Business students?

Third-level institutions need to provide ERP education to maximise the benefits to its students. This study suggests a mix methods method, using classroom and lab teaching in a cross-modular approach in the third of a four year Business degree.

8.4.1 Classroom V Labs

The literature suggests that the traditional tried and tested lecture style delivery does possess some unique strengths (Chamunorwa, 2010), but it does not allow students build an understanding or appreciation of the cross-functional and integrated business processes (Pridmore et al., 2014) of ERP education. The use of computer laboratories (labs) are supported in the current literature as an appropriate means of teaching ERP systems to third-level students as it provides them with hands-on, real-life experiences that cannot be gained using the traditional methods (Gupa and Ruppel, 2007, Pridmore et al., 2014; Johansson et al., 2014).

The majority of the interviewees in this study agree with the current literature that suggests that ERP education should not be delivered entirely in a classroom setting but delivered to the students by a combination of classroom and labs. They suggest that students could be taught the theoretical components of an ERP system during a lecture, while the lab sessions could be used to teach the practical element of the system. Using this approach, students will be able to gain an
understanding of the theory behind an ERP system and be able to appreciate how the different business processes of an organisation are integrated and gain hands-on experience required by industry. This valuable experience will enable students see how the different functions of an organisation fit together and connect what they were taught in the classroom to a practical situation. In order for students and lecturers to get the most from the lab sessions, it was suggested that the lab sessions should be taught in two-hour slots as it can sometimes takes time for students to “get logged on, set-up and ready to start the class”.

8.4.2 Cross-modular V Single Module

A cross-modular approach to teaching ERP systems was favoured by the majority of the interviewees over a standalone module approach. A cross-modular approach was seen as helping students see the bigger picture by connecting multiple modules in the labs. A cross-modular approach is successfully being used in CIT and it seems to be working well. However the challenges of a cross-modular approach, such as a lack of technical support if something was to go wrong, solving the logistics problems that may arise and assigning assessments were also articulated in the interviews. If a cross-modular approach is to be a success there needs to be strong communication and coordination between the lecturers involved.

8.4.3 Appropriate Stage to Introduce ERP Education

As stated earlier, the majority of the interviewees felt that ERP education and in particular, the practical element needs to be introduced in the third year of a four-year degree programme. At this point, students would have a good enough knowledge of business processes and IT systems. The students would now have the ability and confidence to use the ERP system.
8.5 Limitations of this study and Future Research

This exploratory, descriptive research, while narrowing the existing gap in the literature, has limitations. In fulfilment of the requirements for a Masters in Business (Research), this dissertation was the first major piece of academic research undertaken by the researcher. Along with experience, time was another limiting factor for the researcher. The researcher would have like to have looked at how the ERP education provided to Accounting students differs from the ERP education provided to BIS students, but as only three lecturers are providing ERP education in CIT, they are not differentiating the education provided based on the program of study. The introduction of ERP education provides plenty of scope for the researcher to write an in-depth analysis of the process and opens up differentiated ERP education to different cohorts of student as a further area of research.

Further research could validate the findings of this research in other colleges and with other cohorts of students. Further research could be carried out to see if the skill sets mentioned in the literature are what industry actually requires from graduates. As well as latitudinal studies, a longitudinal study where this case study could be re-examined in three to five years would be a worthy area of research. This would provide a complete view of development of ERP education in this case site. Another area of interest to the researcher is the appropriateness of using simulation games to teach the practical side of ERP.

8.6 Conclusion

This study acknowledges that the investment for third-level institutions in ERP is a huge capital and on-going expenditure. Not only must the ERP system or its UAP be purchased, but there are also personnel issues (including lack of training on ERP, inexperience in teaching in a lab setting), programme structure issues (including lack of space on the programme, the need to rewrite module descriptors) and organisational issues (including a lack of computer laboratories, cost of running laboratories and need for more technical assistance). However all
of these challenges must be weighed up against the benefits that practical ERP education has to offer.

The provision of practical ERP education has benefits to the students, potential employers and the ERP vendors, and all of these provide reciprocal benefits to the college. By improving graduates skills and thus enhancing their employability, the profile of the college, and the programmes it provides, will be increased to both potential students and potential employers. Employers may be happy to come into the college to talk to the class or to provide additional teaching material. This helps the college build links with industry. By using a UAP the college can build links with an ERP provider. This promotes that particular brand of ERP, but benefits the college by building a link with an ERP provider to ensure that students are always up-to-date with new technology being introduced in industry.

These benefits can be maximised if ERP education is provided in a mix of theoretical and laboratory settings in a cross-modular fashion. The ideal provision for this teaching pedagogy is to provide the students with the theory (in the classroom) and two consecutive hours of practical experience (in the lab). The theory classes will provide the students with solid business knowledge and they can be introduced to the practical side of an ERP system allowing them to pull all of this knowledge and practical skills together whilst gaining the skills sets and hands-on experience required by industry.

This study suggests that investment in ERP education and in particular practical ERP education benefits all the stakeholders if properly provided.
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Appendices

Appendix A: Interview Protocol

Before the Interview:

1. The interviewer will introduce herself and give the interviewee a short brief on the purpose of the interview.
2. The interviewee will be asked if anything needs to be clarified at this stage.
3. The interviewee will be asked if the interview can be taped.
4. The interviewee will be given some indication of how long the interview will take.

During the interview:

5. The interviewer will have a list of questions to be covered, but may not stick to the exact wording or the order of the questions.
6. The questions will be open-ended allowing the interviewees to expand beyond the facts of the matter and give opinions.
7. Even if the interview is being taped, the interviewer will still take notes.

At the end of the interview:

8. At the end of the interview, the interviewee will be debriefed to ensure he/she is happy with how the interview went.
9. The interviewer will transcribe the interview in full as soon as possible.
Appendix B: Outline of Interview Questions for School of Business Lecturers

1. Tell me about your experience of teaching ERP systems in third-level institutions?

2. Why do you think it is important to include ERP in the Business students’ programme?

3. In your opinion at what stage of the programme, should ERP be introduced? Why?

4. Would students have enough business acumen /IT skills to realise how an ERP system works at that stage?

5. Do you think a Cross-modular approach would be appropriate? What would be the difficulties with this?

6. How should the practical side of an ERP system be taught?

7. What skills should graduates with ERP education have?

8. How do you think ERP education would benefit the business students?

9. How important are soft skills like teamwork, interpersonal skills in ERP education?

10. Would the inclusion of ERP education attract a different type of student to our programmes? If yes, what type?

11. From the perspective of marketing of the course to potential students, how would an ERP element in a Business course be of benefit?
12. From the perspective of improving the credibility of our programmes to potential employers, how would an ERP element in a Business course be of benefit?

13. Can you see any other benefits to introducing ERP education in CIT?

14. What type of business knowledge do you feel students require before embarking on an ERP course/module?

15. What type of IT knowledge do you feel students require before embarking on an ERP course/module?

16. Are students fearful of the complexity of ERP systems? Have you any suggestions on how the college could change these students attitude towards ERP systems or IT education?

17. What do you, as a lecturer, feel are the main challenges that you may face when integrating ERP education into your particular modules?

18. What do you, as a lecturer, think are the main challenges facing the School of Business when introducing ERP education into the college?

19. Has CIT the staff available with adequate ERP expertise to successfully introduce ERP into the curriculum?

   - What attributes do you think staff should have?
   - How can CIT attract experienced staff?
   - If CIT train staff is there a fear they would leave as they remuneration package is higher in industry?

20. Would you envision any resistance from staff if it was to be introduced? And if so, can you explain?
21. What would you suggest the college could do in order to overcome this resistance?

22. Along with the students and the college benefiting from the introduction of ERP into the curriculum, how would staff benefit from teaching an ERP module?

23. What training did you receive or are you receiving in ERP?

24. What is the level of teaching material available to you for your ERP classes?

25. Have you encountered any problems in accessing ERP course material?

26. How do you teach ERP? Do you have a case study or a simulation game? Individual work or teamwork?

27. Do you feel it is best to teach ERP systems in a classroom through a lecturer or in a lab?

28. What are your views on sending students to work with the system in Industry during the course?

29. How difficult is it to implement an ERP course/module into the curriculum?

30. What are the main difficulties you have encountered in teaching ERP?

31. Have you any suggestions on how CIT might overcome these problems?

32. What are the benefits to the main stakeholders involved from CIT’s alliance with SAP?
Appendix C: Outline of Interview Questions for School of Business Management

1. CIT invested in SAP UAP. Can you talk me through the decision in making this investment?
   - Why is important to include ERP education in the Business students’ programme?
   - Has it been worth the investment?

2. What courses would you like to see practical ERP education included in?

3. In which year of these programmes should it be introduced?
   a. Will the students have enough business acumen at this stage?
   b. Will the students have enough IT skills at this stage?

4. How do you think ERP systems should be taught?

5. What were (and are) the main challenges facing the School of Business when introducing ERP education into a course?

6. Would challenges do you as Head of Department/School think you would face if it was decided that an ERP module was to be introduced into the one of your degrees?

7. Can students be fearful of the complexity of ERP systems? Have you any suggestions on how the college could change these students attitude towards ERP systems or IT education?

8. Has CIT the staff to successfully introduce ERP into the curriculum?
   - What attributes do you think staff should have?
   - How can CIT attract experienced staff?
   - If CIT train staff is there a fear they would leave as they remuneration package is higher in industry?
9. Has there been or would you envision any resistance from staff to taking on the teaching of ERP? And if so, can you explain?
   - How can we overcome this resistance?

10. Even though most of the lecturing staff state that a mix of theory and labs is ideal, only three staff use SAP in the labs. Why do you think there is such a low take-up?
   - Do you think CIT need more staff using it?
   - How can CIT maximise its usage?
   - Is there training available with SAP UAP?

11. How do you think ERP education would benefit the business students?

12. Other than knowledge of ERP, what other soft skills do you think ERP education could instil in our students?

13. Would the inclusion of ERP education attract more students into our programmes or even a different type of student to our programmes? If yes, what type?

14. From the perspective of marketing of the course to potential students, would an ERP element in a Business course be of benefit?

15. From the perspective of improving the credibility of our programmes to potential employers, how would an ERP element in a Business course be of benefit?

16. Can you see any other benefits to having ERP education in our programmes?

17. Is there any other way in which CIT can maximise the benefits from SAP UAP in the future?