ENSURING SUCCESSFUL ERP IMPLEMENTATIONS USING THE VISION-TO-PROJECT FRAMEWORK

by

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THESIS

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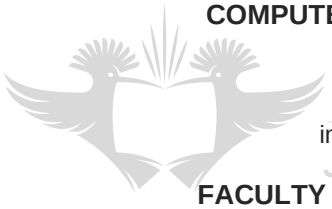

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ABSTRACT

Enterprise resource planning (ERP) systems are implemented within organisations to enable them to work more efficiently and enhance productivity. They also ensure that different levels of information are available to managers within the organisation for strategic and tactical decision-making. The implementation of ERP systems is often associated with great costs, they are resource intensive and cover the whole organisation.

The implementation of ERP systems is perceived as a project that often fails owing to overrun on cost and time. The return on investment (ROI) is also often questioned once an ERP system has been implemented, since the organisation does not always see the benefits of the ERP system versus the effort and cost of implementing it.

The purpose of this thesis is twofold: firstly it determines what an ERP system is and whether it can be subdivided into different components. The focus of this section is on the operational side of an ERP system to determine how it is managed and operated within an organisation. The second focus is on the way that ERP systems are implemented and the management that goes hand in hand with this implementation.

The first focus area is addressed by developing a model that explains ERP and the different components within it. It describes the interactions between the different components and how the ERP system affects the organisation. This model provides a better understanding of an ERP system and shows the technology to be mature.

The second focus area is addressed by a framework that assists organisations in deriving projects from the organisational vision. This ensures that the implementation of an ERP system will directly support the organisation's vision and strategies. This addresses the issue of determining the value of the ERP system as well as ROI. The framework also provides alternative ways and methods that can be used to implement ERP systems.

The value of this research is firstly that it provides a holistic model of what constitutes an ERP system and its effect on the organisation. ERP systems change not only the financial systems, but also the way the organisation operates. They introduce organisational change.

The value of the framework is that it can assist organisations in identifying and implementing projects that will enable the implementation of the organisation's vision and strategies. This will eliminate any favoured projects that are not in support of the organisation's vision and can save the organisation's scarce resources that would have been wasted on these projects. The framework can also assist organisations in determining if they must implement an ERP system and what value this implementation will have for the organisation.

OORSIG

Organisasiehulpbronbeplanningstelsels (OHB-stelsels) word deur organisasies geïmplementeer om doeltreffender te kan werk en om produktiwiteit te verhoog. Dit verseker ook dat verskillende vlakke van inligting aan bestuurders binne die organisasie beskikbaar is vir strategiese en taktiese besluitneming. Die implementering van OHB-stelsels word dikwels geassosieer met hoë koste, dit is hulpbronintensief en strek oor die hele organisasie.

Die implementering van OHB-stelsels word beskou as 'n projek wat gereeld faal omdat dit meer kos en langer duur as die oorspronklike beramings. Die opbrengs op belegging (OOB) word ook dikwels na die implementering van 'n OHB-stelsel bevraagteken omdat die organisasie nie altyd die voordele van die OHB-stelsel sien teenoor die tyd en koste wat dit verg om die stelsel te implementeer nie.

Die doel van die navorsing is tweeledig: eerstens word bepaal wat 'n OHB-stelsel is en of dit in verskillende komponente verdeel kan word. Die fokus van hierdie afdeling is op die operasionele sy van 'n OHB-stelsel om te bepaal hoe dit binne 'n organisasie bestuur en bedryf word. Tweedens fokus die navorsing op die manier waarop OHB-stelsels geïmplementeer word en hierdie implementeringsproses bestuur word.

Die eerste fokusarea word hanteer deur 'n model te ontwikkel wat OHB en die onderskeie komponente waaruit 'n OHB-stelsel bestaan, te verduidelik. Dit beskryf die interaksie tussen die verskillende komponente en hoe die OHB-stelsel die organisasie as geheel raak. Die model verskaf beter begrip van 'n OHB-stelsel en dui aan dat die tegnologie goed ontwikkel is.

Die tweede fokusarea word hanteer deur 'n raamwerk wat organisasies kan help om projekte af te lei uit die visie van die organisasie. Dit verseker dat die implementering van 'n OHB-stelsel die organisasie se visie en strategieë direk sal ondersteun. Dit spreek die kwessie van die bepaling van die waarde van die OHB-stelsel en OOB aan. Die raamwerk stel ook alternatiewe metodes voor wat gebruik kan word om OHB-stelsels te implementeer.

Die waarde van hierdie navorsing is eerstens dat dit 'n holistiese model verskaf van wat 'n OHB-stelsel is en die effek daarvan op die organisasie. OHB-stelsels verander nie net die finansïele stelsels nie, maar ook die wyse waarop die organisasie funksioneer. OHB-stelsels het organisasieverandering tot gevolg.

Die waarde van die raamwerk is dat dit organisasies kan help met die identifisering en implementering van projekte wat die implementering van die organisasie se visie en strategieë moontlik maak. Dit sal voorkeurprojekte uitskakel wat nie die organisasie se visie steun nie en kan die organisasie skaars hulpbronne bespaar wat andersins op hierdie projekte verspil sou word. Die raamwerk kan organisasies ook help om te bepaal of hulle

wel ’n OHB-stelsel moet implementeer en watter waarde hierdie implementering vir die organisasie sal inhou.

AFFIDAVIT: MASTER'S AND DOCTORAL STUDENTS
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THIS WORK IS DEDICATED TO MY WIFE

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1 CHAPTER 1: INTRODUCTION

1.1 INTRODUCTION

For organisations to survive in a highly competitive environment, they must regularly adapt their business as well as the operational processes to address market needs. This can be achieved by implementing an enterprise resource planning (ERP) system (Bosilj-Vuksic & Spremic, 2004). This fact is underlined by McAdam and Gallowat (2005), who state that innovation and change management play an increasingly important role in sustaining "leading edge" competitiveness for organisations in times of rapid change and increased competition. This can only be accomplished with the implementation of an ERP system as it tries to achieve innovative large-scale change in organisations.

Organisations are implementing ERP systems to ensure that information is available to everyone in the organisation (Aiken, 2002). The implementation of an ERP system goes hand in hand with the allocation of organisational resources (Esteves-Sousa & Pastor-Collado, n.d.). These resources will be the time of the employees and/or consultants allocated to implement the system as well as financial allocations from the organisation.

With the allocation of organisational resources to implement an ERP system comes the responsibility to do so within the shortest time fame and with minimum cost to the organisation (Phelan, Zrimsek & Frey, 2002). The organisation must also ensure that the ERP system provides value to the organisation and that the time and cost allocated to its implementation are quantifiable.

1.2 MOTIVATION FOR THIS STUDY

Chen (2001) provides statistics regarding the success rate of ERP implementation: 40% of all ERP installations achieve a partial implementation and 20% are scrapped as total failures. This implies that only 40% of all ERP implementations are perceived as successes. In other research done by Ptak and Schragenheim (1999) it is reported that between 60 and 90% of ERP implementations do not achieve the promised return on investment (ROI).

Although these statistics are based around the years 1999 – 2001, recent research by Hongjun (2005) indicates that in China this figure is as high as 70%.

ERP systems influence entire organisations with some that consist of more than 1 000 modules and 10 000 application programs and have costs ranging from three to four million US dollars for small firms to over one billion US dollars for large organisations (Yu, 2005). These ERP implementations last for one to four years depending on the ERP system complexity. Therefore, unsurprisingly, numerous ERP implementations exceed budget, lag behind projected schedule and fail to match expectations as described in the previous paragraphs.

Based on the information provided above, it is clear that there is a problem. If the information provided by Yu (2005) is used in conjunction with the information provided by Chen (2001), then it means that on average, an amount of six hundred million US dollars is wasted every

year in the implementation of an ERP system. Along with this waste of money is the fact that organisations also do not receive the ROI for the remainder of the 40% of the ERP systems that are perceived as successes.

The goal statement of the thesis is to provide a link between the organisation's vision and strategies and the implementation of an ERP initiative.

1.3 PROBLEM HYPOTHESES

The implementation of an ERP system is often different from that of other information technology projects. The reason for this is that it involves the whole organisation from executives down to operational level. The implementation of an ERP system initiates change on a horizontal level from the finance department, across the marketing department as well as the production department. It also affects all vertical levels within the organisation from strategic level, involving board members, down to the employees at operational level.

This means that the impact of an ERP system is vast if it is a failure as it affects the whole organisation. No one is left untouched by the failure of an ERP system. The opposite is also true: everyone within the organisation benefits from the success of an ERP system.

Based on the information provided above and the goal statement, the problem statement can be summarised as follows:

- Some 60% of ERP installations achieve partial implementation or are scrapped as total failures.
- Between 60 and 90% of ERP implementations do not achieve the promised value.

The following hypotheses are used as reasons for and causes of why ERP implementations are often failures:

- ***Hypothesis 1:*** Organisations do not understand ERP systems and the effect they will have on the organisation during and after implementation.
- ***Hypothesis 2:*** The underlying technology is immature within the ERP field.
- ***Hypothesis 3:*** ERP systems are perceived as insecure environments in which to transact and to transact with other external businesses and customers. This implies that users do not trust the ERP system.

These three hypotheses focus on the operational side of an ERP system. In other words, they deal with how an ERP system is perceived within the organisation after it has been implemented and is being used by the organisation.

- ***Hypothesis 4:*** ERP systems cannot be implemented using existing project management standards.
- ***Hypothesis 5:*** ERP systems cannot be implemented using existing programme management standards.

Hypotheses 4 and 5 focus on the way that ERP systems are implemented and not on the operational level as do hypotheses 1 – 3. The focus is on current and existing project and programme management principles and methodologies and how these can be used to implement ERP systems.

The following hypothesis has to do with the value that organisations can derive from ERP systems and with the third level of ERP implementation, namely the strategic value of ERP systems:

- ***Hypothesis 6:*** ERP initiatives are implemented for the wrong business reasons.

The above six hypotheses are used to determine how the failure rate of ERP implementations can be minimised and the value that organisations obtain from this implementation can be optimised. A decrease of 10% in ERP implementation failures could potentially mean a saving of hundreds of millions of US dollars a year.

The hypotheses described above are addressed by following a structured approach as described in the next section.

1.4 STRUCTURED APPROACH

The problem of ERP implementations being perceived as failures is addressed by investigating each of the hypotheses stated in section 1.3.

The research is approached in a systematic manner where each hypothesis is addressed separately. Each hypothesis is, as a first step, examined to determine the validity of the hypothesis. This is done using different research methodologies such as a literature survey or modelling.

Based on the findings of step 1, the second step is to determine if there are any solutions to the stated problem. The purpose of finding or determining solutions to the problem statement is twofold:

- Firstly, any potential solution should contribute to the current body of knowledge. This enables future researchers to draw information from an updated body of knowledge. It also provides opportunities for new research based on the current results.
- The second reason why a solution must be found where possible is to attempt to minimise the failure rate of ERP implementations and to maximise the value or ROI that organisations receive.

The third step is to ensure that at the end of the research, all the possible solutions are pieced together to provide an overall solution to ensure that ERP implementation failures are minimised and ROI is optimised.

A solution is provided in the form of a structured approach that enables an organisation to use its vision and strategies to determine if an ERP system is needed. This structured approach

ensures that an ERP system is linked to the organisation's vision and that it does add value and yield an ROI.

The above structured approach is accomplished by addressing the different hypotheses in separate sections. Various research methodologies were followed to address each of the hypotheses and these methodologies are discussed in the following section.

1.5 RESEARCH METHODOLOGIES

Various research methodologies can be used to assist a researcher. These methodologies constitute formal methods for conducting scientific research (Hoepfl, 1997; Burns, 2000; Dash, 2005). The following methodologies were used to analyse the different hypotheses:

1.5.1 LITERATURE SURVEY

A literature survey can be used for collecting information to describe, compare or explain knowledge, attitudes and behaviour (Pfleeger & Kitchenham, 2003). According to Kumar (1996), there are three reasons for doing a literature survey:

- It provides clarity and focuses the research problem.
- It improves the methodology that is being used by the researcher to find a solution.
- It broadens the researcher's knowledge base on the specific research area or topic.

The purpose of the literature study in this current research was to become acquainted with the available body of knowledge regarding ERP systems and the reasons why ERP implementations are often perceived as failures. This specific methodology was used throughout the research to determine the current knowledge base and whether there are possible solutions to resolve the problem at hand.

1.5.2 MODELS

A model is usually constructed because it is easier to comprehend or manipulate than the real thing. Models are often used to propose a new idea or concept (Olivier, 2006). Modelling as a research methodology is used to provide the following:

- ***Simplicity***: In an environment as complex as ERP, a model simplifies the ERP concept in such a way that it is understood by all the parties involved.
- ***Comprehensiveness***: Although the model simplifies the ERP environment, it ensures that all aspects of ERP systems are portrayed in the model.
- ***Generality***: The design of a model must be general enough to be applied to all sectors of the ERP environment and not focus on specific aspects.
- ***Exactness***: Models must fit the perceived problem closely for them to be accepted.
- ***Clarity***: The purpose of all aspects of the model must be clearly defined and there must be no ambiguity.

1.5.3 CASE STUDIES

Case studies are used as a technique for detailed exploratory investigation, both prospectively and retrospectively, and attempt to understand and explain the phenomenon or test theories by using qualitative analysis (Patton & Appelbaum, 2003). Case studies do have limitations, according to Flyvbjerg (2006), which can be listed as follows:

- It is difficult to find appropriate case studies to illustrate the problem at hand.
- It is also difficult to quantify the findings of a case study.

Although case studies have their limitations, they are useful in the following scenarios (Flyvbjerg, 2006):

- They provide detailed answers to why and how questions.
- They provide deep insights into the cause and effect of certain actions and/or activities.
- Case studies are effective when theories must be tested in complex environments where there is little or no control over the variables within the environment.

1.5.4 ARGUMENTS

If alternative solutions are compared, it is necessary to argue the differences and/or similarities between the solutions (Bell, 2007:89; Olivier, 2006:9). Arguments are also made for why one solution is better than another in a specific environment. Arguments provide the reasoning behind some of the decisions made in this thesis.

1.5.5 ACTION RESEARCH

Action research is a form of participatory research in which action and research complement each other (Altrichter, Kemmis, McTaggart & Zuber-Skerritt, 2002). The following factors are the most common important factors (Welman, Kruger & Mitchell, 2005):

- ***Versatile design:*** Action research uses a versatile design that continually changes and is adapted in reaction to information and results obtained during the undertaking of the research.
- ***Participant involvement:*** A high premium is placed on the active involvement of all participants.
- ***External validity:*** The programme or process that is developed using action research is not necessarily held up as a solution for any other similar situations. The results of the action research can, however, be used as a basis for similar situations.

According to Lau (1999), action research can be used in the following scenarios:

- When the researcher cannot isolate the variables or the cause from the effect as in the case of case studies.

- When the researcher needs to ensure that the research goals are relevant.
- When effecting a change is as important to the research as is the discovering of new knowledge.

The above five research methodologies are used throughout the thesis and table 1-1 provides a summary of which research methodology was used to address the different hypotheses.

	Literature Survey	Case Studies	Models	Arguments	Action Research
Hypothesis 1: Organisations do not understand ERP systems	X		X	X	
Hypothesis 2: Underlying ERP technology is immature	X	X	X	X	
Hypothesis 3: ERP systems are perceived as insecure environments in which to transact	X		X	X	
Hypothesis 4: ERP systems cannot be implemented using existing project management standards	X		X	X	
Hypothesis 5: ERP systems cannot be implemented using existing programme management standards	X		X	X	
Hypothesis 6: ERP initiatives are implemented for the wrong business reasons	X			X	X

Table 1-1: Linking research methodologies with hypotheses

The various research methodologies that are used in this thesis provide a thorough understanding of the problem and are used to determine if possible solutions do exist or can be developed to ensure that future ERP implementations are more successful.

The following section provides the layout of the thesis. The layout of the different chapters within the thesis explains how each of the different hypotheses is addressed.

1.6 LAYOUT OF THE THESIS

The thesis consists of ten chapters. Figure 1-1 provides a graphical layout of the thesis.

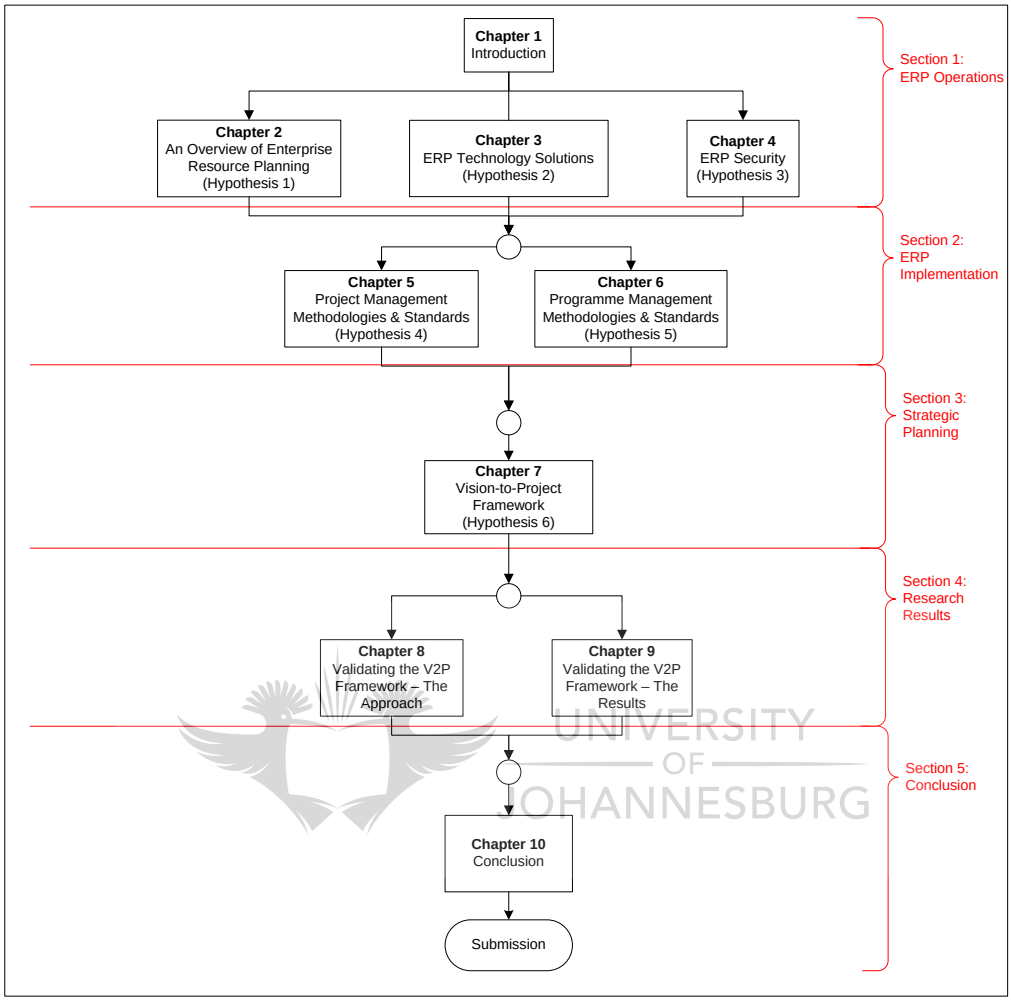

Figure 1-1: Thesis layout

The thesis is broken down into five sections.

1.6.1 SECTIONS

The first section provides a background to the problem at hand and addresses hypotheses 1 – 3 mentioned in section 1.3. This section focuses on the operational side of an ERP system and investigates how it impacts the success rate. Literature surveys were conducted to understand the problem at hand in detail as well as to determine the extent of the problem. This first section addresses the first part of the problem statement.

The second section focuses on the implementation side of an ERP system and addresses hypotheses 4 and 5. The aim of this section is to determine whether project and programme management can be used to implement ERP systems and how they must be applied to

minimise ERP implementation failures. As with the first section, this section addresses the first part of the problem statement.

The third section addresses hypothesis 6 and focuses on the strategic impact of ERP systems on an organisation. The section provides an alternative framework that can be used to implement ERP systems which becomes the focus of chapter 7. This section is the essence of the thesis and provides a possible solution to the problem.

Section 4 uses action research as a research methodology to determine the validity of the framework. Chapters 8 and 9 constitute this section.

Section 5 is the conclusion of the thesis and provides a self-evaluation on how to extend the current research. The chapter also provides conclusions that can be derived from the current research and how they can be applied. The last focal point of the chapter is what future research can be undertaken as a spin-off from the current research. It consists of only one chapter, namely chapter 10.

1.6.2 CHAPTERS

Chapter 1 provides the introduction and the problem statement of the thesis. The approach that is followed during the construction of the thesis is given.

Chapters 2 and 3 deal extensively with ERP systems and the vendors involved in the ERP market. Chapter 2 provides a definition of an ERP system and the different components that constitute this system. These different components are based on modelling and address hypothesis 1. The main objective of chapter 2 is to suggest a model for ERP systems that provides the platform for the rest of the thesis. This model enables organisations to understand the complexity of an ERP system and aids them in better planning of the ERP system implementation.

Chapter 3 describes the existing products and solutions that the ERP vendors provide. By conducting a literature survey, hypothesis 2 is addressed to determine if the underlying ERP technology is mature. Case studies are also provided to indicate how organisations currently use ERP systems. This chapter still addresses the operational side of an ERP system.

Chapter 4 builds on chapters 2 and 3 and focuses on security within an ERP system. Hypothesis 4 states that ERP systems are insecure environments in which to transact. An ERP security framework is provided to ensure that security is incorporated into an ERP system. This means that corporate and IT governance are addressed and underline the impact an ERP system can have on the organisation.

Based on the information and resulting conclusions drawn from chapters 2 – 4, the focus of the thesis moves away from the operational side of ERP systems to the way that ERP systems are initiated and implemented.

Chapter 5 discusses project management and whether it can be used to implement an ERP system. The purpose of this chapter is to address hypothesis 4. The chapter covers current

international standards and methodologies and makes use of arguments to prove the hypothesis.

Chapter 6 addresses hypothesis 5 and explains programme management and how it can be used to implement an ERP system. It also determines whether ERP systems do indeed add value to an organisation. ERP systems are larger than just an individual project and therefore an additional approach is needed to implement an ERP system apart from project management.

The focus of the thesis moves away from the operational and implementation sides of an ERP system towards the strategic impact of ERP systems on organisations. Chapter 7 forms part of this section and addresses the second part of the problem statement, namely to optimise the value that organisations derive from ERP implementation.

Based on the results of the previous chapters, chapter 7 focuses on the business levels within an organisation. The purpose is to determine where an ERP system fits in the organisation and where should it be initiated. Hypothesis 6 is covered in this chapter. As stated earlier, ERP systems cut across the entire organisation and it is important that they form part of the bigger picture within the organisation. ERP systems are not just IT systems, but are organisational systems. A model or framework is provided for aligning ERP systems. Since portfolio management encompasses all the levels of the organisation horizontally and vertically, it is a process that can be used to determine whether ERP systems add value to the organisation. It will also address the hypothesis that ERP systems are implemented for the wrong reasons since they function at strategic level. This ensures that hypothesis 6 can be proven, owing to the fact that the vision and strategies of the organisation are determined at strategic level.

The fourth section of the thesis combines the results from the previous sections and uses action research (see section 1.5.5) to determine if the proposed framework is a workable solution to the problem.

Chapter 8 explains the action research methodology in detail and how it is used to test the Vision-to-Project Framework. It provides the theory of action research, and determines how action research is defined to resolve a research problem, as well as the way it was applied to the framework.

Chapter 9 documents the results of the action research methodology. The results of the action research are used to establish if there are any processes missing within the proposed framework and how the framework can be altered to ensure the successful implementation of an ERP system.

The fourth section consists of chapter 10 only and provides a summary of the thesis as well as any possible future research areas that stem from the current research. The purpose of this chapter is to take each of the six hypotheses and determine whether each one has been proven as true statements or not. Based on these results, final recommendations are made

to ensure the future successful implementation of ERP systems. This chapter also provides guidelines for future research that can be used to ensure the continuous successful implementation of ERP systems.

1.7 RESEARCH VALUE

The value of this research undertaken can be seen from a global perspective down to a project perspective. This research contributes firstly to the global economy. Section 1.2 describes the financial impact ERP systems have on the economy. Failure to implement an ERP system contributes to the loss of money. This loss of money must be recovered by the organisation and this is usually done by increasing the prices of the products or services that the organisation provides. This implies that the customer ultimately pays for the failure of an ERP system. Secondly, such a failure also ensures that the profits of the organisation are lower than the cost of the ERP system, which must be covered by the organisation, and not all losses can be passed on to the customer.

The second contribution to the global economy is that ERP systems can be implemented in better and smarter ways by using portfolio and programme management in conjunction with project management. If ERP systems are implemented in such a way that they ensure successful delivery, millions (measured in US dollars) can be saved based on the information provided in section 1.2. This research addresses the way an ERP system is implemented and focuses primarily on the implementation side as described in section 1.3.

The third value attribute of this research is that the negative connotation surrounding ERP systems can be minimised. Because ERP systems are most of the time over budget, delivered late and do not provide any ROI, organisations have the perception that ERP vendors and consultants implementing ERP systems are in it only for the money. By understanding the role and place of ERP systems within organisations, senior management can ensure that ERP systems are implemented for the right reasons. If more and more ERP systems are implemented successfully and ROI is achieved, the negative connotation will be minimised and organisations will start to realise the value and benefits that ERP systems can add. This value addresses the operational side of an ERP system and ensures that the organisation as a whole understands the way that an ERP system must be managed.

The fourth value attribute is based on the second value attribute. Programme and project managers sometimes do not understand ERP systems. The implementation of ERP systems is approached in the same manner as that of other IT systems. If programme and project managers understand the concept of an ERP system, its different components and the effect it has on the organisation as a whole, then they will be better prepared during the scoping and costing phases. This will allow ERP system implementation to be delivered within time and cost constraints.

The next chapter, chapter 2, provides ERP definitions and determines what constitutes an ERP system. The first hypothesis is used as the basis for this chapter.

2 CHAPTER 2: AN OVERVIEW OF ENTERPRISE RESOURCE PLANNING

2.1 INTRODUCTION

Based on hypothesis 1, i.e. organisations do not understand ERP systems and their complexity, the goal of this chapter is to define ERP systems and their different components, and therefore to prove hypothesis 1.

This chapter defines ERP and explains how it functions within an organisation. It provides an understanding of the role and purpose of ERP within an organisation. It also provides a conceptual model that explains the complexity of an ERP system. The chapter determines if ERP systems themselves are the cause of the failure of ERP systems.

The first objective of the chapter is to define ERP by analysing different definitions. This will indicate if there is a mutual understanding in literature of what ERP is and if there are common areas amongst the definitions.

The second objective is to define the different components of an ERP system, i.e. the architecture of an ERP system, and how they relate to one another. The advantages and disadvantages of an ERP system are also highlighted and industry examples are used to illustrate them.

This chapter is the foundation on which the subsequent chapters are based. It forms part of the background chapters together with chapters 3 and 4. Chapter 3 describes the different ERP vendors and the solutions they provide, addressing hypothesis 2. Chapter 4, which addresses hypothesis 3, focuses on the security aspects of an ERP system.

In order to determine what an ERP system is all about, it is necessary to understand its evolutionary nature. The next section deals with the evolution of ERP systems.

2.2 EVOLUTION OF ERP

The focus of manufacturing systems in the 1960s was on inventory control (ESI International, n.d.). Most of the software packages then were designed to handle inventory based on traditional inventory concepts (Shehab, Sharp, Supramaniam & Spedding, 2004). In the 1970s the focus shifted to material requirements planning (MRP) systems that translated the master production schedule (MPS) built for the items into time-phased net requirements for the sub-assemblies, components and raw materials planning and procurement (Chen, 2001). The MPS is a spreadsheet that projects the demand for each product of the company over time. In its simplest form the MPS is a matrix with time periods as columns and products as rows.

In the 1980s the concepts of MRP-II (manufacturing resources planning) evolved, which was an extension of MRP to the shop floor and the distribution of management activities (ERPWire.com, 2005). In the early 1990s, MRP-II was further extended to cover areas like engineering, finance, human resources and project management. This was named ERP, a

phrase coined by the Gartner Group of Stamford, Connecticut, USA (Wylie, 1990). The intention of ERP is to improve resource planning by extending the scope of planning to include functions such as supply chain management. The major difference between MRP-II and ERP is that MRP-II focuses on the internal scheduling of resources, whereas ERP extends this scheduling to external resources based on customer demands and needs.

ERP systems continued to evolve during the late 1990s owing to various vendors providing various ERP applications for various industries (Jacobs & Weston, 2007). These vendors and products are discussed in more detail in chapter 3.

Although ERP evolved from MRP and MRP-II, it is not clear what ERP systems are, as they often only refer to scheduling of resources. A search on Google revealed 42 800 definitions of what people believe ERP is. This clearly shows that there is no common understanding of the term "ERP" and the following section focuses on defining it.

2.3 DEFINITIONS

What is enterprise resource planning? The following definitions describe and explain what ERP is. Each definition is followed by an interpretation to highlight some of the key components.

- **"**Enterprise Resource Planning is an industry term for integrated, multi-module application software packages that are designed to serve and support multiple business functions" (Information Technology Toolbox, n.d.). This definition implies that ERP systems provide integration between different applications. This means that the organisation can have multiple applications that must be able to integrate. By achieving this integration, the business functions of the organisation are achieved as per the definition. Three issues emerge from this definition: the ERP system (i) is integrated, (ii) consists of multiple applications or modules and (iii) supports multiple business functions.
- "Enterprise Resource Planning comprises of a commercial software package that promises the seamless integration of all the information flowing through the company – financial, accounting, human resources, supply chain and customer information" (Davenport, 1998). This definition also highlights the issue of integration between information. This information is retrieved from various divisions within the organisation, such as the finance department and the human resources department.
- "Enterprise resource planning (ERP) is the industry term used to describe a broad set of activities supported by multi-module application software that helps a manufacturer or other business manage the important parts of its business" (Bitpipe, n.d.). This definition highlights the fact that an ERP system consists of multiple applications, which in turn consist of multiple activities. This illustrates the complexity of an ERP system. The main purpose of this synergy of applications is to support the business itself.

There are three elements that are common throughout the above definitions.

- The first element is that ERP systems consist of one or more applications. These applications span across the organisation in the horizontal as well as the vertical levels.
- The second common element is that these different applications must integrate seamlessly with one another. There are no manual processes in place and all the integrations are automatic.
- The third element is that ERP systems are implemented to ensure the successful management of the organisation. The organisation is seen as a single unit.

It is clear from the above definitions that although several people and organisations have their own definition of an ERP system, there are certain common elements that everyone recognises. It is necessary to define ERP to satisfy the first objective of the chapter. ERP can therefore be defined as an integrated, cross-functional, multi-module application that ensures the successful management of an organisation.

Although people are in agreement about the basic elements of an ERP definition as illustrated above, there is no model or framework illustrating what ERP does or how it functions. This finding is based on a literature survey that was conducted. The following section focuses on the components that constitute an ERP system.

2.4 COMPONENTS OF AN ERP SYSTEM

The previous section provided definitions of ERP. But what are the building blocks of an ERP system? The different components of an ERP system are discussed in this section. A holistic view is taken of an ERP system and how it relates to the organisation in which it functions. This concept of systems thinking (Checkland, 1999:3; Gharajedaghi, 2006:29) is used to explain an ERP system. Systems thinking can be defined as an approach that aims to address complex issues and make wiser decisions in a more manageable and understandable way by looking at the problem holistically. It aims to identify the key factors, establish the main drivers and ascertain how they interact together and influence the outcome by looking at the system as a whole (Sherwood, 2002; Jonker & Karapetrovic, 2004; Zulauf, 2007).

The concept of the four Ps is used as a starting point using systems thinking. The four Ps is a general business model where the Ps originally stood for people, product, promotion and price (Alexandrou, 2002). An organisation's business model was developed around the four Ps and was used extensively during the 1980s and 1990s. This model has been changed and modified to accommodate personal and organisational requirements (Dahlgaard-Park & Dahlgaard, 2007; Zineldin & Philipson, 2007). The 4P model was used to construct an ERP model since, based on an extensive literature study, it can be said that there is no all-encompassing ERP business model available. This was accomplished by using the elements of the 4P model and applying them to an ERP system.

2.4.1 CONCEPTUAL COMPONENTS OF ERP

Based on the definitions provided in section 2.3 as well as information gathered during the literature survey, the four Ps can be substituted with ERP-specific components. The first element of the ERP definition, i.e. multiple applications, can be mapped to the product element of the 4P model. The performance element of the 4P model matches the integration element of the ERP definition. The process element of the 4P model can be mapped to the successful management of the organisation as a whole.

The people element of the 4P model is not covered by the ERP definitions. This element is added to ensure that the entire ERP system is addressed as per systems thinking.

Table 2-1 illustrates the mapping of the 4P model on an ERP system:

THE 4 Ps	ERP CONCEPTUAL MODEL
People	Customer mindset
Product	Software
Process	Change management
Performance	Process flow

Table 2-1: Applying the 4P business model to an ERP system

The people component of the 4P business model is substituted with customer mindset. An ERP system affects the entire organisation, as previously indicated, and is operated by various customers within the organisation. The reason why customers are used instead of users is that the different users are in fact customers of the other divisions within the organisation. As indicated in the definitions, ERP systems consist of various applications and software modules. Thus, product can be replaced with software within the 4P business model.

With the implementation of an ERP system comes organisational change. It is a process that the organisation must undergo to ensure the successful implementation of the ERP system. This change management process replaces the process component of the 4P business model. The last component, performance, is substituted with process flow. The seamless integrations mentioned in the definitions dictate that the ERP system must have process flows to ensure the seamless integration between the software modules.

Based on the 4P business model, a model was devised as shown in figure 2-1 (Marnewick & Labuschagne, 2005a). The figure shows a schematic breakdown of the conceptual components of an ERP system.

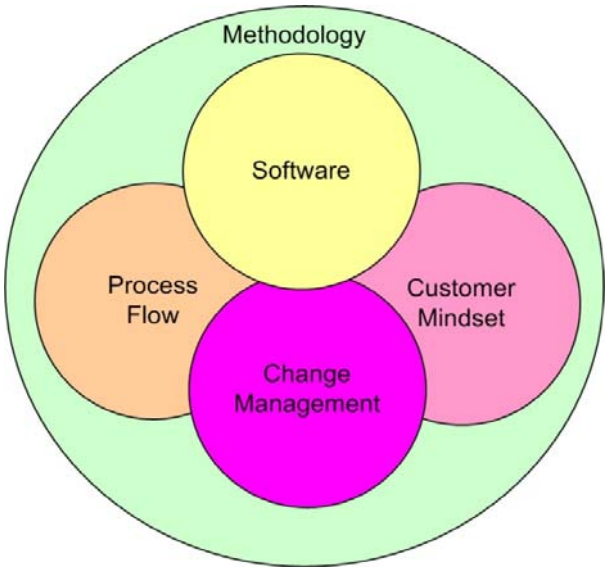

Figure 2-1: Conceptual components of ERP

Methodology encircles all four components to illustrate that each component is addressed and implemented using a structured methodology.

The concept of systems thinking is used to break the conceptual components down into smaller and more manageable components (Sherwood, 2002). The following section discusses the software component, which is one of the common elements as per the definitions.

2.4.2 THE SOFTWARE COMPONENT

Figure 2-2 shows the breakdown of the software component. This section focuses on these areas of expertise within the software component. Based on the literature survey, the components that constitute the software component are the common applications and/or modules used by an organisation. As new common modules are recognised, they can be added to the software component to expand the model.

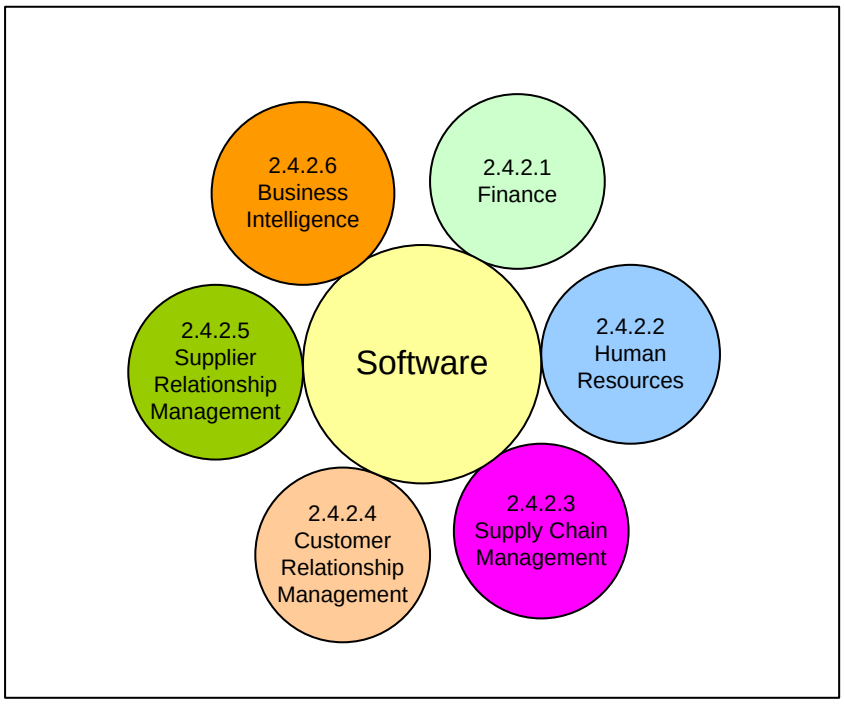

Figure 2-2: Software modules within software component

The software component of the ERP model is the component that is the most visible to the users and is therefore often seen as the ERP system. The following sections provide in-depth detail of the software component. This detail is necessary to explain the complexity of the ERP software component and its enterprise-wide nature.

2.4.2.1 Finance

The finance module focuses on the accounting aspect within an organisation and takes issues like International Financial Reporting Standards (IFRS) into consideration (Monk & Wagner, 2005). The numbering that is used for this section consists of an '**F**' to illustrate that it is the finance module that is under discussion.

- ***F1 – General ledger***

  The ERP general ledger is where all of the organisation's fiscal records are stored and the flow of money within an organisation is tracked (Object Management Group, 2001). In addition, the general ledger controls financial activity and provides extensive reporting and analysis capabilities.

  A chart of accounts and fiscal periods can be easily set up within an ERP system and the accounts are continuously kept up to date. ERP systems assist in the closing of periods, management of the cash flow and production of both corporate and departmental financial statements. Intuitive multi-company capabilities, summary views, transaction-level drill down and an unlimited number of user-defined groups and subgroups help the user keep track of the organisation's financial status.

General ledger transactions are generated automatically whenever activities such as making inventory transactions, paying vendors and receiving work orders are executed. Manual and recurring journal entries can also be posted to the general ledger.

- ***F2 – Accounts receivable***

  Accounts receivable are unpaid customer invoices and any other money owed to the organisation by its customers. The sum of all the customer accounts receivable is listed as a current asset on the organisation's balance sheet (Matolcsy, Zoltan, Boot & Wieder, 2005).

  An organisation normally keeps an accounts receivable ledger account for each customer. The accounts receivable ledger, which can also double as a customer statement, is a record of each customer's charges and payments.

  When a customer purchases something, an organisation will first record the sale in the sales and cash receipts journal. This journal will have accounts receivable debit and credit columns. Charge sales and payments on account are entered in these two columns, respectively.

  Then the credit sales recorded in the sales and cash receipts journal are posted to the appropriate customers' accounts in the accounts receivable ledger. This enables an organisation to know not only the total amount owed to it by all credit customers, but also the total amount owed by each customer.

- ***F3 – Accounts payable***

  Accounts payable are the unpaid bills of the business, in other words the money an organisation owes to its suppliers and other creditors. The sum of the amounts an organisation owes to its suppliers is listed as a current liability on the balance sheet (Rivera & Mosier, 1997).

  Expenses are recorded in the cash disbursements journal at the time the goods or services are purchased, even if an organisation buys on credit. If an organisation deals with a given supplier many times during the month, it does not have to record every purchase. The organisation could accumulate all bills for the month from that supplier and then record one transaction in the purchases journal at the end of the month.

  An organisation should keep an accounts payable ledger account for each supplier. Expenses from the cash disbursements journal are, at the end of each day, posted to the appropriate accounts payable ledger. The accounts payable ledger is a record of what a company owes each vendor.

- ***F4 – Fixed assets***

  Fixed assets consist of real property, which includes land, buildings and improvements thereon, and organisational property, which includes items such as equipment, library

books, museums and art collections and livestock (Ozer, 1997). Real property held as investments of endowment and similar funds is not included in the fixed asset category.

Fixed assets represent a substantial financial investment for an organisation. The costs of acquiring, maintaining, insuring and replacing these assets, along with the depreciation expense, have a substantial impact on both the financial statements and tax liabilities.

- ***F5 – Inventory control***

  The basic function of stock (inventory) is to insulate the production process from changes in the environment (Marklund, 2006). The question that must be answered is how much stock an organisation should keep. It is this question that inventory control attempts to answer.

  There are two answers to this question: the first is to have a lot of stock available and the other is to have none or as little stock available as possible. A lot of stock means that an organisation will never run out of stock and the stock is easily managed, but the associated cost of the stock is expensive. None or very little stock is a difficult way of managing the stock but it is cheap in associated stock costs.

2.4.2.2 Human Resources

Although human resources is by nature a division of its own within the organisation without much integration with other divisions, it forms an integral part of the whole ERP suite of products. The numbering that is used for this section consists of '**HR**' to illustrate that it is the human resources module that is under discussion.

It can be divided into the following three sections:

- ***HR 1 – Human resources administration***

  Human resources administration automates personnel management processes, including recruitment, business travel and vacation allotments.

  It also focuses on the automation of HR tasks from the employer's point of view. Mundane tasks such as the allocation of leave days to an employee can be predetermined and allocated to an employee according to a category (Liu, Combs, Ketchen & Ireland, 2007).

- ***HR2 – Payroll***

  The payroll section handles all the accounting issues and preparation of payments related to employee salaries, wages and bonuses (Spirig, 1989; Mou & Kleiner, 2006). Defining the relevant earnings and deductions is at the heart of any payroll system. Earnings and deductions are classified as follows:

  Earnings

  Earnings within the payroll consist of the following (Turban, Leidner, McLean & Wetherbe, 2008:286):

  - The frequency at which the earnings should be paid.

- How to accumulate the earnings (calendar year to date, tax year to date).
- How the calculation is controlled—by the type of run (regular, supplemental, thirteenth month, and so on), type of payment (commission payment, regular wages, bonus wage, and so on), or human resource action and reason (termination, leave of absence, and so on).

Deductions

Defining an earning or a deduction is almost identical, except that defining a deduction requires a few additional setup items to specify (Turban et al., 2008:288):

- How arrears are processed (for example, when there is not enough net pay to take an entire deduction, should the portion of the deduction not taken be deducted at another time?)

- ***HR3 – Self-service HR***

  This functionality lets workers change their personal information and benefit allocations online without having to send physical forms to the human resources department. The focus is to empower employees to manage their own employment terms and conditions (Greengard, 2006). Employees can, for example, change their own package structure to benefit from tax laws. The issue with self-service HR is security. The ERP system must be set up in such a manner that employees do not have unauthorised access to information. This issue is addressed in chapter 4.

2.4.2.3 Supply Chain Management

A supply chain is a network of facilities and distribution options that perform the functions of procuring materials, transforming these materials into products and transporting these products to customers. Supply chains are found in both service and manufacturing organisations, although the complexity of the supply chain varies greatly from industry to industry and organisation to organisation (Ganeshen & Harrison, n.d.).

Realistic supply chains have various products with components, facilities and capacities that are shared across the chain. Traditionally the marketing, distribution, planning, manufacturing and the purchasing divisions have operated independently along the supply chain. These divisions have their own objectives and are often conflicting. There is a need for a mechanism through which these different divisions can be integrated together to provide the organisation with an optimal solution and not with solutions that suit the various divisions. Supply chain management is the strategy through which such optimal integration can be achieved.

The supply chain includes all activities and processes to supply a product or service to the final customer. Often, it includes more than one company in a series of supplier–customer relationships. The numbering that is used for this section consists of '**SCM**' to illustrate that it is the supply chain management module that is under discussion.

Supply chains usually include four functional components (Clarkston Group, 2000):

- ***SCM1 – Demand planning***
  This is a planning process that predicts the demand for products and services based on forecasts. Accurately forecasting the customer demands improves the customer service, while costs are decreased by reducing demand uncertainty.
- ***SCM2 – Manufacturing planning and scheduling***
  This is a planning process that optimally schedules the manufacturing orders by taking the production capacity into consideration. This is achieved by combining MRP and capacity requirements planning (CRP) to create optimal production plans.
- ***SCM3 – Supply planning***
  This is a planning process that meets customer demand based on the available inventory and transportation resources. This includes the planning of the distribution requirements which determines the need to replenish inventory at branch warehouses.
- ***SCM4 – Transportation planning***
  This is a planning process to optimally schedule, load and deliver shipments to customers while considering constraints, such as delivery date and mode of transportation.

SCM is the act of optimising all activities throughout the supply chain, so that products and services are supplied in the right quantity, to the right location, at the right time and at the optimal cost.

The following section describes the fourth software module, i.e. customer relationship management.

2.4.2.4 Customer Relationship Management

Customer relationship management (CRM) is an information technology industry term for methodologies, strategies, software and other web-based capabilities that help an organisation organise and manage customer relationships (Mitussis, O'Mally & Patterson, 2006). For example, if a marketing department runs a campaign, all the relevant information about the customers and the marketing campaign should be retained for (i) the sales team to follow up on and (ii) the customer service representatives to answer any queries. The idea is to have the same information available to everyone in the organisation so that every product or service need of the customer is met. CRM implies that everyone in the organisation is focused on providing the best service to the customer (Khera, n.d.). The numbering that is used for this section consists of '**CRM**' to illustrate that it is the customer relationship management module that is under discussion.

Effective CRM consists of four data management issues (Bull, 2003; Novicevic, Sloan, Duke, Holmes & Breland, 2006):

- ***CRM1 – Gathering of information***
  The first and most definitely the most difficult part is to collect all the relevant information about a specific customer. The information is originally stored in various places such as

an account manager's pocket PC, a shared database on the server or the chairperson's diary. It is important for the optimal functioning of the CRM system that all of this information be gathered and stored centrally.

- ***CRM2 – Cleaning and collating***
  Once the information has been gathered from all the various sources, it is stored at a central place where everyone within the organisation can access it. The information must be cleaned and all unnecessary information must be discarded. All the relevant information about a customer must then be grouped together to provide a holistic view of the customer.

- ***CRM3 – Providing access***
  Access to the information of a CRM system is crucial to the organisation. It can be organised according to various security levels and is described in chapter 4. Salespeople may, for example, only be able to see sales figures and birthday information of a specific customer. An account manager, on the other hand, may also see outstanding calls and issues. Access to the information must be available through different means such the organisation's intranet, the Internet and client-server application.

- ***CRM4 – Maintenance***
  It is of the utmost importance for the customer information to stay relevant and up to date. People within the organisation will revert to paper and other means of storing customer information if the information provided by the CRM component is not up to date.

The next section deals with the management of supplier relationships.

2.4.2.5 Supplier Relationship Management

With an increasing reliance on contractors and suppliers for material, logistics and manufacturing capacity, the ability to manage these relationships has become critical. To maximise profitability, companies must be able to quickly select the right suppliers, establish strategic relationships and effectively collaborate with them as they help meet business goals. Supplier relationship management (SRM) describes the practices needed to establish the business rules for extended interaction with the suppliers of products and services as they relate to enterprise profitability (Koclanes, 2002). It enables organisations and their suppliers to collaborate on the strategic sourcing and procurement of products while it also manages the overall process from an organisational perspective. SRM encompasses the development of products, the sourcing, the supply planning and the procurement across the entire value chain. This provides the organisation and its suppliers with the ability to create, execute and sustain global sourcing strategies (Poirier & Quinn, 2004; Turban et al., 2008:270). The numbering used for this section consists of '**SRM'** to illustrate that it is the supplier relationship management module under discussion.

- ***SRM1 – Design and engineering***
  The first step is to determine the requirement of the product or service that must be provided by the preferred supplier.
- ***SRM2 – Tender process***
  The purpose of this component is to put a tender selection process in place (Chow, Choy & Lee, 2007) to determine which suppliers to request quotations from and who would ultimately win the tender. This is based on price and past performances of the tendering organisations.
- ***SRM3 – Selection process***
  Ndubisi, Jantan, Hing and Ayub (2005) state that if organisations are using the right strategy for supplier selection and management, it ensures that the right suppliers will adequately support the manufacturer to be flexible enough to meet customers' needs. This is achieved through the use of supplier selection criteria to strengthen the selection process (Ndubisi et al., 2005). Various methods can be used to select suppliers, for instance models (Perçin, 2006) and analysis techniques (Lasch & Janker, 2005; Yang & Chen, 2006).
- ***SRM4 – Procurement***
  Once the selection process has been concluded, the goods or services must be procured from the preferred supplier in a predictable and repeatable manner (Choy, Lee & Lo, 2004).
- ***SRM5 – Monitoring***
  This process continuously monitors the performance of the supplier using metrics such as cost, time, quality, flexibility and innovativeness (Shepherd & Günter, 2006). The contract with the supplier can be terminated based on performance.

The SRM process begins with the analysis of opportunities for sourcing cost and operational improvements (Get smart about sourcing, 2005). Information and practices across all divisions and functions are collected and aggregated for further analysis. This is almost the same process as the gathering of information within the CRM component. Organisations will want to look at historical spending and forecasted requirements across the organisation before evaluating and selecting suppliers. The next step is to implement decision support tools that can be used to help determine the best sourcing strategies for the entire organisation and not just for an individual division. Additional benefits are that communication will be more effective and latency can be reduced. Finally, through the creation of a trading network in which planning and execution data is synchronised as supply and demand signals change, organisations can foster stronger relationships across the entire supply base for a distinct competitive advantage. This is one of the values that the SRM module of ERP provides the organisation.

Embarking on an SRM strategy can help address both financial goals and ensure that decisions are aligned with the broad business strategies of the organisation (Sun Microsystems, 2002).

2.4.2.6 Business Intelligence

The business intelligence (BI) module is a set of decision support tools that enable the user real-time, interactive access, analysis and manipulation of mission-critical organisational information (Graham, 2006). These applications provide users with valuable insight into key operating and strategic information to identify organisational problems and opportunities. Users are able to access and leverage vast amounts of information to analyse relationships and understand trends that support the business decisions. These tools prevent the potential loss of knowledge within the organisation that results from massive information accumulation that is not readily accessible or in a usable form (Cherry Tree & Co., 2000).

All BI systems have a number of factors in common.

- They provide access to good data. It is difficult to do anything without clean and well-organised data. The aim is to ensure that only relevant information is accommodated and ultimately utilised in decision-making.
- They enhance the user's ability to understand the result. The problem ten years ago was to get to the data but the problem today is more about how to deal with all the data.
- BI increases a user's business acumen. Knowing what the data says is important, but the users must ultimately know what to do about it. This knowledge is difficult to build into a piece of software but state-of-the-art analytic applications use industry benchmarks and leverage on expert best practices to benefit casual and novice users.
- BI must always be connected to the organisation's other processes. Even high quality information adds no value if it is separated from the actual day-to-day business. The decision-makers must be able to utilise the refined information and increase their own business environment understanding.

Today's BI systems address all four of these issues. Technologies are available to help users to understand, explore, share and collaborate with the information at hand. Advances in the BI field enable users to understand what to do with the information, what action to take and to monitor the outcomes. Several technologies can assist employees in dealing with the information overload by focusing them on key performance drivers, modelling the outcomes of potential options, and monitoring and tracking the results of decisions. The numbering that is used for this section consists of '**BI**' to illustrate that it is the business intelligence module that is under discussion.

These technologies can be defined and described as follows:

- ***BI1 – Data mining***

  Generally, data mining (sometimes called data or knowledge discovery) is the process of analysing data from different perspectives and summarising it into information that can be used by the organisation to increase revenue, cut costs or both (Froelich, Ananyan & Olson, 2005). Data mining software is one of a number of analytical tools for analysing data. It allows users to analyse data from many different dimensions or angles, to categorise the information and to summarise the identified relationships.

- ***BI2 – Data warehousing***

  The systems that contain operational data contain information that is useful to business analysts. For example, analysts can use information about which products were sold in which regions at which time of year to look for anomalies or to project future sales. Data warehousing uses this information to create stores of informational data (Watson, 2006). Informational data is extracted from the operational data and then transformed for end-user decision-making. For example, a data warehousing tool might copy all the sales data from the operational database, perform calculations to summarise the data and write the summarised data to a separate database from the operational data. End-users can query the separate database (the warehouse) without impacting the operational databases.

  A data warehouse stores tactical information that answers "who" and "what" questions about past events. A typical query submitted to a data warehouse is: "What was the total revenue for the eastern region in the third quarter?"

- ***BI3 – On-line analytical processing (OLAP)***

  It is important to distinguish the capabilities of a data warehouse from those of an OLAP system. In contrast to a data warehouse, which is usually based on relational technology, OLAP uses a multidimensional view of aggregate data to provide quick access to strategic information for further analysis (Brohman & Watson, 2006).

  OLAP enables analysts and managers to gain insight into data through fast, consistent, interactive access to a wide variety of possible views of information. It transforms raw data so that it reflects the real dimensionality of the enterprise as understood by the user.

  While OLAP systems have the ability to answer "who" and "what" questions, it is their ability to answer "what if" and "why" questions that sets them apart from data warehouses. OLAP enables decision-making about future actions. A typical OLAP calculation is more complex than simply summing data, for example: "What would be the effect on soft drink costs to distributors if syrup prices went up by R10 per litre and transportation costs went down by 20c per kilometre?"

From the explanations above, it is clear that OLAP and data warehouses are complementary. A data warehouse stores and manages data while OLAP transforms data warehouse data into strategic information.

The different modules that constitute the software component have been discussed in detail in the above section. The next section discusses the second component of the conceptual model, namely the process flow of information within an ERP system. It is important for the success of the ERP system that the information flow seamlessly between the different software modules as described above.

2.4.3 PROCESS FLOW

Process flow deals with the way that the information flows between the different modules within an ERP system. The process flow within each module of the software component is illustrated in sections 2.4.3.1 to 2.4.3.6. A master process flow diagram illustrates how information flows amongst the different modules within the software component.

The first process flow focuses on the finance software module described in section 2.4.2.1.

2.4.3.1 Finance Process Flow

Figure 2-3 illustrates the flow of information in the finance module.

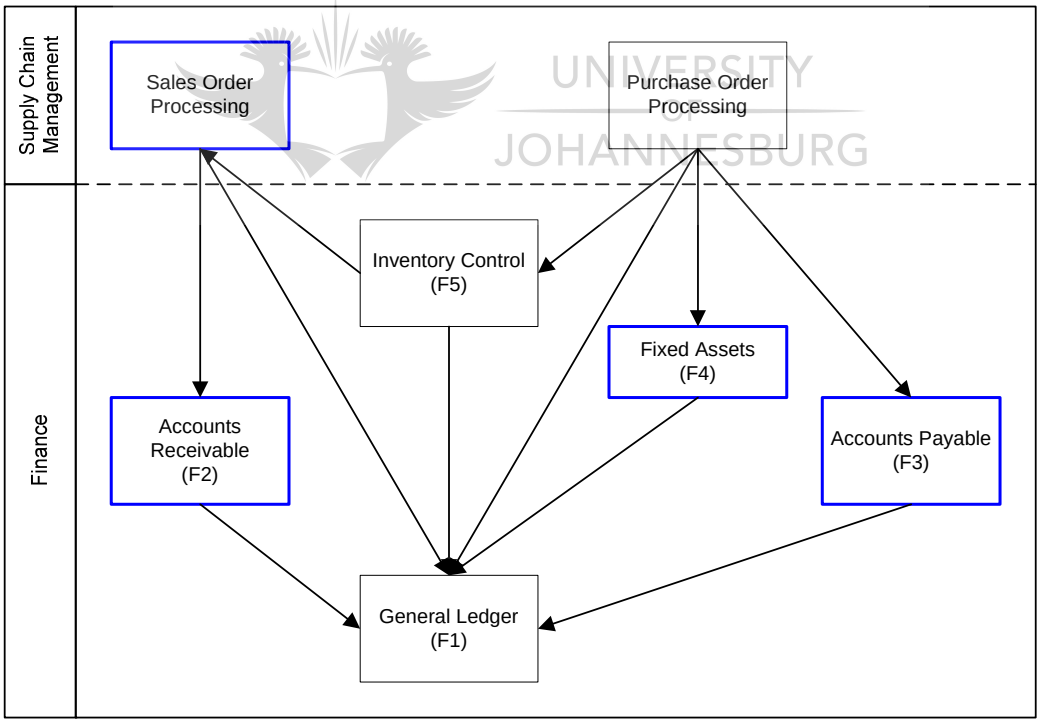

Figure 2-3: Finance process flow

An organisation will place an order using the purchase order process. This order process can be done telephonically or electronically. ERP systems allow a user to place an order through the Internet using supply chain management technology.

The stock or goods purchased through the purchase order process will be delivered to the organisation and will be allocated as stock in the inventory (F5). If a purchase is a capital expense, such as vehicles or buildings, the item will be transferred to fixed assets (F4). The fixed assets will be depreciated over a certain period, for example over a period of three years.

The stock items in the inventory can be sold to a customer. This process is the sales order process. The inventory levels will be adjusted as stock flows in and out.

A sales invoice will be generated and will accompany the goods to the customer. This invoice will be the proof that the customer received the delivered goods and owes the company money.

The above process forms an integral part of the SCM of an ERP vendor.

The organisation needs to pay (F3) its creditors for the goods it received and must also make sure that it collects its debt from its debtors (F2). The payment of bills can be done electronically through electronic funds transfer or through the cash book.

All the entries of the modules described above will end in the general ledger (F1). The general ledger is where all a company's fiscal records are stored and the flow of money within a company is tracked.

It is clear that a fair amount of information travels between the different modules. It is easy for a user of the ERP system to make errors. The advantage of an ERP system is that information is entered once. This minimises the risk of human error.

The other software components such as CRM, SCM and BI are an integral part of this whole process.

2.4.3.2 Human Resources Process Flow

The HR process flow is shown in figure 2-4.

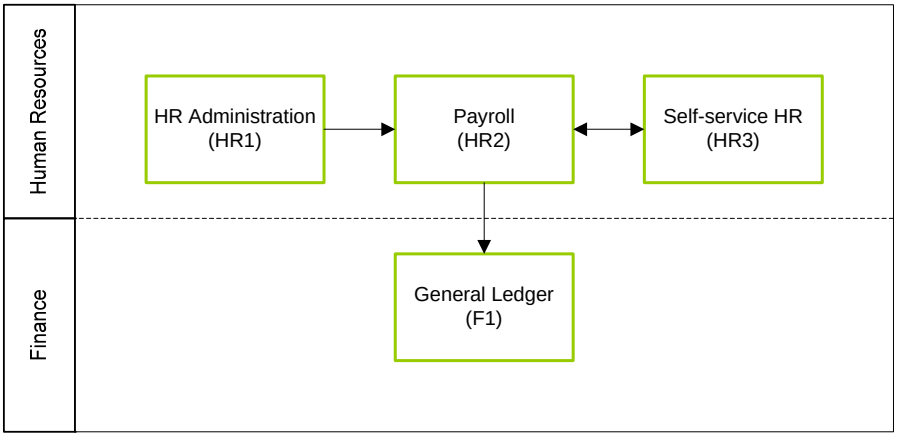

Figure 2-4: HR process flow

As discussed in section 2.4.2.2, HR administration (HR1) involves the organisation itself. Information gathered from HR administration is populated into the payroll system (HR2). This information includes information of new or resigned employees. Performance appraisals are also stored in HR administration.

Information gathered from both the HR administration and the self-service HR modules influences the payroll. Information such as a new employee's salary package will be pulled from the HR administration module. Changes made by the employee in the self-service HR (HR3) module also reflect in the payroll module. Security must be in place to ensure that unauthorised access is not gained to the HR module. It would have a severe impact on the organisation if an employee had read-write access to his/her salary package in stead of read-only access.

The self-service HR module allows the employee to make changes to his/her salary structure or the employee can apply for leave using an online system. A change such as an increase in an employee's travel allowance will influence the payroll module. Interaction between the payroll and the self-service HR module is a continuous process.

The payroll module sends information to the general ledger (F1).

2.4.3.3 Supply Chain Management Process Flow

Supply chain management was discussed in section 2.4.2.3. Figure 2-5 shows the flow of information in the supply chain.

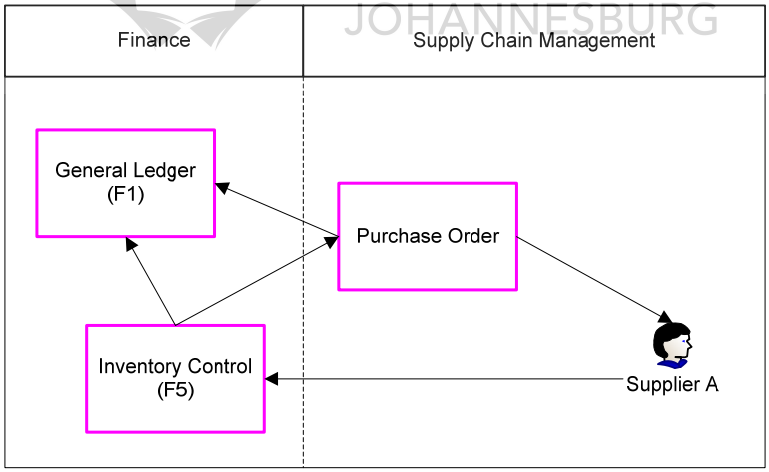

Figure 2-5: SCM process flow

The stock levels in the inventory control (F5) trigger the generating of a purchase order. The stock levels are determined through demand planning. An order for the required stock is placed with the supplier. This order placement can be a physical order or an e-commerce transaction between the organisation and the supplier.

The supplier delivers the required stock to the organisation. The supplier makes use of supply planning and transportation planning to optimise delivery to the organisation.

The entries from inventory control and purchase order will end in the general ledger (F1).

The stock from the supplier will be delivered at a predetermined price as negotiated in the SRM module. The delivery time and duration will also be governed by the SRM.

2.4.3.4 Customer Relationship Management Process Flow

CRM was discussed in section 2.4.2.4. Figure 2-6 shows the flow of information within the CRM software module.

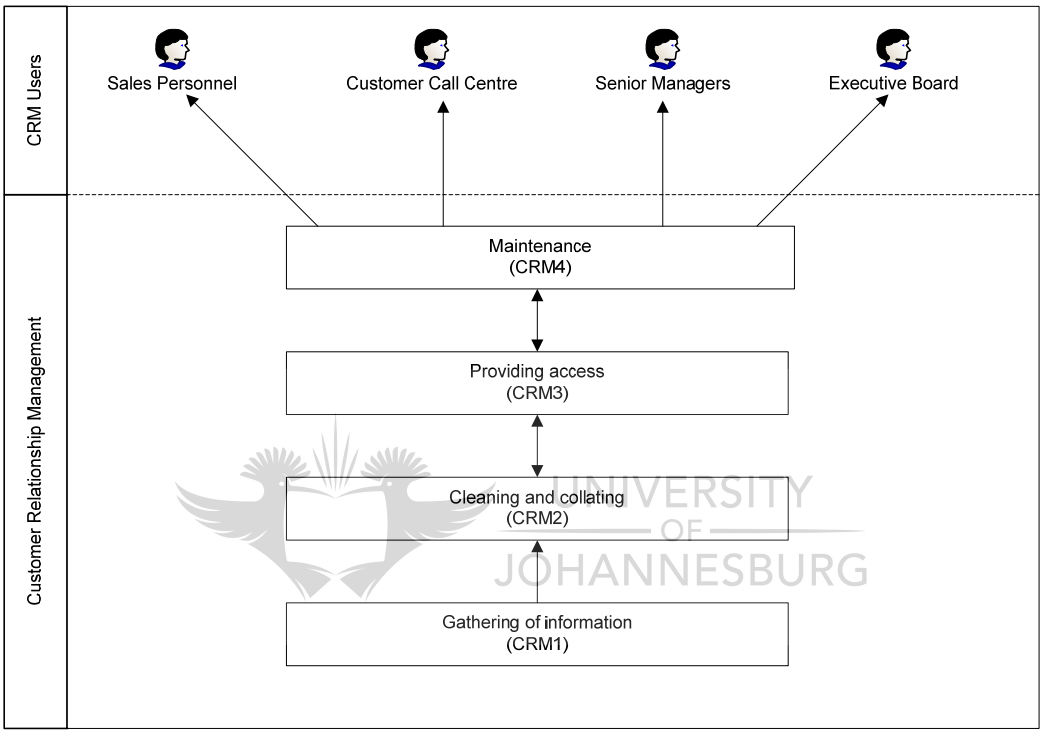

Figure 2-6: CRM process flow

The first process is to gather all the information for a specific customer (CRM1). This process is tedious and cumbersome and will involve sources such as spreadsheets and users' personal information management utilities.

Once all the relevant information has been gathered, it needs to be stored (CRM2). A central database is instituted where all the information will be stored, cleaned and collated by means of the CRM tool that a specific organisation chooses.

The CRM tool will organise the information in a structured way for the information to be easily accessible (CRM3). The information related to a specific customer can be viewed differently by each user. For example, the customer call centre may want to view the problem history of a specific customer, whereas the salespeople may want to see all products sold to a customer.

2.4.3.5 Supplier Relationship Management Process Flow

SRM was discussed in section 2.4.2.5. Figure 2-7 shows the flow of information within the SRM software module.

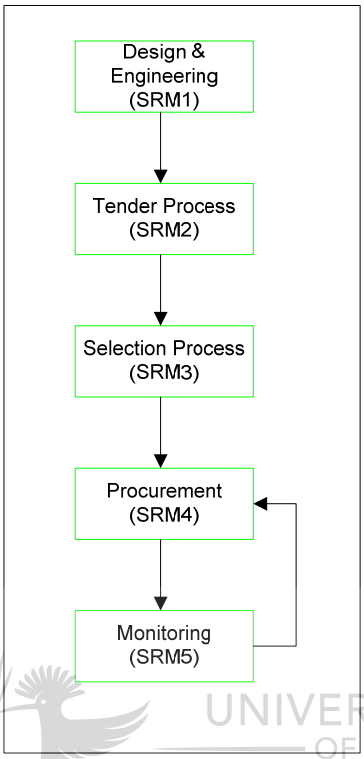

Figure 2-7: SRM process flow

The SRM process begins with a design and engineering phase. This phase establishes the minimum requirements and specifications of a product. It also defines the criteria the supplier must fulfil. The criteria from the design phase form the basis for the tender process. Different suppliers will tender and submit documentation based on the criteria. A selection will take place and a preferred supplier will be chosen.

During the selection process a contract will be drafted between the parties. The procurement process will be determined and forms part of the bigger supply chain management process. Ongoing management of the supplier and its services will continue and adjustments will be made to accommodate changes and shortfalls.

The inbound logistics procedure is a direct result of the procurement procedure and it will establish ways and methods to deal with the procurement and logistics of the stock received.

2.4.3.6 Business Intelligence Process Flow

Business intelligence was discussed in section 2.4.2.6. Figure 2-8 shows the flow of information within the business intelligence software module.

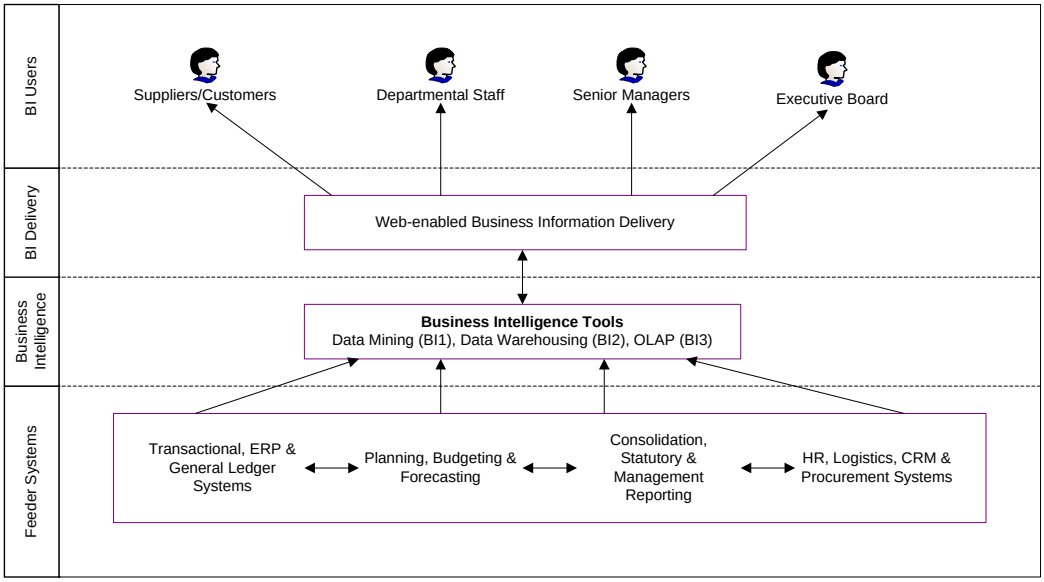

Figure 2-8: BI process flow

A vast amount of data is stored within the organisation. The data can be found either within the finance component of the ERP system or within planning and forecasting which forms part of the SCM component of the ERP system.

The main purpose of business intelligence is to accumulate the data and process it into useful information. This accumulation of the data will take place through different BI tools such as data mining and data warehousing. There are a host of tools and vendors in the marketplace that will supply an organisation with these tools.

The information will be stored in a presentable manner and will be accessed by the relevant people.

2.4.3.7 ERP Business Flow

The previous sections show how the process flows within each software module. The overall process flow and interaction can be seen in figure 2-9.

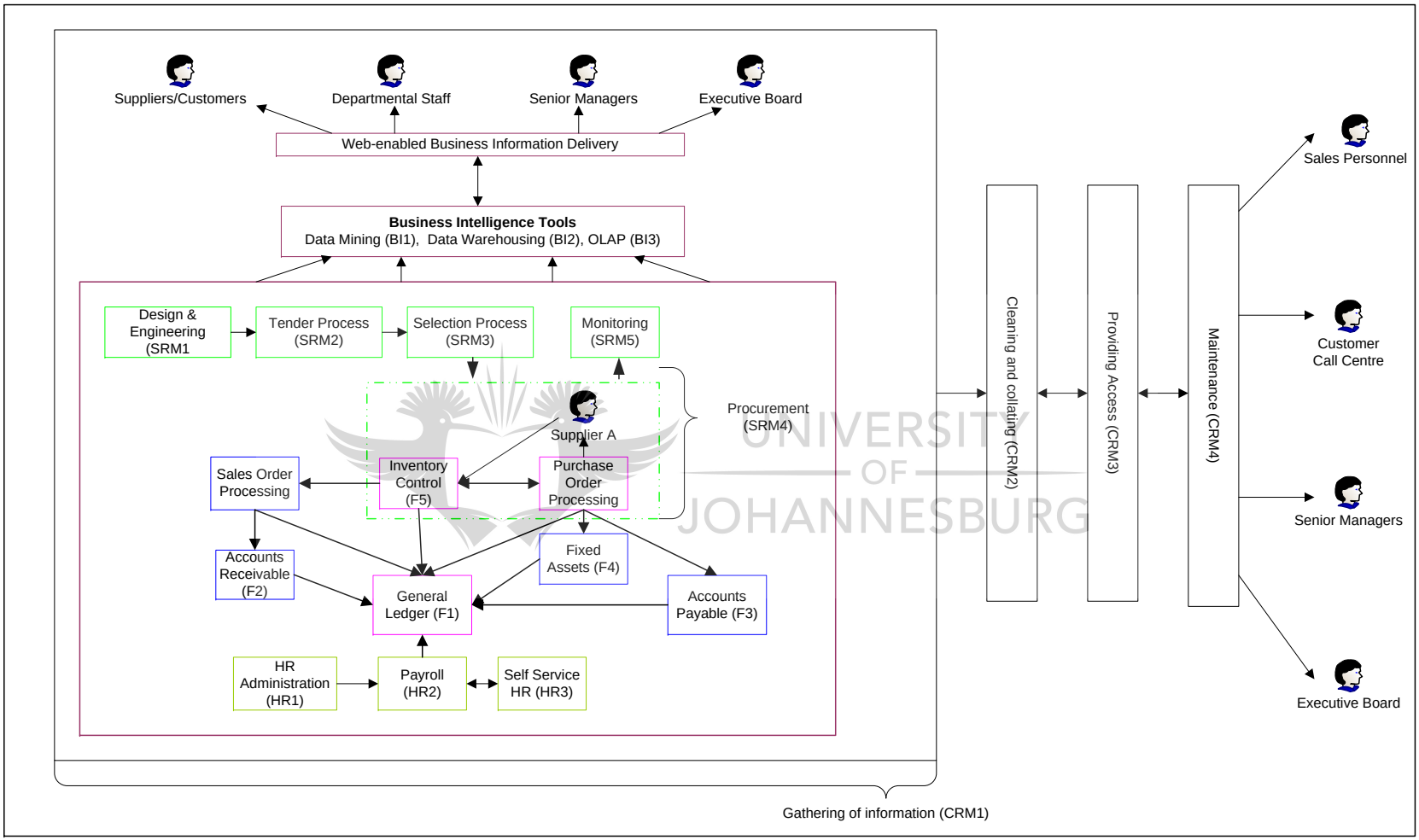

Figure 2-9: ERP process flow

Figure 2-9 shows that all the software components of an ERP system are integrated and that the information flows from one software component to another.

The finance component forms the backbone of the ERP system with the other components slotting in like a puzzle. The general ledger, inventory control, purchase order processing and supplier A form the supply chain management process within the ERP system. The three components of the SCM, i.e. inventory control, purchase order processing and supplier A, form the procurement module within the supplier relationship management.

The human resources process functions on its own but integrates into the larger ERP system, pushing information into the general ledger.

The human resources, finance, SCM and SRM are inputs for the business intelligence process.

All these processes are inputs for the customer relationship management process.

The next section is about the third component, namely the customer mindset. The success of the software component is directly related to the customer mindset.

2.4.4 CUSTOMER MINDSET

Folger (1999) concludes that employee resistance can be a significant deterrent to effective organisational change. The implementation of ERP systems is all about changing the ways that an organisation functions. This resistance to change results in unsuccessful ERP projects (Aladwani, 2001).

A proposed ERP system may hold great promise, but the organisation often fails to consider how the users or customers are likely to view this so-called improvement. ERP systems take away the old tried-and-true ways of the workings of the legacy system. When customers are asked to give up what they know and what they can rely on, they will resist using the new ERP system. It is very important that customers buy into the new ERP system (Maurer, 2002).

Figure 2-10 highlights the different modules that influence the customer's mindset. The customer of the ERP system within the organisation interacts on three levels with the ERP system:

- Firstly, the customer interacts with the ERP system.
- Secondly, the customer interacts with other customers that also use the ERP system. The way that they interact and perceive the ERP system will have an influence on the customer himself/herself.
- The third influence is the organisational influence. Customers are part of the organisation and not an island unto themselves. Organisational decisions and the culture of the organisation will have an impact on the customers. This includes policies and business rules.

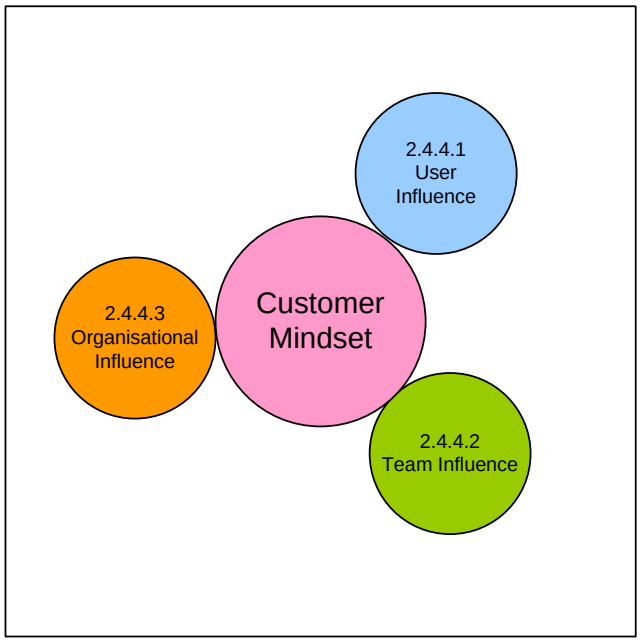

Figure 2-10: Customer mindset component

Each subcomponent of the customer mindset component is discussed in the following sections.

2.4.4.1 User Influence

Section 1.3 stated that one of the sections of an ERP system focuses on the operational level; the focus of the user influence is on the operational side of an ERP system. The success of the ERP system is dependent on the way that the customer perceives and uses the system. Based on figure 2-10, it is clear that the mindset encompasses the whole organisation and not just a single unit or division.

To ensure that the customers fully understand the necessity of using the system correctly all the time, a needs analysis should be done to evaluate the customers' technical skills, the existing job processes and the impact the system will have on the way they work. The customers should adapt to their new environment that is instilled by the ERP system (Del Val & Fuentes, 2003). According to Keebler (2002), ERP is more than a new software system. It is a culture change. If training does not cover why each task is important and how every transaction is part of a larger process, then the users are less likely to use the system correctly or consistently.

Training should include information about the user's new roles and responsibilities, the business objectives of the initiative and the projected benefit to the organisation (Boykin & Martz, 2004). Training plays a major role in the operation of the ERP system after it is implemented. One of the advantages of an ERP system is increased productivity, but the user will initially not be able to perform at the same level of productivity as on the old legacy

system. This can only be achieved once the user is trained sufficiently in the use of the ERP system.

The information provided above highlights two aspects that influence the way that the user perceives the new ERP system. The user must first understand the effect of the change and then secondly undergo training to use the ERP system effectively. These two aspects go hand in hand and are not mutually exclusive.

2.4.4.2 Team Influence

The team influence component addresses the project side of an ERP system and refers to hypothesis 4 as mentioned in section 1.3 of chapter 1.

A typical ERP implementation involves employees from a number of departments within an organisation as well as knowledgeable consultants that will implement the ERP system. It is again an indication that ERP systems cut across the organisation horizontally as well as vertically. A primary reason for less than successful ERP implementations is the inability of this disparate group to come together in a focused team-oriented manner (Swartz & Orgill, 2000). All too often the team membership polarises into “us” versus “them” factions and the implementation degenerates into a mass finger pointing. This is based on team theory (Peled, 2000).

Team theory asks not only what the optimal decision rules are for a given information structure, but also how the information or communication structure of the team affects its performance (Douglas & Gardner, 2004). Different employees within the ERP system implementation have different information on how processes work and how they should fit together. This will have an effect on the performance of the team itself if all the necessary information is not shared amongst the team members.

External ERP consultants also play a major role (Yeh, Miozzo & Vurdubakis, 2006). If there is a significant consultant presence on the project, key partnerships at every level will be required to maintain the cohesiveness of the team. These partnerships must be made at both the horizontal as well as the vertical levels of the organisation and will also ensure a better cohesion amongst the teams. When possible, these consultants should be incorporated directly into the team and function as employees of the organisation. This requires a major trust factor on the part of the organisation but is very important for the successful implementation of the ERP system.

2.4.4.3 Organisational Influence

According to the Project Management Institute (PMI) (2004a), projects and initiatives are part of an organisation. This implies that the implementation of ERP systems is also part of an organisation. The PMI continues by stating that projects and initiatives will be influenced by the organisation that initiated them. This implies that the organisational influence addresses the operational aspect of an ERP system together with the user influence.

The users that are part of the ERP implementation will be influenced by the structure, culture and management style of the organisation (Grubbs & Denhardt, 1999). ERP systems affect the organisations across all divisions and levels, as stated before. The users that implement the ERP system will be in an advantageous position if the organisational structure leans toward a matrix and/or projectised structure (Claver-Cortés, Zaragoza-Sáez & Pertusa-Ortega, 2007). This will enable them to communicate and function across the functional boundaries with relative ease as they are accustomed to there being no functional boundaries (Jackson & Harris, 2003). The functional boundaries within the functionally structured organisation might hamper this communication as people are not used to functioning across divisional boundaries. ERP systems break down all functional barriers within an organisation and the user is required to be multiskilled and multimanaged. Owing to this breakdown of functional barriers, it is difficult to implement an ERP system in an organisation with strict hierarchical structures and line reporting.

The culture within an organisation also plays a major role and influences the individual user. According to Schwalbe (2007:55), the culture of an organisation can be defined as a set of values and behaviours that are shared amongst the employees. The culture of the organisation has a bigger impact on solving organisational problems than the physical organisational structure (Balthazard, Cooke & Potter, 2006; Rad, 2006). The culture of the organisation must be focused on delivering projects and initiatives successfully for the organisation to implement an ERP system successfully.

The information provided in the previous paragraphs clearly indicates that the organisation as a whole does have an influence on the outcome of ERP implementation. This again indicates that an ERP system is affected by and in turn affects the organisation.

ERP system implementation brings with it change and this is unavoidable. The organisation will experience change from all levels within the organisation. The following section deals with the issue of change within the organisation.

2.4.5 CHANGE MANAGEMENT

Change management plays a major role in the successful implementation of an ERP system (Huq, Huq & Cutright, 2006). Change management is the only component that does not fit the 4P business model and is therefore extended to the process component of the 4P business model. It can be divided into four modules as illustrated in figure 2-11.

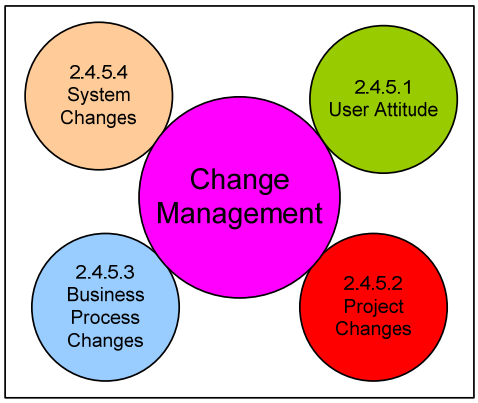

Figure 2-11: Change management component

The above diagram was derived from a literature survey where the four components illustrated were the common denominators (Phelan, 2006; Lamb & Cox, 1999; Flint, Gerrard & Mahoney, 2005).

Change management within an ERP environment addresses both the operational side of an ERP system as well as the project side. The ERP system will institute changes to the day-to-day operations of the users and a legacy system will be replaced by a new system.

2.4.5.1 User Attitude

Resistance to change is one of the major issues that the project will face. It is important to get the users to buy into the ERP project. It is also a reality that not everyone will be delighted with this new project. Change management plays a major role in managing the users' expectations and converting the resisting users to supporters of the system. When ERP implementations fail, it can often be attributed to the fact that the organisation did not dedicate enough time or money to training and managing culture change issues.

There are three main reasons why people resist change (Keener, 1999). They do not understand it, they do not like it or they do not like the project manager. Any one of these can stop an ERP implementation dead in its tracks.

What the organisation needs is the opposite of all three:

- The organisation must create strategies that communicate to the employees in their own language to help them understand why the changes are necessary to the organisation (Ford, 2002). More time should be spent on trying to explain to the employees the cause for the change rather than on the details of the ERP system itself.
- The organisation must determine why employees react against the change. Usually it is because of fear (White, 2000). The organisation must find ways to engage people to help them address the downside of the change. Users can be invited into the planning to ensure that the new system provides the features that they need.
- If the users do not have confidence in the project manager and the project team, the project manager must do everything possible to demonstrate that the team are worthy of

the users' trust. This trust will not be gained overnight and the project manager and team will have to prove themselves time and time again.

It is not easy to manage these issues and working on them can be exhausting. A successful change in the users' attitude will assist in the successful implementation of the ERP system.

2.4.5.2 Project Changes

All ERP projects are subject to scope change at some time during the life cycle. The key to a successful ERP implementation is to manage the change of scope process effectively.

The PMBOK® Guide (PMI, 2004a:121) defines scope change control as (i) influencing the factors which create scope changes to ensure that changes are beneficial, (ii) determining that a scope has occurred and (c) managing the actual changes if and when they occur.

Project scope change control will define the procedures by which the project scope may be changed. Scope change control is the process of identifying and managing change to the deliverables and other work products as they evolve (Legris & Collerette, 2006). These scope changes must go through a system of approval against the original ERP modelling and design. This ensures that the proposed changes are necessary and appropriate, and that the integrity of the ERP system is maintained.

The change control system should establish a framework to monitor, evaluate and approve the changes by the designated people before the change is incorporated into the baseline scope plan.

These changes may impact on the contractual time and budget agreements. It is therefore crucial for every ERP project to have a sign-off of the deliverables. This ensures good project governance as prescribed by the Association for Project Management (2004). Agreement on project deliverables is applicable not only to ERP projects, but also to other IT projects. Any changes to these deliverables can and will have an impact on the project itself. Chapter 5 focuses more on project management itself and scope management is addressed in more detail.

2.4.5.3 Business Process Changes

ERP systems bring with them business process changes. This change in the business process is part of the nature of an ERP system. The key business drivers forcing business process changes are the replacement of legacy systems, to gain greater control, to manage globalisation and to improve the integration of functions across the organisation.

To manage local activities and coordinate worldwide operations, the business process must change. The change must happen for three reasons: stringent business conditions accentuated by channel and brand proliferation, the pressures of managing globally and the intense service demands by customers (Kalakota & Robinson, 1999). ERP systems underwrite all three of these requirements in the following manner:

- Owing to the fact the ERP systems impact the entire organisation (refer to section 2.4.4.3), the business processes must change to ensure that the organisation can compete within the global market. Although organisations might not have international branches or divisions, they are impacted by the global economy and global organisations that have a footprint in their country and region.
- Customers demand service from organisations within their own country as well as internationally based organisations. An organisation must adapt its business processes in such a manner that it can provide excellent service to a customer, even if that customer is situated in another country. Customers will purchase goods from the organisation that provides the best services and not necessarily the closest provider.
- With globalisation has come price pressure as customers insist that manufacturers produce higher-quality goods with shorter delivery times and lower prices. Organisations must have a more accurate and timely information flow to meet these demands.

The organisation must keep in mind that the business processes will be under constant change. They will change as the ERP system is installed and will change as the ERP system evolves and matures. They will also change as the users become familiar with the ERP system.

2.4.5.4 System Changes

The fourth module in the change management component involves the review of current version management and change management processes. IT change management (ITCM) performs this role within an organisation. ITCM cannot be viewed as merely a policy to govern change control within the IT division but it must be strategic and comprehensive. ITCM will incorporate the Information Technology Infrastructure Library (ITIL) (Brown & Nasuti, 2005), which should be the starting point for organisations that want to manage and implement IT change (Brittain, 2006).

When ERP applications or other large package applications are introduced, a number of new change management issues are encountered that are associated with maintaining and reconciling custom and packaged applications (Hooks, 2002). This means that when an ERP system is implemented, operational changes are inevitable and these changes must be governed by ITIL or any other internationally recognised standard.

An effective change management strategy will improve an organisation's change analysis capabilities and provide more fluid and efficient change implementation/migration processes.

The above section explained the important role change plays within an ERP system and it is important for the successful implementation of the ERP system that change be managed properly. A methodology must also be in place to ensure the successful implementation of the ERP system. The following section describes a methodology to implement an ERP system.

2.4.6 ERP METHODOLOGY

This section describes an ERP methodology that can be followed to implement ERP systems and focuses on the project component of an ERP system. Methodology here refers to a systematic approach to implement an ERP system. ERP methodology builds on the theory that an organisation can maximise its returns by maximising the utilisation of its fixed supply of resources.

There are different methodologies available that were designed and perfected to suit different companies and consultancy houses: (i) Ernst & Young have developed a systematic way of approaching systems called The Total Solution and (ii) SAP developed an in-house methodology called ASAP (SAP, n.d.). This road map is a detailed project plan that describes all activities in an implementation. It includes the entire technical area to support technical project management and addresses things like interfaces, data conversions and authorisations (Kelle, 2005).

Based on the above methodologies, it can be deduced that an ERP methodology can be divided into five steps. These five steps have been given different names by different suppliers and consultants.

The five steps to ERP methodology are pre-implementation, analysis, design, construct and implementation and are illustrated in figure 2-12.

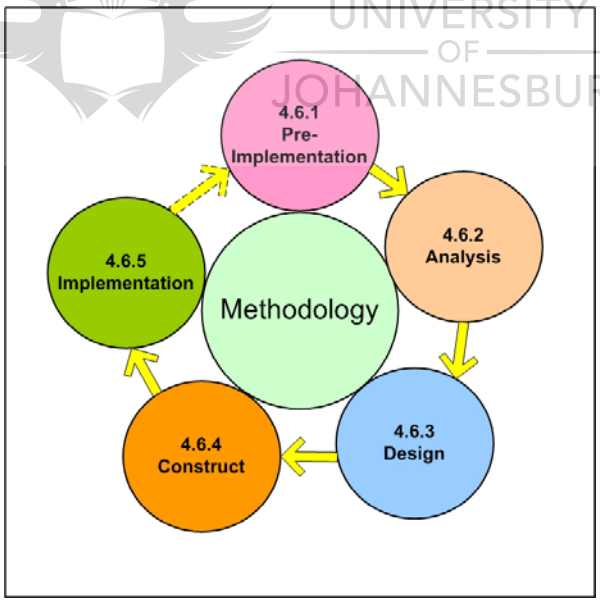

Figure 2-12: ERP methodology

The steps of the ERP methodology are discussed in the following sections.

2.4.6.1 Pre-implementation Phase

Pre-implementation planning helps to identify the operational needs, business drivers, strategic plans and other factors that will define the scope and objective for the ERP solution.

During the pre-implementation planning process, expectations for benefits realisation, magnitude of change, change ownership, process redesign and functionality delivery options are identified.

Deliverables of the pre-implementation planning process will include:

- Project scope and objective
- Business case
- Benefit realisation analysis
- Project budget
- Change management plan and infrastructure
- Implementation plan and infrastructure
- Programme management infrastructure
- Risk management plan
- Board presentation

2.4.6.2 Analysis Phase

The analysis phase evaluates the organisational baselines that form the foundation for process redesign, system build and change management. Business processes are analysed to understand the current environment as well as the integrations. Functional and technical requirements are reviewed to determine the system build needs and cultural and workforce skill evaluations are performed to identify workforce transition requirements. Deliverables of the analysis process include:

- Current process flows
- Operational issues and improvement opportunities
- Process, department and business unit organisational structures
- Existing roles and responsibilities
- Staff levels and skills
- Existing policy and procedures
- Existing applications' functional capabilities
- Existing network infrastructure
- Vendor system functional capabilities
- Existing interfaces
- Data conversion needs

2.4.6.3 Design Phase

The design phase incorporates direction setting information from the pre-implementation phase and baseline information from the analysis phase to create new designs for a desired future state.

Deliverables of the design phase include:

- Desired process model
- Sample screen, report layouts and forms
- Software specification documentation
- Conversion specifications
- Installation schedule
- Hardware needs and gap analysis

2.4.6.4 Construct Phase

The construct phase takes products from the design phase to create tangible operational processes and information system support. As the process model begins to become clearer, the process model and the information system build are evaluated against each other to ensure appropriate alignment of process capabilities and information system support. Deliverables of the construct phase include:

- New roles and responsibilities
- Personnel impact analysis
- Finalised process models
- Testing plans and results
- Data conversion
- Interface development
- Screen, reports and form development
- Database builds

2.4.6.5 Implementation Phase

The implementation phase prepares for the final ERP solution deployment. Final changes are made to business processes, policies and procedures and system builds to prepare for a go-live. Once a go-live occurs, a post-implementation audit is performed to measure the effectiveness of the ERP solution in meeting its goals and objectives. Deliverables of the implementation phase process are:

- Policies and procedures
- Training materials
- Performance measurement tools
- Workforce migration plan

The implementation phase is governed by ITIL as described in section 2.4.5.4. A measuring mechanism must be in place to measure the result of the implementation phase with the aims and goals of the pre-implementation phase. This measuring tool is the link between the pre-implementation phase and the implementation phase.

The methodology becomes a full circle where the inputs of the first phase influence the results of the implementation phase.

The methodology described is used to implement and manage the other four components of the ERP model. The different modules of the software component must be implemented using the methodology. During the implementation of the software component, the different process flows within the organisation change and this is addressed during the analysis phase. The modules of the change management component are managed during the different phases to ensure that the ERP implementation adheres to corporate governance through the processes and procedures that are instilled by ITIL.

Based on the information provided in section 2.4, it is clear that hypothesis 1 is partly proven. The information is available to understand ERP systems and the effect it has on the organisation itself. On the other hand, the hypothesis is not proved in the sense that some organisations do not understand ERP systems and hence the creation of the ERP model. The ERP model can assist organisations in understanding ERP systems and the effect they will have on the organisation.

The second objective of the chapter is thus satisfied owing to the fact that an ERP model is provided to aid organisations to know what software modules there are, the changes ERP systems instil as well as the way ERP systems should be implemented.

Based on information provided in the previous section, an ERP model is provided, but the model does not provide the advantages or disadvantages of an ERP system. The next section discusses these advantages and disadvantages.

2.5 ADVANTAGES OF ERP SYSTEMS

The previous sections explained what ERP is, how it works and the interaction between the different components. But what are the benefits of an ERP system? The advantages and benefits of an ERP system must outweigh the cost and effort for it to be a good investment.

There are many ways that an ERP system can help an organisation. The first part determines the general advantages an organisation can expect after the installation of an ERP system. The second part determines the additional advantages per industry. By focusing on industry-specific advantages and benefits, the practical implications of the advantages are experienced.

2.5.1 GENERAL ADVANTAGES

The general advantages are the benefits that an organisation can expect once it has implemented an ERP system. Real cases are used to illustrate the advantages that organisations did receive from their ERP implementations. This is based on the case study tool. Case studies are used to learn from the current situation in real life (Olivier, 2006).

2.5.1.1 Cost Benefit

First, an organisation's operating costs can be reduced. Brigham's Ice Cream (Appendix A.1) had a 25% saving in operational expenses after the installation of the J.D. Edwards Solution. This saving was immediate and significant.

2.5.1.2 Time Efficiency Benefit

An ERP system integrates all parts of an organisation so that it has more control of its operation. Also, an ERP system increases the organisation's time efficiency. Since all the parts are now connected and integrated with one another within an ERP system, people take less time to perform tasks. In the manufacturing area of Hoffman Enclosures (Appendix A.2), the cycle time for making standard products has dropped by 60% and the cycle time for custom products has been cut by more than 50%.

ERP systems improve timeliness of information by permitting customers to post daily instead of monthly. Batesville Casket Company (Appendix A.3) moved to a real-time system, replacing the previous monthly batch process. Visibility of inventory and demand across the organisation improved the procurement effectiveness and inventory level management.

2.5.1.3 Faster Access to Information

Moreover, people now have more and faster access to their information, which improves the time and resources for decision-making. For now, having an ERP system means increased information availability for the organisation, which means that the organisation can access information quickly and easily. Komatsu's suppliers (Appendix A.4) have the ability to update purchase orders acknowledgements and shipping information on the ERP system directly using an e-commerce web interface.

Paper documents are reduced by providing online formats for quickly entering and retrieving information. Euramax Coated Products (Appendix A.5) cut down on the stream of paper that used to circulate between different departments by at least 25%.

2.5.1.4 Integration and Consolidation

Furthermore, organisations often have different types of software integrated within them. An ERP system consolidates all the software into a single system. Software consolidation is another main advantage of an ERP system. Every division in an organisation has its own customer database. With the implementation of an ERP system, the customer database is centralised and managed from a single point. This allows for the database to be consistent.

The above cases provide an understanding of the benefits of an ERP system. These benefits are wide ranging and can help an organisation to perform efficiently and therefore save money and become competitive.

The next section covers industry-specific advantages and how the general advantages of an ERP system can be applied to a specific industry.

2.5.2 INDUSTRY ADVANTAGES

An ERP system helps not only organisations in general to gain advantages, but they provide advantages to some of the specific industries.

2.5.2.1 Manufacturing Industry

For the manufacturing industry, an ERP system provides better delivery service for organisations. For Hoffman Enclosures (Appendix A.2), the finished goods inventory was reduced by 20% without sacrificing availability levels for the customers.

2.5.2.2 Distribution Industry

An ERP system can shorten the total throughput time for the organisation to do tasks in process of operation. For the distribution industry, workers can now keep track of inventory and an online tracking system is used to take care of all that routine work that organisations used to do. After iBaan for Metals was implemented at Euramax Coated Products (Appendix A.5), their planning procedures were greatly improved. It used to take three to four days to convert sales orders into production orders and then bills of materials. This time was reduced to one hour.

Hoffman Enclosures (Appendix A.2) has seen a 20% increase in productivity in the distribution process with the financial close time falling from seven days to three and a half days. Since Hoffman ships nearly ten million products to customers each year, the 20% increase has a significant financial impact.

2.5.2.3 Transportation Industry

An ERP system allows the transportation industry to do online dispatch. Managers can keep track of their truck drivers and know whether or not their employees are doing their jobs. They have a global positioning system (GPS) to point out all the positions of the employees in transportation industries (SAP Technical Brief, n.d.). The GPS is incorporated into the SCM module of the ERP system.

Azienda Milanese Servizi Ambientali S.p.A. (Amsa) (Appendix A.6) is a group of companies providing environmental and waste services to the city of Milan and neighbouring communities. Through the use of radio frequency identification and GPS technologies, Amsa gained the ability to plan and track the itinerary and location of vehicles and equipment.

2.5.2.4 Service Industry

One more industry which gains specific advantages from using ERP systems is the project services industry. An ERP system helps these companies to automate many services and reduce the time to make reports since more information is quickly available through the ERP

system. Komatsu (Appendix A.4) eliminated communication delays of requirements to the suppliers and the supplier delivery commitments to Komatsu have also been eliminated.

Given the above examples, it is clear that there are tangible as well as intangible gains, such as executive times becoming available for better and more productive causes, elimination of unproductive reconciliation efforts on various counts, improved decision-making owing to availability of timely and appropriate information and improved process times.

A coin does have two sides. If one side of the coin is the benefits and advantages of an ERP system, then the other must be the disadvantages.

2.6 DISADVANTAGES

Although there are many advantages of an ERP system, there are still some disadvantages. It is important that the organisation as a whole understand the disadvantages of implementing an ERP system. This will allow the organisation to make an informed decision as to whether an ERP system must be implemented or not.

2.6.1 COST

Cost is a very important issue for an organisation to consider when implementing an ERP system. The high costs of setting up an ERP system are so prohibitive that it would be out of reach for many small businesses.

According to Poston and Grabski (2001), organisations experience adverse financial effects. This is due to the complexity of an ERP system. The cost of implementing an ERP system is not just based around the software component, but includes the effect it has on the organisation as a whole. These costs are not easy to measure and the incurred costs are not always attributed to the ERP implementation. Additional costs are (i) upgrading the IT infrastructure to accommodate the ERP system, (ii) changing organisational and business processes as described and (iii) other direct costs such as user training.

2.6.2 SECURITY

Also, another disadvantage would be the security within an ERP system, that is, who has access to the system and who can change the information within the system. These are some of the many questions asked about the security of an ERP system.

As illustrated in section 2.4.2, the ERP system has no boundaries and works seamlessly with customers, providers and trusted partners locally and internationally. This opens the ERP system to application security concerns. Lanowitz (2005) describes application security as the involvement of the developers to create secure source code to prevent the inclusion of potential security vulnerability. She also predicts that by 2009 80% of organisations will have an application security incident.

This relates to corporate governance and the effect it has on organisations. If Lanowitz's predictions are true, then the directors of the organisation will be liable for these security incidents. Precautions must be taken by the organisation to ensure that ERP security forms part of the bigger corporate governance of the organisation and does not function on its own.

If ERP systems count for 10% of an organisation's applications, then there is a serious concern about the security of an ERP system. Chapter 4 focuses on the security related issues within an ERP system.

2.6.3 TIME CONSTRAINT

For an organisation, time is also a valuable resource. Since an ERP system does not take a short time to implement in an organisation, it may slow down the routine operations. As indicated earlier (Hongjun, 2005), the implementation of an ERP system can take as long as five years. This means that organisations must have a long-term strategy when they implement an ERP system. Firstly, the physical implementation of an ERP system will take a considerable time and ROI will take additional time after the successful implementation of the ERP system. The ROI mentioned here refers to the advantages of an ERP system as described earlier.

An organisation must weigh up the advantages against the disadvantages and make an informed decision on whether an ERP system will be a benefit to the organisation.

2.7 CONCLUSION

The chapter focused on ERP as a business model and process.

It is clear from the literature study that there are multiple ERP definitions. ERP means different things to different people. The purpose of this chapter was to determine if ERP is defined and understood and to determine the components and processes of an ERP system. An ERP system is divided into different components. The reason for this is to classify fixed areas or components within an ERP system and to make an ERP system understandable and manageable.

The five components of the ERP system ensure that the management of an organisation understands what ERP is and what the influence of the ERP system will be on the organisational processes and culture. It is important that the management of an organisation understand the influence of the ERP system. It does not just entail replacing the legacy system, but also a whole business process change.

Each component is broken down into modules. The general perception is that an ERP system is just the finance module. It is important that everyone in the organisation understand the different components and the interaction between them.

It is also important to clearly define and explain the advantages and disadvantages of an ERP system, as set out in this chapter. The advantages are divided into general advantages and advantages per industry. Management knows that there is an advantage for the organisation

but it is not always clear what these advantages are and if there are any advantages for a specific industry.

Based on the information provided in this chapter, ERP systems alone cannot be the reason why implementations fail. It is clear from the various decisions made that some organisations do understand what an ERP system is and the effect it will have on an organisation. People that understand ERP systems and still experience problems with their implementation must seek the problem elsewhere and this is the focus of the next chapters.

Organisations that do not understand ERP systems can use the ERP model described in the chapter to firstly understand ERP systems and secondly plan better for the implementation of an ERP system, as they will understand the full impact of an ERP system.

This means that hypothesis 1 is proved for some instances but not proved for others, and as such does not provide a clear indication of the reason for ERP failures.

The value of this conceptual model is that it simplifies ERP and reduces ERP systems to manageable and understandable components. This simplicity enables organisations and particular project managers to focus their attention on all four components and not just the software component.

A second value is that organisations can use the ERP model to plan their implementations better. The model also provides the organisations that do understand ERP to either optimise their implementations or to seek other areas of improvement.

The next chapter deals with the role players in the ERP market. It investigates the products of each vendor and draws a comparison between the different vendors in order to determine if the underlying technology is mature within the ERP field.

3 CHAPTER 3: ERP TECHNOLOGY SOLUTIONS

3.1 INTRODUCTION

Chapter 2 explained ERP using a conceptual model to illustrate the different components within an ERP system. It also proved that ERP as a technology is not the reason why ERP implementations fail.

Hypothesis 2 states that the underlying ERP technology is immature.

The goal of this chapter is to determine the maturity of ERP by analysing the industry role players and their different technical product and solution offerings.

The first objective is to determine which vendors dominate the ERP market space and are therefore the main role players in the ERP industry.

The second objective is to determine the maturity of the different offerings measured against the baseline of the ERP model presented in chapter 2.

The third objective of the chapter is to determine the future trends for ERP systems and what organisations can expect of these enhancements and upgrades. The focus on the future of ERP is important. Future developments will also ensure that organisations that invested in an ERP system will continue to derive value from the system. The usage of ERP systems will be illustrated using two case studies.

3.2 PRINCIPAL ERP VENDORS

In 2001, the total ERP market in South Africa equalled R839.3 million (BMI-TechKnowledge Group, 2002). The market experienced phenomenal year-on-year growth of 30% from 2000 to 2001. During 2002 moderate growth was experienced owing to economic weakness.

The table below shows the South African vendor market share (BMI-TechKnowledge Group, 2002). There is currently (November 2008) no updated information on the South African market, but if the international growth trend of 9.4% (Eschinger, 2005a) for 2004 and the growth forecast of 6.3% (Eschinger, 2005b) for 2009 are taken into consideration, then the forecast figures are as illustrated in table 3-1.

VENDOR	2000		2001		2004		2009	
	Rm	% share	Rm	% share	Rm	% share	Rm	% share
SAP	285	44.2	370.5	44.1	471.36	44.14	639.77	44.14
SSA[1]	49.6	7.7	33.3	4.0	42.37	3.97	57.50	3.97
Oracle	182	28.1	267.5	31.9	340.32	31.87	461.91	31.87
Other	128.9	20	168.1	20	213.86	20.03	290.27	20.03
TOTAL	**645.5**	**100**	**839.4**	**100**	**1067.92**	**100**	**1449.45**	**100**

Table 3-1: South African vendor market share (Adapted from BMI-TechKnowledge Group, 2002)

Table 3-1 illustrates that the ERP industry is substantial and that one must take notice of this industry and the impact of ERP on an organisation. It is a negative picture given the fact that 20% of ERP projects are terminated before completion (ComputerWorld, 2001). This amounts to a R167 million a year loss in revenue to organisations in South Africa. If the failure rate can be minimised, it will make a contribution to organisations through the costs that will be saved.

The "Other" category in table 3-1 includes Epicor, GEAC, Great Plains, Infinium, JBA and Navision. These solutions are second-tier ERP solutions and are mainly for the small and medium organisations, whereas the first tier focuses on large organisations. Some of the second-tier vendors are new to the ERP market and the solutions they provide are not as encompassing. Although the study focuses on tier 1 ERP vendors and solutions, it must recognise the role and importance of the second-tier ERP vendors.

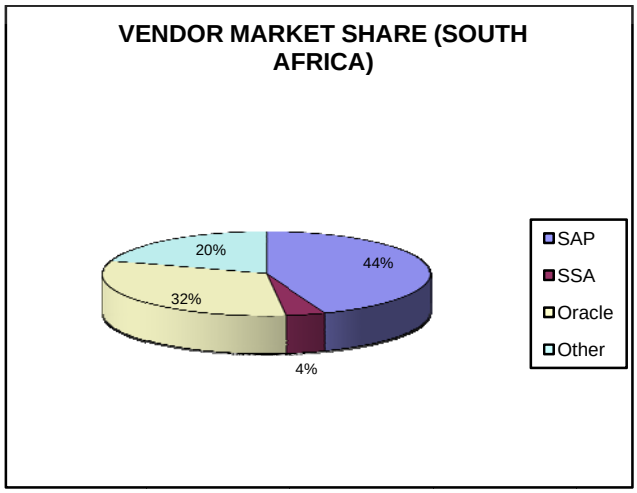

Figure 3-1: Vendor market share

[1] During 2003 and 2004, the ERP market was consolidated and mergers and acquisitions took place. These mergers and acquisitions saw PeopleSoft, J.D. Edwards and Oracle merging into one ERP vendor known as Oracle. SSA acquired BAAN during this period.

The total international software revenue for the ERP software market increased by 5.2% in 2005. This totals to an amount of more than $16 billion. This is up from $15.7 billion in 2004. The South African market is small in comparison to the world market as South Africa's contribution is a mere $152 million dollars.

As figure 3-1 illustrates, SAP and Oracle are the dominant market players, with SSA in a weak third place. The picture will not change in the foreseeable future based on the forecast by Eschinger (2005b). The three major role players in the ERP software market are therefore SAP, Oracle and SSA. The identification of these role players satisfies the first objective of the chapter.

The following section looks at the product offerings of SAP, Oracle and SSA.

For each vendor, some background is provided as well as a detailed description of the technical products and solutions they offer to organisations.

3.3 SAP

3.3.1 BACKGROUND

SAP (Systems, Applications and Products in Data Processing) is an ERP software package and was the first vendor to integrate an organisation's worldwide functions into one application. Five former IBM programmers founded SAP AG in Germany and released the first version of their software (SAP R/2) in 1979. Its domination of the market occurred during the 1980s, expanding first throughout Europe (early 1980s) and then North America (1988). SAP R/3, an advanced client-server based version of the R/2 product, was released in 1992. Forty-four per cent of US companies were using it within five years of its expansion. SAP introduced its latest major product upgrade in 1999. Named mySAP.com to emphasise its shift to an e-business focus, mySAP.com builds on the strengths of the SAP R/3 product in a fully Internet-enabled architecture. MySAP.com also incorporates SAP's newest business applications for CRM, SCM and data warehousing. Prior to the introduction of mySAP.com, these applications had been incorporated as add-ons to SAP R/3 and were known as New Dimension products.

SAP had a large lead over its local rivals in revenue terms in 2003 and had an installed base of 325 installations in South Africa and over 300 IT professionals in supporting roles. Based on the growth forecast figure of 9.4%, the installed base could have grown to 325 installations by the end of 2003 and to 730 installations by the end of 2009.

3.3.2 SOFTWARE

Figure 3-2 illustrates the software components of SAP.

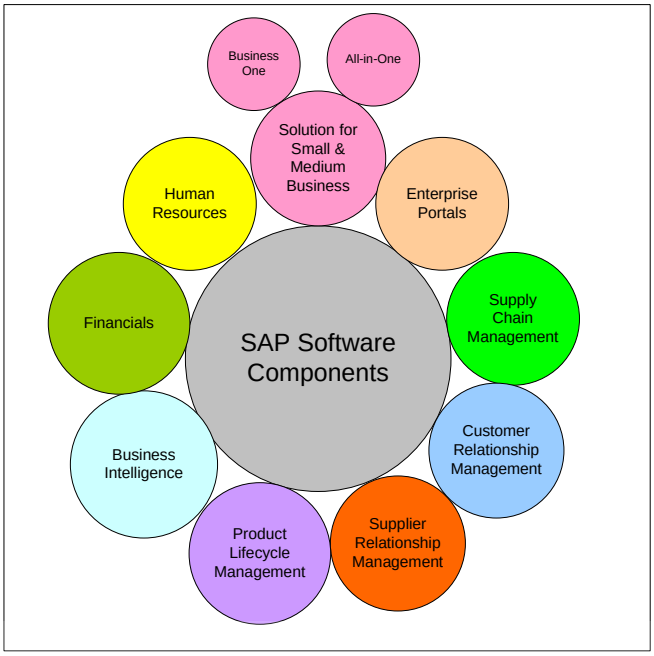

Figure 3-2: SAP's software components (SAP, 2006)

A brief description of each component is provided in the following sections. The description focuses on the high-level functionality of each component and not the detailed functionality.

3.3.2.1 Solutions for Small and Medium Business

Small and mid-size businesses have unique needs. They require a cost-effective solution that can be up and running quickly and that will continue to meet their needs as the business grows. SAP Smart Business Solutions provides solutions specifically designed for companies in the small and mid-size business marketplace. Nearly half of all SAP installations are in organisations with annual revenues under $200 million.

SAP provides two solutions for small and medium businesses:

SAP Business One

This solution is designed to meet an organisation's common business needs such as accounting, reporting, logistics and sales force automation. It is designed for small companies that require less complex industry-specific functionality from their IT solutions.

mySAP All-in-One

This solution comes pre-packaged to meet the needs of an organisation and can be fine-tuned to perform in a specific industry. It is designed for companies that require a high degree of industry-specific functionality.

3.3.2.2 mySAP Enterprise Portals

In today's economy, a company needs to take full advantage of the information resources and maximise the value of its IT investments. It is not enough to simply have information. The company needs to turn information into action and action into results (De Búrca, Fynes & Marshall, 2005).

mySAP Enterprise Portal enhances the organisation's ability to access and work with information across the extended enterprise. Users can identify and address business issues effectively since information and applications are unified. Predefined business packages speed up the implementation process and provide ready-to-use portal content that is tailored to job- and industry-specific needs.

3.3.2.3 mySAP Supply Chain Management

mySAP Supply Chain Management (mySAP SCM) handles the planning, execution and management of events that often interfere with supply chain excellence. It enables an organisation to operate supply chain networks efficiently and reach customers effectively. mySAP SCM delivers coordination capabilities that track financial, informational and materials processes and identify processing exceptions. The coordination capabilities of mySAP SCM can help an organisation transform linear, sequential supply chains into adaptive supply chain networks that promote a distributed, dynamic environment. Organisations gain visibility into inventory, planning and scheduling through the use of mySAP SCM. This allows organisations to anticipate problems, adjust schedules and transactions and manage the extended supply chain proactively. In addition to coordination, mySAP SCM covers supply chain planning, execution and collaboration.

This functionality of mySAP's SCM relates to the definition of SCM in section 2.4.2.3 in chapter 2. Although SAP uses different names and terminology for the processes within mySAP SCM, it fits the generic SCM software component.

3.3.2.4 mySAP Customer Relationship Management

The mySAP Customer Relationship Management (mySAP CRM) solution connects front-office and back-office functions into a single customer-centric operation. It enables collaboration among employees, partners and customers by providing relevant, personalised information from multiple data sources and business processes. This solution delivers functionality throughout the customer engagement cycle and provides the functionality an organisation needs for marketing planning, campaign management, telemarketing, lead generation and customer segmentation. mySAP CRM also enables real-time availability checks, contract management, billing management, fulfilment visibility and order tracking. It also allows an organisation to provide customer care across all channels.

The CRM definition and methodology described in section 2.4.2.4 of chapter 2 encompasses the SAP product and indicates that SAP is following the industry standard.

3.3.2.5 mySAP Supplier Relationship Management

mySAP Supplier Relationship Management (mySAP SRM) provides a solution that maximises return on relationship with all suppliers. It integrates operations across enterprise boundaries, promoting supplier collaboration by automating processes with all suppliers for all purchased goods and services. mySAP SRM addresses the supply cycle, which ranges from strategic sourcing to operational procurement and supplier enablement. With mySAP SRM, an organisation can collaborate with suppliers for purchased goods and services. The organisation can constantly optimise supplier selection, compress cycle times and benefit from focused sourcing and procurement strategies.

3.3.2.6 mySAP Product Lifecycle Management

mySAP Product Lifecycle Management (mySAP PLM) provides companies with an integrated environment that ensures that all people involved in product development, manufacturing and service have quick and secure access to current information. mySAP PLM is an e-business solution that enables collaborative engineering, custom product development, project, asset and quality management among multiple business partners. mySAP PLM integrates all participants in the development process: designers, suppliers, manufacturers and customers. Engineering is therefore no longer a linear value chain but a three-dimensional, collaborative community focused on a common goal. mySAP PLM provides proactive quality management to improve equipment and plant performance.

3.3.2.7 mySAP Business Intelligence

mySAP Business Intelligence integrates all the organisational information so that an organisation can turn information into business operations. It enables an organisation to use this information to manage and analyse every single aspect of the business. mySAP Business Intelligence allows the customer to use data analysis to manage the relationships with business partners and customers.

The solution delivers capabilities in the following areas:

- ***Data warehousing:*** data warehouse management, business modelling, extraction, transformation and loading enable the organisation to build data warehouses, model information architecture according to business structure and manage data from multiple sources.
- ***Business intelligence platform:*** online analytical processing, data mining and alerting provide a foundation for accessing and presenting data, searching for patterns and identifying exceptions.
- ***Business intelligence tools:*** query design, reporting and analysis and Web application design allow the organisation to create analysis reports, support decisions at every level and present business intelligence applications on the Web.

3.3.2.8 mySAP Financials

mySAP Financials can help an organisation maintain financial control and accountability and enable it to achieve sustainable growth and profitability. mySAP Financials include the following sections:

- General Ledger
- Accounts Receivable
- Accounts Payable
- Fixed Assets Accounting

These financial terms were discussed in section 2.4.2.1 of chapter 2. mySAP Financials help an organisation with:

- Financial planning and forecasting
- The planning and performance management cycle
- The cost of finance
- The financial supply chain

This allows the users within the organisation access to the information they need when they need it.

3.3.2.9 mySAP Human Resources

Companies need to fully leverage their human capital to sustain a competitive position. This requires integrating employee processes and information with business processes and strategies to achieve optimal business results. mySAP Human Resources (mySAP HR) delivers human capital management (HCM) solutions that provide human resources, executives and line managers with the functionality to:

- Deploy the right people to implement the company's strategic initiatives.
- Analyse and make HR decisions based on real-time information.
- Align employee objectives with the company's strategic goals.
- Support employees in all phases of the employee life cycle.
- Respond to business changes.

mySAP HR combines strategic HCM features with workforce analytics to clearly demonstrate HR's contribution to the bottom line. The solution supports HR to the line management level to ensure that employee objectives are aligned with the company's strategic goals.

The three divisions of human resources, namely HR administration, payroll and self-service HR as described in section 2.4.2.2 of chapter 2, are addressed by the solution offered by SAP.

3.4 ORACLE

3.4.1 BACKGROUND

The Oracle Corporation was founded in 1977 by Larry Ellison, Bob Miner and Ed Oates. Under the original moniker, Relational Software Inc., Ellison, Miner and Oates created the first commercial SQL (Structured Query Language) database Version 2. This was based entirely on published research by IBM. A paper by Codd (1970) described a "mathematically consistent and complete way of managing and retrieving information". After reading the report in 1976, the three founders spent two years writing the code that would institute the first version of Oracle, which was first implemented in the Advanced Technology Division of Wright-Patterson Air Force Base. In 1982, RSI changed its name to Oracle Systems Corporation. One year later, the company took their database a step further with Version 3. This became the first portable SQL database to run on PCs, minicomputers and mainframes. In 1984, Oracle established offices in Canada, the Netherlands and the United Kingdom and reached revenues of $12.7 million. On 12 March 1986, Oracle had its Initial Public Offering, and closed the day with a market value of $270 million.

Seeking to become more than just a database software company, Oracle ventured into the applications market in 1988 with their release of Unix Relational Financial Applications. In 1995, with $2.967 billion in revenues, Oracle entered the business intelligence market with Discoverer/2000, a suite of query and analysis tools to access corporate data warehouses. The network database, Oracle8, was introduced in 1997, along with the innovation of bringing applications to the Web. In an effort to focus exclusively on Internet architecture, the client-server version of Oracle Applications was abandoned one year later with Release 11, offering full-scale ERP functionality for manufacturing, SCM, financials, human resources and CRM. Maintaining their stronghold in their core product base, the company released Oracle8i in 1999, the first Internet database, which would be the foundation for their October 2000 release of the E-Business Suite 11i, an integrated suite of front- and back-office applications.

Oracle offer a range of applications including products from J.D. Edwards and Peoplesoft that they acquired earlier in the 2000s. They have also upgraded their own applications and newer releases have since been made.

3.4.2 SOFTWARE

Figure 3-3 shows the software offering of Oracle. It is clear from the diagram that the software component differs completely from that of the ERP model as well as the other vendors. This difference can be attributed to the fact that Oracle focuses more on the database side of the ERP business. Oracle is, however, moving towards a more complete ERP solution by providing an e-business suite.

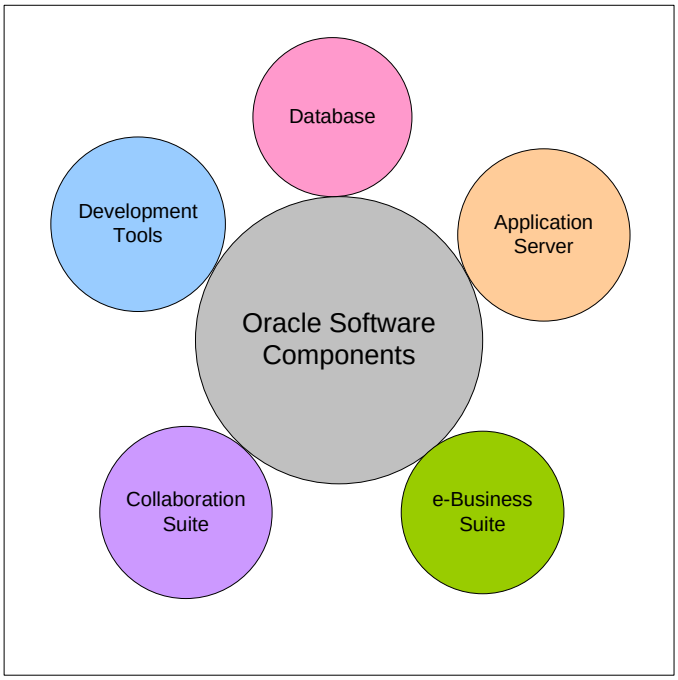

Figure 3-3: Oracle's software components

The various software components of the Oracle offering are discussed in the following section. This discussion is an overview of the components.

3.4.2.1 Database

Oracle Database is a database designed specifically for the Internet and is available in three editions:

Enterprise: Offers scalability and reliability in both clustered and single system configurations. It provides features for OLAP and business intelligence and delivers a low total cost of ownership.

Standard: A low-cost alternative for small and medium business or departmental applications that want the power of Oracle but do not require the high-end options of the Enterprise Edition.

Personal: A full-featured version of the Oracle Database targeted at individuals who require full compatibility with the entire Oracle Database family.

3.4.2.2 Application Server

Oracle9*i* Application Server integrates everything needed to develop and deploy e-business portals, transactional applications and Web services.

Oracle9*i* Application Server provides organisations with various ways and methods that enable them to transact more securely and in a user-friendly manner with their customers. Some of the features include an integrated, standards-based platform to deploy various Web

services and Internet applications and it allows an organisation to aggregate all its disparate websites into personalised, secure portal pages for all its users.

3.4.2.3 e-Business Suite

Oracle e-Business Suite is a complete set of business applications for managing and automating processes across an organisation. The e-Business Suite consists of the following modules:

Human Resources

Oracle Human Resources Management System (HRMS) delivers the technology and capabilities needed to create a competitive advantage for e-business success. Oracle HRMS empowers businesses with the tools to find, extract and analyse data related to human capital. This intelligence positions an organisation with the readiness to deploy the best resources for maximum employee productivity, satisfaction and retention.

Supply Chain Management

Oracle Supply Chain Management delivers an integrated solution in five critical business areas, namely product development, planning, procurement, manufacturing and order fulfilment. Oracle delivers intelligence capabilities that enable an organisation to monitor and continuously improve supply chain performance.

A fast, flexible modular implementation approach fits the needs of different companies and entire supply chains. Oracle Supply Chain Management breaks down the communication barriers between organisations, identifies opportunities for revenue growth and savings and employs business intelligence in every decision at every step in a process.

Financials

Oracle Financials is a family of industry financial management and accounting applications. With Oracle Financials, an organisation can support global business, drive efficiencies, establish appropriate controls and manage key financial drivers.

Other modules of the e-Business Suite are sales, order management, procurement, service and marketing. These modules relate to the sections within the software component of the ERP model.

3.4.2.4 Collaboration Suite

Oracle Collaboration Suite is a single, integrated system for all of an organisation's communications data: voice, email, fax, wireless and files.

Oracle Collaboration Suite permits an organisation to do the following:

- Replace fragmented solutions that do not work together with an integrated suite of collaboration applications based on a single infrastructure. The Collaboration Suite

provides the vehicle for the fragmented solutions to communicate through a central interface.

- Access all its communications content via desktop applications, the Web, PDAs and cellphones. In today's world of mobile technology, the Collaboration Suite provides organisations with the capability to request information from any destination and from any device that can connect to the corporate network.

3.4.2.5 Development Tools

Oracle Developer Suite is a complete, integrated environment that combines application development and business intelligence tools. Oracle Developer Suite allows developers to build transactional applications which can be deployed to multiple channels. These transactional applications can be extended with business intelligence capabilities including ad hoc query and analysis, high-quality Web reporting and advanced analysis.

These development tools of Oracle do not form part of the software component of the ERP model. This is an addition to Oracle's ERP solution and might give them a strategic advantage.

3.5 SYSTEM SOFTWARE ASSOCIATES, INC.

3.5.1 BACKGROUND

SSA Global was originally founded as System Software Associates, Inc. with headquarters in Chicago in 1981. In July 1982, SSA launched its ERP product, BPCS (Business Planning and Control System). During the early 2000s SSA started to acquire smaller ERP organisations to widen its product as well as customer base.

SSA acquired Baan in July 2003 during a period of acquisitions within the ERP market (SSA, 2006).

SSA changed its name to Infor in 2007 after all the acquisitions and realignment of the organisation. The application offerings have also been renamed to compete against other vendors (Infor, 2008).

3.5.2 SOFTWARE

The various software components of SSA are shown in figure 3-4.

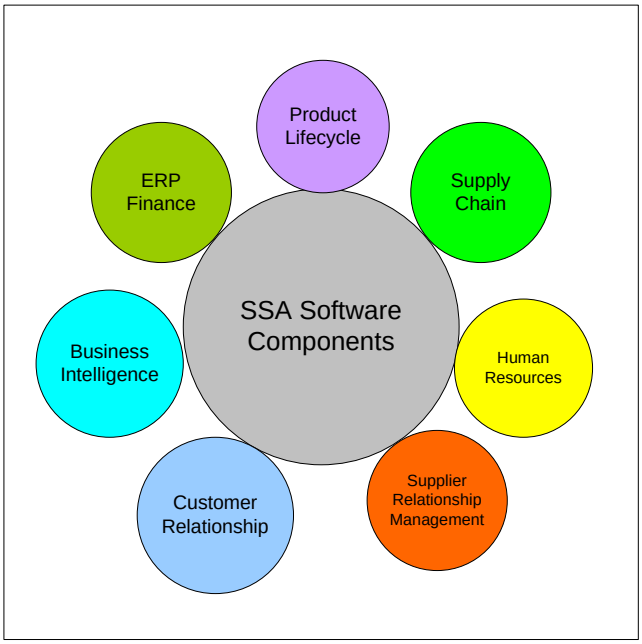

Figure 3-4: SSA's software components

A brief description of each component is provided in the following sections. The description focuses on the high-level functionality of each component and not the detailed functionality.

3.5.2.1 Product Lifecycle Management

SSA's Product Lifecycle Management is an Internet-enabled solution that spans the complete life cycle of a product. SSA's PLM captures product information at any relevant stage in the life cycle and helps ensure that every department is working with the correct information.

The PLM component enables organisations to be more effective. It does so by collecting product information from existing solutions and processing them together into a comprehensive information basis which supports product-related business processes throughout a product's life cycle.

3.5.2.2 Supply Chain Management

SSA's Supply Chain Management helps organisations synchronise manufacturing and distribution activities, collaborate across the enterprise and across multiple trading partners in the value chain. By providing information that supply chain workers need to make better supply chain decisions, responsiveness is improved and greater business success can be achieved.

Given what SSA's SCM does as described above, it can be said to correspond with the definition of SCM as described in section 2.4.2.3 of chapter 2.

3.5.2.3 Human Resources

SSA Human Capital Management (HCM) assists organisations in managing their human resources. It provides an organisation with the tools to attract the right employees for every job and provide them with optimal compensation, benefits, self-service, learning and performance management programmes so that the employees remain motivated and committed.

3.5.2.4 Supplier Relationship Management

SSA Supplier Relationship Management (SRM) provides an organisation with a tool to turn the way the organisation acquires goods and services into a strategic advantage. It enables the organisation to achieve value from direct and indirect spend by helping it to evaluate sourcing alternatives. It also streamlines procurement processes to fit the demand chain.

3.5.2.5 Customer Relationship Management

The CRM solution of SSA is one that addresses the processes, integration, collaboration and information requirements of customer-intimate organisations. This solution is a combination of software and applied business intelligence developed to help organisations maximise customer acquisition, loyalty, retention and profitability. SSA's CRM combines demand chain technologies with supply chain efficiency and delivers cross-enterprise analytics that effectively manage core business processes.

3.5.2.6 Business Intelligence

Business intelligence is often defined in terms of products and technology: data warehousing, OLAP and data mining. The diversity of BI products and solutions is confusing. A tactical guideline is to build a framework that defines how BI can be deployed across all domains within the enterprise.

The design principle of SSA's BIS is to provide such a BI framework consisting of infrastructure, tools and business content.

3.5.2.7 ERP Finance

SSA's ERP Finance helps to make an organisation's financial performance more predictable and it offers advanced control over traditional finance functions. The ERP Finance component of SSA consists of nine modules:

- General Ledger
- Accounts Receivable
- Sales Invoicing
- Accounts Payable
- Cash Management
- Financial Budget System
- Financial Reporting System

- Cost Accounting
- Fixed Asset Management

These modules are described in section 2.4.2.1 of chapter 2 and it is clear that SSA also follows the standard solution of what ERP Finance should be.

3.6 ERP VENDOR COMPARISON

The previous section gives an explanation of the technical solutions offered by the three major ERP vendors. It explains who they are and what products they provide. This section makes a comparison between the different vendors' products and the different industries they service.

The different vendors and their solutions are mapped against the ERP model proposed in chapter 2. This comparison ties in with the second objective of the chapter, namely to determine the maturity of the different offerings measured against the baseline of the ERP model.

3.6.1 COMPARISON BY INDUSTRY

Not all ERP products can be used in all industries. Implementing an ERP product in an industry that it was never intended for might lead to failure. This failure cannot be blamed on the product itself but rather its incorrect or inappropriate use. Table 3-2 shows the presence of the vendors in different industries:

INDUSTRY	VENDOR		
	SAP	SSA	ORACLE
Aerospace & defence	X	X	X
Automotive	X	X	X
Banking	X		X
Chemicals	X	X	X
Construction	X		X
Consumer products	X	X	X
Energy	X		X
Financial services	X		X
Food & beverages		X	
Higher education	X		X
High tech/electronics	X	X	X
Health care	X		X
Homebuilders			
Industrial manufacturing	X		X
Insurance	X		X
Life sciences		X	X
Media	X		
Mining	X	X	
Pharmaceuticals	X	X	
Professional services	X		X
Public services	X		X
Paper	X	X	
Real estate			X
Telecomm	X	X	X
Staffing			
Utilities	X		X
Wholesale distribution	X	X	X

Table 3-2: Comparison by industry

This table was compiled by visiting each vendor's website to determine the industries they target and in which they are active with their own solution and product range.

It can be deduced from the information in table 3-2 that SAP and Oracle are widely used by organisations and this shows in the market share that they occupy as seen in table 3-1.

3.6.2 COMPARISON TO ERP SOFTWARE COMPONENT

The correlation between the different vendors' ERP solution to the ERP model's software component is illustrated in table 3-3. It is clear from this table that all of the vendors do fit the software component of the ERP model.

ERP MODEL	VENDOR		
	SAP	SSA	ORACLE
Business intelligence	X	X	X
Customer relationship management	X	X	X
Financials	X	X	X
Human resources	X	X	X
Supplier relationship management	X	X	X
Supply chain management	X	X	X

Table 3-3: Comparison to ERP model

The products or solutions that the vendors provide as additional services, which might sometimes provide them with a competitive edge over a competitor, are illustrated in table 3-4.

ADDITIONAL PRODUCTS AND SERVICES	VENDOR		
	SAP	SSA	ORACLE
Application Server	-	-	X
Collaboration Suite	-	-	X
Database	-	-	X
Development Tools	-	-	X
Hospitality	-	X	-
Product Lifecycle Management	X	X	-
Solution for Small & Medium Business	X	-	-

Table 3-4: Additional products and services

The following section describes tables 3-3 and 3-4 in the light of the information they provide.

3.6.2.1 SAP

SAP conforms to the ERP model with the products and solutions it provides. It is clear from table 3-3 that all the software components of the ERP model are addressed by SAP. SAP does have two additional software components, namely solutions for Small and Medium Businesses and Product Lifecycle Management. The Small and Medium Business solution is a scaled-down version of SAP's ERP solution and is thus not a true software component. SAP is using this product to penetrate the tier 2 section of the ERP business. This is the sector of the market where Microsoft Great Plains is providing a solution for small and medium organisations (Koh & Simpson, 2005; Beheshti, 2006). The tier 2 market share is 20% of the total ERP market share in South Africa and customers and business are available as new customers.

The Product Lifecycle Management component is an additional component and adds additional value to the SAP solution. SAP and SSA are the only two vendors that offer this solution.

3.6.2.2 Oracle

Oracle does have all the software components as suggested by the ERP model. The other software components provided by Oracle are all based and focused on its database. The Application Server was developed to provide database functionality to an organisation and with the product range provided by Oracle, even small organisations can utilise Oracle's database. This allows Oracle to penetrate the 20% of the ERP market that the top three vendors do not occupy.

The other two components, namely the Collaboration Suite and the Development Tools, are also there to enhance the database functionality.

3.6.2.3 SSA

SSA does have all the software components as suggested by the ERP model. SSA, however, provides an additional component, namely Product Lifecycle Management. It is the only vendor apart from SAP that provides this component to the industry.

Table 3-4 illustrates that there are seven solutions by the ERP vendors that do not form part of the software component of the ERP model. The reasons why these solutions are not part of the software component are as follows:

- These solutions are vendor specific and are there to enhance either one or more of the software components.
- These solutions are not provided by all the ERP vendors and are used and developed by one or two of the vendors.
- These solutions are developed to provide the specific vendor with an advantage over its competitors.

It is clear from the previous sections that SAP is still the leading ERP vendor in the ERP industry. It provides the most comprehensive range of products and solutions to an organisation and is widely used in a range of industries. These industries vary from educational institutions to the aviation industry. SAP provides the most solutions and products to an organisation.

Oracle is in close competition with the range of products that it provides to an organisation. Based on the information provided in the previous sections, SSA is not a major role player in the ERP industry anymore. The company is not widely used across a wide range of industries. Its market share is also decreasing as per table 3-1.

It can be deduced from the previous sections that ERP in its current state is a mature industry. This means that the ERP products and solutions do not cause ERP projects to fail. It is necessary to investigate the future of ERP to ensure that the ERP project model developed in chapter 2 also includes future trends and will be applicable to these ERP products and solutions.

3.7 ERP SYSTEMS – THE FUTURE

Through the 1990s, companies like SAP, Baan, PeopleSoft, Oracle and J.D. Edwards became identified as large ERP vendors. The focus on ERP peaked with Y2K worries that had companies scrambling to close their books before the year 2000 (Rostron, 1999).

Since the ERP system is now acknowledged as the backbone for all e-business initiatives within an enterprise, ERP vendors are uniquely positioned to capture a large market share in comparison with the best-of-breed SCM/procurement players (Ekanayaka, Currie & Seltsikas, 2002). The integration of CRM, SCM and e-procurement systems into an ERP system is considered a major requirement by organisations.

Organisations are starting to transform themselves from vertically integrated organisations focused on optimising internal organisational functions to more agile, core competency-based entities that strive to position the organisation optimally within the supply chain and the value network (Perrey, Johnston, Lycett & Paul, 2002). A primary aspect of this positioning is engaging not just in business-to-business (B2B) and business-to-consumer (B2C) electronic commerce, but in collaborative commerce (c-commerce) processes as well. Collaborative commerce involves collaborative, electronically enabled business interactions among an organisation's internal personnel, business partners and customers throughout a trading community (Ratnasingam, 2004). In a collaborative world, enterprises must compete not only on the availability, cost and quality of their products and services, but also on the quality of the information they can publish for consumption by collaborating partners.

The demand on ERP processes and systems to meet this change is causing users to redesign ERP processes to include outward-facing elements, thereby rendering the vast majority of current ERP systems obsolete from both architectural and business relevance perspectives. As a result, the fundamental value proposition for ERP is being forced to change, evolving into ERP II.

Gartner defines ERP II as a business strategy and a set of industry-domain-specific applications that build customer and shareholder value by enabling and optimising enterprise and inter-enterprise, collaborative operational and financial processes (Bond, Genovese, Miklovic, Wood, Zrimsek & Rayner, 2000).

ERP II starts as an application strategy that sets a vision for the integration of all enterprise-centric and commerce-oriented business processes without the requirement of a single-vendor approach. As a deployment strategy, ERP II allows an organisation to determine the degree of vendor centricity required to fulfil the organisation's process requirements and include best-of-breed components (Møller, 2005). This is accomplished with the integration capabilities native to ERP II.

ERP II includes six elements that impact business, application and technology strategy as illustrated in figure 3-7 (Bond et al., 2000):

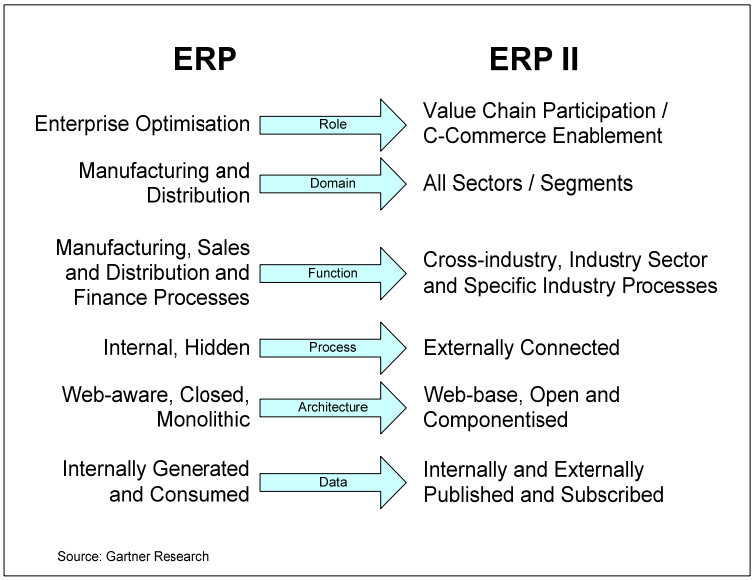

Figure 3-5: ERP versus ERP II

The six elements are described in the following section.

The Role of ERP II

The role of ERP II expands from the resource optimisation and transaction processing of traditional ERP to leveraging the information involving those resources in the enterprise's efforts to collaborate with other enterprises. This is not just the conducting of e-commerce buying and selling. ERP II's role expands beyond the optimising of internal resources. It also implies that resources can be exposed that are able to collaborate with other organisations.

ERP II's Business Domain

The domain of ERP is the normal distribution and manufacturing domains of the organisation. ERP II expands beyond this to include non-manufacturing industries. It will allow any organisation to implement and utilise the functionality of the ERP system. This means that organisations in the education sector can deal with an organisation in the manufacturing sector and that an ERP II solution will be available for a specific sector.

The Function Addressed

Functions addressed within these industries expand beyond the broad manufacturing, distribution and financial areas to include those specific to an industry sector or a particular industry. It is important to clarify that ERP II is not about functionality per se but it is about the integration of that functionality. The functionality is also about how to go about deploying this functionality.

ERP vendors become ERP II vendors when they enable an organisation to pursue an ERP II strategy by providing the functionality as an integrated solution.

The Processes Required

The ERP process will change from a hidden internal process to an external process. This process will be connected to the relevant collaborative enterprises. These processes can be divided into one-to-one or one-to-many processes. One-to-one processes are extensions of traditional ERP processes that provide direct links to the most important partners in the supply chain. One-to-many processes still rely on the core ERP capabilities but also require an e-marketplace that allows for greater levels of supply chain visibility and collaboration between multiple partners.

The System Architecture

ERP II will utilise open architecture based on Web technology. This open technology eases the collaboration between the enterprises involved. The web-centric architecture of ERP II products and solutions is so different from ERP architectures that a complete transformation is needed.

The Way Data is handled

ERP II data expands from ERP's attempt to store all data within the enterprise to handling data in a distributed manner throughout a trading community.

ERP evolved from MRP in the 1970s and it illustrates once again that the concept of ERP is mature. This mature base forms a solid platform for the design and growth of ERP II. Figure 3-6 shows the progression from MRP to ERP II. It can be seen that as MRP progresses to ERP II, the functionality broadens. With the onset of the Internet, external connectivity increases and where ERP included e-commerce as an add-on functionality, ERP II embraces the connectivity. This connectivity has resulted in c-commerce.

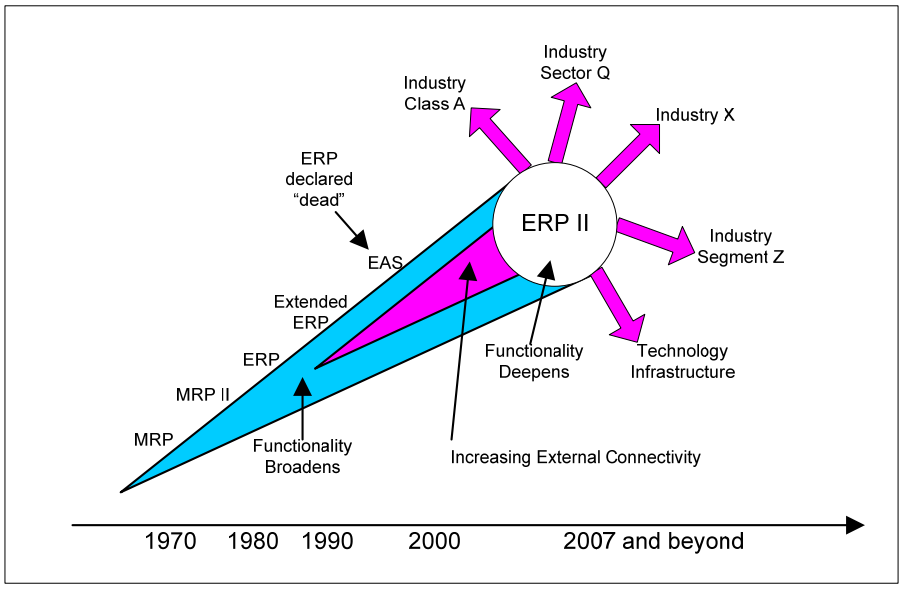

Figure 3-6: ERP II progression

A debate is still ongoing about the usefulness of ERP II and the advantages of using best-of-breed solutions all integrated to work as a single piece of an extended organisation (Buonanno, Faverio, Pigni, Ravaniri, Sciuto & Tagliavini, 2005; Møller, 2005). But as ERP II develops, its major differentiator will be in its architectural design, where the thrust will be to build modules that are open and componentised. This will allow organisations to forgo full changes and make incremental changes only as required. Against this background, upcoming application integration technologies such as Web services are the ones that will pave the way for the adoption of ERP II.

ERP II is Web-based, open and componentised. This is different from being Web-enabled and the ultimate ERP II concept may be implemented as a set of distributed Web services (Møller, 2005). Møller suggests that ERP is the central component in the ERP II framework. Collaborative components are added as part of ERP II and deal with communication and integration between the ERP II system and external suppliers and customers.

The conceptual model described in chapter 2 does not cater for ERP II but can be altered to incorporate the collaborative components suggested by Møller (2005). Figure 3-7 shows the adapted ERP model to cater for ERP II.

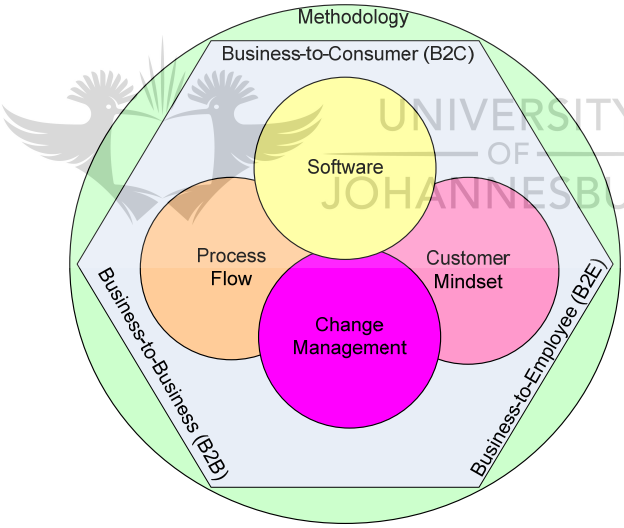

Figure 3-7: ERP II conceptual model

The collaborative component was added to the original ERP model. The original components will still have an impact on the collaborative component:

- The different modules within the software component will interact with one another but can also provide and request information from the collaborative component.
- Process flows will have to be amended to allow for the flow of information between the different collaborative components and the software components.
- The customer mindset will be an even bigger issue that must be addressed as users do not know who they are transacting with in, for instance, the B2C environment. Fears of security breaches must be addressed.

- The modules of change management must still be adhered to even if collaboration is added. Change management will play an ever bigger role since the complexity increases with the addition of the collaborative component.
- The methodology of implementing an ERP system is still valid as the collaborative interfaces are just extra components that must be added and incorporated into the ERP system.

3.8 CONCLUSION

The chapter focused on the different ERP vendors and the products and solutions they provide to an organisation.

The first objective of the chapter was to determine which vendors dominate the ERP market space and are therefore the main role players in the ERP industry. Based on market share and sales, the three top ERP vendors are SAP, SSA and Oracle. These three ERP vendors target tier 1 within the ERP market.

The second objective was to determine the maturity of the different offerings measured against the baseline of the ERP model presented in chapter 2. The purpose of this analysis was to determine the extent of each ERP vendor's offering of products and services. This analysis indicated that the three top ERP vendors do have a wide range of products and services. It also indicated that the product offerings are not only targeting a specific industry, but can be implemented across a wide range of industries. The ERP vendors' products fulfil the minimum requirements of the ERP model described in chapter 2.

The third objective was to determine the future trends for ERP systems and what organisations can expect of these enhancements and upgrades. ERP has come a long way from MRP in the 1960s. Based on the literature review, ERP II is the next step in the evolution of ERP. ERP II is based on ERP but adds the functionality of collaboration to the ERP system. This will allow the organisation to transact with other organisations and/or customers.

Hypothesis 2 is proved incorrect as per the objectives of the chapter. Based on the information provided in the chapter, it is clear that the ERP technology is mature. This is based on the following facts:

- The ERP market is worth millions in South African rands.
- The solutions provided by ERP vendors are of a wide range and span across various industries.
- A lot of time and effort has been spent on taking ERP to the next level of ERP II.

The value of this chapter is that it provides an organisation with an objective view of the ERP market. It provides proof by means of comparison that ERP is mature and that there is a future ahead for the next level, namely ERP II.

The same argument can be used as in chapter 2. Organisations that do not have one of the three leading ERP players installed might experience problems implementing an ERP system as it might not be as mature as those of the three leading ERP solution providers. This might contribute to the implementation failure rate and the organisations can benefit by upgrading to one of the three leaders.

Chapter 2 indicated that one of the disadvantages of an ERP system is its security aspect. The following chapter will focus on ERP security and determines if the perceived lack of security within an ERP system is the cause of ERP implementation failures.

4 CHAPTER 4: ERP SECURITY

Chapters 2 and 3 dealt with the hypotheses that (i) ERP systems are not understood and (ii) ERP is an immature technology. Based on these hypotheses, solutions were provided to enable the implementation of ERP systems to be more effective. These solutions are the proposed ERP model in chapter 2 and the discussion of the maturity of ERP technology solutions.

Chapter 2 (section 2.6.2) highlighted the fact that the security within an ERP system is a concern to many organisations. ERP security will become more critical if ERP II is adopted and collaboration becomes a day-to-day function. The third hypothesis of this research is that ERP systems are perceived as an insecure environment in which to transact.

An ERP system can be perceived as a successful implementation but if the security surrounding the ERP system is not in place, then the integrity of the ERP system is under question and the ERP system can no longer be perceived as successful.

The goal of this chapter is to develop a secure ERP system to be compliant with international standards. This will be done by addressing the following three objectives:

- The first objective is to determine the availability of a generic security framework that can be applied to ERP systems. ERP systems form part of the bigger IT system and must adhere to policies and procedures implemented by the IT system.
- The second objective is to secure ERP systems by applying the IT security framework to the ERP system to ensure that it conforms to IT and corporate governance.
- The third objective is to provide a secure ERP model by integrating the IT security framework into the proposed ERP model. This will ensure that ERP systems are secure to transact with. Collaboration will not take place if organisations and/or users perceive another organisation's ERP system as insecure.

The layout of the chapter is based on the three objectives. The first section of the chapter describes a generic information security framework. The second section determines if there are any shortfalls in applying this framework to an ERP system. The third section uses the framework to relate information security to the ERP model presented in chapter 2.

4.1 INTRODUCTION

Information is one of the most important assets of the organisation. For any organisation, information is valuable and should be appropriately protected (Oppenheim, Stenson & Wilson, 2001). Security is to combine systems, operations and internal controls to ensure the integrity and confidentiality of data and operation procedures in an organisation. Availability of the information is just as important to the organisation (Scott & Krischer, 2002). The integrity of the information can be above board and the information can be confidential, but if it is not available to the organisation, it is of no use. The information must also be selectively available and not available to everyone that accesses the system. With the advent of

information technology, users' roles in information systems have evolved from IT specialists for access information facilities, to non-IT personnel for regular operations, to unspecified individuals from outside.

ERP systems must adhere to the same policies and procedures as other IT systems because ERP systems form part of the overall IT system of an organisation.

According to Dhillon (2004), information security has always been considered as an afterthought in the design, development and implementation of new systems. It is also an afterthought in establishing new or improving business processes. However, given the increased dependence of businesses on information, security is increasingly being considered proactively (Von Solms & Von Solms, 2004). Security still ends up being considered as an afterthought if the information above is analysed. What takes precedence is a functioning system or an implementation of a new technology. Security is often relegated to lower down in the list of priorities. Posthumus and Von Solms (2004) state that information security is viewed as a technical issue and hence seems to lack the attention of top management. Information security should be more than a technical issue and should also be a strategic concern. The same rule applies to ERP systems: firstly because of their inheritance from IT systems and secondly because of the strategic impact of collaboration such as B2B and B2C.

To overcome the issue of reactive information security it must be enforced and supported by the business strategies of the organisation (Hurley, 2003). This can be done through corporate governance, which dictates the way that information is protected against unlawful access. Corporate governance is the set of policies and internal controls by which organisations are directed and managed (Nelson, 2005). Information security governance is a subset of corporate governance that relates to the security of information systems (Entrust, 2002).

ERP systems are all about business related information and as such must be governed by the same principles as information security. An ERP system controls all the business related information of an organisation as well as information relating to customers and suppliers. It is necessary to protect this information and to ensure that the ERP system conforms to auditing standards such as Sarbanes-Oxley (Blosch & Hunter, 2004). Auditing standards came more into play after the Enron saga. Baker and Hayes (2005) claim that the issue with Enron should be viewed as an accounting failure, with investors and creditors being severely misled by false financial statements produced by Enron. Astute financial analysis would have revealed the instability of the Enron business model, thereby alerting investors and creditors to the lack of creditworthiness of the company.

The security and protection of the information within the ERP system is therefore crucial to the existence of the organisation. If information regarding customers is leaked, it can lead to fewer sales and less revenue. Information security must be applied to the ERP system as well and must incorporate the ERP system within the information security framework.

The next section focuses on a generic IT security framework and how the framework can assist organisations in complying with corporate governance requirements.

4.2 SECURITY FRAMEWORK

There are various security frameworks and each of them addresses a specific need, for example a security framework for online distance learning (Furnell, Onions, Knahl, Sanders, Bleimann, Gojny & Roder, 1998), a framework to analyse e-commerce security (Kesh, Ramanujan & Nerur, 2002) or the security framework for Internet banking (Hutchinson & Warren, 2003).

A generic information security framework is illustrated in figure 4-1. The framework can be divided into three components. These components are people, technology and policy (Pal & Thakker, n.d.). These three components are interdependent, i.e. the policy component will dictate how people must interact with the system and will also provide the guidelines for the technology framework. Any change to one of these components will have an effect on the two other components.

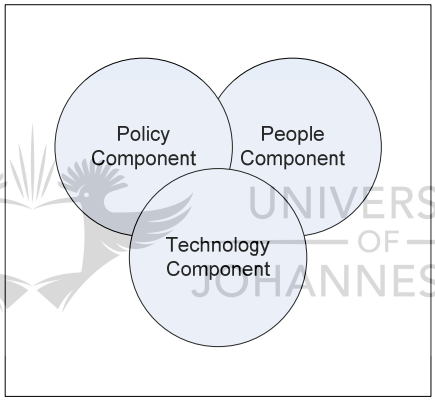

Figure 4-1: Security framework

The components of the framework are discussed in the context of an ERP system in the next section.

4.2.1 PEOPLE COMPONENT

The people component can be divided into two groups. The first group is the people responsible for deploying and maintaining the security and the second group is the people that are affected by security, i.e. the users.

The first group within the people component comprises the people that implement and support the security processes. This ensures compliance with international and national legislation. A few key roles include senior management, security administrators, IT administrators and auditors. Each person involved in the security framework will know exactly what their individual roles and responsibilities are. This means that there is no overlap in the roles and responsibilities and that every person involved will be responsible and accountable.

The second group of people within the people component is the actual users of the IT systems. These are the people that are affected by the security systems in place. They must be aware of the reasons why security is in place as well as the consequences if they breach the security. A simple example is what happens if a user gives his password to another user. The consequences may be fraud or theft and the question is then how to determine the guilty party.

It is important that both the users as well as the people responsible for implementing security understand the effect of security as well as the importance of enforcing it.

According to Martins (2003), the people component can be divided into nine aspects as illustrated in figure 4-2.

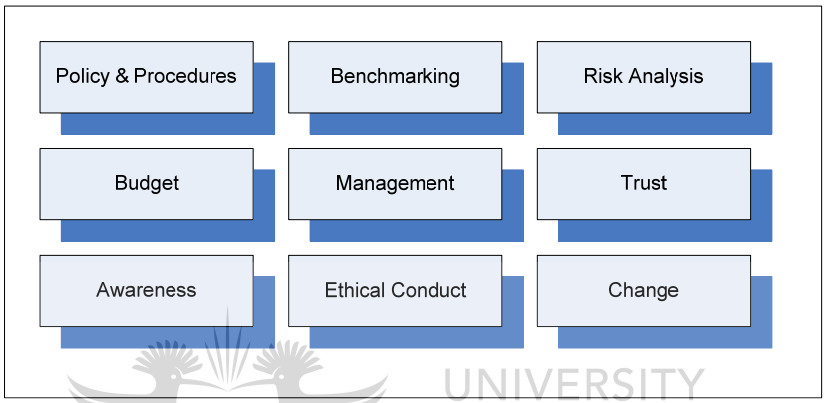

Figure 4-2: People component

Each component is briefly discussed in the following section.

- ***Policy and procedures:*** The information security policy dictates employee behaviour and states what is expected of employees. This in time becomes part of the information security culture (Hughes & Stanton, 2006). These policies and procedures are different from the policy component, although the policy component will influence the policies and procedures within the people component.
- ***Benchmarking:*** Guidelines on information security processes such as awareness, training and asset classification can be promoted in the organisation through benchmarking (Lillywhite, 1994). This will enable the organisation to compare itself to other similar organisations and to international standards such as Sarbanes-Oxley. It will also provide guidance for the employees' interaction with information assets so that they behave accordingly, thereby ensuring the security of information.
- ***Risk analysis:*** Through risk analysis, organisational assets, threats to these assets and security measures can be identified to develop the information security policy. This will enable the organisation to incorporate the necessary information security culture which could differ between organisations (Gerber & Von Solms, 2001). Employees need to perceive risk analysis as an accepted activity and part of everyday life in the organisation in order to incorporate it as part of the information security culture. This risk analysis

must form part of the organisation's risk management plan and cannot function on its own. The risk management plan must cater for IT security.

- ***Budget:*** A financial plan is necessary to implement an information security culture. For instance, employees need training, technical controls need to be implemented and teams need to be enabled to assess the security of networks. Spending money on the issues that need to be implemented, e.g. the formulation of an information security policy, needs to be accepted as an everyday activity. Spending money on information security will result in a potential revenue generator and business differentiator as it becomes part of the information security culture.
- ***Management:*** Management is responsible for information security. Management develops an organisation's vision and strategy which are required to protect information assets and which are implemented in the organisation. People will behave in a certain way, guided by the vision and strategy, which they follow to ensure the protection of information assets. In time, a culture will begin to emerge, reflecting the vision and strategy as well as the experiences the people had when implementing them. Therefore, management needs to model the correct information security behaviour, since it will become accepted as the way things are done and will be the reference for employee behaviour, which will later develop into a certain information security culture in the organisation (Siponen, 2000).
- ***Trust:*** Information security is arguably the most important issue in instilling trust in an IT environment. If management and employees trust one another, it is easier to implement new procedures and guide employees through changes of behaviour regarding information security. The perceptions of employees and management of trust between them need to be positive and should be seen as one of the organisation's characteristics, which will aid in instilling an information security culture. In the case of the Enron saga, trust was breached by the management of Enron and led to the ultimate downfall of the organisation.
- ***Awareness:*** Since the effectiveness of information security controls depends on the people who are implementing and using them, employees need to be enabled through awareness and training to behave according to what is expected of them in order to ensure the security of information assets (Valentine, 2006). There is a need for an information security culture in which employees are enabled and equipped to behave in such a way that they do not pose a threat to the security of information assets in the organisation.
- ***Ethical conduct:*** Good practices are not added to an organisation through regulation, incentives and monitoring. They must rather form part of the culture which is established throughout the organisation. Therefore, employees need to incorporate ethical conduct or behaviour relating to information security as part of their everyday life in the organisation (Phukan & Dhillon, 2000). This will be part of the culture of the organisation as described in section 2.4.4.3 of chapter 2. Ethical conduct, e.g. not copying organisational disks at

home or using the Internet for personal gain during working hours, needs to be enforced as the accepted way of behaving in the working environment for the correct information security culture to emerge in time.

- ***Change:*** New technology changes, e.g. wireless networks, involve challenges to ensure secure communication and to help users to use it in a secure way. These changes need to be managed and accepted positively in the organisation. Implementing an information security policy could also mean that employees need to change their working practices to ensure the effective implementation of information security. These changes need to be managed in such a way that employees are able to incorporate the changes into their working environment. The accepted changes will then in time become part of the information security culture. These changes will form part of the change management modules described in section 2.4.5 of chapter 2.

These nine aspects form the basis of the people component and should be taken into consideration with the other two components of the security framework. It must be noted that these nine aspects are applicable to both groups within the organisation.

The following section discusses the second component of the security framework as illustrated in figure 4-1.

4.2.2 POLICY COMPONENT

Information security is a key aspect of information technology governance (IT Governance Institute, n.d.). Various methods are available to an organisation to make information security part of corporate governance. International standards include IT Infrastructure Library (ITIL) and Control Objectives for Business Information Technology (CobiT).

Figure 4-3 illustrates the breakdown of the policy component into the three levels of CobiT, ITIL and ISO 17799.

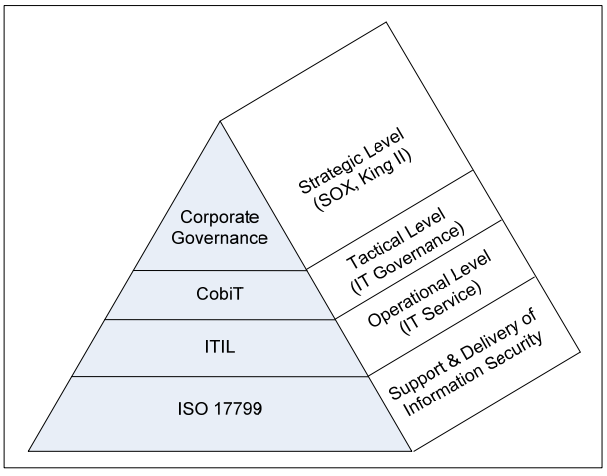

Figure 4-3: Policy component

Corporate governance is guided by Sarbanes-Oxley (SOX) in the United States of America and in South Africa the equivalent is King II. Corporate governance is initiated and managed at strategic level within an organisation. The subsequent levels of the policy component are discussed in the next sections and provide an overview of the different policies.

4.2.2.1 Control Objectives for Business Information Technology (CobiT)

Organisations rely completely on the processing of information such as an ERP system (Tihanyi & Thomas, 2005). The biggest issue that faces an organisation is whether the ERP system delivers the needed information, in other words whether IT is aligned with the strategies of the organisation (De Búrca et al., 2005; Verville & Bernadas, 2005). Information technology must also be aligned with the vision and strategies of the organisation. One of the strongest practices available to assist an organisation in determining if IT supports the vision and strategies of an organisation is CobiT (Malik, 2001).

Organisations that deploy CobiT find that the clarity and simplicity it brings to an organisation is highly valuable. The CobiT framework can be used to explain how IT processes can deliver information needed by the organisation to achieve its objectives.

CobiT is an IT governance control framework and maturity model and its purpose is to ensure that IT resources are aligned with the organisational vision and strategies. However, CobiT does not include control guidelines or practices, which are the next level of detail. It does not include process steps and tasks either because it is a control framework rather than a process framework (Mingay & Bittinger, 2002). CobiT focuses on what organisations need to do and not how they need to do it. ITIL focuses on how it needs to be done and is discussed in the following section.

4.2.2.2 IT Infrastructure Library

Successful implementation and management of IT requires a balanced focus on three critical elements, namely people, process and technology (Brittain & Mingay, 2002). Two of these elements, namely people and technology, are addressed by the security framework. The third element, policy, is related to the process element of IT management. Processes must be in place to implement the policies of the IT division. The reverse is also true. Policies will dictate the process that must be followed within the IT division (Brown & Nasuti, 2005). ITIL focuses on the process component of IT management and is a valuable resource to manage the processes within an organisation (So & Bolloju, 2005).

ITIL describes and defines key processes such as problem, change and configuration management. It also provides a framework for managing these processes (ITIL, n.d. What is ITIL?). By forcing a focus toward aligning and defining a specific process, the IT department can identify opportunities for improvements in efficiency which can result in the improved ability to better manage service delivery and quality of service. ITIL is currently available in version 3 (ITIL, n.d. ITIL V3).

ITIL is based on defining best-practice processes for IT service delivery and support rather than defining a broad-based control framework. It deals with the method and has a much narrower scope than CobiT because it focuses on IT service management but it defines a more comprehensive set of processes within the narrower field of service delivery and support.

It can be said that CobiT dictates what needs to be done, but ITIL provides the mechanism for how it must be done. By using the combination of CobiT and ITIL, the implementation of IT security forms part of IT governance and ultimately part of corporate governance (Mingay & Bittinger, 2002). One of the components of ITIL is information security and deals specifically with the way information security must be implemented.

ISO 17799 forms the basis of security governance. CobiT says what must be done, ITIL explains how it must be done and ISO 17799 focuses specifically on the detail of security.

4.2.2.3 ISO 17799

ISO 17799 is an accepted international standard that provides guidelines and recommendations for security management (Hoekstra & Conradie, 2002; Chang & Lin, 2007). ISO 17799 can be divided into 10 modules that can be used by an organisation to implement security. The modules are:

- ***Security policy:*** This is the documentation and communication of the information systems policy. It must be reviewed on a regular basis (Hughes & Stanton, 2006).
- ***Security organisation:*** This module focuses on the allocation of roles and responsibilities to individuals within the organisation. It will have an impact on the people component of the security framework. The module also controls the access of third parties to facilities.
- ***Asset classification and control:*** The function of this module is to determine information assets and to define the levels of protection that these assets require.
- ***Personnel security:*** The module focuses on the recruitment and screening of employees, the training and awareness of employees in security related aspects as well as the reporting of security incidents that occur (Power & Forte, 2006).
- ***Physical and environmental security:*** Facilities must be protected by secure areas and equipment must be housed within these secure areas. This also includes the control of access to information and property.
- ***Communications and operations:*** The establishment of operational procedures, segregation of duties and the protection of information against malicious software forms part of this specific module.
- ***Information access control:*** This module manages the access to the application, operating and network levels (Krehnke & Krehnke, 2006).
- ***System development and maintenance:*** Identification of system security requirements, incorporating security into applications and various security aspects such as encryption

form part of this module. This module interacts with the technology component of the security framework.

- ***Business continuity:*** Business continuity includes plans, a framework that determines roles and responsibilities, the testing of business continuity and the maintaining and updating of the business continuity plan (Stanton, 2005).
- ***Compliance:*** Information must comply with legal requirements and it must be retained according to legislation such as the Electronic Communications and Transactions Act of South Africa or SOX (Watts, 2006).

ISO 17799 forms the lowest level of corporate governance and provides specific aspects that must be implemented and addressed within the organisation.

It is clear from the above that there can be no doubt any longer that information security, seen as the discipline to ensure the confidentiality, integrity and availability of electronic assets, is an extremely important aspect in the strategic management of any organisation. It is also a known fact that the important strategic role of information security is only really established in an organisation once senior management gives it full support and commitment. Information security has long since moved away from being only a technical issue, and has really today become a management issue (Von Solms, 2001).

Information security is driven by policies and corporate governance as explained in the previous sections. It is also important that these policies and corporate governance be applied to the ERP system of the organisation. The ERP system cannot stand in isolation. All the business information of the organisation is stored within the ERP system and it is therefore essential that the system adhere to ITIL and CobiT. This issue of system changes during the implementation of an ERP system is discussed in section 2.4.5.3 of chapter 2. This adherence to international standards and procedures makes the ERP system easier to audit and provides a sense of comfort to the executives of the organisation. This comfort will only be achieved if the ERP system forms part of the bigger picture of ITIL and CobiT within the organisation.

The implementation of ITIL and CobiT alone does not ensure the security of the information. Technology and its application play a vital role in ensuring that information is safe and secure. CobiT, ITIL and ISO 17799 provide an organisation with more than enough information on how to implement and manage information. It is therefore not necessary to recommend any changes to these standards. These standards are more than appropriate to provide guidelines for the implementation of an ERP system.

The next section deals with the technology aspect of information security.

4.2.3 TECHNOLOGY COMPONENT

The technology component of information security can be broken down into five pillars (Von Solms & Eloff, 1997). The five pillars provide an organisation with a system to do the design of an ERP system and are discussed in the following sections.

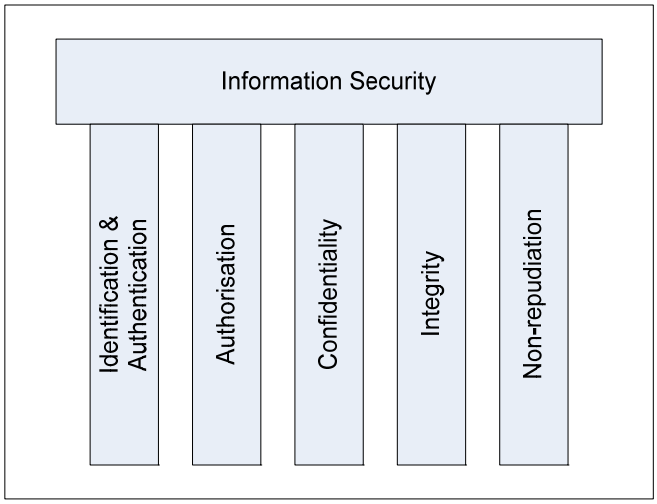

Figure 4-4: Five pillars of information security

Each pillar is discussed in relation to an ERP system in the following sections.

4.2.3.1 Identification and Authentication

The first responsibility of information security within an ERP system is to ensure that the ERP system is accessed by authorised users only (Yang, Wang, Bao, Wang & Deng, 2004). This is necessary to ensure that only users who are legitimate users can access the system. The ERP system allows pre-registered users to access the system. This implies that all users must be created upfront by the ERP system administrator before they can access the system.

Any user of the ERP system will be issued with a unique user-id. This user-id will be used to gain access to the ERP system. Any user who wants access to the ERP system will be requested to enter his/her user-id. Once the user enters the user-id, the ERP system will check whether such a user-id exists or not. If it does not, then the request is rejected and no access is allowed.

If the user-id is valid, then the next step is to authenticate it. User-ids are no secret and different users within an organisation will know one another's user-ids and it is thus easy to enter the user-id of someone else. The next step is therefore to prove that the offered user-id really belongs to the user offering it. This is known as authentication and is based on the fact that the user has a secret parameter only known to him/her. This secret parameter linked with the user-id will give the user access to the ERP system if the ERP system can match the user-id and secret parameter.

Once the user gains access to the ERP system, he/she can then transact within it. He/she could potentially transact at random unless some form of restriction is enforced. Authorisation prohibits a user from transacting at random.

4.2.3.2 Authorisation

One of the most critical aspects to consider within information security and ERP security is to restrict the access rights and actions of the users within the ERP system (McLean, 2000).

Different functions with associated rights are found within an ERP system such as the printing of an invoice or the issuing of an order. Each of the functions has an impact on the organisation. A user with unauthorised access to the HR module within the ERP system can potentially manipulate salaries or annual increases, or an order clerk can issue an order to a fictitious customer.

A security matrix needs to be designed that lists the different users within the ERP system as well as the different levels of access they have to the different modules within the ERP system. This security matrix will show the explicit rights that a user has and if these rights are not listed within the security matrix, then the user will not have the necessary access.

The first step is to determine which modules a user can access within the ERP system. A user can access only the order entry module within the financial component or the entire HR component.

The second step is to determine the types of access within the specified module like read, write or execute access. To generate orders, a user must have read, write and execute access. Another user might just print invoices and will therefore only have read access on the ordering module.

The ERP system administrator must control the levels of authorisation and the authorisation must be audited on a regular basis to prevent unauthorised access.

4.2.3.3 Confidentiality

Protecting the confidentiality of data implies the assurance that only authorised people may view specific data sets (McMillen, 2004).

Confidentiality is ensured by encrypting the data in such a way that it cannot be read without a decryption tool. Only authorised people can decrypt the data into its original form (Eigeles, 2006). Encryption is the only real technology available to protect the confidentiality of the data.

During the design and implementation of the ERP system, encryption of the data must be considered. It is of no use to the organisation if access and authorisation are controlled and managed through the ERP system but someone can access the data by other means.

Unauthorised access to the data can take place in the following ways:

- People use sniffer equipment to eavesdrop on the network of the organisation. The purpose of this eavesdropping is to get hold of a user's ID and password (Kruse II & Heiser, 2004). This can then be used to gain access to the ERP system.
- Hackers outside or inside the organisation can gain access to the ERP database, which is used to store all the information of the ERP system. Access to the database provides hackers with the opportunity to alter the data or to sell it to the competitors of the organisation (Furnell, Chiliarchaki & Dowland, 2001).

The data must be encrypted right from the beginning and the ERP system must be able to encrypt and decrypt the data. In other words, when an order clerk issues an invoice, the ERP system must decrypt the data to display it as an invoice. The data should not be able to be presented directly as an invoice. This process of encryption and decryption must be transparent to the users of the ERP system.

4.2.3.4 Integrity

The ERP system will have no value to the organisation if the information it displays does not have integrity (Cohen, 1988). All the necessary identification, authentication and authorisation might be in place for an order clerk to process an invoice, but it is of no use if the system indicates that there are, for example, 100 bags of a specific product available where there are in actual fact only 50 bags available. This implies that the integrity of the ERP system is at stake and the users will not trust the system anymore and will revert to a manual system.

Integrity means that only authorised users can modify the data of the ERP system (Tickle, 2002). Modification refers to the update, deletion and creating of data within the ERP system. There are various methods to provide integrity to the data and these methods should be incorporated into the design of the ERP system.

One such method is to use an authenticator (Pernul, Tjoa & Winiwarter, 1998). An authenticator proves the secure state of information transmitted between the user and the ERP system. An additional piece of identification or token is added to the information to prove the authenticity of the information.

4.2.3.5 Non-repudiation

With the use of an ERP system and the associated e-commerce side of an ERP system, it has become increasingly important to ensure that the person transacting with the organisation really is the person they state they are (Feng & Wah, 2002). With the introduction of ERP II and collaboration, this will become an increasingly serious issue for organisations.

In the past, a signature was enough proof to indicate that a customer did order stock or pay the invoice. In the electronic age, new ways of verification must be used to prove that a legitimate transaction took place if queries arise from either the customer or the auditors of the ERP system.

The organisation must devise ways and methods to ensure that a transaction done through the e-commerce side is legitimate and can be proven as legitimate in case of a query or dispute. Organisations can make use of digital signatures or public key encryption to enforce valid and legal transactions (Bell, Thimbleby, Fellows, Witten, Koblitz & Powell, 2003).

The proof of origin and message integrity services can be provided in a number of ways. The easiest method is for the sender to append a message authentication code (MAC) to the message, which is then verified by the recipient. Because the MAC is computed using a secret cryptographic key, known only to the two communicating parties, then provided the MAC verifies, the recipient is convinced that the message must have come from the claimed sender and the message has not been altered during transmission. This is known as a digital signature (Ganley, 1998).

The way to implement a digital signature is to use public key indicators (PKIs). PKIs ensure that people are who they say they are and also prove that documents have not been tampered with, which is critical when conducting online transactions, such as placing orders or transferring money (Rothman, 1999). PKIs involve the use of extremely long prime numbers, called keys. Two keys are involved - a private key, which only one person has access to, and a public key, which can be accessed by anyone. The two keys work together, so a message scrambled with the private key can only be unscrambled with the public key and vice versa. The more digits in these keys, the more secure the process.

It is clear from the five pillars that the security of data within the ERP system is important to the organisation. It is also clear that all five pillars must be involved and not only one or two. This is necessary to ensure that the ERP system is perceived as a trustworthy system.

The security framework discussed in the previous sections provides the organisation with a method to implement information security and to ensure that the information is intact as far as possible. The framework can be used to implement ERP security as well and will therefore be used to implement and manage security. This security framework can be used to manage access to IT systems and, in particular, ERP systems. Based on this information, the first objective of the chapter has been met.

There are, however, certain areas within an ERP system that are not covered by the security framework, especially within the technology component. The following section discusses ERP security threats and links them to the framework to determine possible gaps.

4.3 ERP SYSTEM SECURITY THREATS

While most information security initiatives focus on perimeter security to keep outsiders from gaining access to the internal network, the potential for real financial loss comes from the risk of outsiders acting as authorised users to generate damaging transactions within business systems (Van Holsbeck & Johnson, n.d.).

The continued integration of ERP software increases the risk of both hackers who break through perimeter security and insiders who abuse system privileges to misappropriate assets through acts of fraud (Litan, 2003).

Security in the ERP world requires a new way of thinking about security: how business transactions can inflict financial losses from systems-based fraud, abuse and errors.

While external threats from attacks and intrusions continue to rise, the opportunity for insider fraud and system abuse has increased exponentially with the advent of a single automated system that manages accounts payable, employee benefits and other sensitive information.

Initially ERP security focused on the internal controls that aim to limit user behaviour and privileges while the organisation relied on network perimeter defences such as firewalls, virtual private networks (VPNs) and intrusion detection to keep outsiders from accessing the ERP system. However, increasingly integrated information systems with numerous system users require new levels of transaction-level security.

Most organisations struggle in their ERP security efforts because they implement systems with a plan that leaves control design and implementation until the end of the process. However, ERP implementations are invariably over budget and behind schedule (Ptak & Schragenheim, 1999), so strict internal controls are often glossed over to keep costs down and make up time. Some organisations decide against stringent controls because internal controls can introduce additional overhead by making it hard for employees to do their jobs with process inefficiencies. These controls form part of corporate governance and must be included in the ERP system. The success of an ERP system will also be measured against the compliance with corporate governance and not just the time and effort it took to implement the ERP system.

The biggest drawback of relying on internal controls for ERP security comes from the costly and time-consuming maintenance of those controls (Blosch & Hunter, 2004). As employees are promoted, reassigned or terminated, organisations must continually update their business systems with each employee's correct authorisation level. The advent of new business partners, the creation of new business departments or entry into new markets also requires new or modified procedural rules. Maintenance of the ERP system can turn into a never-ending resource drain.

ERP systems affect many processes, people and technologies as described in chapter 2. They introduce a whole new environment to an organisation, one that affects the security and data integrity of every business process they interact with. Organisations continue to expand their planning systems to include SCM, CRM and real-time enterprise concepts. As they do so, concern and uncertainty over ERP security and potential ERP security risks grow.

Addressing these ERP security concerns can be a problem. ERP systems are implemented rapidly, have complex security requirements, suffer resource constraints and require manually intensive administration. Organisations are often uncertain how to monitor security. ERP

security may be an organisation's first attempt to address IT system security. Organisations new to security will face extra difficulties because they lack resources and a culture that supports IT security.

Van Mien and Noakes-Fry (2004) have identified some major ERP security concerns. These concerns are mapped back to the five security pillars to determine if the five pillars are enough to address security within an ERP system. These ERP security concerns are:

- Poor management of access control
- Failure to detect abnormal transaction execution
- Breaching confidentiality and integrity of data
- The problem of downtime or unavailability
- The need to segregate duties
- Auditing of the ERP system

These concerns are discussed in detail and linked to the five pillars to determine if the five pillars address these concerns raised by Van Mien and Noakes-Fry (2004).

4.3.1 POOR MANAGEMENT OF ACCESS CONTROL

Problems arise within ERP systems, with ERP systems from multiple vendors and with non-ERP systems. Security authorisation and user issues become complex within ERP systems. For instance, a policy covering user access in the ERP system may contain several potentially confusing policies, procedures and conditions dealing with a variety of roles, systems and transactions. Organisations must address two challenges:

- To create a process to establish, review and change user authority profiles as and when required, and ensure that changes are properly authorised (Betteridge, 2002).
- To decide how user accounts should be managed, put password controls into place and work out what to do with "super user" accounts.

To overcome the issue of access control, organisations must implement a user provisioning process that ties user management workflow features to other business processes (for example, employing automated procurements and e-mail approvals) and role- and policy-based access management.

The issue of access control or authorisation is addressed by the second pillar in figure 4-4. If the organisation implements the use of a security matrix tied to role-based access, this issue does not have to be a concern (Eigeles, 2006). The organisation must ensure that the correct access is given to the right employees.

4.3.2 FAILURE TO DETECT ABNORMAL TRANSACTION EXECUTION

A great deal of fraud is initiated by insiders and takes advantage of poor handling of users' access permissions within the system and insufficient audit and control to trace illegal transaction access (Porter, 2003). Real-time monitoring and authorisation are needed to spot fraud among the 10 000 transactions processed every day in the average ERP system. It is

vital to control each critical transaction. Authorisation checks are critical to determine whether duties are segregated appropriately.

Organisations must implement authorisation engines and blocking systems (Guel, 2002). Blocking systems need to block transaction execution as soon as tolerances are exceeded, for example during invoice verification. Random invoices should be blocked for spot checks. Transaction authorisation engines are needed to trace, check and review users' activities and compare them with the activities users are permitted to perform.

The authorisation pillar deals with the issue regarding authorised and unauthorised access. The threat of abnormal transaction execution will be minimised if proper authorisation is in place and assigned to users (Alsène, 2007). Organisations must not just rely on authorisation to minimise abnormal transactions, but must implement audit trails and security checkpoints to control abnormal transactions. These abnormal transactions must be highlighted on a regular basis in order to alert the organisations to them.

4.3.3 BREACHING CONFIDENTIALITY AND INTEGRITY OF DATA

ERP systems face traditional data security and human security issues. Social engineering ploys could trick a responsible person into granting access to key information. ERP integration is built on the principle that data is captured only once (Maurizio, Girolami & Jones, 2007). For example, a purchase order captures all the information necessary for supply of goods, allowing the goods receipt, invoice receipt and payment to be based on this initial data capture. In human resources, auditors must evaluate whether the security access restrictions to sensitive data are adequate. Systems must be consistent with the laws and regulations governing storage and transmission of personal data.

Organisations must ensure that all source data has been prepared by authorised personnel who are acting within their authority and that duties are segregated. They must implement a data management process to classify data according to business criticality and control the mapping and the workflow of data stored within database repositories. This requires the development and maintenance of transaction and data cartography.

4.3.4 SEGREGATION OF DUTIES

It is not unusual for people to have several roles in an organisation but this can lead to regulatory violations. Most systems of internal control rely on segregating access to assets from responsibility for maintaining the accountability for those assets (Foster, Ornstein & Shastri, 2007; Mansar & Reijers, 2007). One person should not do both. Responsibilities that should be segregated include:

- Transaction initiation (acquisitions or disposals)
- Transaction authorisation
- Transaction recording
- Custody of assets

- Reconciliation of physical fixed assets and liabilities to records

For example, it would be a violation of the segregation of duties principle to authorise one person to set up a new vendor and to enter an invoice. Those responsible for acquiring, disposing of, recording and maintaining fixed assets should be responsible for only one of these functions and should have no system access to functions outside their assigned role. Those responsible for processing transactions relating to fixed assets should not maintain, or even be able to update, the master file of fixed assets.

In a manual system, segregation of duties may be enforced administratively, based on assignment of job responsibilities. In an automated system, segregation of duties is typically enforced through use of automated access restrictions, like authorisation engines and audit systems.

Three of the five security pillars address the concerns raised by Van Mien and Noakes-Fry (2004) and are illustrated in table 4-1.

CONCERN OR ISSUE	ADDRESSED BY
Poor management of access control	• Authorisation • Identification and authentication
Failure to detect abnormal transaction execution	• Authorisation • Identification and authentication
Breaching confidentiality and integrity of data	• Confidentiality • Integrity
Segregation of duties	• Authorisation • Identification and authentication

Table 4-1: Mapping of security pillars

The following two concerns are not addressed by any of the five security pillars.

4.3.5 DOWNTIME OR UNAVAILABILITY

ERP systems need to remain available for business continuity as demanded by ITIL and ISO 17799. Organisations must be prepared to restore the system and data and reduce the need for system downtime, maintenance and management. Particular problems include scheduling background jobs, distributing and balancing workloads, monitoring the performance of ERP applications, databases, operating systems and networks, generating alerts and customer-tailored performance thresholds and analysing exceptions.

With the advent of the global economy and customer demands to access goods and services immediately, an organisation cannot afford its IT systems not to be up and running 24 hours a day. A customer in Japan might place an order with an organisation in Europe. Owing to the time difference the order is placed in the evening in Europe. If the organisation's systems are not up and running 24 hours a day, the order will be lost. The problem this causes to ERP systems is that there is never time to do system maintenance and if a disaster does occur, the organisation will lose business even if the ERP system is down for only a couple of hours.

Service levels such as response time and system downtime must be managed. An organisation can implement automated ERP performance and availability management to improve service levels and speed up the response when failures do occur.

4.3.6 AUDITING THE ERP SYSTEM DESIGN

System design auditing should be performed as early in an ERP implementation as possible. But when resources are stretched and deadlines short, audit issues can be overlooked. Unfortunately, this can lead to an insecure system with poorly designed controls. Once the system is deployed, auditing requires a risk-based systems review supported by detailed checklists and practical experience in designing controls (Herrbach, 2005; Sällebrant, Hansen, Bontis & Hofman-Bang, 2007). This sort of review will not only uncover weaknesses but also support a redesign to improve security levels.

The auditing of the ERP system includes the physical auditing of transactions to ensure that the information flowing between the modules is not tampered with. It also includes the financial aspect of the ERP system to ensure that financial statements are balancing and that fraud was not committed (Chan & Leung, 2006).

Given these highlighted threats, it is obvious that the five pillars proposed by Von Solms and Eloff (1997) do not address all the issues regarding an ERP system. The five pillars can be extended to seven pillars to include the issues of downtime or unavailability and the auditing of the ERP system, as illustrated in figure 4-5. This can be seen as the ERP security pillars (Marnewick & Labuschagne, 2005b).

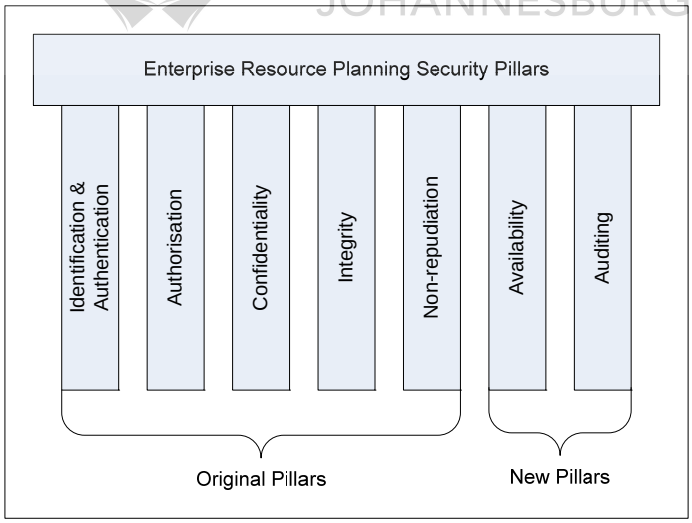

Figure 4-5: Seven pillars of ERP security

The security framework dictates the way security within the ERP system is addressed. This is due to the fact that ERP security is a section of information security. Information security is governed by the vision and strategies of the organisation as well as corporate governance and legislation.

The security framework illustrated in figure 4-1 can be used to manage the security issues surrounding ERP systems. The only change to the security framework is the addition of two pillars within the technology component. This change is made to accommodate the security within an ERP system.

ERP security must adhere to the people and policy components of the security framework. Special attention must be given to ITIL and CobiT to ensure that the organisation complies with national corporate governance standards such as King II and the South African Electronic Communications and Transactions Act. This means that ERP security cannot be treated as an add-on functionality but must be in line with the vision and strategies of the organisation.

The design of the ERP security framework addresses the second objective of the chapter. The ERP security framework is based on the general IT security framework but with additional pillars to specifically accommodate issues related to ERP systems.

The next section deals with the implementation of security within the ERP system to ensure that ERP security is not treated reactively.

4.4 INTEGRATING INFORMATION SECURITY WITHIN ERP MODEL

The ERP model and its components were explained in chapter 2. The ERP model (Marnewick & Labuschagne, 2005a) consists of four components that are implemented through a methodology and is illustrated in figure 4-6. Each component of the ERP model is mapped onto each component of the security framework.

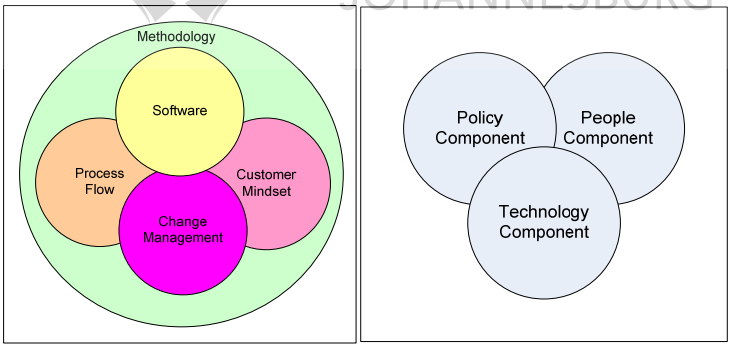

Figure 4-6: Mapping of security framework onto ERP model

The ERP model forms the basis for implementing the security framework discussed in section 4.2. This alignment of the ERP model and the security framework enables an organisation to implement an ERP system that conforms to international security standards. It will ensure that once security is implemented, it is an ongoing function within the ERP system and it will not be neglected.

The following sections discuss the integration of the ERP model with the security framework. This alignment highlights the different areas within the security framework that will be of value to the different components of the ERP model.

The first section discusses the software component of the ERP model.

4.4.1 SOFTWARE COMPONENT OF THE ERP MODEL

The software component of an ERP system comprises all the modules within the ERP system such as the financial or the SCM modules as discussed in section 2.4 of chapter 2.

4.4.1.1 Policy Component of the Security Framework

As section 4.2.2 explained, the policy component is all about the policies and procedures that must be in place to manage and enforce security. Although the software component only deals with the software modules within an ERP system, ITIL and CobiT will determine how the software is implemented. CobiT will dictate to the SRM module how security must be managed with a customer. ISO 17799 will have an effect on the software module and a summary is shown in table 4-2.

- ***Security policy:*** A policy needs to be defined on how the ERP system will function and it will include all relevant information.
- ***Asset classification and control:*** Although an ERP system is perceived as software, it also includes hardware and networking infrastructure. All these assets need to be classified and controlled. They also include intellectual capital such as customisation of the ERP system.
- ***Physical and environmental security:*** The physical ERP servers need to be hosted in a secure environment. Access to the system must be controlled and only certain individuals need to have access to these premises.
- ***Communications and operations:*** Operational procedures must be in place, e.g. frequency of backups and the protection of the ERP system against unlawful access.
- ***Information access control:*** Only certain users can have access to the ERP system and even to only some modules and functions within the ERP system.
- ***System development and maintenance:*** This module will define the security within each software module and how the data will be encrypted.
- ***Business continuity:*** The ERP system must be available for transacting and business continuity plans must be defined and tested to ensure that the ERP system can function in the event of a disaster.
- ***Compliance:*** The ERP system must comply with standards and legislation.

Almost all the aspects of ISO 17799 must be taken into consideration except, for instance, personnel security. The software component does not dictate who will be employed by the organisation.

4.4.1.2 People Component of the Security Framework

Although people are going to use the ERP system and will be affected by the security surrounding the ERP system, the software component is not affected that much by the people

component. The issues that do affect the people component are the soft issues such as trust and ethical conduct.

- ***Budget:*** Money needs to be spent by the organisation to ensure that the users of the ERP system understand the way the system works, the effect of security on the way they work and the issues surrounding ERP security.
- ***Management:*** The users of the ERP system will enforce security only if it is encouraged by the management of the organisation.
- ***Change:*** The implementation of the ERP system will have an effect on the users since it will bring change into their lives. The organisation must know how to deal with this change and this forms an integral part of the change component of the ERP system.

The technology component will focus on the issues that will have an effect on the software component of the ERP model.

4.4.1.3 Technology Component of the Security Framework

The seven pillars of ERP security can be applied to the software component. The identification and authentication pillar will determine who will have access to the software components and the authorisation pillar will determine the type of access and also the access to the different modules within the software component. The information supplied to the user by the software modules must be integrated as well as confidential. This means that information must flow from one side of the ERP system, such as SRM, right through to the printing of the invoice without any user intervention. It also means that special deals that were loaded by the supplier must not be visible to outside people and must remain confidential.

Non-repudiation plays an important role, particularly in the SRM and SCM modules. All the software modules must always be available especially for the interaction and flow of information between the different modules as well as for customer and supplier convenience. All aspects must be auditable and it is very important that the software comply with auditing standards.

The second component of the ERP model is the customer mindset component. This component deals with the way the users perceive the ERP system. It might be perceived as a threat or a mechanism to facilitate their work.

4.4.2 CUSTOMER MINDSET COMPONENT OF THE ERP SYSTEM

4.4.2.1 Policy Component of the Security Framework

The policies and standards of the organisation will affect the way users perceive the ERP system. Security must be integrated into the ERP system in order to minimise its effect. The users must not see security as a burden but as a necessity to ensure the integrity and confidentiality of information. If the organisation takes security seriously, then the users will also take security seriously. A few modules of ISO 17799 play a role in the customer mindset

component. One is the security organisation that determines the roles and responsibilities within the organisation. Another is the personnel security module that determines who is employed.

4.4.2.2 People Component of the Security Framework

The people component and the customer mindset both deal with the way that the user interacts with the ERP system and the security issues surrounding the system. These two components influence each other and are interdependent on each other. Details of the comparison of these two components are as follows:

- ***Policy and procedures:*** The policy and procedures instilled by the organisation will influence the employees of the organisation. The way they work and methods they use will be governed by the policies and procedures.
- ***Benchmarking:*** The organisation can use benchmarking to compare itself to other organisations. This comparison will enable the organisation to determine where it is lacking security and how it measures up as an organisation to the rest of the industry.
- ***Risk analysis:*** The employees of the organisation must be involved in the day-to-day risk analysis. This will ensure that the security policies are up to date and will also make the users aware of any security breaches.
- ***Budget:*** The organisation needs to train the users on the impact of security on their lives and the way that they work. The implementation of security changes the way users work and interact with the ERP system and the budget should be allocated to address these issues.
- ***Management:*** The management of the organisation will make security a way of living by enforcing and implementing security themselves.
- ***Trust:*** The users of the ERP system must be trusted by the organisation to interact with the ERP system. The organisation must trust that users will enforce and adhere to the security rules and regulations.
- ***Awareness:*** The users must be aware of the impact on the confidentiality and integrity of the system if they do not abide by the security policies.
- ***Ethical conduct:*** The integrity of the ERP system will be affected by the ethical code and conduct instilled by the organisation. The users of the ERP system must be aware of the fact that they cannot take work home and work on the information at home.

These aspects of the people component will influence the way that a user will interact with the security surrounding the ERP system. The next component is the technology component and the impact it has on the users' mindset.

4.4.2.3 Technology Component of the Security Framework

Identification and authentication play a vital role in the customer mindset component. The mindset of the users will determine if the technology component will have an effect or not. If the users do not buy into the rules of the technology component, then the security will have no effect. For example, the users must understand what the consequences are if they pass their username and password on to someone else. This affects the authorisation pillar as well. The users must not reveal their passwords to any other person.

The consequences can be far-reaching and the users must be aware of them. The ERP system must also be audited to ensure that the users comply with the policies and procedures of the organisation.

The ERP system cannot be implemented within an organisation if there are no changes. The following section will discuss the change management component of the ERP model.

4.4.3 CHANGE MANAGEMENT COMPONENT OF THE ERP SYSTEM

Change management deals not only with the changes that the ERP system enforces on the organisation, but also with system changes once the system is implemented and the business process changes.

4.4.3.1 Policy Component of the Security Framework

Changes to the ERP system cannot be made without considering the policies and standards of the organisation.

The deployment of new versions of software will be managed by ITIL and the use of ITIL will ensure a smooth upgrade. During the lifetime of an ERP system, business processes will change. These changes must be managed using ITIL and business process changes will definitely have an impact on the security. Certain aspects of security might change and these changes must be made by taking CobiT into consideration. ISO 17799 plays a vital role in the implementation of the ERP system and will manage the security aspects during the changes that are instilled by the ERP system. Changes to the security policies will be addressed by the security policy component and the new roles and responsibilities will be addressed by the security organisation component.

4.4.3.2 People Component of the Security Framework

Certain aspects of the people component do have an impact on the change component of the ERP model. Policies and procedures will change during the implementation of an ERP system and awareness regarding the system will change to accommodate a new method of doing things. The management of the organisation must also ensure that the users are aware of these changes to the policies, and the necessary education must be provided.

4.4.3.3 Technology Component of the Security Framework

System and business process changes do affect the following four pillars:

- ***Confidentiality:*** The system or business process changes must not have an effect on the confidentiality. The information must still only be accessible by authorised users.
- ***Integrity:*** The information must not be compromised during changes and must still be intact after the changes to the ERP system.
- ***Availability:*** The ERP system must be available for transacting and this makes it difficult for system administrators to implement new system changes. Careful planning is needed to minimise the effect of downtime.
- ***Auditing:*** After system or business process changes, the ERP system must still pass all audits.

4.4.4 PROCESS FLOW COMPONENT OF THE ERP SYSTEM

The process flow component of the ERP system deals with the way and method that information flows between the different software modules.

4.4.4.1 Policy Component of the Security Framework

ISO 17799 will have an effect on the way the different components interact with one another. It will also determine the level of information that flows between the different software components.

- ***Asset classification and control:*** This component will determine the protection between the different modules and will ensure that the different software modules do not influence one another in a negative way.
- ***Communications and operations:*** During the flow of information between the different modules, this component will provide the guidelines to ensure that the information is intact and not tampered with.

Aspects that must be considered during the process flow are the access control and the system maintenance of the ERP system.

4.4.4.2 People Component of the Security Framework

The people component does not play a vital role because all information flow takes place in the background of the ERP system. The only aspect of the people component that must be taken into consideration is that the users must be aware of how the system works. Although information flows between the modules in the background, they must be aware of the impact their actions might have later on in the system.

Users must be provided with the necessary education and training to understand the impact of their actions on the total ERP system and not just on the section that they control.

4.4.4.3 Technology Component of the Security Framework

The flow of information between the different software components must be controlled by the following pillars:

- ***Integrity:*** The information that flows from one software module to another or even within a module must be the same when it reaches the other software component. The information must not be altered during the process flow.
- ***Availability:*** The ERP system must be available to ensure that information can flow between the different modules. If some modules are not available, this can lead to corrupt data or the recapturing of data.
- ***Confidentiality:*** Information will be confidential, since no user interacts with the information as it flows from one module to another. The less user interaction, the better the confidentiality of the information.

The following section maps the methodology component of the ERP model onto the components of the security framework.

4.4.5 METHODOLOGY COMPONENT OF THE ERP SYSTEM

4.4.5.1 Policy Component within ERP Security

The policies of the organisation must be adhered to when ERP security comes into play. The ERP system is not independent and must adhere to these policies and standards. As with the people component, this ensures that ERP security is in line with the information security policies.

It is the responsibility of the management to ensure that CobiT and ITIL are adhered to during and after the implementation of the ERP system. This adherence to international standards and policies ensures that customers are satisfied in dealing with the organisation. Customers are comfortable dealing with an organisation if they know that the organisation and subsequent system meet international standards such as CobiT and ITIL.

The policies of the organisation take precedence over the policies of the ERP system. This means that the ERP system must be adapted to accommodate the policies of the organisation and not the other way around.

The people and policy components form an integral part of ERP security and ensure that the ERP system adheres to the policies and standards of the overall information security. The technology component is the component that will ensure that these two components are implemented within the ERP system.

4.4.5.2 People Component within ERP Security

The people component will determine who within the organisation is responsible for the security aspects in the ERP system. These responsibilities will be derived from the overall people component of the security framework and will be incorporated into the ERP system security. If a person's responsibility is to implement password policies for the organisation, then that same person must be responsible for the password policies of the ERP system.

This will ensure that the people involved in ERP system security will view issues within the holistic context of organisational information security and not just as ERP system security. The team responsible for implementing the ERP system must incorporate information security

experts and these experts must ensure that the policy regarding information security is applied within the ERP system.

The project manager responsible for the implementation of the ERP system must ensure that all the relevant people are involved and incorporated into the project team. This will allow security to be implemented from the beginning of the implementation and not just as an afterthought (Posthumus & Von Solms, 2004).

The people involved in the security aspects surrounding an ERP system must adhere to the policies and international standards enforced by the organisation.

4.4.5.3 Technology Component of ERP Security

The different aspects within the technology component must be included during the design of the ERP system. These aspects will ensure that the ERP system is secure and that the data and information provided by the ERP system are reliable and trustworthy.

The seven pillars of ERP security must be incorporated into the ERP system. These pillars form the foundation of ERP security and determine what users and customers are allowed to do within the ERP system. These pillars also ensure that the integrity, confidentiality and availability of the information are above suspicion.

The project manager must ensure that these pillars are addressed during the design of the ERP system and that they form part of the overall project plan. The seven pillars must be just as part of the design as the process flows of information between the different software modules.

The above sections mapped the ERP model to the security framework to determine how the security framework can be used to implement and manage ERP systems. Table 4-2 provides a summary of this mapping process.

	Policy Component	People Component	Technology Component
Software Component	• CobiT • ITIL • ISO 17799 o Security policy o Asset classification & control o Physical & environmental security o Communications & operations o Information access control o System development & maintenance o Business continuity o Compliance	• Budget • Management • Change	• Identification & authentication • Authorisation • Confidentiality • Integrity • Non-repudiation • Availability • Auditing
Customer Mindset	• CobiT • ITIL • ISO 17799 o Security organisation o Personnel security	• Policy & procedures • Benchmarking • Risk analysis • Budget • Management • Trust • Awareness • Ethical conduct • Change	• Identification & authentication • Authorisation • Auditing of the people

Change Management	• CobiT • ITIL • ISO 17799 o Security policy o Security organisation o Communications & operations o Information access control o System development & maintenance	• Policy & procedures • Budget • Management • Awareness • Change	• Confidentiality • Integrity • Availability • Auditing
Process Flow	• ISO 17799 o Asset classification & control o Communications & operations o Information access control o System development & maintenance o Compliance	• Awareness	• Integrity • Availability • Confidentiality
Methodology	• ITIL • ISO 17799 o Personnel security o Communications & operations	• Policy & procedures • Risk analysis • Management • Awareness • Change	• Identification & authentication • Authorisation • Confidentiality • Integrity • Non-repudiation • Availability • Auditing

Table 4-2: Mapping of ERP model to security framework

It is clear from table 4-2 that an ERP system cannot be implemented or managed without taking the security framework into consideration. The security framework provides the project manager and system administrator with guidelines, policies and standards to implement and manage the ERP system. The information security framework must be kept in mind and adhered to during the design and implementation of the ERP system. This will allow an organisation to ensure that security is integrated into the ERP system and that it is not implemented afterwards.

4.5 CONCLUSION

This chapter focused on security within an ERP system. It provided a security framework that can be used to address all relevant security aspects within an organisation and to ensure that it forms an integral part of an ERP system. The security framework was mapped onto the ERP model to provide the organisation with a clear understanding of which security issues must be addressed within which ERP component.

It is clear given the above that security must form an integral part of an ERP system and that it will be difficult to add it on once the ERP system has already been implemented. If security is added after implementation, the ERP system will have difficulty adhering to IT and corporate governance requirements. An ERP system is also an integral part of the organisation and cannot be treated as an independent system without taking the organisation's policies and procedures into consideration.

This chapter provides an organisation with a framework to ensure that all aspects surrounding IT and corporate security are built into an ERP system. The organisation can quickly

determine where the ERP system is at fault regarding security and this fault can be rectified before it causes major problems.

Another aspect that must not be forgotten is that ERP security is an ongoing process. The official process starts with the pre-implementation phase where security is designed and built into the ERP system. The official process stops with the implementation of the ERP system. However, this is not where everyone's responsibilities end. As the system is kept up to date and new technologies emerge, security must be addressed as an everyday event to keep the information intact.

Given the above information, hypothesis 3 (ERP systems are perceived as insecure environments in which to transact) is proven. The current problem is that ERP security is added after the implementation of the system and this is why ERP systems are perceived as insecure. The ERP security framework addresses this issue and provides an organisation with a way to ensure that ERP security is part of the holistic approach and is governed by CobiT and ITIL.

Chapters 2 to 4 focus on the operational side of an ERP system. The information provided by these chapters indicates that there is a general understanding of ERP and what it entails and that the technology is mature. ERP as such is not the cause of ERP implementation failures.

Organisations can make use of the ERP and ERP security models together with the technologies discussed in chapter 3 to ensure that their ERP implementations are successful. The information provided in these chapters ensures that the scoping and planning of the ERP implementation will be more accurate if all the components are taken into consideration.

If all of the above has been done and there is still a problem, then the focus must be shifted from the operational aspect of an ERP system to the physical implementation or project side of an ERP system. This implies that the methods used to implement the ERP system could be at fault.

The following chapter focuses on this aspect and determines if project management can be used to implement an ERP system.

5 CHAPTER 5: PROJECT MANAGEMENT METHODOLOGIES AND STANDARDS

5.1 INTRODUCTION

It is clear from the information in chapters 2 and 3 that some organisations understand the concept of ERP and that the ERP technology is mature and well developed. Based on hypotheses 1, 2 and 3, ERP as such is not the reason why ERP implementations fail. This implies that the operational side of an ERP system is well defined and managed by many organisations. The ERP model in chapter 2 and ERP security framework in chapter 4 will also assist organisations in the implementation of their ERP systems.

The result is that ERP system failures are caused by another phenomenon and ***hypothesis 4 states that ERP systems cannot be implemented using existing project management standards***. The goal of this chapter is thus to determine if a project management approach can be used to implement ERP systems or if poor project management is the cause of ERP implementation failures. To achieve this goal the following objectives must be achieved:

- The first objective is to contextualise project management as a discipline and to determine its relationship with programme and portfolio management.
- The second objective of this chapter is to determine the maturity of project management as a discipline. Guidelines found in a literature survey to measure maturity are applied to the discipline of project management to determine its maturity.
- The third objective is to determine if ERP systems can be implemented using a project management standard and methodology.
- The fourth objective is to determine if the PMBOK® Guide as a standard and PRINCE2 as a methodology can be used to implement ERP systems.

The emphasis of this chapter is on the implementation of an ERP system as indicated in chapter 1, whereas the previous chapters emphasised the usage of an ERP system. The layout of the chapter underlines this, as the chapter is divided into four sections where the (i) first section positions project management, (ii) the second section focuses on project management maturity, (iii) the third on a specific project management standard and (iv) the fourth section on a specific project management methodology.

5.2 CONTEXTUALISING PROJECT MANAGEMENT AS A DISCIPLINE

The management of an organisational initiative can be divided into three categories, namely a project, a programme or a portfolio (De Reyck, Grushka-Cockayne, Lockett, Caldereini, Moura & Sloper, 2005; PMI, 2005a; Reiss, Anthony, Chapman, Leigh, Pyne & Rayner, 2006:18).

The purpose of a project is to deliver a pre-defined product or service, while the purpose of a programme is to deliver organisational benefits and consists of related projects (Reiss et al., 2006; Wellman, 2007). A portfolio, on the other hand, is the grouping together of

programmes to meet strategic objectives (PMI, 2005a; Apfel, Gomolski, Handler, Hotle, Light & Steinberg, 2006; Maylor, Brady, Cooke-Davies & Hodgson, 2006).

This division of projects, programmes and portfolios forms the basis of figure 5-1 and all other concepts are related to projects, programmes and portfolios and are based on an extensive literature survey (Turner, 1996; May, 1999; Jugdev & Thomas, 2002; Crawford, 2005; Dvir, Sadeh & Malach-Pines, 2006; Maqsood, Finegan & Walker, 2006; Morris, Crawford, Hodgson, Shepherd & Thomas, 2006; Mullaly, 2006; Andersson & Müller, 2007; Reich, 2007). For the purpose of this study, the three management levels (project, programme and portfolio) will be referred to as the 3Ps and form the Y-axis of the figure.

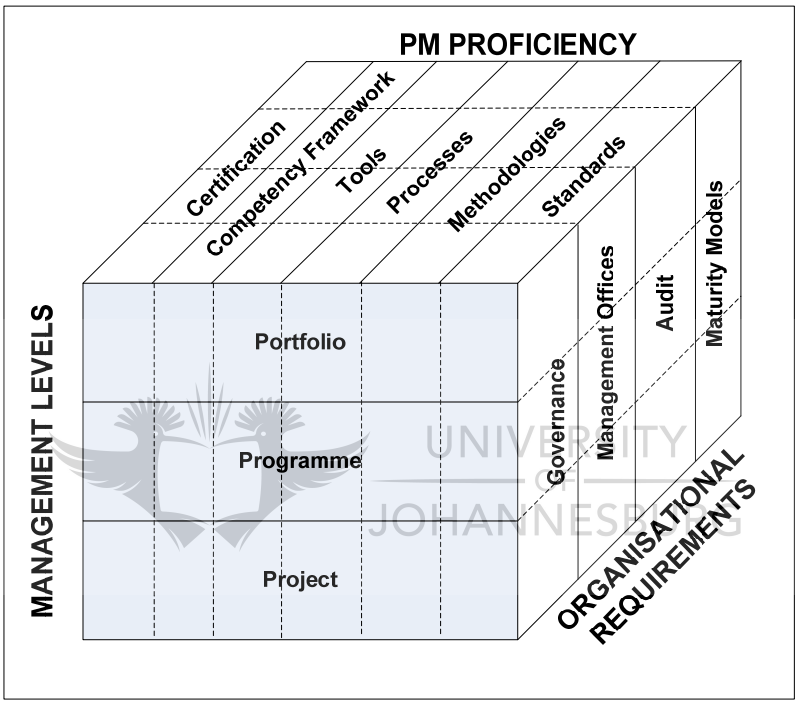

Figure 5-1: Conceptualising project management

The X-axis consists of all the components that constitute proficiencies that a project, programme or portfolio manager should possess.

Bredillet (2003) states that project management standards are becoming crucial to implement organisational strategies. In addition, Crawford (2005) explains that project management standards were developed to ensure that project managers are competent in the field of project management.

A standard can be defined as “a published document which sets out specifications and procedures designed to ensure that a material, product, method or service is fit for its purpose and consistently performs in the way it was intended” (Standards Australia, n.d.). The International Standards Organisation defines a standard as “a published specification that establishes a common language, and contains a technical specification or other precise

criteria and is designed to be used consistently, as a rule, a guideline, or a definition" (International Standard Organisation, n.d.).

There are various international project management standards, for example (i) the PMI's "A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – 3rd Edition" (Rose, 2005), (ii) the Association for Project Management's APM Body of Knowledge, or APMBoK (Morris, 2001), (iii) the Project Management Association of Japan's "A Guidebook of Project & Program Management for Enterprise Innovation" and (iv) the Global Alliance for Project Performance Standards (GAPPS). GAPPS deals with the development of agreed frameworks that serve as a basis for the review, development and recognition of local standards that will facilitate the mutual recognition and transferability of project management qualifications (GAPPS, 2007).

Based on these definitions it can be concurred that a standard provides the rules and specifications that must be followed to ensure a high quality product or service. If this is applied to project management, then a project management standard provides the project management community with a set of rules and common understanding of what must be done to ensure that a project is successful.

Lewis (2000) defines a methodology as the procedures that must be followed in carrying out the overall process. These procedures include what forms must be completed, the meetings that must be held and the approval of changes. Bal and Teo (2001) agree with Lewis and define a methodology as "a collection of procedures, techniques, tools, and documentation aids which will help" project managers to implement a project. Phillips, Bothell and Snead (2002) are of the opinion that a methodology is a process that is successful regardless of the scope and size of the projects, the tools used for the projects and the people working on the projects. A methodology is a repeatable process with project-specific methods, best practices, rules, guidelines, templates, checklists and other features for building quality systems that are manageable and deliver value to an organisation (Murch, 2005).

There are several project management methodologies, namely (i) the Rational Unified Process, which is a software development methodology (Graham, Van Veenendaal, Evans & Black, 2007), (ii) Projects in Controlled Environments (PRINCE2), a true framework developed and instituted in the United Kingdom under the Office of Government Commerce (OGC), a government agency (Hall & Fernández-Ramil, 2007), (iii) System Development Life Cycle (SDLC), the classic "waterfall" approach (also a software development methodology) (Gremba & Myers, 1997; Wieder, Booth, Matolcsy & Ossimitz, 2006), (iv) Solutions-based Project Methodology, a simplified approach for consultants to work with their clients (Charvat, 2003) and (iv) TenStep (Crawford, 2004).

It is clear from these definitions that there are several views of and definitions for a methodology and that these are sometimes opposing or conflicting. Based on these definitions, the common denominator is that a methodology defines how things are supposed to be done or executed.

Schwalbe (2007:86) defines the relationship between a standard and a methodology: a standard is what must be done and a methodology is how it is supposed to be done. Cockburn (2006) describes a standard as one of the components of a methodology. A methodology makes use of standards such as management and decision standards but also includes project management standards.

This means that a standard and a methodology are two sides of the same coin and that they are interdependent on each other to ensure the success of a project. A project management standard provides the rules and guidelines of what must be done within a project, whereas a project management methodology provides the guidelines on how these standards must be applied within a process or methodology to ensure project success.

The next component is the process component as illustrated in figure 5-1. The focus is on the different processes within the 3Ps. A process transforms an input into a desirable output where the output is monitored and compared against a predefined standard (Lewis, 2000). The PMI (2004a) indicates that there are five process groups within the field of project management, namely initiating, planning, executing, monitoring and closing. The aim of these processes is to ensure that a project is delivered successfully within the constraints of the project (Schwalbe, 2007:80). Processes must also be in place for the programme and portfolio management levels. The PMI also published processes for these two management levels (PMI, 2005a; PMI, 2006c). Standards indicate to a 3P manager what to do and are integrated into the processes, meaning that within each process, there are certain concepts, for instance scope management or time management, that explain to the 3P manager what must be done. Processes are also used in methodologies to define the management activities during the lifespan of the project (OGC, 2003). Processes are the connection between the methodologies and the standards, i.e. methodologies explain how a project must be executed, processes are the activities to execute the project and the standards are what must be done during the execution of the project.

The fourth component that a project manager must be proficient in is the kind of tools that are used to support the processes, such as the scheduling tool, reporting tools and collaboration tools (Retief, 2004). These tools can assist the project manager to be more productive if the tools are utilised optimally (Rigby, 2001). Complex project management methods such as earned value (Besner & Hobbs, 2006) and critical path methods (Murphy & Ledwith, 2007) can be automated using a tool such as Microsoft Office Project (Microsoft Corporation, 2007). The methods that are mentioned are part of the standard, methodology and process components. For instance, during the planning process Microsoft Office Project can be used to develop a critical path method to determine the best way to execute the project. 3P managers should have the competency to use the appropriate tools to ensure the optimum outcome of a specific activity.

Edum-Fotwe and McCaffer (2000) define project management competency as the combination of acquired knowledge, the skills that were developed through experience and

then finally, the application of this acquired knowledge. Competency can include factors like motives, self-concepts, knowledge and skills (Light & Hotle, 2006; Robinson, Sparrow, Clegg & Birdi, 2007). This implies that task-oriented and worker-oriented competencies are taken into consideration in this definition. The PMI (2002) defines project management competency as what project managers bring to a project through knowledge, how project managers perform or are able to do on a project and how they behave on a project. The international Project Management Association (IPMA) defines competency as knowledge plus experience plus personal attitude where knowledge and experience relate to function and attitude relates to behaviour (Gale & Brown, 2003). Based on these definitions, competency spans across the components of the X-axis. This implies that 3P managers must have the knowledge of standards such as PMBOK® and the APMBoK, they must have knowledge of methodologies, the various processes and the tools that are available to them. Apart from the knowledge of these components, the 3P managers must also be able to apply this knowledge in a working environment to ensure the successful delivery of a project, programme or portfolio. The 3P manager must be able to focus on the specifics of the project/programme/portfolio but must also be able to have a long-term view of the product or services that must be delivered.

The last component is certification. Crawford and Pollack (2007) explain that standards such as the PMBOK® Guide and APMBoK are used for certification and to accredit a project manager. Morris, Crawford, Hodgson, Shepherd & Thomas (2006) state that "certification simply says that the person has done all that is required in terms of acquiring and demonstrating knowledge". 3P managers can also be certified in a methodology such as PRINCE2 (PMProfessional Learning, n.d.). Certification is linked with the maturity level of the organisation and the certification levels (Caupin, Knoepfel, Koch, Pannenbäcker, Pérez-Polo & Seabury, 2006) of the IPMA can assist to ensure that 3P managers are certified according to the level of maturity of the organisation. For instance, an organisation at maturity level 5 must have a majority of 3P managers at level 4 of the certification model of the IPMA and cannot have 3P managers still on levels 1 and 2. On the other hand, organisations at maturity levels 1 and 2 can have 3P managers at level 4 of the certification model. The conclusion is that the higher the organisation's maturity level, the higher the level of certification of the 3P managers.

The Z-axis forms the basis of the organisational requirements in terms of legislation such as Sarbanes-Oxley (Brown & Nasuti, 2005) and best practices such as CobiT (Hong, Chi, Chao & Tang, 2003). By adhering to the legislation and international best practices, organisations ensure that they conform to good corporate governance through the implementation of project, programme and portfolio management (3PM) (APM, 2004). This axis consists of four components which together ensure that the 3P underwrites corporate governance.

The first component on this axis that addresses these needs is 3P governance. The APM (2004) defines project governance as all the activities of corporate governance that are related to the activities of a project. The PMI (2005a) defines governance as the process of

creating and using a framework that aligns, organises and executes activities in a coherent manner to achieve the organisational goals at all levels of the organisation. According to Turner (2006), project governance can be described as "the structure through which the objectives of the project are set, and the means of attaining those objectives are determined, and the means of monitoring performance are determined". The common elements of these definitions are that the activities of any project must be in line with the organisational vision and strategies. This definition can be extrapolated to include programmes and portfolios. A general definition can be that a structure must be in place that allows organisations to determine the objectives of the 3Ps and the means of attaining these objectives, and to ensure that means do exist within the organisation to monitor the performance of any of the 3Ps.

The second component on the organisational requirements axis is management offices. The project management office (PMO) has become a prominent feature in many organisations (Hobbs & Aubry, 2007). Seventy-six per cent of a PMO's function is to develop and implement a project management methodology for an organisation (Hobbs & Aubrey, 2007). According to Thiry and Deguire (2007), "the PMO is a governance structure for organisational project management" and the role of the PMO should move from developing and implementing methodologies towards a governing structure. The APM (2004) identifies portfolio management and project sponsorship as two key components of project governance. The PMO is therefore the structure through which governance is assured.

Auditing is the third component and organisations are experiencing pressure to develop the means to constantly audit themselves internally (Maurizio et al., 2007). Project audits are conducted through PMOs against the relevant governance framework to enhance organisational learning (Aiyer, Raajkumar & Havelka, 2005; Hobbs & Aubrey, 2007). The auditing of the 3Ps includes all three management levels. The aim is to ensure that organisations have processes and tools in place so that projects, programmes and portfolios can be audited based on the 3P levels. Auditing the 3Ps is important because (i) it provides enhanced control over the organisational systems, (ii) organisations are in a better position to understand the environment they operate in and (iii) organisations understand why projects succeed or fail and this will have an impact on the overall organisational success (McDonald, 2002). The auditing process links back to the governance component as the auditing component ensures that everything was done as per the governance requirements. This implies that 3P managers are accountable for their actions if they do not adhere to the definition of project governance (Wellman, 2007).

Organisations assess their level of maturity and performance in project management through the use of project management maturity models. This is the fourth component on the Z-axis. Project management maturity models consist of four to five levels and are designed around the organisation's environment, structure and needs (Eve, 2007). The more mature an organisation is in terms of project management, the higher the level on the model, i.e. level 3

indicates that the majority of project management processes are in place and are used by the majority of the people in the organisation (Jugdev & Thomas, 2002). Organisations mature from one level to another, i.e. an organisation cannot mature directly from level 1 to level 3 but can mature from level 1 to level 2 to level 3. Level 5 indicates that all the project management processes are in place, as for level 3, but the processes are measured and continuously improved upon (Jugdev & Thomas, 2002). Organisations start at level 1 and the goal is to reach at least level 3 where the majority of the management processes are in place (Pennypacker & Grant, 2003). One of the aspects of governance is the means of monitoring performance (Turner, 2006) and the performance in relation to the 3Ps is that organisations must mature. The vehicle to mature, according to the maturity model, is the PMO, which assists organisations in this task (Hobbs & Aubrey, 2007). The third component (audit) is used to ensure that the organisation complies with the requirements of each maturity level. If an organisation is currently at maturity level 3, then the audit will indicate that all the criteria for level 3 have been met and are adhered being to. It will also indicate if there are certain procedures that are not adhered to at level 3.

The contextualising of the project management domain indicates that project management per se is not an island and does interact with several other components. It also provides the context for the rest of the chapter as it places standards and methodologies in relation to the other components.

Given the various components that form part of the 3Ps, the following section focuses on the maturity of the project management discipline. This is different from project management maturity, which measures an organisation's maturity levels with regard to project management.

5.3 MATURITY OF PROJECT MANAGEMENT DISCIPLINE

The project management discipline needs to be measured against maturity guidelines to determine if project management as a discipline is mature. According to Crawford (2004), Charters (2006) and Eve (2007), professional disciplines must adhere to the following five principles to be classified as mature:

1. There is a substantial body of knowledge. This body of knowledge consists of scientific research and is not prescribed by a single professional body but through a variety of professional bodies (Gale & Brown, 2003).
2. There are codes of practice and standards. These are based on sound scientific research in the field of project management and a general agreement by practitioners on the codes of practice and the various standards.
3. There is an education process. This process supports the codes of practice and standards of project management. Qualifications and accreditations are used to distinguish between the various education processes.
4. There is a core of professional practitioners. These practitioners have 3PM qualifications and certifications and contribute to updating the codes of practice and standards.

5. There is a professional body with a code of ethics. The professional bodies are represented by practitioners and academic researchers who manage the codes of practice as well as the standards and support research.

As early as 1996, Ford and Gibbs listed criteria for a mature discipline and these criteria included the five mentioned above plus two additional criteria: (i) legislation and (ii) licensing. These two criteria are incorporated into various professions, for example the medical, engineering and accounting professions, where a practitioner must be licensed by a governing body to practise (Wright, Coleman & Glover, 1998; Casabona, 2003). The profession is also governed by legislation, for instance Sarbanes-Oxley in the USA in the case of the accounting profession (Nagy & Cenker, 2007). These two criteria ensure accountability on the practitioner's side and protect the customer or patient on the other. The project management profession is generally neither governed by legislation nor does a practising project manager require a licence.

For the project management profession to be recognised as such, legislation should govern the profession and a practitioner must have a licence to be an active practitioner. This is currently not the case.

Wang (2002) adds another criterion called professional community. The purpose of a professional community is where members have a sense of identity and are bound together by the project management culture. He also states that research must still be done on this topic and that not enough information is available. Therefore this criterion will be excluded from this study.

For the purpose of this study, the five maturity criteria listed above are used to make the following comparisons to determine if the project management community is mature:

5.3.1 BODY OF KNOWLEDGE

The body of knowledge can be divided into the following three elements:

- ***Journals:*** Several international journals promote scientific research in the field of project management. Among these journals are the *International Journal of Project Management* published by Butterworth-Heinemann Publishers (Elsevier, 2007), *The Project Management Journal* originally published by the Project Management Institute (Crawford, Pollack & England, 2006) and now in partnership with John Wiley & Sons as well as the *Journal of Project Finance* published by H.W. Wilson Company (WilsonWeb Journal Directory, 2007).
- ***Books:*** Recent years have seen the publication of several books on project management (Morgan & Sousa-Poza, 2005). Books are also emerging on programme management (Reiss et al., 2006) and virtual project management (Goncalves, 2007).
- ***Conferences:*** The focus of conferences is twofold: the first is practitioner oriented and the second is research oriented. There are various conferences such as the PMI's Global Congresses and the IPMA's World Congress. The PMI also hosts a research conference

every second year primarily to discuss new project management related findings (Project Management Institute, n.d.).

5.3.2 CODES OF PRACTICE AND STANDARDS

The second principle that professional disciplines must adhere to is that there must be codes of practice as well as standards.

- ***Codes of practice:*** These are a set of rules according to which practitioners in a particular profession are expected to behave (Pratten & Ashford, 2001). Examples of codes of practice include the manner that a work breakdown structure (WBS) (PMI, 2006a) is derived and used to determine costing and resources or earned value management (PMI, 2005b) which is used to determine project performance (Schwalbe, 2007:285).
- ***Standards:*** The PMI has published "A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – 3rd Edition" (Rose, 2005) and the APM has published the United Kingdom's equivalent called the APM Body of Knowledge (Morris, 2001). These publications are seen as industry standards as the PMBOK® Guide was adopted by the American National Standard Institute as ANSI/PMI 99-001-2000 (Project Management Institute Mid-Missouri, 2001) and the OGC in the United Kingdom publishes a methodology called PRINCE (Office of Government Commerce, n.d.). The Project Management Association of Japan (PMAJ) published "A Guidebook of Project & Program Management for Enterprise Innovation", also called the P2M, in 2001. This publication is directed at enabling Japanese organisations to become as competitive as the organisations in the USA (PMAJ, n.d.). GAPPS focuses on the development of agreed frameworks that serve as a basis for the review, development and recognition of local standards that will facilitate the mutual recognition and transferability of project management qualifications (GAPPS, 2007).

5.3.3 EDUCATION PROCESS

The education process is the third criterion of the maturity criteria and consists of the following elements:

- ***Qualifications:*** Many universities and educational institutions provide education in the field of project management. In South Africa, qualifications must be accredited by the South African Qualifications Authority (SAQA). There are various project management qualifications that are accredited by SAQA (SAQA, n.d.). International universities such as the University of Québec and the University of Technology in Sydney also offer accredited project management qualifications.
- ***Certifications:*** Both the PMI and APM offer certifications whereby practitioners can be certified as professional project managers (Crawford, 2006a). According to Wang (2002)

and Gedansky (2002), the Project Management Professional (PMP) certification of the PMI contributes to the fact that project management is a profession. The certification is not an once-off certification but must be kept updated to ensure that project managers keep abreast of the latest developments and trends. The PMI also offers the CAPM (Certified Associate in Project Management) that recognises a demonstrated understanding of the fundamental knowledge, processes and terminology. The PMAJ offers certifications whereby project managers can become certified in the P2M (PMAJ, n.d.). Certification can also be achieved in PRINCE2 and the APMBoK (APM, n.d.).

- ***Training:*** The aim of training is to obtain skilled behaviour (Sloman & Philpott, 2006), for instance training in the use of a scheduling tool to assist in project planning. The PMI offers a list of approved training providers and their courses (PMI, n.d.) called registered education providers. The same service is provided by Project Management South Africa (PMSA, n.d.) and the APM (APM, n.d.).

5.3.4 PROFESSIONAL PRACTITIONERS

Professional practitioners have qualifications and certifications and contribute to updating the codes of practice and standards

- ***Certified practitioners:*** The PMI is a professional body with more than 250 000 PMP professionals that represent 125 countries (Project Management Institute, n.d.). In Japan, the PMAJ has over 2 500 certified project managers (PMAJ, n.d.).
- ***Qualified practitioners:*** Qualifications include formal university degrees in the field of project management (Crawford & Pollack, 2007). A professional might have a formal bachelors or postgraduate degree in project management.

It must be noted that in some fields and industries, certification and qualifications are recognised as a prerequisite to practise as a professional project manager. For example, in the construction industry, a project manager must have a formal engineering qualification but only a project management certification.

5.3.5 PROFESSIONAL BODIES

The professional bodies are represented by practitioners and academic researchers and are the fifth criterion.

- ***Global bodies:*** The PMI originated in the USA but evolved into a global body with numerous chapters throughout the world, and its counterpart is the APM in the United Kingdom with a membership of 15 000 (APM, n.d.).
- ***National bodies:*** PMSA increased its members from 400 in 1997 to over 1 200 in 2007 (PMSA, n.d.). The Australian Institute of Project Management has a membership of over 6 000 project management practitioners (Australian Institute of Project Management, n.d.).

- ***Regional bodies:*** Owing to the size of some countries such as the USA, South Africa and Australia, some of the national bodies have regional branches, for instance in South Africa there are eight regional branches (PMSA, n.d.) and in Australia there are also eight regional chapters (Australian Institute of Project Management, 2007).

The five criteria identified by Crawford (2004) and Charters (2006) provide a baseline for measuring the maturity of a discipline. These criteria are listed in table 5-1. Because the project management profession does not include the criteria of legislation and licensing, the project management profession must be classified as a semi-profession (Morris, Crawford, Hodgson, Shepherd, & Thomas, 2006).

Criteria	Elements	Examples
Body of knowledge	Journals	• *International Journal of Project Management* • *PM Journal*
	Books	• www.amazon.com • PMI Bookstore
	Conferences	• PMI Global Conference • PMI Research Congress • IPMA World Congress
Codes of practice & standards	Codes of Practice	• WBS • EVM
	Standards	• PMBOK® Guide • APMBoK • P2M • PRINCE2 • GAPPS
Education process	Qualifications	• Accredited university degrees and diplomas • Undergraduate degrees • Master's degrees • PhD degrees
	Certifications	• PMP certification • CAPM certification • APMBoK certification • MSP certification
	Training	• List of registered education providers from PMI • List of registered education providers from PMSA • List of registered education providers from APM
Professional practitioners	Certified	• PMP • P2M certification • PRINCE2 • APMP
	Qualified	• Degree in engineering for civil industry
Professional bodies	Global	• PMI • APM • IPMA
	National	• PMSA • AIPM
	Regional	• Gauteng branch of the PMSA

Table 5-1: Project management profession maturity criteria

Based on the mapping process of the project management profession on these criteria, it can be concluded that the project management discipline is relatively mature, which satisfies the second objective of the chapter. This implies that, based on the maturity of project management as a discipline, a project management approach could be used to implement an ERP system.

The following section describes a standard within the project management discipline. The focus is on the Project Management Institute's PMBOK® Guide (PMI, 2004a). The reason for discussing this standard is that it is seen as the *de facto* standard (Buckle & Thomas, 2003; Thomas & Buckle-Henning, 2007). The count for all the PMBOK® Guide editions (1996, 2000 and the third edition) together comprises 2 137 354 as of February 2007. The circulation of the third edition alone is 701 702 (Goldman, 2007). South Africa also follows the PMI's standard, whereas large parts of Europe follow either the standard of the PMI or the APM.

5.4 PROJECT MANAGEMENT BODY OF KNOWLEDGE AS A STANDARD

The PMI was founded in 1969 by five volunteers (University of New England, n.d.). In the 1970s the first issue of *Project Management Quarterly* (PMQ) was published and later renamed *Project Management Journal*® (PMJ) (Morris, 2001). By the end of the 1980s, membership of the PMI reached over 2 000 individuals worldwide. A code of ethics (Wang, 2002; Gray, 2005) was adopted for the profession and the first Project Management Professional (PMP®) Certification examination was administered. The first PMI project management standard was published as the *PMQ Special Report on Ethics Standards and Accreditation* (Crawford, 2004).

By 1990, PMI's membership reached over 8 500 and by 1993 the annual membership growth rate rose to over 20% per year. The PMI at present (August 2008) supports 277 221 members in 149 countries worldwide (PMItoday, 2008). The members of the PMI are people that learn and apply project management in various industries such as business management, construction, mechanical engineering, information technology and telecommunications.

PMI also established a presence on the World Wide Web and published the project management standard, A Guide to the Project Management Body of Knowledge (PMBOK® Guide). The PMBOK® Guide evolved from 1983 to the latest edition in 2008. The 1983 edition was named "Project Management Quarterly Special Report" and that was then formally renamed "A Guide to the Project Management Body of Knowledge" in 1996 (Clemens, n.d.). A decision was made that the PMBOK® Guide would be updated every four years (Skulmoski, 2001). The PMBOK® Guide was adopted by the American National Standard Institute as ANSI/PMI 99-001-2000 (Project Management Institute Mid-Missouri, 2001). This implies that the PMBOK® Guide is acknowledged as an American standard. It is currently under review to become an ISO standard, which will give it international status (International Standards Organisation, 2007).

The PMBOK® Guide is a basic and most influential reference for the project management profession (Reich & Wee, 2006). The PMBOK® Guide is an inclusive term that describes the sum of knowledge within the profession of project management. It also identifies and describes the subset of principles and practices that are generally accepted and applicable to most projects most of the time.

The PMBOK® Guide is a set of techniques and standards that provide the project manager with planning and control techniques that consist of three components, i.e. the project life cycle, project process groups and the nine knowledge areas. Figure 5-2 is a graphical representation of this relationship between these components and each component is discussed in detail in subsequent sections.

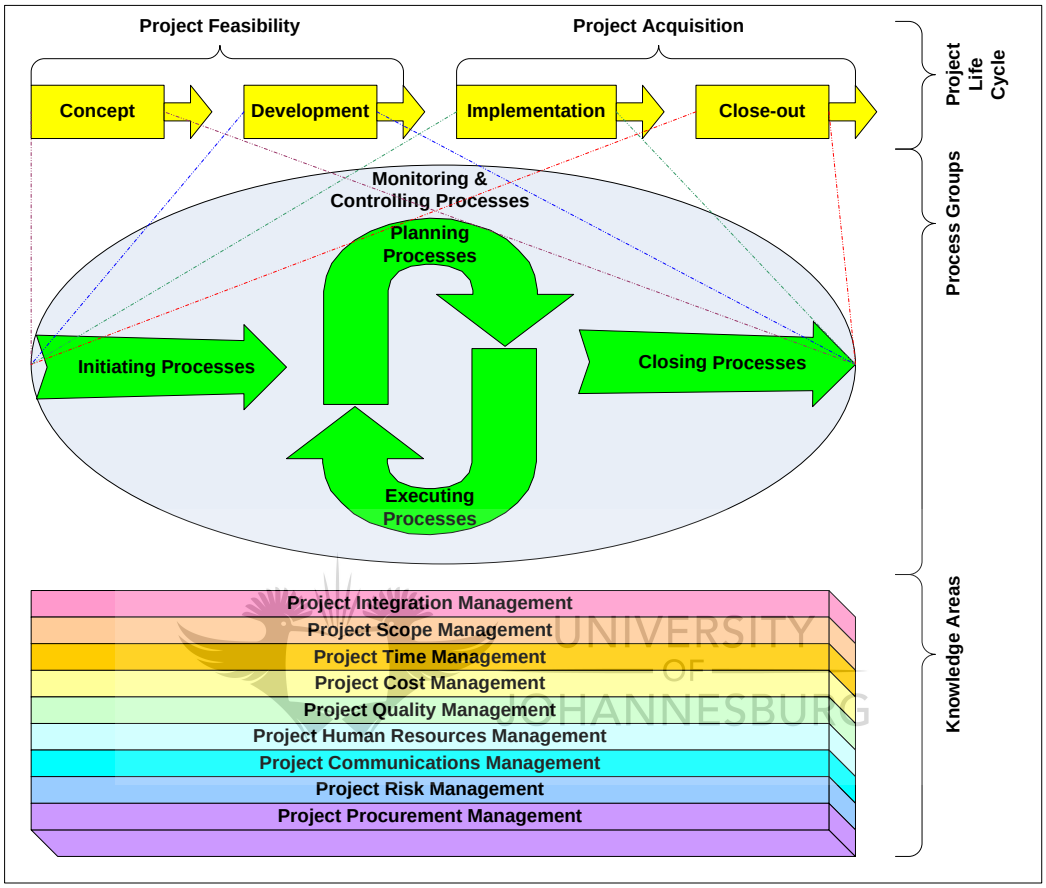

Figure 5-2: Relationship between project life cycle, process groups and knowledge areas

The first component of the relationship is the project life cycle (PLC) and forms the overall category for the process groups and knowledge areas.

5.5 PROJECT LIFE CYCLE

A project life cycle is a collection of project phases and defines what work is to be performed in each phase (Kloppenburg & Petrick, 1999; Milosevic & Srivannaboon, 2006; Schwalbe, 2007:61). The project life cycle normally consists of four or five phases (Javed, Maqsood & Durrani, 2006; Atkinson, Crawford & Ward, 2006; Stewart, 2008). According to Srivannaboon (2006), organisations "use different project life cycle phases, selecting those that are most relevant to their industry, company culture and other significant issues". For the purpose of this study, the focus is on the four most common phases as defined by Schwalbe (2007:61) since the focus is on IT project management.

- ***Concept phase:*** This is the first phase in the project life cycle and it gives a brief description of the project itself (Tummala & Burchett, 1999; Schwalbe, 2007:61). It includes aspects such as the deliverables of the project and the preliminary costs. This can be related to the pre-implementation phase of the ERP methodology as discussed in section 0. This phase focuses on the identification of the operational needs, business drivers, strategic plans and other factors that define the scope and objective for the ERP solution.
- ***Development phase:*** The aim of this specific phase is to elaborate on the deliverables of the concept or initial phase (Besner & Hobbs, 2006). The project team creates detailed project plans and more accurate costing and scoping can be done since additional information is available to the project team. This phase provides an in-depth WBS up to three levels deep. This allows the project team to make more accurate assumptions about the project (Hill, Thomas & Allen, 2000). The two phases, analysis and design, of the ERP methodology (sections 2.4.6.2 and 2.4.6.3) provide the project team with the detailed information that they need to construct a three-level WBS. The outputs of these two phases are in line with the outputs of the project life cycle development phase as they ensure that a detailed project plan and accurate costing and scope planning are possible owing to the detailed information that these two phases produce.
- ***Implementation phase:*** During this phase, the project team delivers the product as specified in the previous two phases and provides performance reports to the stakeholders (Bonnal, Gourc & Lacoste, 2002; Jugdev & Müller, 2005). It is also the phase that normally takes the longest to complete and is the most expensive phase in terms of time and cost during the project life cycle (PMI, 2004a; Jugdev & Müller, 2005). The corresponding phase from the ERP methodology is the construct phase (section 2.4.6.4) and the aim of this phase is to take the deliverables from the analysis and design phases and create tangible operational processes.
- ***Close-out phase:*** Client acceptance plays an important role in the close-out phase (Dvir, 2005; Hyväri, 2006) and all the work is completed during this phase (Schwalbe, 2007:63). The completed product or service must be related back to the original specifications defined in the concept phase (Jugdev & Müller, 2005). The implementation phase (section 2.4.6.5) of the ERP methodology focuses on the close-out of the ERP initiative and the deliverables of this phase include the physical ERP system, policies and procedures as well as a workforce migration plan. The post-implementation audit is performed to measure the effectiveness of the ERP initiative against the goals and objectives.

The PLC plays an important role in the management of an IT project as it provides the project manager as well as the organisation with an organised way of managing projects. It does not matter if the PLC consists of four or five phases, as long as the phases cover the work that must be done throughout the PLC. It can also be concluded through the comparison of the

ERP methodology component with the PLC that the phases of the ERP methodology described in section 2.4.6 are comparable with those of the PLC. This implies that the ERP methodology must rather be referred to as the ERP PLC, as the focus is on what work must be performed rather than how it must be performed.

Figure 5-3 shows the mapping of the project life cycle onto the ERP methodology:

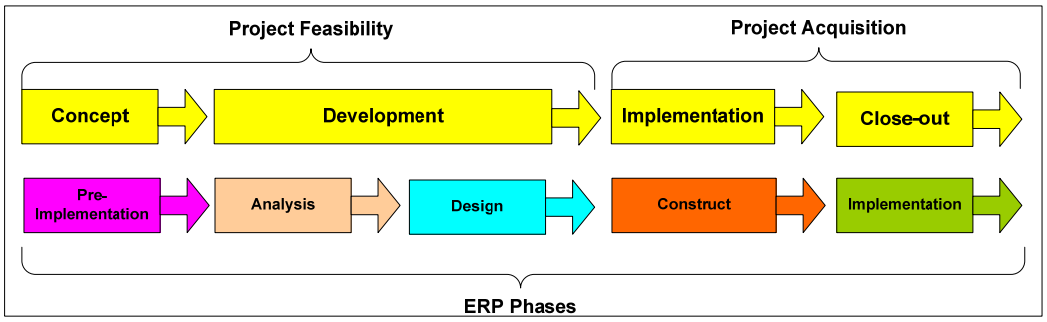

Figure 5-3: Mapping of ERP methodology on project life cycle

The second component as illustrated in figure 5-2 is the different process groups.

5.6 PROCESS GROUPS

The process groups are divided into five groups (Marchewka, 2006:65; Goncalves, 2007:205). These five process groups are dependent on one another and follow the same sequence for every project (PMI, 2004a). The aim of these five process groups is to deliver a specific result (Schwalbe, 2007:80) and each of these processes occurs continuously during the PLC.

- ***Initiating process:*** The initiating process group focuses on the beginning of a project or life cycle phase (Marchewka, 2006:65; Schwalbe, 2007:81). It requires the organisation to make commitments regarding resources, for instance time, money and people. During this process, a business need is defined and someone in the organisation takes accountability for the project. The implication for the implementation of an ERP initiative is that this initiative must address a business need and once this need has been identified, someone needs to take accountability for the initiative to ensure its successful implementation.
- ***Planning process:*** This process group is used to manage a successful project for the organisation. The planning process group matures the project scope, and costs and schedules the activities that occur within the project (PMI, 2004a). According to Marchewka (2006), the planning process should be in line with the size of the project, i.e. the larger the project, the more planning must be done. This is especially true for the implementation of an ERP initiative. Owing to the size of the ERP initiative, the planning must be done thoroughly to address all the components of the ERP model as discussed in chapter 2.

- ***Controlling process:*** This process includes regular progress reports to ensure that the project team meets the project objectives (Schwalbe, 2007:80). These objectives are in line with organisational needs to ensure that the project realises the benefits. Because of the complexity of an ERP initiative, the controlling process is important to ensure that all the components are implemented as defined by the planning process. Controls inform the project team when deviations from the original plan occur but also measure the progress.
- ***Executing process:*** Resources are coordinated to carry out the project plan and to produce the products or services as defined in the initiating phase (Schwalbe, 2007:80). The organisation must make resources available to the ERP initiative to ensure its successful execution. These resources include people and money as described in sections 2.4.4 and 2.4.5.
- ***Closing process:*** The aim during the closing process is to bring the project or life cycle phase to a systematic and orderly completion. The main focus should be to ensure that the project deliverables have been achieved and that the benefits have been realised. The formal acceptance of the project or life cycle phase is also part of this process. The same logic is applied when an ERP initiative is closing. The ERP initiative is measured based on the value that it was supposed to deliver and the users of the ERP initiative take formal acceptance of the system.

The third component as illustrated in figure 5-2 is the different knowledge areas.

5.7 KNOWLEDGE AREAS

The following sections describe the nine knowledge areas as explained by the PMBOK® Guide and are illustrated in figure 5-4.

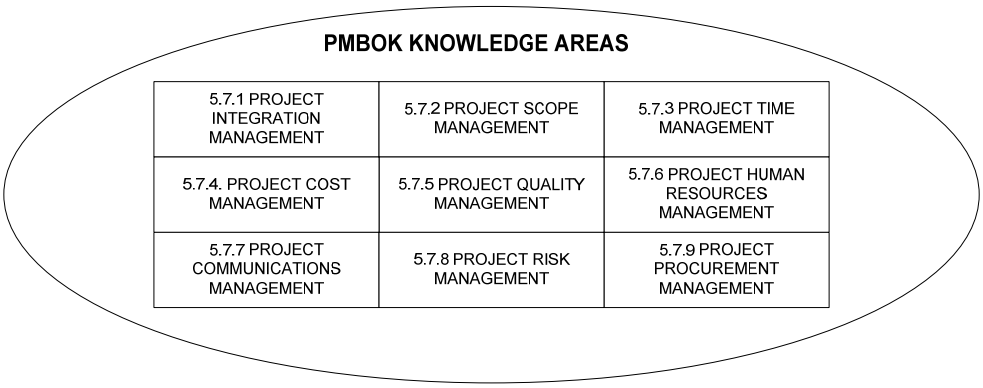

Figure 5-4: PMBOK® Guide knowledge areas

The nine knowledge areas are briefly explained and how they assist in the implementation of an ERP system is determined.

5.7.1 PROJECT INTEGRATION MANAGEMENT

Project integration management includes all the processes that are required to ensure that the various elements of the project are properly coordinated (Morris, 2001; Schwalbe, 2007:127). This means that trade-offs must be made between competing objectives and alternatives to meet the deliverables of the project.

Figure 5-5 shows the processes of project integration management.

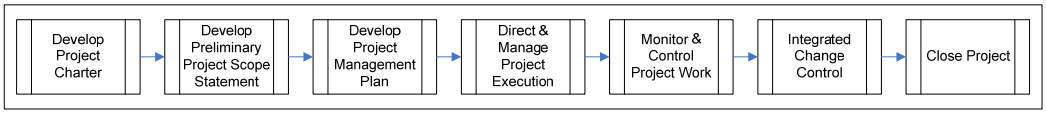

Figure 5-5: Project integration management processes

Each of these processes occurs at least once during a project and are discussed in detail in appendix D. These processes are used to determine if the PMBOK® Guide can be used to implement an ERP system. Appendix D provides the detail and logic for this comparison.

5.7.2 PROJECT SCOPE MANAGEMENT

Project scope management includes the processes required to ensure that the project includes all the work required, and only the work required to complete a project successfully (Javed, Maqsood & Durrani, 2006; Rozenes, Vitner & Spraggett, 2006). Completion of the project scope is measured against the project plan.

Project scope management consists of the following five processes:

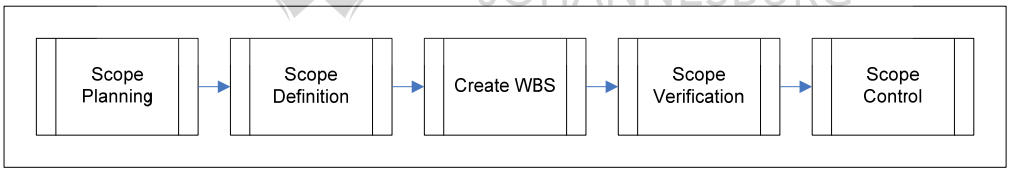

Figure 5-6: Project scope management process

Project scope management plays a vital role during the pre-implementation phase of the ERP methodology and it is crucial to an ERP project. The scope of the project must be defined beforehand and any changes must be managed to ensure that the project finishes on time and within budget.

It is very easy for scope changes to arise during the implementation of the ERP system. Scope changes can arise through the newly defined business processes that do not align with the ERP software. They can also be caused by the enhancements that are only recognised after the users start working on the system. It is important that records be kept of these changes and that the consequence of these changes be communicated to the customer. These scope changes also form part of the ERP model.

5.7.3 PROJECT TIME MANAGEMENT

Project time management involves the processes that are required to ensure that a project is completed on time (Steyn, 2001; Shtub, Bard & Globerson, 2005). The time management process is shown in figure 5-7.

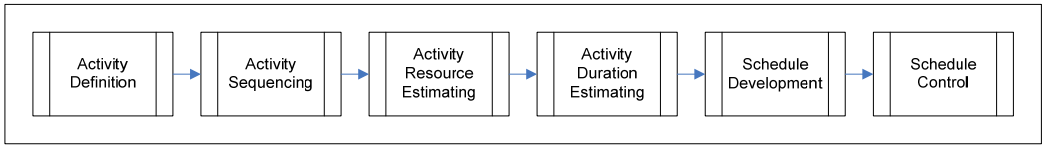

Figure 5-7: Project time management process

An ERP system must be delivered on time to ensure that the product is relevant to the organisation and to save the organisation additional costs if the implementation overruns on time.

5.7.4 PROJECT COST MANAGEMENT

The cost of the project is just as important as scope and time are to the project outcome. The cost of the project is usually dependent on the scope and time of the project. If any one of the two processes is prolonged or extended, it will definitely influence the cost of the project (Kuehn, 2006).

The process that is required to ensure that the project is completed within the approved budget is included in project cost management. Project cost management is concerned with the cost of the resources needed to complete the project activities (Kinsella, 2002). It also focuses on the cost effect of the decisions made by the project team.

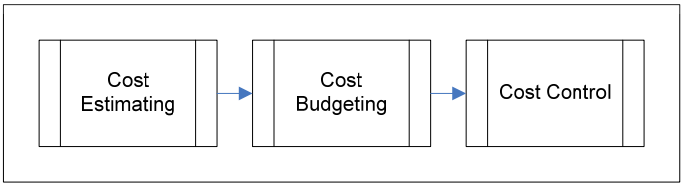

Figure 5-8: Project cost management process

The cost of implementing an ERP initiative is one of the critical success factors (Finney & Corbett, 2007). The budgeted cost of an ERP initiative can quickly be exceeded if the planning was not done in enough detail as explained in section 5.6.

5.7.5 PROJECT QUALITY MANAGEMENT

Although scope, time and cost play an important role in the duration of the project and if the project is perceived as successful, the quality of the product or system cannot be ignored (Conti, 2006). If the users of the new ERP system perceive that the system is below standard or does not meet their needs, then the system has failed. The user attitude is important to the outcome of the project as stated in chapter 2.

The quality of a product and service will determine the long-term success of the project. The PMBOK® Guide defines project quality management as the processes required to ensure that the project will satisfy the needs for which it was undertaken by addressing the management of the project as well as the product of the project (PMI, 2004a).

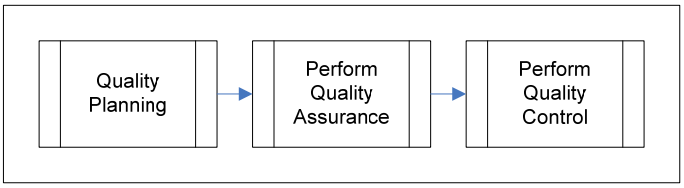

Figure 5-9: Project quality management process

The required condition of the delivered product or service is laid down in the scope of work, specifications and the project quality plan. It must be noted that quality control includes the product results as well as the project management results such as cost and schedule performance (Winters, 2001; Metaxiotis, Zafeiropoulos, Nikolinakou & Psarras, 2005).

5.7.6 PROJECT HUMAN RESOURCES MANAGEMENT

Project human resources management is a vital link in project management. The selection of team members and the development of the team are crucial to the success of the project (Kloppenberg & Petrick, 1999; Fitzpatrick & Askin, 2005). One of the components of the ERP model is the customer mindset. The customer mindset is influenced by the team as described in section 2.4.4.2 of chapter 2.

Project human resources management revolves around the processes required to make the most effective use of the people involved in the project. The process is illustrated in figure 5-10.

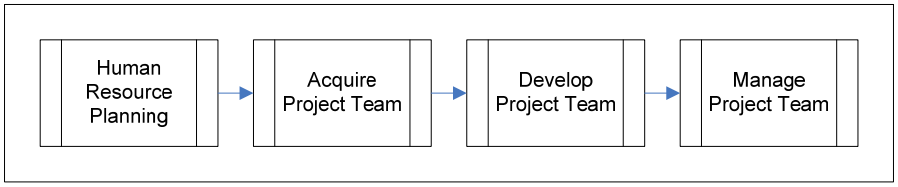

Figure 5-10: Project human resources management process

Team dynamics are of the utmost importance during the implementation of an ERP system. This is due to the duration of the project as well as the stress and long working hours involved during the implementation. It is the responsibility of the project manager to ensure that individual team members do not upset the performance of the project team as a united entity.

5.7.7 PROJECT COMMUNICATIONS MANAGEMENT

The PMBOK® Guide (PMI, 2004a) defines project communications management as the processes required to ensure timely and appropriate generation, collection, dissemination, storage and ultimate disposal of project information. It provides the critical links between

people, ideas and any information necessary for the success of the project (Wearne, 2006). The following figure shows the project communications management process:

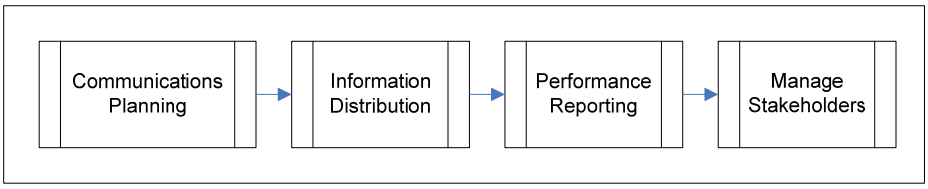

Figure 5-11: Project communications management process

The communication within an ERP project must be distributed to everyone on the team as well as to the project sponsor. Communication is vital because the ERP team involves a lot of people, and their actions and activities influence the organisation as a whole. The project management office as the central point of the ERP system implementation must distribute the information to the relevant role players (Horwitz, Bravington & Silvis, 2006).

5.7.8 PROJECT RISK MANAGEMENT

Project risk is an uncertain event or condition that has a positive or a negative effect on a project objective if it happens. In other words, any event that prevents or limits the achievement of the project's objectives as defined at the outset of the project is a project risk. Project risk management is the systematic process of identifying, analysing and responding to project risk (Taylor, 2006; Na, Simpson, Li, Singh & Kim, 2007). This means that the consequence of positive events must be maximised and that of negative events minimised. The organisation must be committed to address risk management throughout the project. Figure 5-12 shows the processes that the project team must entertain to identify and manage the risks.

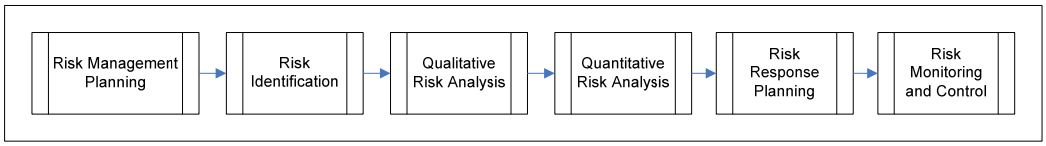

Figure 5-12: Project risk management process

Controlling and managing the risks will influence the outcome of the ERP project. The project manager must ensure that close controls are put on each of the risks that were identified. Even the lesser risks can grow to huge risks if they are not managed effectively.

5.7.9 PROJECT PROCUREMENT MANAGEMENT

Although procurement is not included in the ERP business model, it forms part of the software component and is essential for the SCM process.

Project procurement management deals with the acquisition of goods and services required to perform the project's scope of work (PMI, 2004a). This could be drawings, materials,

equipment or professional services (Kadefors, Björlingson & Karlsson, 2007). It is important to identify the items which have a long lead time.

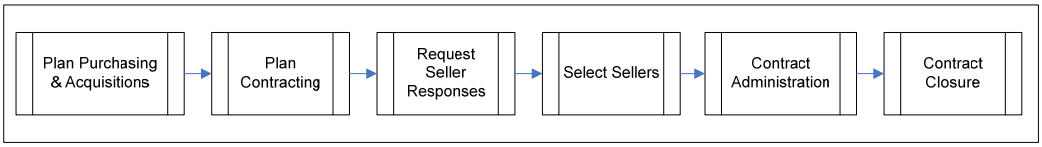

Figure 5-13: Project procurement management process

The nine knowledge areas of the PMBOK® Guide can be utilised and incorporated to implement ERP systems. They provide project managers with a set of tools that will help them to implement an ERP system using an international set of project management standards.

The PLC consists of various phases and there is no standard on the number of phases that must constitute a PLC (Lewis, 2000; PMI, 2004a). The consensus is that a PLC consists of at least four phases, namely (i) the conceptualisation or initiation of the project, the (ii) development or execution phase, (iii) the implementation phase and (iv) the close-out phase (Wideman, 2004; Schwalbe, 2007:61). The nine knowledge areas described above are an integral part of the PLC (Taylor, 2006; Rozenes, Vitner & Spraggett, 2006).

This implies that from the very beginning of the PLC right up to the project closure and lessons learned, the knowledge areas must be applied. This application of the knowledge areas might vary during the PLC, for instance project scope management will have a stronger focus right at the beginning of the project to ensure that project is scoped correctly (Hyväri, 2006). The focus during the execution of the project is more on the control but the project manager must still ensure that scope of the project is managed through scope changes.

One of the criteria of maturity is that a discipline must have standards and methodologies. The PMBOK® Guide was discussed as a standard and the next section discusses PRINCE as a methodology.

PRINCE was designed to manage large IT projects and for this reason it is discussed to determine if it can be used to implement an ERP system.

5.8 PRINCE AS A METHODOLOGY

PRINCE is a project management methodology covering the organisation, management and control of projects (Bentley, 1999). It was first developed by the Central Computer and Telecommunications Agency (CCTA) and is now part of the OGC. PRINCE has been a United Kingdom government standard for IT project management since 1989 (Office of Government Commerce, n.d.).

Since its introduction, PRINCE has become widely used in both the public and private sectors and is now the UK's *de facto* methodology for project management (Furlonger, 1999; Harpham, 2005). Although PRINCE was originally developed for the needs of IT projects, the method has also been used in many non-IT projects (Crawford, 2006a). The latest version of

the method, PRINCE2, was designed to incorporate the requirements of existing users and to enhance the method towards a generic, best practice approach for the management of all types of projects (Dalcher & Brodie, 2007).

The decision to focus on PRINCE2 as a project management methodology lies in the following:

- PRINCE2 is a process-based approach for project management providing a tailored and scalable method for the management of all types of projects (Harpham, 2005; Soffer, Golany & Dori, 2005).
- The method describes how a project is divided into manageable stages that enable the efficient control of resources and regular progress monitoring throughout the project (Bedford & Morelli, 2006). The various roles and responsibilities for managing a project are fully described and are adaptable to suit the size and complexity of the project as well as the skills of the organisation. Project planning using PRINCE2 is also product-based, which means that the project plans are directed at delivering results and are not simply about planning when the various activities on the project will be done.
- A PRINCE2 project is driven by its business case, which describes the organisation's justification, commitment and rationale for the project's deliverables or outcome (Kerzner, 2003; Norrie & Walker, 2004). The business case is regularly reviewed in conjunction with the project's progress to ensure that the business objectives, which may well change during the life of the project, are still being met.

Each process is defined with its key inputs and outputs together with the specific objectives to be achieved and activities to be carried out. Figure 5-14 illustrates the processes of PRINCE2 and must be read according to the numbering sequence.

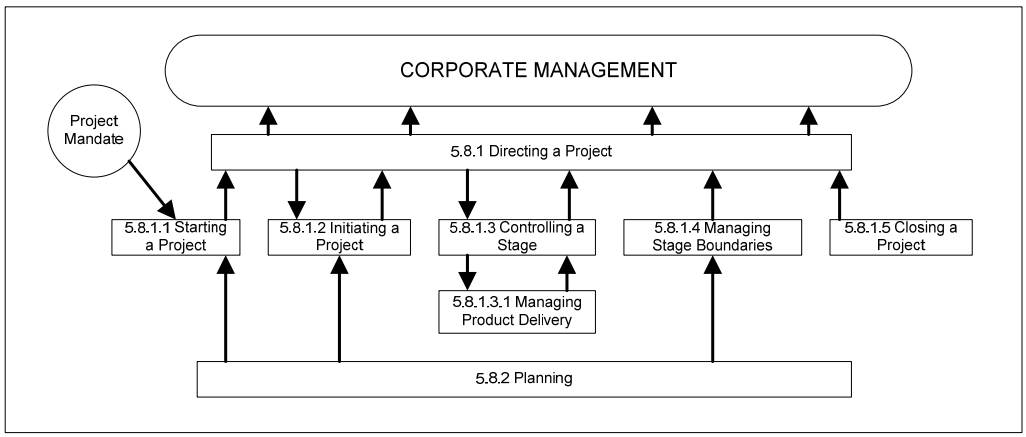

Figure 5-14: PRINCE2 processes

The following sections discuss the processes within PRINCE2 and relate them to ERP system implementation.

5.8.1 DIRECTING A PROJECT

The directing-a-project process runs from the start-up of the project until its closure. This process is aimed at the project board, which consists of the customer, a representative from the user side and someone who represents the supplier or specialist input. The project board manages by exception, monitors via reports and controls through a number of decision points.

The focus of this process is on the project's life cycle (Wideman, 2002). PRINCE2 defines five definite processes in its PLC, which differs from the description of a PLC in the previous section. The processes of PRINCE2 conform to the generic project life cycle as they are the same as the minimum phases of the PLC. PRINCE2 does not focus on the PLC, although the deliverables are product-based as discussed earlier.

This process relates to the entire methodology component of the ERP model as described in section 2.4.6. The methodology component runs from the beginning to the end of the implementation of the ERP model and the directing-a-project process also runs from the initiation to the closure of a project.

The key processes within the directing-a-project process can be defined as follows:

5.8.1.1 Starting a Project

This is a pre-project process that is designed to ensure that all the prerequisites for initiating the project are in place. A project mandate defines in high-level terms the reason for the project and what the outcome of the project should be.

ERP implementations need to go through the same phase. A project mandate is formulated that explains why an organisation implements an ERP solution and what the results should be once the ERP solution is implemented successfully. The project team that implements the ERP system consists of representatives of the different divisions of the organisation, representatives of the software vendor and the consultants that implement the ERP system. This process corresponds to the pre-implementation phase (section 0) where some of the deliverables are the business case and a benefits realisation analysis.

5.8.1.2 Initiating a Project

The success and the thoroughness of this process determines the success and outcome of the project (Andersen, 2006). All the initial planning of the project is conducted during this process.

The objectives of initiating a project are to:

- Agree whether or not there is sufficient justification to proceed with the project. This is very important because of the impact that ERP systems have on an organisation (Wilson, Clark & Smith, 2007). The impact on the organisation will be financial as well as the changes within the organisation like cultural and business process changes.

- Establish a stable management basis on which to proceed. Owing to the long duration of implementing an ERP system, it is crucial that the management of the organisation be committed to the ERP implementation and that the management of the implementation not change hands too often during the ERP implementation life cycle.
- Document and confirm that there is an acceptable business case for the project.
- Agree to the commitment of resources for the first stage of the project. It is important to commit resources to the ERP implementation. These resources must be knowledgeable in their areas of expertise and they must be available for the duration of the project. The correct information will be available to the project team if the resources are knowledgeable and it will ensure the consistency of the project if the same resources are always available. This relates to the team influence as discussed in section 2.4.4.2 where the construction of the ERP implementation team is crucial for the successful implementation of the ERP system. It also relates to the human resources management knowledge area of the PMBOK® Guide.
- Enable and encourage the project board to take ownership of the project. If the project board takes ownership of the ERP implementation, it will show to the rest of the employees that the management of the organisation is committed to the success of the project and this will filter through to the individuals within the organisation to deliver their best.
- Provide the baseline for the decision-making processes required during the project's life. A multitude of decisions must be made during the implementation of an ERP system. These decisions range from important decisions such as "can the project be delayed for six months" or minor decisions such as the layout of an order entry screen. It is important to design and develop a responsibility matrix to decide who and when certain decisions can be taken and authorised.
- Ensure that the investment of time and effort required by the project is made wisely and by taking into account the risks to the project. The risk and influence of an ERP system implementation are enormous and it must be beneficial to the organisation to spend the time and money as well as run the risks associated with the new ERP system. The influence of the organisation on the success of ERP implementation was discussed in section 2.4.4.3. The organisation must ensure that the ERP system will deliver the results the organisation requires and needs.

The initiating-a-project phase correlates to the analysis phase of the methodology component as discussed in section 2.4.6.2 where some of the deliverables include the defining of roles and responsibilities and the determination of staff levels and skills.

5.8.1.3 Controlling a Stage

This process describes how activities are monitored and controlled to ensure that a stage stays on course and determine how it reacts to unexpected events. The process forms the core of the project manager's effort on the project, i.e. the process which handles the day-to-

day management of the project itself. Throughout the stages there will be a cycle consisting of:

- Authorising the work that needs to be done. The project manager, as the single point of responsibility, knows what and when work needs to be done on the project as per the detailed project plan. The project manager must provide the resources allocated to a specific task as well as the authorisation to proceed with the execution of the task. This can be, for example, instructing the developer to engage in negotiations with the order entry clerk to design the layout of the screen.
- Gathering progress information about completed or in-progress tasks. As the ERP project progresses and tasks are finished, it is important to process this information to determine the overall health and status of the ERP implementation. This will assist the project manager in determining if the project is on schedule or not.
- Determining changes. Changes will occur during the ERP implementation as described in section 2.4.5 of chapter 2. The project manager must be wary of these changes and if they do occur, actions must be taken and the project board must be informed about any changes to the outcome of the project.
- Reporting. Regular meetings should be held during the ERP implementation life cycle. During these meetings, report back will be given by the entire project team. This will indicate problem areas that must be addressed as well as the project status.
- Taking any necessary corrective action. During the implementation of the ERP system, the project manager must take any corrective actions to ensure that the ERP system is installed within the time and budget constraints.
- The controlling-a-stage process covers these activities, together with the ongoing work of risk management and change control.

The following process is a subprocess of the controlling-a-stage process.

Managing Product Delivery

The objective of this process is to ensure that planned products are created and delivered by (Office of Government Office, 2003):

- Ensuring that tasks allocated to the team are effectively authorised and agreed upon. This means that the project team must know exactly what must be implemented and how the ERP system must be implemented and that the necessary authorisation is in place for the project team to do these implementations. This point relates to the scope management knowledge area of the PMBOK® Guide as per section 5.7.2.
- Ensuring that work conforms to the requirements of interfaces identified in the work package. These requirements are stipulated in the design phase of the ERP methodology (section 2.4.6.3). For the ERP system to be successful, it is important that all the work that the project team does conforms to the specified requirements. This ensures that unnecessary time is not wasted on redoing work to meet the specified requirements.

- Ensuring that the work is completed. There are numerous dependencies within an ERP project, for example the installation of the software is dependent on the hardware being in place. It is the project manager's duty to make sure that work gets done at the right time and also that it is done effectively and efficiently. This relates to the project quality management knowledge area of the PMBOK® Guide described in section 5.7.5.
- Assessing work progress and forecasts regularly. The project manager must take stock of the progress of the ERP implementation. This means an assessment on work that has already been done as well as work still outstanding. This provides an overall status of the ERP implementation and indicates if the implementation is on track or is in danger of running late.
- Ensuring that completed products meet quality criteria. Each component of the ERP system must meet the quality criteria (section 5.7.5) that were defined at the beginning of the project. This is applicable to screen layouts, business processes and the integrity of the ERP system itself. Products that do not meet the quality criteria need to be redone and this leads to additional time and money that needs to be spent. Meeting the quality standards also ensures that the ERP system is of high quality and the users will feel comfortable using it.
- Obtaining approval for the completed products and processes. Sign-offs and approval must be obtained for each product and process that is delivered. This ensures that everyone understands the minimum requirements that the products and processes must adhere to, to meet the quality and required standards. It also ensures that everyone involved in the sign-off delivers the best possible product.

5.8.1.4 Managing Stage Boundaries

This process provides the project board with key decision points on whether to continue with the project or not. A key decision point or milestone is a task that the project board uses to identify significant events in the project schedule, such as the completion of a major phase. This is very applicable if it was decided to implement the ERP system in a phased approach. The objectives of the process are to:

- Assure the project board that all the deliverables planned in the current stage plan have been completed as defined. Each ERP implementation has different stages such as hardware installation, business process review, software installation and customisations. Each stage, in turn, has different deliverables such as screen layouts and new business processes. At the end of each stage, all the defined deliverables must be completed and presented to the project board.
- Provide the information needed for the project board to assess the continuing viability of the project. The project manager must provide the project board with information that can be used to determine if the implementation is still viable and that it does make business sense to continue with the implementation of the ERP system.

- Provide the project board with information needed to approve the current stage's completion and authorise the start of the next stage. At the end of each stage, the project manager will show the project board the deliverables of the current stage and whether these deliverables are completed. These deliverables will be measured against the requirements that were stipulated in the starting-a-project phase. The project board will give permission to continue with the next stage upon completion of all the deliverables of a specific stage.
- Record any measurements or lessons learned which can help later stages of this project and/or other projects.

5.8.1.5 Closing a Project

The purpose of this process is to ensure a controlled closure to a project. The process covers the project manager's work to wrap up the project either at its end or at a premature closure.

The closing phase of the project is just as important as the other phases such as the planning phase. During this phase hand-over to the day-to-day operations of the organisation occurs and the issues surrounding ongoing support must be resolved. The ERP system must be fully implemented and independent of the team that implemented it. The organisation must ensure that the ERP system fulfils the criteria that were set at the beginning of the project. Ongoing support of the ERP system must be defined as well as who is responsible for the support.

Once the project is signed off as completed, the project team will dissolve and the individuals from the organisation will resume with their normal day-to-day duties and the team members will continue with another ERP project.

5.8.2 PLANNING

Planning is a repeatable process and plays an important role in other processes. It describes the planning tools and methods that are used to construct project plans (Dalcher & Brodie, 2007). It identifies the deliverables as well as the activities that produce the deliverables, and estimates the effort that is involved in producing the deliverables.

PRINCE provides a product-based start to the planning activity. It also provides a planning framework which can be applied to any type of project. This involves:

- Establishing what products are needed
- Determining the sequence in which each product should be produced
- Defining the form and content of each product
- Resolving what activities are necessary for their creation and delivery

PRINCE2 is a methodology for managing exceptionally large projects. It helps the project manager work out who should be involved and their responsibilities. It gives the project manager a set of processes to work through and explains what information should be gathered along the way.

Based on the information provided in sections 5.4 and 5.8, the following section compares the relationship between PRINCE2 as a methodology and the PMBOK® Guide as a standard. This comparison strengthens the third and fourth objectives of the chapter and illustrates how PRINCE2 and the PMBOK® Guide can be used together to implement an ERP system.

5.9 PRINCE2 AND PMBOK® GUIDE

Based on the works of Furlonger (2002), Wideman (2002) and Pudusserry (2006), it can be concluded that PRINCE2 and the PMBOK® Guide serve different purposes and are therefore not directly comparable but rather complementary. The PMBOK® Guide takes the best approach to convey the subject content of each knowledge area but is not effective when it needs to provide guidance for running a project. By contrast, PRINCE2 provides a robust easy-to-follow methodology for running most projects, provided that the objectives are clear and the deliverables are either well described or capable of being so. Refer to appendix E for a detailed comparison of PRINCE2 and the PMBOK® Guide.

This section focuses on the synergies between PRINCE2 and the PMBOK® Guide and, together with the previous section, provides a holistic comparison.

Table 5-2 illustrates how the PMBOK standards can be related to PRINCE2. The knowledge areas of the PMBOK® Guide are mapped onto the phases of the PRINCE2 methodology. This illustrates what must be done according to the PMBOK® Guide during the project life cycle as per PRINCE2.

		PRINCE2					
PMBOK ® Guide		STARTING A PROJECT (5.7.1)	INITIATING A PROJECT (5.7.2)	CONTROLLING A STAGE (5.7.3)	MANAGING STAGE BOUNDARIES (5.7.4)	CLOSING A PROJECT (5.7.5)	PLANNING (5.7.6)
	PROJECT INTEGRATION MANAGEMENT	- Project Plan Development	- Project Plan Execution	- Integrated Change Control			
	PROJECT SCOPE MANAGEMENT		- Initiation - Scope Planning - Scope Definition	- Scope Verification - Scope Change Control			
	PROJECT TIME MANAGEMENT			- Activity Definition - Schedule Control			- Activity Sequencing - Activity Duration Estimating - Schedule Development
	PROJECT COST MANAGEMENT		- Cost Estimating - Cost Budgeting	- Cost Control			- Resource Planning
	PROJECT QUALITY PLANNING			- Quality Control	- Quality Assurance		- Quality Planning
	PROJECT HUMAN RESOURCE MANAGEMENT		- Staff Acquisition - Team Development				- Organisational Planning
	PROJECT COMMUNICATIONS MANAGEMENT				- Information Distribution - Performance Reporting	- Administrative Closure	- Communications Planning
	PROJECT RISK MANAGEMENT		- Risk Identification - Qualitative Risk Analysis - Quantitative Risk Analysis	- Risk Monitoring & Control			- Risk Management Planning - Risk Response Planning
	PROJECT PROCUREMENT MANAGEMENT			- Solicitation - Source Selection - Contract Administration		- Contract Closeout	- Procurement Planning - Solicitation Planning

Table 5-2: Synergy between PRINCE2 and the PMBOK® Guide

From this table it can be deduced that together PRINCE2 and the PMBOK® Guide can be used to implement ERP projects. Knowledge of both the PMBOK® Guide and PRINCE2 can assist project managers in implementing more successful projects. PRINCE2 can be utilised as the methodology, and the knowledge areas of the PMBOK® Guide can be used to supplement and enhance the stages of the PRINCE2 methodology.

The previous sections explained the PMBOK® Guide and PRINCE2 and the relation between the two concepts. Based on this knowledge, it can be concluded that the third objective of the chapter has been met, namely to determine if a standard and a methodology do exist for project management. Based on the information provided in the previous sections, it can be concluded that the PMI's PMBOK® Guide standard and OGC's PRINCE2 methodology are international standards.

ERP systems are implemented using a methodology as described in section 2.4.6 of chapter 2. The next section deals with PRINCE2 and the PMBOK® Guide as methodologies and standards and determines if they can be used to implement an ERP system and replace the ERP methodology.

5.9.1 MAPPING PRINCE2 AND PMBOK® GUIDE TO THE ERP MODEL'S METHODOLOGY COMPONENT

The methodology of PRINCE2 can be used in ERP implementations because ERP implementations are fairly large projects, as per the ERP model. The ERP business model in chapter 2 includes a methodology to implement the other four components of the ERP business model. The processes of PRINCE2 can be mapped onto the processes of the ERP business model as illustrated in figure 5-15.

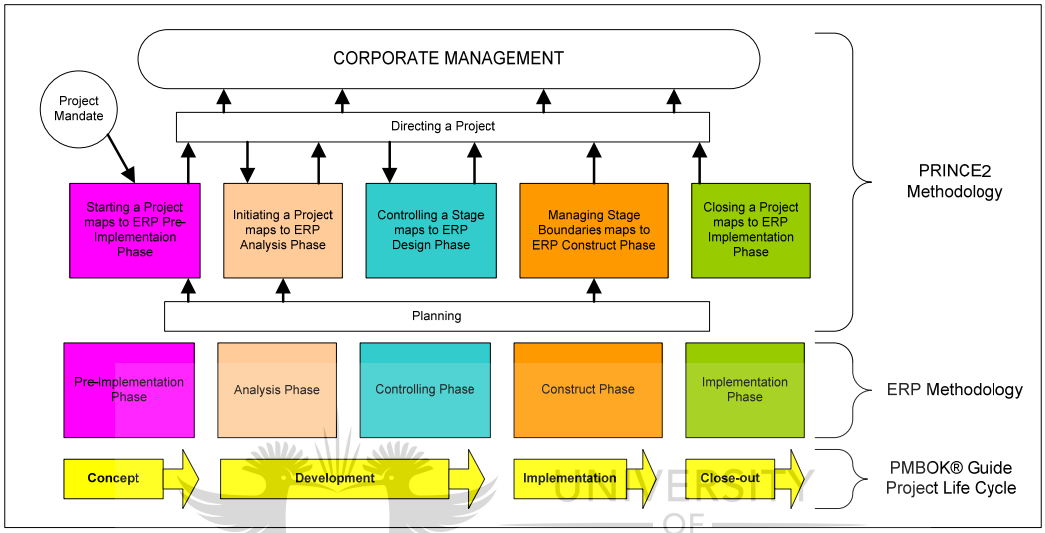

Figure 5-15: Mapping PRINCE2 and PMBOK® Guide onto ERP methodology component

Although figure 5-15 indicates that PRINCE2 can be used to implement an ERP initiative, section 5.7 also indicated that the project life cycle can be used to implement an ERP initiative, although two phases of the ERP methodology are consolidated into one, i.e. the development phase. This linkage and concurrence between the ERP methodology and PRINCE2 enable a project manager to use PRINCE2 as a methodology to implement ERP systems and to use the knowledge areas of the PMBOK® Guide to determine what needs to be done during each phase.

5.9.2 USE OF PMBOK® GUIDE AND PRINCE2 TO IMPLEMENT ERP SYSTEMS

The fourth objective of the chapter is to determine if the PMBOK® Guide as a standard and PRINCE2 as a methodology can be used to implement ERP systems. Based on the information provided above, it can be concluded that both the PMBOK® Guide and PRINCE2 can be used to implement an ERP system as they are complementary to each other.

Hypothesis 4 stated that ERP systems cannot be implemented using existing project management standards. This hypothesis is false and it can be concluded that ERP systems can be implemented using project management. This conclusion is based on the fact that the four objectives of the chapter have been met. Project management was contextualised as a

discipline and its relationship with programme and portfolio management determined. It was established that project management is a mature discipline, that standards and methodologies do exist and that these standards (PMBOK® Guide) and methodologies (PRINCE2) can be used to implement ERP systems.

5.10 CONCLUSION

The chapter focused on project management as a discipline to implement ERP systems. The first objective was to contextualise project management in relation to programme and portfolio management. The contextualisation also took into account components from the organisational requirements perspective as well as from the project management proficiency perspective.

Objective 1 of the chapter has been achieved as figure 5-1 conceptualises project management, and the relationship with the other management levels and components are clearly defined.

The second objective was to determine if project management is a mature discipline, and was met. The third objective of the chapter determined the relationship between project management standards and methodologies and the fourth objective focused on the PMBOK® Guide as a standard and PRINCE2 as a methodology.

The conclusion was that project management is a mature discipline and is based on the fact that project management complies with the guidelines for maturity. The other contributing fact is that the standard and methodology discussed are also a *de facto* standard and methodology and are updated at regular intervals to be relevant.

Hypothesis 4 states ***that ERP systems cannot be implemented successfully using project management standards***. The four objectives of the chapter were achieved and thus the goal of the chapter was achieved, which implies that hypothesis 4 is false. Based on the examples it is clear that the PMBOK® Guide and PRINCE2 can be used to implement ERP systems. The argument is that 40% of ERP implementations are failures as indicated in chapter 1. This failure rate can be improved if organisations use the ERP model together with project management standards and methodologies to implement ERP systems. The ERP model provides an organisation with an understanding of the scope of the ERP implementation, whereas the project management standards and methodologies provide an organisation with proven ways to implement the ERP system.

Hypothesis 4 only addresses the problem of ERP implementation failure rate but does not address the issue that ERP implementations often do not achieve the promised ROI.

ERP systems change the entire organisation and address it on a horizontal as well as vertical level. Individual departments or sections within an organisation can implement an ERP system and can have project success. However, the ROI will still not be achieved as the ERP implementation is not optimised throughout the organisation. Each division must implement the ERP model and thus duplicate resources and effort. Another consequence is that

business processes are only considered at divisional level and not across the entire organisation. Projects are managed at operational or tactical level within the organisation and not from a strategic or business level.

To decrease the percentage of ERP implementations that do not achieve the required ROI, all these individual projects across the organisation must be managed as a holistic ERP implementation. Such a holistic approach can only be achieved if all these projects are managed in a collaborative manner. This also means that the decision to implement ERP systems must be taken at a strategic or business level and not at tactical or operational levels.

The next chapter determines whether programme management can be used to optimise ERP implementations and provide organisations with a better ROI.

6 CHAPTER 6: PROGRAMME MANAGEMENT METHODOLOGIES & STANDARDS

The previous chapter concluded that project management can be used to implement ERP systems but does not address the issue of poor ROI. To realise the full benefit of an ERP system and to maximise the ROI, another approach might be required. This is based on the rationale of systems thinking where a holistic view of an ERP system should provide a better ROI for the organisation.

Hypothesis 5 states that ERP systems cannot be implemented using existing programme management standards. The goal of this chapter is to determine whether programme management can be used to implement an ERP system and improve the ROI.

The first objective is to determine the maturity of programme management as a discipline. This is done by measuring programme management against the criteria for maturity as set out in chapter 5.

The second objective is to determine if ERP systems can be implemented using available standards and processes of programme management.

The third objective is to determine the improvement in ROI by using these standards and processes. This is done by analysing how ROI is achieved and comparing this to the current standards and processes.

The layout of the chapter is based upon these three objectives. The first section focuses on the maturity of programme management. The second section deals with a standard and a process for programme management, and the third with the benefits management within programme management. For the purpose of this study, the focus will be on ROI as part of benefits realisation. The reason is that Ptak and Schragenheim (1999) report that between 60 and 90% of ERP implementations do not achieve the promised ROI. Hongjun (2005) indicates that in China this figure is as high as 70%.

Based on the maturity criteria of Crawford (2004), Charters (2006) and Eve (2007), the following section covers the principles of maturity.

6.1 MATURITY OF PROGRAMME MANAGEMENT DISCIPLINE

Programme management refers to the management of the benefits from multiple interrelated projects (Lycett, Rassau & Danson, 2004; Thiry & Deguire, 2007). This differs from the management of multiple projects. In the management of multiple projects, the projects are not related and are managed separately and the benefits of the individual projects are not grouped together to provide a holistic benefit (Dooley, Lupton & O'Sullivan, 2005; Sutterfield, Friday-Stroud & Shivers-Blackwell, 2006).

Programme management forms part of the three tiers of project management, programme management and portfolio management as described in figure 5-1 of chapter 5. It is clear

from figure 5-1 that programme management must also address the same components as project management and that includes maturity.

Vereecke, Pandelaere, Deschoolmeester and Stevens (2003) warn that programme management is not a mature discipline. The research they conducted came to the conclusion that organisations interpret and apply programme management differently. Since Vereecke et al. published their results, the PMI (2006c) issued a standard and several articles were published in international journals. For programme management to be recognised as a mature discipline, it must adhere to the same criteria as were used to measure the maturity of project management (Crawford, 2004; Charters, 2006; Eve, 2007):

- ***There is a substantial body of scientific research***. The discipline of programme management is a relatively new discipline (Vereecke et al., 2003) but articles about programme management were published in the *International Journal of Project Management* as early as 1997 (Pellegrinelli, 1997) as was a book by Reiss (1996). In the last couple of years, several articles have seen the light and were published in international journals (Maylor et al., 2006; Dietrich, 2006; Pellegrinelli, Partington, Hemingway, Mohdzain & Shah, 2007). Dinsmore and Cooke-Davies (2006) also published a book on programme management. Papers read at conferences on project management focus on programme management (Frigenti & Comninos, 2006; Crawford, 2006b; Nieto-Rodriuez, Evrad & Salah, 2006; Muller & Blomquist, 2006). In October 2006 Reiss, Anthony, Chapman, Leigh, Pyne and Rayner published a book on programme management which covers topics such as the introduction to programme management, the processes of programme management and how to measure the maturity of programme management.
- ***There are codes of practice and standards.*** The PMI published a standard in 2005 called the Standard for Program Management (PMI, 2006c) and the OGC in the United Kingdom published a framework called Managing Successful Programmes (Pellegrinelli et al., 2007). The PMAJ released the P2M – A guidebook for Project and Program Management for Enterprise Innovations in 2001. The focus of the P2M is on "a consistent chain from a mission, through strategies to embody the mission, a program(s) to implement strategies, to projects comprising a program'' (Morris & Pinto, 2004). Therefore, the document can be applied to individual projects and also to programmes within the wider organisational context. Unlike the project management standards, none of these programme management standards have achieved international recognition through ANSI or ISO yet.
- ***There is an education process.*** The PMI introduced a pilot programme to certify individuals as programme management professionals (PMI, 2006). This programme became available to the general public on 1 October 2007 (PMI Global Operations Center, 2007). The APM provides certification in its framework called Managing Successful Programmes (Office of Government Commerce, 2007). Various other

institutions provide short courses in programme management (4PM, 2007; Aspe Technology, 2007).

- ***There is a core of professional practitioners***. Because the PMI introduced certification only in late 2007, there are no professional practitioners in the programme management discipline yet apart from the pilot participants (Farnan, 2007). The APM (OGC, 2007) only certify users in their framework (Managing Successful Programmes) and since it is mostly used in the United Kingdom, the certified professionals are predominantly based in the United Kingdom and Europe.
- ***There is a professional body with a code of ethics.*** Both the PMI and the APM as professional bodies have issued publications on programme management and as professional bodies ensure that there are codes of ethics. The project management code of ethics of the PMI (Gray, 2005) can be utilised in the programme management field since programmes incorporate projects and the same code of ethics should and can be used.

The criteria used to measure the maturity of programme management are illustrated in table 6-1.

Criteria	Elements	Examples
Body of knowledge	Journals	• *International Journal of Project Management* • *PM Journal*
	Books	• www.amazon.com • PMI Bookstore
	Conferences	• PMI Global Conference • PMI Research Conference • IPMA World Congress
Codes of practice & standards	Codes of practice	• EVA (earned value analysis)
	Standards	• Program Management Standard • Managing Successful Programmes • P2M
Education process	Qualifications	• No formal university degrees and diplomas
	Certifications	• PgMP Certification • MSP Certification
	Training	• List of registered education providers from PMI • List of registered education providers from PMSA • List of registered education providers from APM
Professional practitioners	Certified	• PgMP • MSP
	Qualified	• Nothing
Professional bodies	Global	• PMI • APM • IPMA
	National	• PMSA • AIPM
	Regional	• Gauteng branch of the PMSA

Table 6-1: Programme management profession maturity criteria

The conclusion that can be drawn from the above information is that the programme management discipline is not as mature as the project management discipline. Although the programme management discipline has certification, there are not enough certified professionals yet to constitute a critical mass of professionals. Inroads have been made with

the publication of the PMI's "The Standard for Program Management" (2006c) and the book by Reiss et al. (2006). Programme management has matured since 2003 when Vereecke et al. made their statement but the need for a programme management maturity model does exist. Although the organisational project management maturity model (OPM3) mentions that maturity is reflected by the combination of best practices within the project, programme and portfolio domains, the focus is still on effective organisational management (PMI, 2003).

For the purpose of this study, programme management is considered mature enough as a discipline to implement ERP systems. Although programme management certification was only launched in October 2007, the references to various books and publications in the previous section provide an organisation with information on how to utilise programme management. This is, however, dependent on the outcome of the second objective. Because various programme management standards do exist, the following section focuses on two standards. This allows for the comparison of these standards and to determine if there is consensus on what programme management is.

Section 5.2 discussed the concepts of standards and methodologies. The same principles still hold for programme management where standards define what must be done and methodologies define how it must be done. There is currently no methodology like PRINCE2, for instance, that enables programme managers to determine how programme management must be done. A literature survey provided a number of standards and processes that describe what must be done in programme management, but none of these provide a methodology on how it must be done.

The next section focuses on a programme management standard, i.e. the standard of the PMI called The Standard for Program Management (PMI, 2006c). This standard is discussed in relation to ERP implementations. The reason for this is to maintain consistency with how the PMI's project management standard was discussed in section 5.4.

6.2 THE STANDARD FOR PROGRAM MANAGEMENT

The Standard for Program Management (PMI, 2006c) defines programme management as a centralised management of a programme to achieve the programme's strategic benefits and objectives. The general consensus is that a programme consists of interrelated projects that provide an organisation with benefits that are of strategic value as illustrated in figure 6-1.

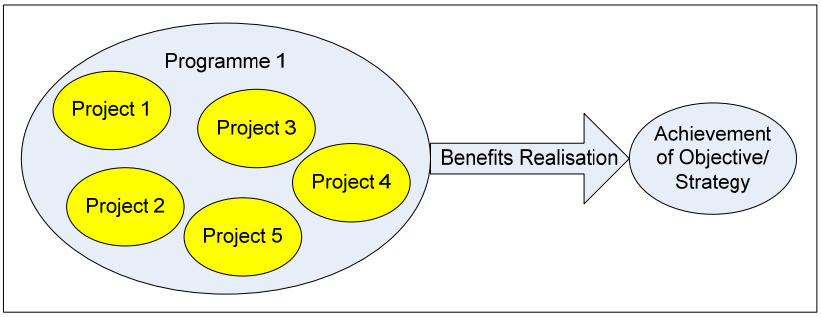

Figure 6-1: Programme management benefits realisation

These definitions imply that if programme management is used to implement ERP systems, it will realise one or more benefits and that it can be optimised for such an implementation.

Figure 6-2 indicates the relationship between programme and project management as well as the management controls of each discipline. This is also in line with the conceptualisation of project management as discussed in section 5.2 and illustrated in figure 5-1.

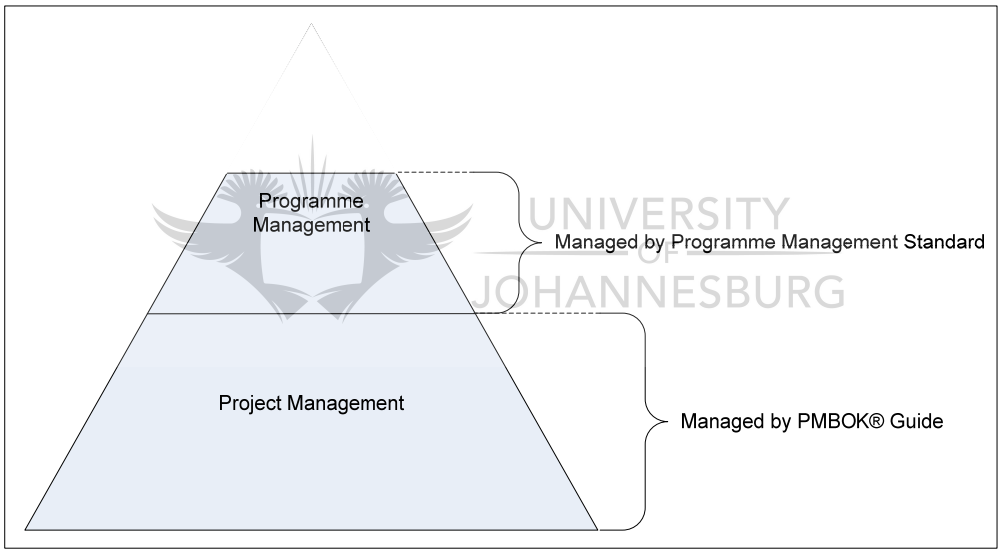

Figure 6-2: Programme and project management relationship

It is clear from figure 6-2 that projects are part of programmes, as discussed earlier, to ensure the realisation of the combined benefits. Projects can be managed using the PMBOK® Guide and each project within the programme will be managed using this guide, but the programme itself will be managed by the PMI's Standard for Programme Management. It is important to define these relationships, as each discipline addresses different needs within the organisation.

The combination of figures 6-2 and 5-2 implies that programme management consists of the management of multiple projects consisting of three components that are related to one another, namely the project management life cycle, the project management process groups and the project management knowledge areas.

For the purpose of this study, the focus is on the programme life cycle and how it can help to ensure the perceived ROI of an ERP implementation. The reason for this is that the process groups and the knowledge areas have already been discussed in sections 5.6 and 5.7. The following section discusses the programme life cycle as defined by the PMI (2006c) and is illustrated in figure 6-3.

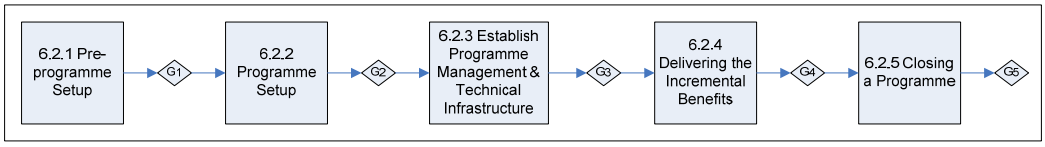

Figure 6-3: Programme management life cycle

The programme life cycle is initiated through the pre-programme setup phase, which is discussed briefly in the next section.

6.2.1 PRE-PROGRAMME SETUP PHASE

The main objective of this phase is to establish a foundation for the approval of a programme. The management of the organisation initiates the programme with a mandate that details the strategic objectives and benefits of the programme (Thiry, 2004).

Owing to its nature, programme management focuses on the achievement of business objectives and is thus more strategic than project management (Thiry, 2002). The first step in the pre-programme setup phase needs to show how the programme would map to and achieve the business objectives through the various projects that form part of the programme. In the case of an ERP system implementation, the divisional or departmental ERP system implementations will be grouped together into a programme to form an ERP implementation programme. The business objective of such an ERP programme might be to optimise the business processes within the organisation (Metaxiotis et al., 2005). This can only be achieved if the ERP system is implemented across the organisation as an entity and not as separate ERP projects within the various divisions (Maurizio et al., 2007). Implementing ERP systems per division will mean that only the division's business processes are optimised and not those of the entire organisation (Bozarth, 2006). This implies that the sum of optimising the business processes is higher than the sum of the individual business process optimisation. This can be related to systems thinking where the aim is to see the total picture (Frank, 2002). The purpose is to determine interrelationships and address complex issues. This is covered in section 2.4.1 and with ERP implementations, the entire ERP initiative should be seen as the total picture and the interrelationship between the components should be determined.

If systems thinking is applied to programme management, then it means that a programme must be viewed holistically and that the interrelationships must be determined between the various interrelated projects of the programme.

The next step in the phase is to define a high-level plan that shows how the business objective will be achieved by the specific programme. This plan must indicate the programme objectives and how they are aligned with the organisation (Blomquist & Müller, 2006). This plan is based on the project plans that form part of the programme. In the case of an ERP implementation, the various ERP implementation plans are consolidated into the programme. These plans include the hardware, software, business process plans as well as the change management plans.

The last step in the phase is the selection and approval of the programme (Antony, 2006). Programmes are selected and approved by taking the following factors into consideration:

- ***The availability of resources:*** The resources do play a major role in the success of an ERP implementation as discussed in section 2.4.4. Resources are allocated to the programme based on the requirement of the ERP system and consist most of the time of users, consultants and developers. These resources are pulled from a collective pool of resources and the best resource for a specific task at a specific point in time is allocated to the task.
- ***Preliminary budget estimates:*** ERP implementations are fairly expensive and the budget estimates are thus crucial to justify the cost of ERP implementation against ROI and that is why ERP implementations are perceived as not delivering the promised ROI (Ptak & Schragenheim, 1999; Bennington & Baccarini, 2004). The individual project budgets are consolidated into a programme budget and this provides the total budget figure.
- ***The benefits that the programme will realise:*** The benefits that the ERP system will realise must be clearly defined in terms of the individual projects that form part of the programme as well as the benefits that will be realised by the programme itself. Benefits can be categorised into tangible or intangible benefits where tangible benefits are immediately obvious and easily measurable while intangible benefits are not (Thomas, Delisle, Jugdev & Buckle, 2002; Bennington & Baccarini, 2004; Remenyi, Bannister & Money, 2007). For example, the individual projects might realise the optimisation of the business processes within each individual division, but the programme will go one step further by optimising all these business processes to ensure that business processes across the organisation are optimised (Reiss et al., 2006). Bennington and Baccarini (2004) also mention two additional benefits, i.e. efficiency and effectiveness benefits. These two benefits are of importance to ERP initiatives because efficiency benefits seek to reduce the cost of performing a particular process, whereas effectiveness benefits means doing things different to better achieve the required results (Fitzgerald, 1998).
- ***The risks associated with the programme:*** All the associated risks with the programme must be listed and mitigated to ensure the success of the programme. A holistic view of all the risks provides the organisation with a better mitigation strategy. This is not the case if risks are mitigated in isolation of one another.

The outputs of this phase are either the approval or rejection of the programme. If the programme is approved, a programme charter is drafted, a programme manager and a programme sponsor are assigned and resources are identified and committed (PMI, 2006c). From the above discussion, it is clear that there is a need for an organisational structure to facilitate this phase, i.e. a programme office (Kerzner, 2003). The programme office provides a permanent structure to the organisation to assist with strategic planning, methods and standards as well as the continuous improvement of the programme office.

Once the programme has been approved by the organisation and passed gate review G1 in figure 6-3, the next phase is then to set up the programme itself.

6.2.2 PROGRAMME SETUP PHASE

The objective of this phase is to develop a detailed plan which provides the direction on how the programme will be managed and define the key deliverables of the programme itself.

The detailed programme plan must include aspects such as the deliverables and the cost of the programme. It also addresses the issues and risks that are associated with the programme. The projects that will form part of the programme must be identified during this phase. These projects will either already exist or new projects need to be defined. A transition plan must also form of this phase as it will determine how the programme benefits are sustained once they are transferred to the organisation.

The duration estimation based on the duration of the individual projects is determined during this phase. The ERP programme's duration will be at least as long as the combined time of the individual projects. Time must be allocated to the ERP programme to ensure that benefit realisation is also taken into consideration during the duration estimation and that it is not excluded. A schedule is determined based on the duration of the individual projects that form part of the ERP programme. The consolidation of all risks across the individual projects is also calculated. This consolidation highlights risks that appear in each individual project and the sum total of these risks might be higher than the individual risk itself if it is addressed in isolation.

All the individual project plans, e.g. project, communication and risk management plans, are consolidated into one master plan for the programme. These plans are based in the nine knowledge areas of the PMBOK® Guide as discussed in section 5.7 and illustrated in figure 5.2. This implies that the programme's communication plan will be a consolidation of all the interrelated projects' communication plans. Apart from these consolidated plans, the programme has its own distinct communication or risk management plans that are programme specific and addresses the issues related to the programme.

The next phase within the programme management life cycle is the establishment of a programme management and technical infrastructure. This phase is reached once the programme has passed gate review G2 in figure 6.3.

6.2.3 ESTABLISH A PROGRAMME MANAGEMENT AND TECHNICAL INFRASTRUCTURE

The programme manager and programme team establish the structure that is needed to work with as well as the technical infrastructure to facilitate that work (PMI, 2006c).

The organisations must support the controlling and monitoring of the programme itself and the individual projects and ultimately make decisions for the programme. This support is provided through the programme management office. According to Dai and Wells (2004), the purpose of the programme management office is to assist the organisation at large with strategic matters through the implementation of programme management principles, tools and techniques. It is also often called a centre of excellence (Walker & Christenson, 2005). This differs from the project or programme office that manages a specific project/programme (Kerzner, 2003). This view is supported by Hobbs and Aubrey (2007), who also indicate that the project office focuses on the management of a project. They also state that the terms "programme management office" and "programme office" are interchanged within organisations. For the purpose of this study, the definitions of Dai and Wells (2004) are adopted.

The programme management office normally consists of the following:

- An executive sponsor who is primarily responsible for ensuring that the benefits are delivered and who sits with the programme board to make business decisions about the programme. Although the ERP system is perceived as an IT system, it is a financial system and must be governed by the finance department of an organisation (Hendricks, Singhal & Stratman, 2007). This is normally an executive from the finance department since the impact of the ERP system is often more financial than technical.
- The programme team that develops the deliverables of the programme. The importance of team members within an ERP system is discussed in section 2.4.4.2. The team plays an even bigger role within a programme than within a project. The reason is that the programme team must ensure that the programme objectives and thus the business objectives are achieved.
- A programme office that support the programme manager and programme team (Apfel et al., 2006). The programme office forms part of the programme management office and the function of the programme office is to manage the progress of the programme on a day-to-day basis.

The outputs of this phase are facilities that are required to support the programme as well as relevant IT systems and communication technologies with the necessary support arrangements to sustain the programme throughout its life cycle. These IT systems are not the same as the IT requirements of the ERP system itself, but are there to support the programme.

The fourth phase focuses on delivering the incremental benefits of the programme. The various projects are initiated and their respective deliverables are coordinated to deliver the incremental benefits.

6.2.4 DELIVERING THE INCREMENTAL BENEFITS

The programme must have passed gate review G3 in figure 6-3 to continue with the initiation of the projects. The programme manager is responsible for the management of the group of related projects in a consistent and coordinated way in order to achieve the incremental benefits that could not be obtained by managing the projects as stand-alone projects. The various project managers are still responsible and accountable for the successful delivery of the individual projects.

As explained previously in section 6.2.1, the benefits of a programme can be divided into tangible and intangible benefits. It is difficult to measure the intangible benefits but they cannot be ignored. Remenyi et al. (2007) propose a six-step methodology that can be used to measure the intangible benefits based on the cause-and-effect of the new ERP system and the changes the new ERP system will bring to the organisation.

There are also a number of methodologies available to measure the tangible benefits of an ERP system such as user attitudes, return on management, ROI as well as strategic match analysis and evaluation (Remenyi et al., 2007).

The aim of this phase is to manage the programme as a whole while ensuring that the individual projects within the programme are managed according to best practices. The responsibility of the programme manager is to review the efforts of each project during each project life cycle phase. Control over these projects is achieved by progress reports and using gate reviews at each of the different phases in the projects' life cycle.

The final phase in the programme management life cycle is the closure of the programme.

6.2.5 CLOSING A PROGRAMME

This phase starts after gate review G4. All the projects have been completed and the programme organisation and infrastructure are closed down. There are some key activities that must be executed when a programme reaches the end of the life cycle:

- Review the status of the anticipated and the realised benefits with the stakeholders and programme sponsor. The intended ROI of the ERP system must be evaluated against the cost and time spent on the ERP implementation. This function will be performed by the programme management office.
- Disband the programme organisation. This includes appraisals of personnel and contract closures. This specific function as well as the following function will be performed by the programme office as the programme is closing down.
- Provide customer support to ensure that guidance and maintenance will be provided in case an issue arises or a defect is detected after the closure of the programme. This

assurance is generally defined by a contract or service level agreement (Wu & Wang, 2006). Once the programme is completed, it becomes operational and this activity forms part of the operational aspects of the programme.

- Document the lessons learned in the organisational database so that they can be referenced in the future by similar programmes. Lessons learned are expressed as weaknesses or areas to improve and as strengths and best practices of the performing organisation to be utilised in the future (Reich & Wee, 2006). This activity will be performed by the programme management office to ensure that future programmes are managed better.
- Manage any required transition to operations. This forms part of the process to transform the programme into operations.

The PMI's Programme Management Standard can be used to govern and provide standards for the implementation of an ERP system. It provides an organisation with a process that enables it to implement an ERP system in a holistic manner by addressing the organisational needs and not divisional or departmental needs.

There are numerous programme management processes (Haughey, 2001; Thiry, 2004; Lycett, Rassau & Danson, 2004; Reiss et al., 2006). In the next section another programme management process is explained, namely one defined by Reiss et al. (2006), to determine if programme management can be used to implement an ERP initiative. The reason for choosing this particular process is that it is comprehensive and also the most current process at the time of writing. The rationale for discussing a second process is to determine if there is a sense of commonality between the various processes and standards. This is necessary to ensure that there is the same logic in the absence of a programme management methodology.

6.3 GOWER HANDBOOK OF PROGRAMME MANAGEMENT

The programme management processes as defined by Reiss et al. (2006) is illustrated in figure 6-4.

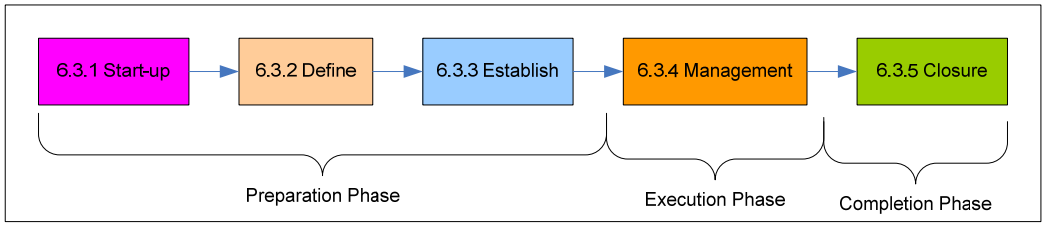

Figure 6-4: Programme management process

It is initiated by a mandate and follows five processes to ensure the successful delivery of the programme.

The objectives of the preparation phase are to provide a clear definition of what the programme must achieve as well as establish a basis for managing the programme.

6.3.1 START-UP OF A PROGRAMME

The objective of the start-up process is to determine if it is worthwhile for the organisation to initiate the programme and if it justifies an initial investment to develop an approach on how to implement the programme. If this is related to the implementation of an ERP initiative, the objective of this process should be to determine the benefits that the organisation will achieve from the ERP implementation. Some benefits could be streamlined organisational processes or better customer service, but all these benefits are subsequent to the ROI that the organisation will achieve from investing organisational resources into the ERP implementation.

6.3.2 DEFINE A PROGRAMME

The objective of this process is to provide the organisation with a detailed plan on how the programme will be implemented. Part of this process is to provide the detailed benefits of the programme for the organisation after its successful implementation. These are derived from the benefits that were determined in the start-up process. In the implementation of an ERP system, the individual components of the ERP system are grouped together to form an ERP programme. The objective would then be to determine the order in which and plans on how to implement these components in such a way that the organisation receives the optimum ROI as well as uses the best executed plan. The final decision at the end of this programme is to determine if the programme must continue or not.

This implies that the organisation has already spent resources on this programme without receiving any tangible benefits from it. The rationale is that the time spent upfront warrants this expenditure and provides the organisation with a final decision to go ahead with the programme or not. Once the decision is made to continue with the programme, the next process is establishing a programme.

6.3.3 ESTABLISH A PROGRAMME

According to Reiss et al. (2006:55), the objective of this process is firstly to define the infrastructure and secondly to determine the processes that enable work on the programme. The infrastructure provides, for example, the setup of a programme management office. This relates to figure 5-1 where a component of the contextualising model indicates that there must be management offices in place for the management of a programme. The infrastructure also provides the physical IT systems that must be in place for the programme and these must be separated from the IT infrastructure that is needed for the ERP system, as this is a separate project that forms part of the ERP programme itself.

The processes that must be in place at the end of this phase are, for example, planning and change control processes. This also relates to figure 5-1 as these processes form part of the conceptualisation model.

Once the programme has been established, the preparation phase is completed and the next phase is entered called the execution phase. The objectives of this phase are to deliver the anticipated change through the individual projects and to use the products and services delivered by the projects within the organisation.

The execution phase consists of only the programme management process.

6.3.4 MANAGE A PROGRAMME (PROGRAMME EXECUTION)

Eighty percent of the actual work of the programme is done during this process (Reiss et al., 2006:63). The objective of this process is to deliver the anticipated benefits to the organisation. This is done through the execution of the individual projects that are incorporated into the programme. In the case of an ERP initiative, the individual projects are executed in an orderly fashion, for instance the execution of the infrastructure project as well as the implementation of the software modules once the infrastructure is in place.

Throughout this whole process, the programme manager must keep in mind the anticipated benefits that must be realised. That is the primary focus of the programme, whereas the primary focus of the individual projects is to implement them successfully.

Once the programme has been executed successfully, the only process that is left is the closing of the programme. The primary objective of the completion phase is the revision of the programme to determine its realised benefits in relation to its strategic intent. The closure process is the only process within this phase.

6.3.5 CLOSURE

There are a few activities that must be finalised during this process before the programme can be closed. These activities include:

- The decommissioning of the programme team and the programme office. It must be noted that the individual projects have already been decommissioned.
- The extraction of the lessons learned from the team members to ensure continuous learning throughout the organisation. This activity is managed through the programme management office to ensure that new programmes are not susceptible to the same mistakes and errors.
- Ensure that all arrangements for benefits realisation are in place. This is done through the programme management office.

These phases and processes discussed above form the basis of the programme management process as defined by Reiss et al. (2006).

The following table shows the similarities between the programme management life cycle and the programme management process.

	PMI's Program Management Standard	Gower Handbook of Programme Management	Purpose
Phase 1	Pre-programme setup	Startup	Programme approval
Phase 2	Programme setup	Define	Detailed plan on how the programme will be managed including deliverables
Phase 3	Establish programme management & technical infrastructure	Establish	Establishes the infrastructure as well as the processes
Phase 4	Delivering the incremental benefits	Management	Delivery of anticipated benefits
Phase 5	Closing a programme	Closure	Programme is closed down and evaluated

Table 6-2: Comparison of programme management phases

It can be concluded from table 6-2 that although the phases are labelled differently between the PMI's Program Management Standard and the Gower Handbook of Programme Management, the concepts within each phase are the same.

This concludes the achievement of the second objective of the chapter. There are standards and processes available and the fact that there are some overlapping areas indicates that programme management as a discipline is converging into a common understanding of what programme management is and constitutes.

The next section covers the third objective, namely the realisation of benefits through the usage of programme management based on the ROI that an organisation receives from a programme.

6.4 ANALYSING THE STANDARDS FOR BENEFITS MANAGEMENT

One of the issues regarding the implementation of ERP systems is that the ROI is not always achieved. Hypothesis 5 states that ERP systems cannot be implemented using existing programme management standards. ROI can be defined as "a ratio of resources (usually financial) gained or lost in a process/investment/result to the total amount of resources provided" (White, 2007). A positive ROI suggests that the benefits overshadow the cost that has been generated by the process or investment, whereas a negative ROI indicates that the cost of the investment or process overshadows the benefits that were generated. In an ERP environment this implies that the benefits that the organisation receives from the ERP implementation must outweigh the costs and effort that serve as inputs to the ERP implementation.

As indicated in chapter 1, a positive ROI is often not achieved and 30 to 40% of ERP implementations do not realise benefits at all (Remenyi & Sherwood-Smith, 1998; Bennington & Baccarini, 2004). To ensure that ERP implementation delivers a positive ROI, its benefits must be determined. Benefits can be defined as an outcome whose values are considered advantageous by an organisation. This links to the ROI where the benefits must outweigh the costs of such an implementation. According to Bennington and Baccarini (2004), to realise benefits in an ERP implementation, the implementation must be organised in such a manner that the potential benefits are realised. This implies that benefits must be identified and organised, and then after the ERP implementation, it must be determined if these benefits are realised. Once the benefits are realised, a comparison can be done to see if the benefits of the ERP implementation outweigh its cost and effort.

The following sections assess the PMI's Program Management Standard and the programme management process of Reiss et al. against benefits realisation to determine if they can be utilised to realise benefits and ultimately ensure a positive ROI for the organisation.

There are a few frameworks that can be used to realise benefits (Lin, Pervan & McDermid, 2007), but the process of benefits realisation can be summarised as follows (Bennington & Baccarini, 2004):

Step	Action	Description
1	Benefits identification	Identifies and documents benefits that are relevant to the ERP implementation and that can be used to convince the organisation of the benefits of the ERP implementation.
2	Benefit key performance indicators (KPIs)	KPIs are used to provide relevant, accurate and consistent measurements of each benefit of the ERP implementation.
3	Benefits realisation plan (BRP)	The BRP outlines where the benefits should be realised within the organisation, who will receive the benefits and when the benefits will be realised.
4	Benefits monitoring & control	The benefits of the ERP implementation must be monitored throughout the lifespan of the implementation. This ensures that any internal or external influences on the ERP implementation are constantly taken into consideration.
5	Benefits realisation	The last step of the process is to determine if the benefits are realised. This is done by measuring the actual benefits against the planned benefits of step 1.

Table 6-3: Benefits realisation process

The process in table 6-3 is used to assess if the PMI's Program Management Standard and the programme management processes of Reiss et al. address and underwrite this process and the results are shown in table 6-4.

Step	Action	PMI's Program Management Standard	Gower Handbook of Programme Management
1	Benefits identification	The identification of benefits is addressed in the pre-programme setup phase (section 6.2.1).	The identification of benefits is addressed in the start-up of programme process (section 6.3.1).
2	Benefit KPIs	Although KPIs are not explicitly mentioned, metrics and measurements are addressed in the BRP.	KPIs form an integral part of the benefits management process.
3	BRP	The BRP forms part of the benefits management theme and includes factors such as: • Intended interdependencies between benefits • Alignment with the strategic goals of the organisation • Benefit delivery scheduling • Metrics and measurement • Responsibility for delivery of the final and intermediate benefits within the programme • Benefits realisation	The BRP forms part of benefits management and includes several factors.
4	Benefits monitoring & control	The benefits of the programme are measured during the establishment of a programme management and technical infrastructure as discussed in section 6.2.3. One of the outputs of this phase is a control framework that measures the envisaged benefits within a programme.	The benefits of the programme are measured during the execution of a programme as discussed in section 6.3.4.
5	Benefits realisation	The closing of a programme (section 6.2.5) reviews the status of the anticipated and realised benefits with the stakeholders and programme sponsor.	The closing of a programme (section 6.3.5) reviews the status of the anticipated and realised benefits with the stakeholders and programme sponsor.

Table 6-4: Comparison of the benefits realisation process

It can be concluded from table 6-4 that the both the PMI's Program Management Standard and the process of Reiss et al. can be used to implement a programme as well as the fact that both ensure benefits realisation through the successful delivery of programmes.

The third objective of the chapter was to determine how programme management standards can be used to determine benefits realisation, or ROI. Table 6-4 indicates that both the standards discussed provide an organisation with a way to determine and manage the benefits of an ERP implementation.

All three objectives have been met and it can be concluded that programme management can be used to implement ERP systems and that ROI can be used as a benefits realisation methodology to measure the benefits of the programme.

6.5 CONCLUSION

The chapter focused on programme management as a discipline. The first section applied the principles of Charters (2006) to determine if programme management is a mature discipline. The second section of the chapter focused on the Program Management Standard of the PMI and the programme methodology described by Reiss et al. The third section of the chapter argued that the current standards and frameworks available to organisations can be used to realise the benefits and therefore provide a positive ROI.

The conclusion that can be drawn from this chapter is that first of all, programme management is mature enough as a discipline to be applied by an organisation. The only negative factor is that there are only a few certified programme managers. The second conclusion that can be drawn from the information provided is that the standard and process provide an organisation with a means to successfully manage programmes within the organisation. The third and most important conclusion is that the benefits that are realised through programme management provide the input to determining if a positive or negative ROI is achieved by the specific programme.

The value of this chapter is that it illustrates, through the benefits management of programme management, that programme management itself can be used to manage and implement an ERP system. Although project management can achieve the successful implementation of an ERP system, it focuses extensively on delivering the ERP system within the triple constraint of time, cost and scope. This in itself solves one part of the problem, namely the fact that ERP systems are typically late.

Using programme management provides the implementation of an ERP system with a strategic nature. Programme management focuses on delivering the strategies and business objectives of an organisation. This means that the implementation of an ERP system ensures that some strategies and/or business objectives are met, thus ensuring that the organisation achieves the maximum benefits from the ERP implementation. This substantiates hypothesis 5, namely that current programme management standards can be used to implement an ERP system.

The following chapter discusses how ERP initiatives must be initiated to achieve the maximum benefits for the organisation, as the current assumption is that an ERP initiative has already been identified.

7 CHAPTER 7: VISION-TO-PROJECT FRAMEWORK

Based on the information provided in the previous chapters, it is clear that the failure of ERP systems cannot be attributed to either the operational side or the programme management of an ERP system. Chapter 5 established that ERP systems can be implemented using project management, but to achieve real business benefits and ROI, programme management must be used to implement an ERP system. This was established in chapter 6.

Hypothesis 6 states that ***ERP initiatives are implemented for the wrong business reasons***. Based on this, the goal of the chapter is to determine how ERP initiatives should be initiated. Three objectives are used to achieve this goal:

- The first objective is to determine the different organisational levels and how they are used to implement and manage projects and programmes within an organisation.
- The second objective is to determine the correlation between the organisational decision-making levels and project, programme and portfolio management. This correlation is used to determine at which level ERP implementations should be initiated.
- The third objective is to determine the link between the initiation of an ERP system implementation and the vision and strategies of the organisation.

The following section focuses on the first objective, which determines the various levels of decision-making within an organisation.

7.1 DECISION-MAKING HIERARCHY

The aim of this section is to define the different levels of decision-making within an organisation. This provides a better understanding of when decisions are made, who makes them and what the consequences are of these decisions in the short and long term.

Decisions are made on a daily basis by different people within the organisation (Van der Merwe, 2002). The effect of these decisions also influences the way the organisation is run in the short as well as the long term (Desai, 2000).

The decision-making process within an organisation is explained and provides a clear understanding of the relationship between the levels of decision-making and the influence of these decisions on projects in general and specifically on ERP implementations. This affects one of the components within organisational theory. Organisational theory can be defined as the way an organisation functions and how it affects and is affected by the environment (Jones, 2001:8). The other two components address the design and culture of the organisation.

Managing activities internal to an organisation is only part of the modern executives' responsibilities (Nadler, 2004). The modern executives must also respond to the challenges posed by the organisation's immediate and remote external environments. To deal effectively with everything that affects the growth and profitability of an organisation, executives employ

management processes that position the organisation as optimally as possible in its competitive environment by maximising the anticipation of environmental changes and unexpected internal and competitive demands (Kakabadse, Ward, Korac-Kakabadse & Bowman, 2001).

This all-encompassing approach is known as strategic management, which is defined as the set of decisions and actions that result in the formulation and implementation of strategies designed to achieve an organisation's objectives (Richardson, 1994; Dew, Goldfarb & Sarasvathy, 2006). A strategy is a large-scale, future-oriented plan for interacting with the competitive environment to achieve the organisation's objectives (Manas, 2006). Although the plan does not detail all future deployments, it does provide a framework for managerial decisions (Joshi, Kathuria & Porth, 2003).

According to Pearce and Robinson (2000), the strategic management of an organisation can be split into three levels of strategies. Figure 7-1 illustrates the three levels of strategies and decision-making within an organisation. The fourth level is the level where the strategies of the organisation are executed, namely operational level. This is where the employees within an organisation perform their daily tasks (Marnewick & Labuschagne, 2006).

The three levels of Pearce and Robinson plus the additional fourth level all form part of the organisational vision.

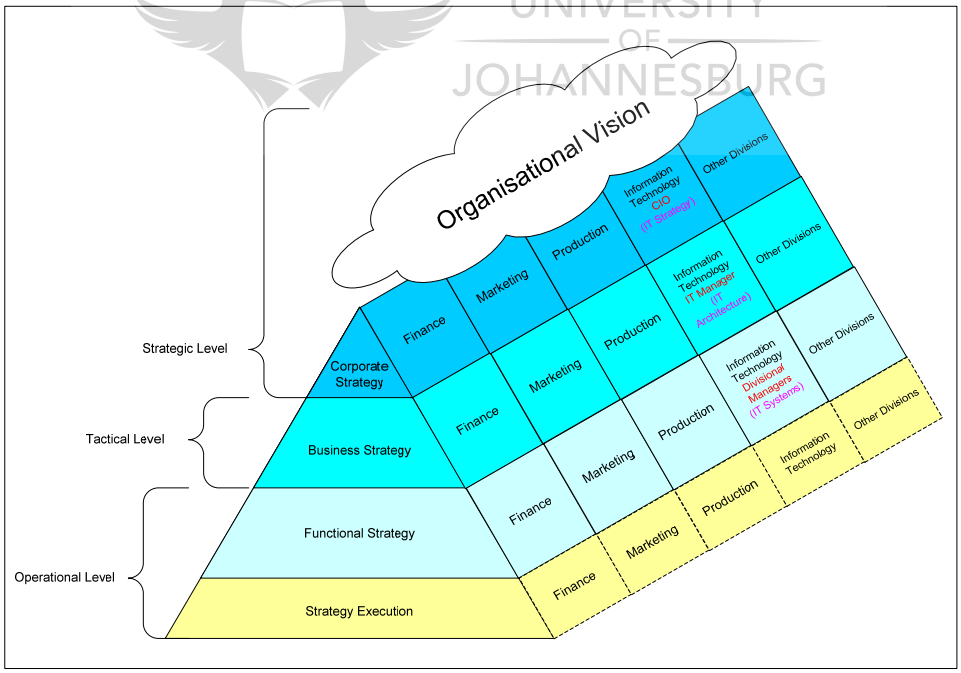

Figure 7-1: Strategy and decision-making levels

It is clear from figure 7-1 that there is a relationship between the different strategies. This relationship is a one-to-many relationship where one corporate strategy will lead to several business strategies. This means that more than one business strategy is necessary to

accomplish the corporate strategy. These strategies will be accomplished by the different divisions within the organisation. The same applies to the functional strategies of an organisation. More than one functional strategy is necessary to accomplish and fulfil the business strategies of the organisation.

The four levels illustrated in figure 7-1 are explained in detail in the following sections. These strategies will also be related to the organisation's IT strategy and ultimately the implementation of the ERP system within the organisation. This is done to determine the place of ERP initiatives within an organisation and, based on this, hypothesis 6 is addressed.

7.1.1 CORPORATE STRATEGY

The corporate strategy, also known as the strategic level, is at the top of the organisational level hierarchy and is composed of a board of directors, chief executive and administrative officers (Miller, 1994; Frenzel & Frenzel, 2004:73). They are responsible for the organisation's financial performance and for the achievement of non-financial goals such as enhancing the organisation's image and fulfilling its social responsibilities. This is the level that an organisation's chief information officer (CIO) will belong to. It must be noted that this level is governed by regulatory aspects such as SOX, KING II and CLERP 9 (The Corporate Law Economic Reform Program). Adherence to SOX or KING II enforces corporate governance (Brown & Nasuti, 2005).

Strategies are decided on by the board and span the activities and functional areas of these organisations. Corporate-level strategic executives attempt to exploit their organisation's distinctive competencies by adopting a portfolio approach to the management of the businesses and by developing long-term plans (Ambrosini & Bowman, 2003).

Every division of an organisation has a corporate strategy that is formulated from the vision of the organisation. This includes divisions such as finance and marketing. These corporate strategies address the business needs of the organisation. The outcome and results of decisions that are taken at this level can only be measured over a period of a couple of years. This means that the corporate strategy of an organisation considers the long term (Haselmann, 2006). It is extremely difficult to measure the outcome of a decision beforehand as the results of the decision can only be seen over the long term (Nadler, 2004). It must be noted at this stage that the organisational structure as explained in section 2.4.4.3 does not play a role in the formulation of strategies. A project-based organisation's corporate strategies will be the same as those of a functional and/or matrix organisation (Jabnoun, 2005; Raps, 2005).

The people responsible for the corporate strategies are the chief financial officer (CFO), the CIO and the directors of the divisions. The CIO is responsible for the corporate strategy of the IT division and the chief operating officer (COO) is responsible for the corporate strategy of the operational divisions, such as manufacturing. The CIO could, for example, have a

corporate strategy that states that the organisation will always have the latest technology available and implemented.

The members of the board, and this includes the CIO, are accountable for decisions taken at this level. This means that the CIO, as an individual, is liable for any failures within the organisation if the IT strategies that he/she envisioned were not to the benefit of the organisation. This accountability and liability of an individual ensures that strategies are thought through and that these strategies are achievable and executable (Pawling, 1986; Huse, Minichilli & Schoning, 2005).

The different corporate strategies of the organisation must be broken down into manageable and tangible strategies and it is the purpose of the business strategies to fulfil this function. It is the responsibility of the different IT managers to perform this function in the case of the IT division. They disseminate the corporate IT strategy into smaller strategies that form the business strategies.

7.1.2 BUSINESS STRATEGY

In the middle of the decision-making hierarchy is the business level composed of business managers. These managers must translate the defined strategies of the corporate level into concrete objectives for the individual business divisions. Business-level strategic management determines how the organisation competes in the selected market (Weir, Kochhar, LeBeau & Edgeley, 1999; Säfsten & Winroth, 2002). It strives to identify and secure the most promising market segment within that arena. This segment is the piece of the total market that the firm can claim and defend because of its competitive advantages. The business strategies or objectives of an organisation are also known as the tactical strategies of an organisation.

The outcome of decisions at this level is measured over a medium-term period. The people involved in the decision-making process at this level can be evaluated only at the end of this period. They are responsible for the outcome of the product or service delivered but the overall accountability still lies with the board of directors at corporate level. These people are normally the different IT managers within the IT division of the organisation and are responsible for the implementation of the IT strategy. Since the corporate strategy to business objective ratio is a one-to-many relationship, a few business objectives can be devised to fulfil the corporate strategy. Given the example above of the IT strategy, Klouwenberg, Koot and Van Schaik (1995) as well as Frenzel and Frenzel (2004:549) explain that the IT managers will investigate the different types of technology available including all aspects from infrastructure and security to applications. They will make decisions on the technologies that will be implemented within the organisation. The application IT manager will make a decision on whether to implement an ERP system or not.

The IT managers will be responsible for their decisions but, unlike the CIO, will not be accountable for them. This responsibility implies that the IT managers might not be rewarded

if this business strategy does not realise the corporate strategy. IT managers are governed through the implementation of CobiT (refer to section 4.2.2.1) (Hong et al., 2003; Luthy & Forcht, 2006).

The third level within the decision-making hierarchy is the functional strategy. It is also known as the operational level of the organisation.

7.1.3 FUNCTIONAL STRATEGY

Managers at this level develop short-term objectives in areas such as production, operations, finance and information technology (Kim & Arnold, 1996; Somers & Nelson, 2003). Their principal responsibility is to implement the organisation's functional strategies. Whereas corporate and business level managers centre their attention on doing the right things, managers at functional level focus their attention on doing things right (Williams, Van der Wiele, Van Iwaarden & Visser, 2004). They address issues such as the efficiency and effectiveness of production and marketing systems, the quality of customer service and the success of particular products and services in increasing the organisation's market share (Mohanty, 1995).

This level is governed by ITIL (refer to section 4.2.2.2) and forms the last level of governance after KING II/SOX and CobiT. ITIL is a set of best practices used to manage service delivery and service support of the IT environment (Fitsilis, 2006).

The results of decisions can be seen almost immediately and mistakes or wrong decisions can be rectified almost immediately. The section managers within the IT division are the people responsible for the functional strategies and, based on the example, will make a recommendation on the IT systems that must be used within the organisation. They are the people in charge of the hardware or networking sections. It will be at this level that a decision will be made on the type of ERP system that should be implemented.

The section managers involved in the decision-making process will only be responsible for the outcome of the decisions and will not be accountable for the decisions made. This responsibility means that they might not receive any performance bonuses or increases if the functional strategies do not meet the business strategy.

7.1.4 STRATEGY EXECUTION

Strategy execution combined with the functional strategy forms the operational level. The fourth level within the decision-making hierarchy does not form part of the model by Pearce and Robinson (2000). This level is added to ensure that the strategies of the organisation are executed at operational level (Marnewick & Labuschagne, 2004).

This is the level where the employees do the physical work as decided on by the section managers, and the completion of the work fulfils the functional strategies of the organisation. The people at this level are responsible for the work that they do and are penalised if it is not up to the standard of the organisation.

It must be made clear that this is the level where the ultimate success or failure of the corporate strategies is determined. If the strategy execution is flawed or incorrect, then by implication the functional strategies, related business strategies and related corporate strategy will be a failure.

This level is also the level where project execution takes place. The functional strategy level is the level where the project management of the functional strategies takes place, but the project execution takes place at strategy execution level. This execution of the project takes place through the allocation of resources as well as the WBS.

There are different levels within the organisation in which different but related decisions are taken. This means that the execution of a business strategy is different from the execution of a functional strategy. It is clear from the above section that different decisions are taken at different levels and the outcome and responsibility of these decisions varies from level to level.

The first objective of this chapter has been met as it has been determined that there are different levels of decision-making and management within an organisation.

The different strategies and objectives within the organisation need to be implemented and it is clear that the corporate strategy needs a different method of implementation than for the functional strategies. The following section discusses different ways of implementing business strategies and objectives within the organisation.

7.2 RELATIONSHIP BETWEEN ORGANISATIONAL DECISION-MAKING PROCESSES AND MANAGEMENT OF PROJECTS

The PMI (2005a) defines portfolio management as a collection of programmes and other work that is grouped together to facilitate the effective management of that work to meet strategic business objectives. The PMI (2006c) defines a programme as a group of related projects managed in a coordinated way to obtain benefits and control not available from managing the projects individually.

From these two definitions, a relationship can be established between portfolio, programme and project management and it is illustrated in figure 7-2. This relationship is also shown in section 5.2.

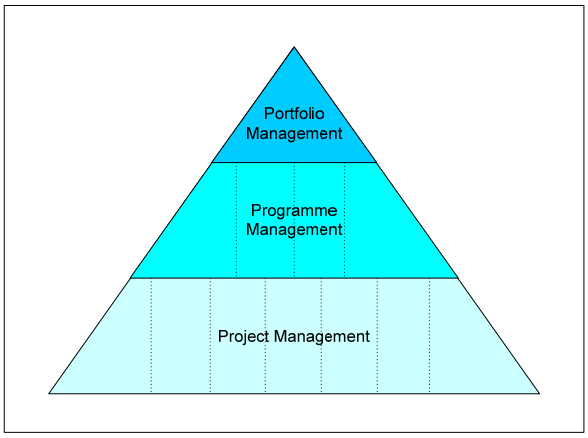

Figure 7-2: Management relationship

Portfolio management provides the portfolio manager with an overview of all the programmes and therefore all the subsequent projects within the organisation. This provides the portfolio manager with a holistic view and informed decisions and strategies can be made because all the information is available to the portfolio manager (Killen, Hunt & Kleinschmidt, 2008).

This relates to the corporate strategy of the organisation where a holistic view of the organisation's strategies is available to the board members. Each division within the organisation has a portfolio and is managed by the director of the division. The CIO or in some organisations the IT director will, for example, manage the IT portfolio and will be responsible for ensuring that the IT portfolio is in line with the corporate IT strategy and that this, in turn, is in line with the vision of the organisation. It is important that the portfolio and the corporate strategy be aligned. If this is not the case then discrepancies start to emerge and will cause the corporate strategy to be a failure. The CIO aligns this strategy with his/her portfolio and a programme manager is appointed to implement this strategy.

A portfolio consists of programmes (PMI, 2005a) and the corporate strategy consists of business strategies as per figure 7-1. The conclusion can be made then that business strategies or objectives are implemented and managed by programmes. This implies that the programmes can consist of all the business strategies and that the execution and management of the programmes ensure the successful fulfilment of the business strategies. Programme managers manage the programmes within the portfolio. They focus on a particular programme itself and are responsible for the success of this programme within the portfolio. Each division within the organisation has its own programmes that are part of the portfolio of that specific division.

The same logic can be applied to programme and project management. The programme itself can be divided into different projects and project managers are responsible for their successful implementation. As with portfolio and programme management, each division has its own projects and these projects form part of the division's bigger strategy. A business strategy is divided into different functional strategies and the projects are aligned with the

functional strategies of the division. The successful completion of the projects will ensure that the functional strategy of the division is implemented as defined.

These three management concepts of a project can be related to the decision-making levels of the organisation as illustrated in figure 7-3.

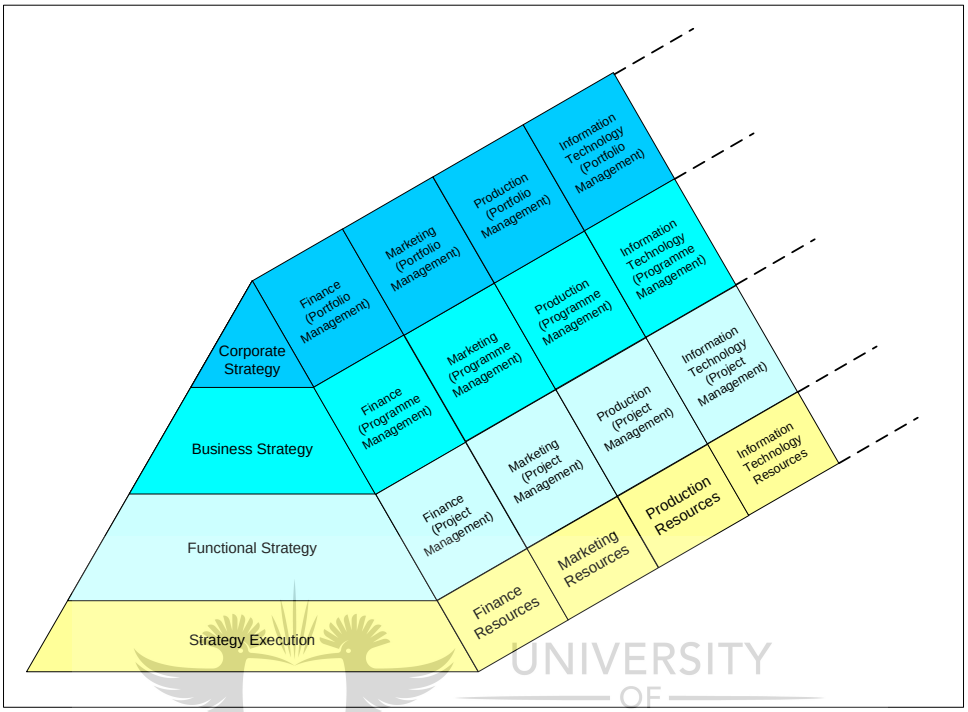

Figure 7-3: Relationship model

The corporate strategy of the organisation decides on the type and scale of portfolios that form part of portfolio management. It also dictates the business strategies and objectives as explained earlier in the chapter. The portfolio is divided into programmes to facilitate its management. These programmes are also in line with the business strategies.

The lowest strategy level is the functional level and project management enables the managers to succeed and fulfil the criteria set out for the functional strategies. The management of each project forms part of programme management and the projects are managed by individual project managers, but the overall success of the programme is the responsibility of the programme manager.

The purpose of the second objective was to align the different decision-making levels with project, programme and portfolio management. Based on the information provided in the previous sections, it can be concluded that there is a correlation between project, programme and portfolio management and the various levels within an organisation.

The situation that arises from this model is that each functional division has its own portfolio, programmes and projects and there is no correlation between the various divisions' projects or programmes. Enterprise projects which span across several divisions are not catered for

either. This underlines the fact that a cross-divisional system such as an ERP system will face problems.

Owing to the complexity of ERP systems as indicated in chapter 2, as well as the diversity of alternatives to an ERP system, selecting an ERP system is a time-consuming task (Ziaee, Fathian & Sadjadi, 2006). Several methods are proposed for selecting a suitable ERP system and Ziaee et al. propose a modular approach. Ptak and Schragenheim (1999) suggest a scoring method that is intuitively easy to use. Another method is based on the nominal group technique and the process of analytical hierarchy (Teltumbde, 2000). The problem with all these methods is that they do not take the organisational vision and strategies into consideration and this underlines hypothesis 6 that organisations do not take a holistic view of ERP systems.

The following section focuses on techniques and processes that can be used to break the vision of the organisation down into smaller and more manageable strategies and business objectives and to determine if there is a way to implement these strategies through project management. This addresses the second component of organisational theory where the focus is on the design of the organisation (Weick, 2001:89). This addresses the third objective as well as the problem identified with the relational model in figure 7-3.

7.3 ALIGNING PROJECTS WITH THE ORGANISATIONAL VISION

Although the OPM3 (PMI, 2003) recognises the fact that the vision and strategies of an organisation are implemented by means of projects, it does not provide a clear approach for proceeding from the vision to the projects. According to PriceWaterhouseCoopers, “any project undertaken by a company should be driven by business objectives” (Peterson, 2002). They also state that many organisations lack a structured process through which to derive projects from the business objectives. Longman and Mullins (2004) also acknowledge the fact that an organisation’s strategy should provide the boundaries for projects. They further state that “installing effective project management includes putting a mechanism in place to evaluate every project for its fit with the strategy before implementation”.

The question is: How should a portfolio be constructed and managed in order to implement and fulfil the organisational strategies?

Figure 7-4 suggests such a structured, conceptual framework that might be useful in deriving projects from the organisational vision and continuously monitoring the contribution that these projects make towards achieving the vision (Marnewick & Labuschagne, 2006).

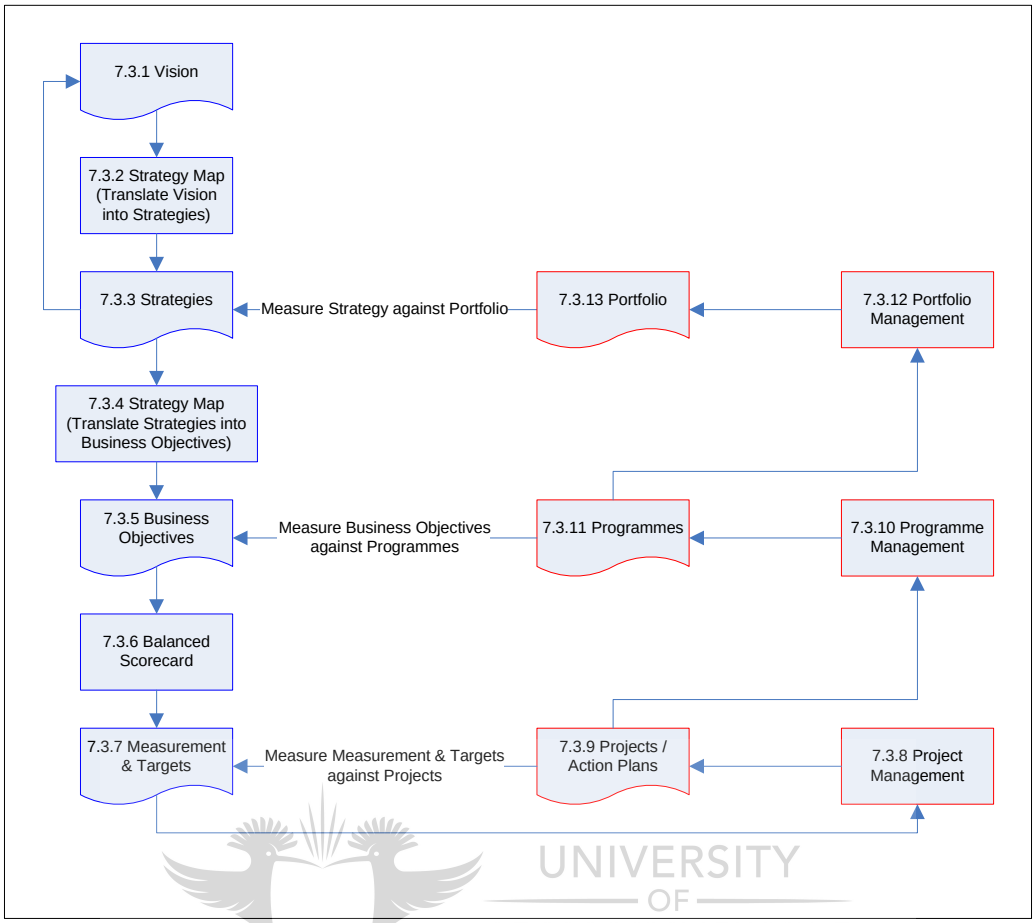

Figure 7-4: Vision-to-Project Framework

The following sections discuss each of the components of the Vision-to-Project (V2P) Framework.

7.3.1 ORGANISATIONAL VISION

A vision, in organisational settings, is a concrete idea that describes what needs to be achieved by the organisation's members and how this should be done (Norton, 2004). It is important that a vision be based on reality, and discussed and shared by key people associated with the organisation (Pearce & Robinson, 2000; Bogler & Nir, 2005).

Formulating a vision is a very complex process, especially if the CEO of the organisation intends to improve the effectiveness of the organisation. For followers, a vision that is consistently or overly vague may be difficult to follow since it lacks a well-defined direction. Thus, it is important that a vision be articulated explicitly, and that it generate enthusiasm (Testa, 1999; Ezingeard, McFadzean & Birchall, 2007).

The CEO needs not only to have a well-defined idea of the vision and how to reach it, but also the rhetorical and communicative skills to express it (Higgs & Aitken, 2003). To achieve a vision that is a "mental image" of a desirable future position of an organisation, leaders need

to describe it using identifiable metaphors and concepts that unveil the direction for the future and articulate defined mission statements along with the possibly vague ideas (Lynn & Akgün, 2001). Most important about the vision is the necessity that it be realistic and credible, and that it project a future attractive enough to convince the followers to invest efforts in pursuing it, rather than simply continuing with the status quo.

One of South Africa's leading food companies is used as an example throughout the rest of the chapter. This company is called Company A for reasons of anonymity. The results of the portfolio process are shown in appendix B. This company was selected because the current implementation of an ERP system is seen as a failure there.

The vision of Company A is "to be the number one food supplier in Africa". The number one position is based on market share. It is clear from this vision that it is well defined and the number one position is explicitly mentioned.

It is the duty of the CEO and the board of directors to quantify the vision. Different methods are available to do this, such as the 7-S framework of McKinsey (Rasiel & Friga, 2001) or the 3Cs framework of Kenichi Ohmae (Ohmae, 2000). The problem with these methods is that they provide ways and methods to determine and describe strategies. None of these methods provides a methodology or process to link projects to the vision and strategies of the organisation.

The combination of strategy maps and balanced scorecards provides a process whereby an organisation can link projects to the vision and strategies (Marnewick & Labuschagne, 2006). The strategy map of an organisation is used to derive business objectives from the vision. The balanced scorecard is used to provide measures for each strategy. This allows an organisation to measure the progress of a strategy.

7.3.2 STRATEGY MAPS – TRANSLATING VISION INTO STRATEGIES

Strategy maps are used to describe the vision and strategies of the organisation by means of processes and intangible assets (Marr & Adams, 2004; Kaplan & Norton, 2004). Strategy maps are used to align intangible assets like information technology with the organisational strategies and ultimately the vision of the organisation. Intangible assets can be described as knowledge that exists in an organisation to create differential advantage (Eckstein, 2004). Differential advantage can formally be defined as "an advantage unique to an organization; an advantage extremely difficult to match by a competitor" (American Marketing Association, 2005). Figure 7-5 illustrates the strategy map framework as well as the four perspectives of the balanced scorecard.

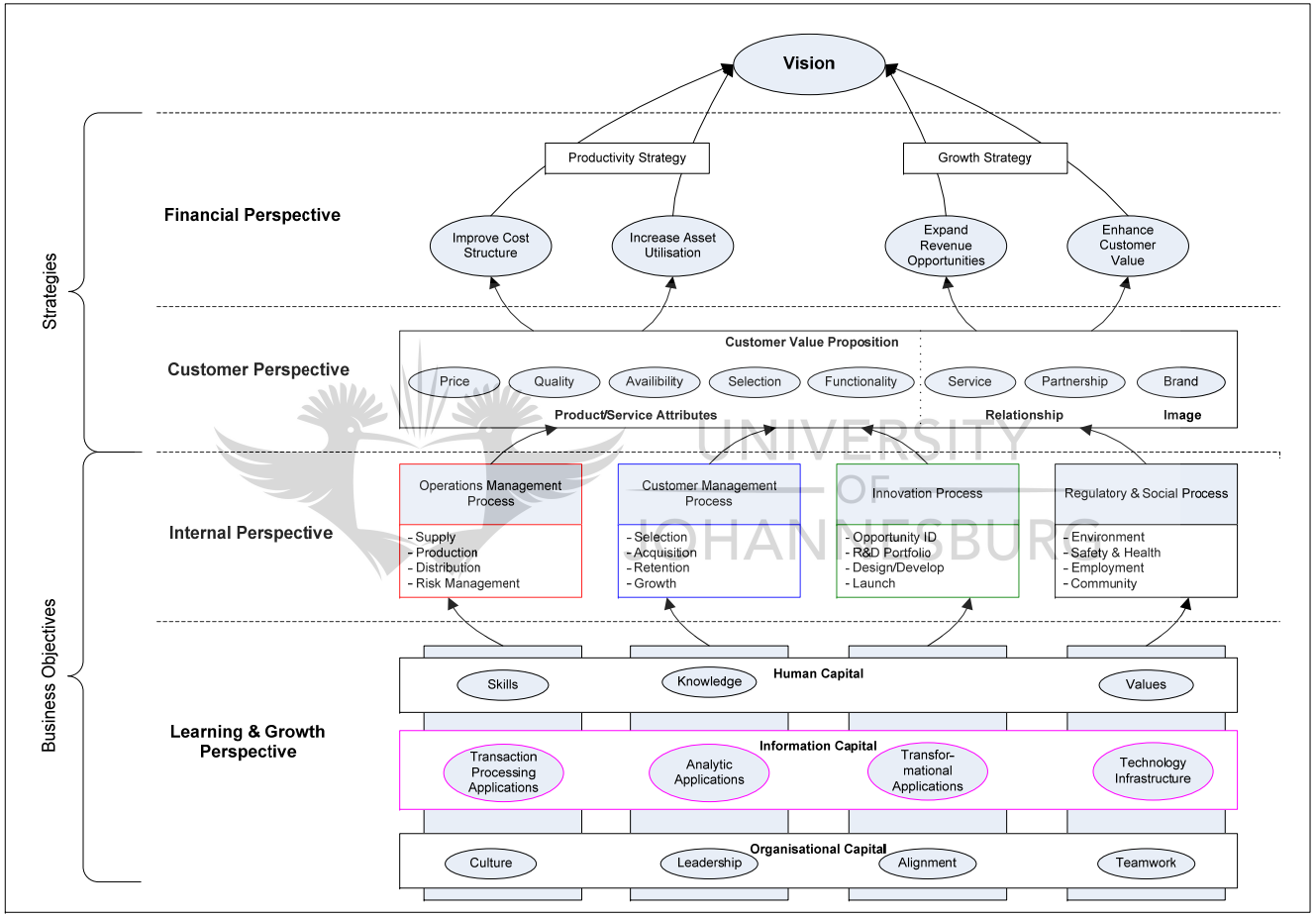

Figure 7-5: Strategy map (Kaplan & Norton, 2004)

The strategy map starts with a vision and follows a top-to-bottom and a bottom-to-top approach. This approach means that the vision dictates all the lower levels but the bottom-up approach enables the organisation to link everything to the vision. Although the approach is a top-to-bottom approach, the lower levels must be linked to the upper levels to ensure that there is a consistent link between the upper and lower levels of the strategy map. The top-to-bottom flow enables an organisation to take the vision and break it down into its different components and ultimately into different projects. The purpose of the strategy map is to take the vision and break it down into measurable components. It must be made clear that not all the components need to be incorporated into the strategy.

The strategy map provides a framework for an organisation but it is up to the organisation to determine which of the components it wants to use. The four perspectives on the right-hand side of figure 7-5 provide the different focal points of the strategy map. The strategy map is discussed using the four perspectives. The financial and customer perspectives provide the strategies of the organisation, whereas the internal and learning and growth perspectives provide the business objectives.

The balanced scorecard is used to link measurements to a strategy and is discussed in section 7.3.6.

This section is about the financial and customer perspectives. By focusing on the financial and customer perspectives, an organisation is able to eliminate the confusion between formulating the strategies and the business objectives. The strategies must be defined first and then the business objectives that follow from the strategies as described in section 7.1.

The first perspective is the financial perspective and provides the two main strategies for the organisation, namely the growth and productivity strategies. This allows an organisation to be focused on specific strategies and not spread the attention to different strategies that do not facilitate the implementation of the vision.

7.3.2.1 Financial Perspective

Financial strategies relate to profitability and ROI and focus on the way that organisations become more profitable by increasing income or decreasing expenditure (Randoy, Oxelheim & Stonehill, 2001). Section 7.1.2 indicated that IT is an investment for the organisation and the principles of the strategy map can also be used to determine the IT related strategies to implement the IT investment.

The financial performance of an organisation is improved through two basic strategies:

Growth Strategy

Organisations can generate profitable revenue growth by enhancing and strengthening relationships with customers (Buckley, 2006). This enables the organisation to sell more of its existing products or services or any new and additional products or services.

Organisations can also generate growth by selling entirely new products. They can also deliver products and services to an entirely new segment in the market.

Productivity Strategy

The productivity of an organisation can be addressed in two ways. The first is to lower the costs by reducing the direct and indirect expenses (Wang, Zantow, Lai & Wang, 2006). This enables an organisation to produce the same quantity of outputs while spending less on people and material.

The second productivity strategy is to utilise financial and physical assets more efficiently (Filbeck & Gorman, 2000). The working capital needed to support a given level of business can be reduced.

The directors of an organisation must find the balance between the growth and productivity strategies. These two strategies are often in direct conflict and it is crucial to the organisation that they keep the balance.

The financial strategies focus on how the organisation can increase profitability and ROI (Thackray, 1995; Rowley, 2002). This is not possible without a strategy that links this to the needs of prospective customers. The customer perspective focuses on this aspect of the organisation.

7.3.2.2 Customer Perspective

The organisation identifies the targeted customer segments in which it wants to compete. The customer strategies focus on the following:

- ***Customer satisfaction:*** This is how satisfied the customer is with the organisation as a whole entity as well as with the products provided by the organisation (Alomaim, Tunca & Zairi, 2003).
- ***Customer retention:*** The retention of customers deals with ways and methods to retain customers and not to lose them to the opposition (Reynolds & Lancaster, 2006).
- ***Customer acquisition:*** The acquisition of customers entails the different methods available to attract new customers to purchase the organisation's products and services (Gummerus, Liljander, Pura & Van Riel, 2004).
- ***Customer profitability:*** The cost of attracting new customers is substantially more than the cost of retaining customers. The organisation must focus on retaining and growing current customers rather than acquiring new customers (Wang & Hong, 2006).
- ***Market share*** An organisation targets a certain market, for instance black female consumers. The organisation will try its utmost to be the dominant player in the specified market (Laverty, 2001; O'Regan, 2002).

These focus areas are interrelated as one will lead to the other. Customer satisfaction leads to customer retention and through word of mouth, leads to new customers or the acquisition

of new customers. The overall market share will be increased through the new customers. The retention of customers will increase the profitability of the organisation as it is more expensive to acquire new customers than it is to retain current customers.

The strategy map of an organisation produces financial and customer strategies that are linked to the vision of the organisation. The realisation of the strategies ultimately ensures the success of the organisation as they are linked to the organisational vision.

7.3.3 ORGANISATIONAL STRATEGIES

The above section explained the first part of what a strategy map is and how it can be used to help an organisation. Using strategy maps, the vision can be divided into the financial perspective as well as customer perspective. These two perspectives form the basis of how and where an organisation wants to be and how it wants to be seen by the outside world.

The organisation presented in appendix B is used to illustrate how the strategy map is used to determine the financial and customer strategies. The vision of Company A was discussed in section 7.3.1.

7.3.3.1 Financial Perspective

The financial perspective is divided into two strategy groups, namely the productivity and revenue growth strategies. Using the example of Company A, the strategies can be defined as follows:

Productivity Strategy

- (F1) Become an industry cost leader. The realisation of this strategy enables the organisation to produce the same product as the competitors but at a lower production cost. This means that the profit margin will be higher than the competitor's profit margin.
- (F2) Maximise use of existing assets. Current assets like a mill or a bakery must be maximised and this can be achieved by running the mill or bakery at full capacity instead of 80%. The operating cost of running a mill or bakery at 80% is the same as running it at 100% but the production increases by 20%.

Revenue Growth Strategy

- (F3) Revenues from new customers. This strategy focuses on acquiring new customers. The focus area will be the black consumer market and the pre-teen market.
- (F4) Increase customers' account share. Current customers only buy specific products and the account share can be increased by introducing products that will be in synergy with the current products.

The four financial strategies determine the customer strategies and the next step is to determine the customer strategies. These are also determined using the strategy map as explained in the previous section.

7.3.3.2 Customer Perspective

The customer perspective entails how the organisation sees the customer. It focuses on the type of products provided to the customer, the type of relationship the organisation wants with the customer and the image that the organisation wants to portray to the outside world.

The customer strategies can be defined as follows:

- (C1) Lowest cost supplier. Products must be delivered to the distributor and customer at a lower cost than the delivery cost of the opposition. This will make Company A a preferred supplier.
- (C2) Perfect quality. The quality of the products must decrease returns because returns have an effect on profits as well as the customers' perception of the product.
- (C3) Speedy purchase. Products must be delivered to the distributor as soon as possible without any delays. Delays might cause competitor products to be purchased.
- (C4) Appropriate selection. A variety of products must be available to the consumer and not just one specific product. The consumer wants to choose between white and brown bread and even make a distinction between the different white breads.

The organisational strategies are derived from the organisation's vision for the markets, products, operations, workforce and business models they will pursue. Strategies are defined at organisational level to address two concerns (Harris, 2003):

- What current assets are available that can be invested to accomplish strategic goals? Assets go beyond the traditional view of the organisation's assets (financial and physical assets) to include many intangible or intellectual assets. These include employee knowledge, delivery channels and networks, and customer intelligence. To respond to this concern, the organisation must perform an inventory of the assets that it can "invest" toward strategic goals. Information technology is seen as an intangible asset within the organisation and the organisation must have a specific focus to implement IT as an investment. An ERP initiative must be viewed as an investment and success criteria must be provided to determine if it will realise the organisational strategy.
- Which assets are required but not available? These gaps in organisational competencies, delivery channels, customer intelligence, market intelligence, higher financial returns and other factors must be filled to accomplish the strategic goals.

Thus, an organisation's strategies extend beyond simple financial returns to include and overtly emphasise non-financial and synergistic forms of value. This will include factors such as knowledge capital, business models, critical business processes, sophisticated technical and human networks.

Once the organisation determines the strategies, the second step is to determine the business objectives that realise the strategies.

7.3.4 STRATEGY MAPS – TRANSLATING STRATEGIES INTO BUSINESS OBJECTIVES

Once the strategies are determined, the third and fourth perspectives of the strategy map can be applied to determine the business objectives. These two perspectives are illustrated in figure 7-5. These business objectives are derived directly from the strategies.

The business objectives will focus on the internal processes of the organisation as well as the learning and growth perspective.

7.3.4.1 Internal Processes Perspective

Managers identify the processes that are most critical for achieving customer and financial strategies. This enables an organisation to focus the internal business processes on those processes that will deliver the determined strategies in the most successful manner. Two processes may address the same business objective, but one process is more optimal than the other and is therefore a better solution (Kaplan & Norton, 1996).

The first process within the internal process perspective is the operations management process.

Operations Management Process

This process produces and delivers the organisation's products and services. It entails:

- ***Supply:*** Establishing excellent supplier relationships and lowering the total cost of purchasing goods and services. The organisation benefits from good supplier relationships because the supplier gives the best cost and new innovations from the supplier will be passed onto the organisation.
- ***Production:*** Producing existing products and services for current customers. The organisation needs to focus on lowering the cost of producing products, continuously improve processes, improve the utilisation of fixed assets and improve the working capital efficiency within the organisation. The organisation thus provides a better service to its customers as well as saves money.
- ***Distribution:*** Distributing and delivering products and services to customers. This process consists of delivering products and services at a lower cost to the customer and the enhancement of quality.
- ***Risk management:*** Managing operating and organisational risk. The organisation must reduce the risk factor by selecting the right supplier, the correct risk and capital solutions and comply with risk management processes. This is in line with the management of risks within a financial portfolio.

The second process entails managing the customer processes.

Customer Management Process

This process focuses on the importance of customer relationships. Customer management consists of four generic processes:

- ***Select customers:*** Identify customer segments attractive to the organisation and create a brand image that will attract customers within the specific segment.
- ***Acquire customers:*** Secure prospects within the market and convert them into customers.
- ***Retain customers:*** Ensure product quality, correct problems and transform customers into highly satisfied devotees.
- ***Grow customer relationship:*** Get to know the customers and build relationships with them.

Business objectives should include a process of execution along all four of these processes. Organisations acting without an explicit customer management process do poorly in the selection and retention processes.

Innovation Process

The third process within the internal process perspective is the innovation process. Sustaining competitive advantage requires that organisations continually innovate to create new products, services and processes. Successful innovation drives customer acquisition and growth, margin enhancement and customer loyalty. Managing innovation includes four processes:

- ***Opportunity identification:*** Identify opportunities for new products and services. The identification of opportunities can come from the organisation itself or from outside sources like suppliers and customers. This process must focus on future needs and the development of more effective products and services.
- ***Research and development portfolio:*** Manage the research and development portfolio. This portfolio might include a variety of projects such as basic research projects and breakthrough projects.
- ***Design and development:*** Design and develop the new products and services. This process brings new concepts to the market. The concept must have a desired functionality and must be produced at a cost enabling profit margins.
- ***Launch:*** Bring the new products and services to market. This process consists of the methods and ways to deliver the new product to the market.

The fourth and last process within the internal process perspective is addressing regulatory and social issues.

Regulatory and Social Process

Organisations must earn the right to operate in the communities and countries in which they operate and sell. National and local regulations impose standards on an organisation's operations. Organisations must comply with all these regulations. Corporate governance and the implementation of ERP security will be an example of such regulations as explained in chapter 4.

Four internal categories enable an organisation to provide the optimum business objectives to realise the strategies of the organisation.

- ***Environment:*** Organisations report on their performance regarding the environment on a regular basis and this will include energy and resource consumption, water emissions and air emissions.
- ***Health and safety:*** Organisations use standardised measures of employee health and safety performance. Each country has its own standards and organisations must report on these standards.
- ***Employment practices:*** Organisations report on the diversity of employees and attest to the ways in which increased diversity contributes to the success of the organisation.
- ***Community investment:*** Organisations contribute money to community-based non-profit organisations and report on the extensive volunteering done by employees in the community.

Once the internal processes of the organisation are determined, they must be linked to the intangible assets of the organisation. This is done through the learning and growth perspective.

7.3.4.2 Learning and Growth Perspective

This perspective together with the internal perspective forms the basis of the business objectives. This is illustrated in figure 7-5.

The learning and growth perspective highlights the role for aligning the organisation's intangible assets with its strategy. Intangible assets can be organised into three categories:

Human Capital

Human capital deals with the availability of skills, talent and know-how required to support the business objectives and ultimately the vision.

- ***Skills:*** These refer to the specific skills that employees must have to do their day-to-day job.
- ***Knowledge:*** Knowledge is gained through experience and is acquired over a period of time. Knowledge will enable an employee to work faster and smarter.
- ***Values:*** The personal values of the employee must be in alignment with the values of the organisation. This will help the employee to identify with organisational values and will assist in establishing the overall culture and values of the organisation.

The second process within the learning and growth perspective is information capital and covers how IT systems can realise the vision of the organisation.

Information Capital

Information capital deals with the availability of information systems, networks and infrastructure required to support the strategy.

- ***Transformational applications:*** Systems and networks that change the prevailing business model of the organisation.
- ***Analytic applications:*** Systems and networks that promote analysis, interpretation and sharing of information and knowledge.
- ***Technology infrastructure:*** The shared technology and managerial expertise required to enable effective delivery and use of information capital applications.
- ***Transacting processing applications:*** Systems that automate the basic repetitive transactions of the organisation.

These four categories will help the organisation to align IT with the organisational vision. The third category is organisational capital.

Organisational Capital

Organisational capital deals with the ability of the organisation to mobilise and sustain the process of change required to execute the strategy.

Organisational capital is addressed by the following categories within the organisation:

- ***Culture:*** The vision and organisational strategies needed to be executed based on the awareness and internalisation of the mission, vision and core values.
- ***Leadership:*** The availability of qualified leaders at all levels to mobilise the organisation toward its strategy.
- ***Alignment:*** Individual, team and departmental goals and incentives must be linked and aligned with the vision of the organisation.
- ***Teamwork:*** Knowledge with strategic potential must be shared throughout the organisation and must not be kept by only one individual within the organisation.

The objectives in these three components must be aligned with the objectives of the internal processes and integrated with one another. These objectives describe the importance of intangible assets and provide a powerful framework for the management of intangible assets.

The next section continues to use the example of Company A and illustrates the different business objectives derived from the organisational strategies.

7.3.5 BUSINESS OBJECTIVES

The business objectives are tangible and it is easy for the organisation to determine if a particular business objective is contributing to the strategies of the organisation. The business objectives are derived from the internal and learning and growth perspectives as

illustrated in figure 7-5. The business objectives that are derived from the example are shown in appendix B.

The business objectives are determined by applying the internal and learning and growth perspectives to the customer perspective. The business objectives derived will have to fulfil the strategies derived from the customer perspective.

The business objectives for the operations management processes defined in the example are as follows:

- (I1) Outstanding supplier relationships. This will enable the organisation to receive better service and lower cost products from the suppliers.
- (I2) Efficient time distribution. Products and services must be delivered within a desirable time frame to the customer.
- (I3) Produce goods and services focusing on cost, quality and time. Products and services must be provided within the constraints of cost, quality and time. Quality should never be compromised.
- (I4) Provide ongoing service. Service to customers must be of high standard as well as an ongoing process to continuously ensure excellent service.

Given the example used throughout the chapter, the business objectives within the customer management process can be defined as follows:

- (I5) Provide convenient order-handling process. A process or service must be in place to order supplies from the supplier as well for the customer to order finished products from the organisation.
- (I6) Provide a desirable variety of products. The products that the organisation supplies must address the needs of the higher as well as the lower income customer.

The innovation process can be divided into the following business objectives:

- (I7) Process innovation. The manufacturing process must be in a continuous cycle of improvement to produce the same products at a lower cost and a faster rate.
- (I8) Manage capital projects. The layout of capital must be managed to provide the maximum ROI for the organisation. Capital projects must realise the strategies and vision of the organisation.

To be the number one food company in Africa, Company A must comply with national and international regulations and this intention can be seen in the business objectives for the regulatory and social process:

- (I9) Contribute to the upliftment of communities.

- (I10) Fulfil requirements of the Electronic Communications and Transactions Act of South Africa.

The objectives of the competence perspective can be defined as the following:

- (L1) Create electronic supplier and customer relationships. To manage the expectations of the customers and suppliers, an electronic customer relationship model must be in place. This will allow the organisation to determine the needs in a timeous and efficient manner.
- (L2) Process improvement. All processes within the organisation must be optimised. These processes include the time to take an order, to place an order or to provide financial statements.

Once the organisation knows what the objectives are, it must determine the measurement criteria to measure the success of the objectives. Balanced scorecards can be used to provide these measurements.

7.3.6 BALANCED SCORECARDS – DETERMINING TARGETS AND MEASUREMENTS

The balanced scorecard provides executives with a comprehensive framework that will translate an organisation's vision and strategies into a coherent set of performance measures (Kaplan & Norton, 1996; Ritter, 2003).

The balanced scorecard was developed by Kaplan and Norton and provides measurement criteria for the business objectives derived from the vision and strategies using a strategy map. It is organised into the following four perspectives (Kaplan & Norton, 2004):

- ***Financial perspective:*** Financial performance provides the ultimate definition of an organisation's success. Strategy describes how an organisation intends to create sustainable growth in shareholder value. If the different strategy levels are taken into consideration as illustrated in figure 7-3, then this perspective is directed at the corporate strategy level. The financial perspective provides an organisation with the financial measurement to measure the financial success of the organisation.
- ***Customer perspective:*** Success with targeted customers provides a principal component for improved financial performance. In addition to measuring the outcome indicators of customer success, such as satisfaction, retention and growth, the customer perspective defines the value proposition for targeted customer segments. Choosing the customer value proposition is the central element of the business strategies of the organisation.
- ***Internal perspective:*** Internal processes create and deliver the value proposition for customers. The performance of internal processes is a leading indicator of subsequent improvements in customer and financial outcomes. This perspective is targeted to realise the measurement of the functional strategies as this level of strategies aims to improve

internal processes and project management. Measurement in this perspective will be aimed at the four processes as defined by the strategy map. The categories within each process will have measurement criteria and this will determine the success or failure of the process.

- ***Learning and growth perspective:*** Intangible assets are the ultimate source of sustainable value creation. Business objectives within the learning and growth perspective describe how the people, technology and organisational climate are combined to support the organisational strategies. The strategy map provides the different categories for which measurement criteria must be defined. The strategy map will provide "what needs to be measured", whereas the learning and growth perspective will determine "how it will be measured".

Although the different perspectives are tied to a specific level within the strategy map, it must also be said that these perspectives influence the other levels and that there is coherence between the perspectives and the strategies and business objectives of the organisation.

7.3.7 MEASUREMENTS AND TARGETS

The balanced scorecard provides the organisation with measurement criteria to measure the progress made on each strategy and business objective. The measurement criteria for the organisational strategies and business objectives are depicted in table 7-1. The strategies and business objectives derived from the vision in sections 7.3.2 and 7.3.4 form the basis of the measurement criteria. Every strategy and business objective must be measured. If a strategy or business objective cannot be measured, then it cannot be used to implement the vision of the organisation.

	STRATEGIES	BUSINESS OBJECTIVES	MEASUREMENT CRITERIA
FINANCIAL PERSPECTIVE	***Productivity strategy***		
	F1: Become industry cost leader		F1.1: Net cash flow
	F2: Maximise use of existing assets		F2.1: EBIT (Earnings before Interest & Taxes)
	Revenue growth strategy		
	F3: Revenues from new customers		F3.1: Increase market share
	F4: Increase customers' account share		F4.1: Increase expenditure from existing customers
CUSTOMER PERSPECTIVE	***Offer products & services that are consistent, timely and low-cost***		
	C1: Lowest cost supplier		C1.1: Production cost
	C2: Perfect quality		C2.1: Product returns
	C3: Speedy purchase		C3.1: Delivery speed of ingredients
	C4: Appropriate selection		C4.1: Customer demography
INTERNAL PROCESSES PERSPECTIVE		***Operations management***	
		I1: Outstanding supplier relationships	I1.1: Preferred supplier
		I2: Efficient time distribution	I2.1: Time to deliver product
		I3: Produce goods & services: cost, quality & time	I3.1: TQM (Total Quality Management) I3.2: Contractual relationship
		I4: Provide ongoing service	I4.1: Execution & delivery
		Customer management	
		I5: Provide convenient order-handling processes	I5.1: Number of mistakes when placing an order

		I6: Provide desired variety of products	I6.1: Category profile/channel
		Innovation	
		I7: Process innovation	I7.1: Process time
		I8: Manage capital projects	I8.1: ROI
		Regulatory & social	
		I9: Contribute to communities	I9.1: Donations & sponsorship
COMPETENCE PERSPECTIVE		***Information capital***	
		L1: Create electronic supplier & customer relationships	L1.1: Information availability of customer & suppliers
		L2: Process improvement	L2.1: Time to process order L2.2: Time to provide product

Table 7-1: Measurements criteria

Once the organisation has defined what the measured criteria must be to realise the strategies and business objectives, it must determine the targets against which the measurement criteria will be measured.

Every measurement criterion must have a nominal value allocated to it. Take, for example, measurement criterion L2.1. The organisation must determine what an acceptable time to capture an order is. If it takes too long to capture an order, then it defeats the business objective to improve the process. If the time defined is too short and the order clerk cannot meet the target, then it undermines the confidence of the order clerk.

Table 7-2 provides the targets linked to each measurement criterion.

	MEASUREMENT CRITERIA	**TARGET**
FINANCIAL PERSPECTIVE	F1.1: Net cash flow	> R158 million
	F2.1: EBIT	> R141 million
	F3.1: Increase market share	30% growth
	F4.1: Increase expenditure from existing customers	45% growth in expenditure
CUSTOMER PERSPECTIVE	C1.1: Production cost	-25% in production cost
	C2.1: Product returns	5% return on products
	C3.1: Delivery speed of ingredients	Delivery within 24 hours
	C4.1: Customer demography	80% black and 20% white
INTERNAL PROCESSES PERSPECTIVE	I1.1: Preferred supplier	I1.1: 80% first choice
	I2.1: Time to deliver product	I2.1: < 8 hours
	I3.1: TQM I3.2: Contractual relationship	I3.1: 1% defect
	I4.1: Execution & delivery	I4.1: 100% customer satisfaction
	I5.1: Number of mistakes when placing an order	I5.1: <1% on order total
	I6.1: Category profile/channel	I6.1: 80% wheat/maize products & 20% confectionary
	I7.1: Process time	I7.1: Production time -25%
	I8.1: ROI	I8.1: 70% ROI
	I9.1: Donations & sponsorship	I9.1: 10% of profit

COMPETENCE PERSPECTIVE	L1.1: Information availability of customer & suppliers	L1.1: Immediate access to information
	L2.1: Time to process order	L2.1: 2 min for 5 line order
	L2.2: Time to provide product	L2.2: <24 hours

Table 7-2: Targets

The measurement criteria and related targets are linked to a strategy or business objective. The strategy map provided the focus areas of the organisation and the balanced scorecard will provide the measurement criteria for each of these objectives. The "Measurement Criteria" and "Target" columns of Table 7-2 show the measurements derived from the objectives as well as the targets set by the organisation. These targets are measurable and will allow the organisation to measure its progress.

The next step in the process is to take the measurement criteria and targets and to translate them into projects. The projects will be used to implement a product and/or service that will satisfy the measurement criteria.

7.3.8 PROJECT MANAGEMENT

The strategy map in conjunction with the balanced scorecard provides the organisation with business objectives with the relevant measurement criteria and targets to determine the success of an individual business objective.

The principles of project management are applied to each business objective that was defined by the strategy map. This means that a feasibility study will be done to determine if a business objective is viable and which project must be initiated to implement a business objective (Zandona, 2001). It is possible that more than one project as a solution will be provided by means of the feasibility study. Various techniques can be used to determine the best project, such as net present value (Law, 2004), internal rate of return (Burke, 1999) and payback analysis (Levine, 2001). Non-financial techniques include weighted scoring and categorisation schemes (Schwalbe, 2007:142). The measurement criteria and targets might indicate two potential projects that will achieve the same result. The above techniques can be used to determine which project best contributes to the strategies and objectives of the organisation. The result is a collection of projects that will best achieve the set targets for the strategies and objectives.

The second issue that must be addressed by project management is the elimination of duplicate projects and is addressed by the principles of programme management. The different projects initiated by the business objectives must be grouped together to eliminate duplication. It is clear from appendix B that the implementation of a CRM system is required by two different business objectives, i.e. I9 and I4. It does not make sense to implement two different CRM systems, but the requirements and needs must be grouped together and the final CRM system must incorporate all the requirements and satisfy each business objective in the organisation.

The project manager in charge of the CRM project will be reporting to one or more programme managers because the CRM project will form part of one or more programmes.

It is also clear that the IT division or department is not the owner of these systems but is just the facilitator for their implementation. The IT department or division will add value to the process by providing the best technology to implement the CRM system.

Once the projects are defined and listed as legitimate projects, they will be managed according to international standards and procedures.

7.3.9 PROJECTS AND ACTION PLANS

The previous step determined and defined the projects that should be initiated to realise the business objectives. The success of a specific project will be determined by the measurement criteria as described by Burke (1999) and Stewart (2001).

The next step in the process is to group the projects together in logical groups called programmes.

7.3.10 PROGRAMME MANAGEMENT

The determination of programmes is crucial to the organisation because these programmes will be linked to the business objectives determined by the strategy map. The different projects defined in section 7.3.8 are grouped together to form a programme. These programmes are based upon the internal processes and competence perspectives of the strategy map. This enables the organisation to link projects directly to the strategies. This means that all the projects that form part of the operations management process are grouped together into an operations management programme.

Duplicate projects need to be removed and complementary projects integrated. Duplicate projects are a result of the different measurement criteria. It might happen that the same project was identified to satisfy two different measurement criteria. The main purpose of programme management is to identify and consolidate these duplicate projects in such a manner that the organisation benefit from executing these projects in unity rather than separately. This is a very important part of the process, as there are limited resources available to execute these projects. The resulting projects are then formally initiated using the traditional project management processes.

Figure 7-6 shows how the different projects are grouped into the different programmes.

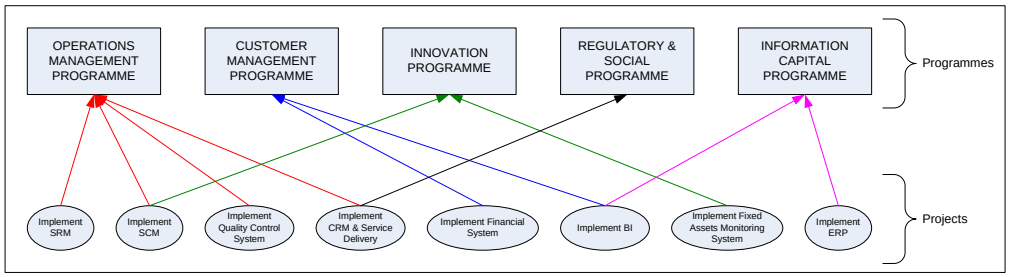

Figure 7-6: Grouping of projects into programmes

Not all organisations will have these programmes and these programmes can come and go as the vision and strategies of the organisation change. The number of projects within a programme will also change as the objectives change.

The grouping of projects into the programmes as seen in figure 7-6 has the benefit that the programme manager can relate the outcome of the projects directly to the outcome and success of the programme. The net result of the projects will determine the success or failure of the specific programme.

Once the programmes have been defined, it is essential that these programmes be managed in a professional manner.

7.3.11 PROGRAMMES

The previous section explained how the different projects are grouped and managed according to the standards of programme management. The success of each programme depends on how much it realised the business objectives and benefits linked to the specific programme. There will be a direct correlation between the success of the programme and the success with which the business objectives were implemented.

The next step in the process is to manage the programmes in such a manner that optimal return is gained by the implementation of these programmes.

7.3.12 PORTFOLIO MANAGEMENT

Portfolio management is about managing the portfolio in such a way that the organisational strategies are implemented and realised optimally (Lyn & Hsieh, 2004).

The portfolio manager manages the portfolio and makes decisions on the following:

- ***The priority of the programmes:*** It might be more beneficial to the organisation to do one programme before another. The programme portfolio manager must make decisions on the priority of the programmes.
- ***The inclusion or exclusion of programmes:*** The vision and strategies of the organisation will change over time. It is the responsibility of the portfolio manager to determine which programmes are still necessary to fulfil the strategies and vision.

7.3.13 PORTFOLIOS

The different programmes described in section 7.3.11 form the basis of the portfolio of the organisation. By translating the organisational strategy into action plans or programmes, the strategy map as well as the balanced scorecard provide the portfolio officer with a certain number of programmes to include in the portfolio.

The portfolio focuses on the financial and customer perspectives of the strategy map. These two perspectives provide the organisational strategies and the portfolio must ensure that these strategies are implemented in such a way that they can be perceived as successful and therefore the vision of the organisation will be realised through the successful implementation of the strategies.

The portfolio on the financial perspective of the strategy map must not be confused with the financial portfolio of the organisation. The portfolio and the financial portfolio of an organisation will together realise the financial strategies of the organisation.

A typical portfolio is illustrated in figure 7-7. It is clear from this diagram that a portfolio can consist of up to seven programmes. These programmes are based on the internal processes and competence perspectives as described in sections 7.3.4.1 and 7.3.4.2.

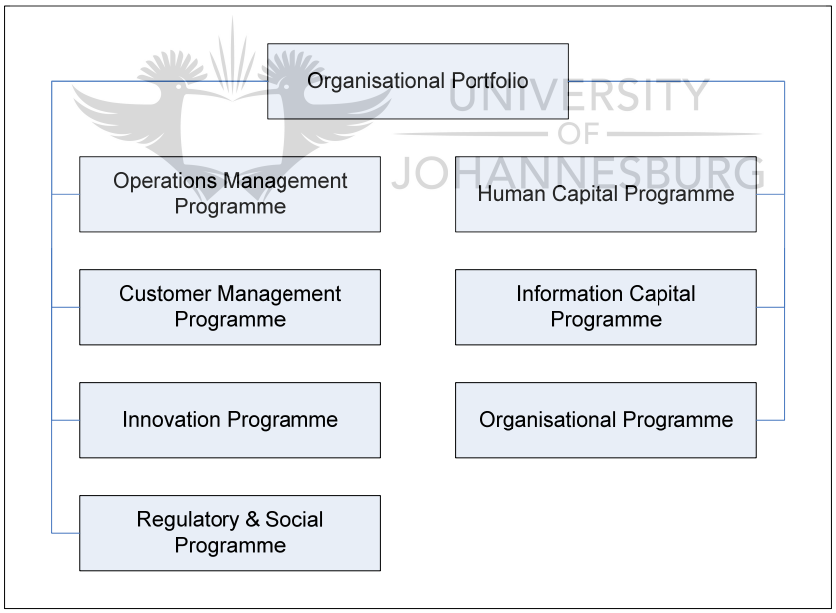

Figure 7-7: Typical portfolio

The different programmes are managed by a coalition of all the divisional directors within the organisation. The divisional directors will ensure that the different projects within the programme are managed and that the different programmes are a success. The portfolio officer (PO) is accountable for the successful management of the portfolio. It is the PO's duty to implement the organisational strategies by means of the different programmes. The divisional directors will be reporting to the PO but also to the CEO of the organisation. Figure

7-8 illustrates the matrix diagram of an organisation that will manage the vision and strategies through a strategy map.

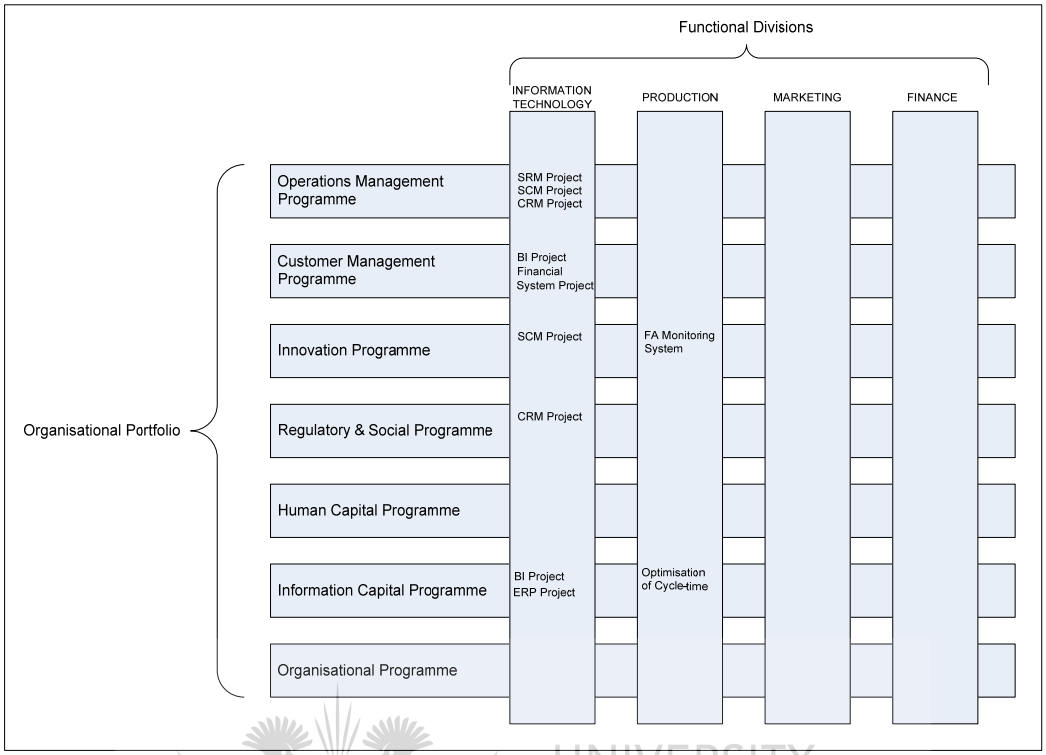

Figure 7-8: Typical organisational portfolio

The IT director is responsible for every project that falls under his/ division. The same goes for all the other divisional directors. They are accountable for the successful implementation of the different programmes and will have a two-tier responsibility. They are firstly responsible for the successful management of the different programmes and secondly for the effective management of their individual divisions.

The PO is responsible and accountable for the management of the programmes within the portfolio.

This differs from the relationship model in section 7.3.1 where each division had its own projects, programmes and portfolio to manage the divisional strategies.

7.3.14 FROM PROJECT BACK TO VISION

In the previous section, a top-to-bottom process was proposed to turn the vision into projects. In this section, a bottom-to-top process is proposed to monitor the achievement of the vision by measuring project performance and progress.

The organisation must monitor the progress towards achieving the vision and strategies on a regular basis to ensure that the selected projects produce the expected results. Any deviations need to be addressed by taking corrective action.

Monitoring takes place at three levels:

- The measurement criteria and targets enable the organisation to monitor individual projects. It is the project manager's duty to ensure that the projects achieve these targets.
- The achievement of business objectives is monitored through the implementation of programmes, as every programme is linked to a business objective. The programme manager must ensure that the programmes achieve these objectives.
- The successful deployment of strategies depends on the execution of the portfolio. If the portfolio is managed successfully, the organisational strategies will be achieved. The portfolio manager must ensure that this is achieved.

If all the organisational strategies are achieved, then the vision of the organisation is realised. Figure 7-9 illustrates the relationship between and dependency of the vision and the strategies. The vision determines the strategies, and the strategies determine the success of the vision.

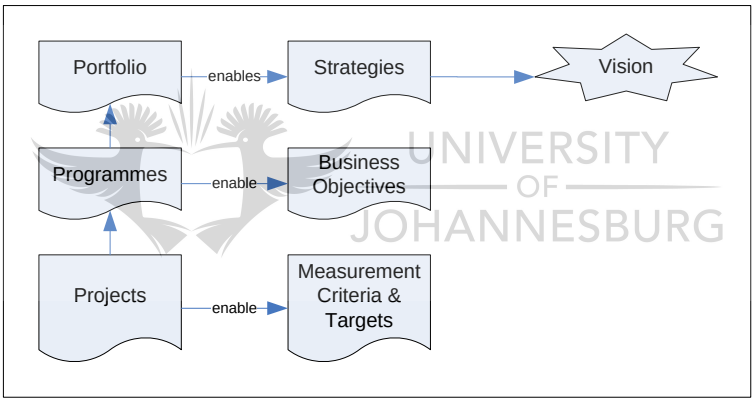

Figure 7-9: Interrelation between vision and strategies

The vision takes a long-term view of the organisation, while projects take a shorter-term view. This process enables the organisation to focus on the shorter term — that is, the projects — while the success of the short-term projects results in the success of the long-term vision and strategies.

Based on the Vision-to-Project Framework, it can be deduced that there is a direct link between projects and the organisational vision and strategies. This same link can be used to conclude that ERP system implementations can be derived from the organisational vision and therefore it will provide the organisation with a high ROI. This implies that the second problem of ERP systems not delivering on the promised ROI can be eliminated if the ERP system implementation is based on the organisational vision and strategies.

7.4 CONCLUSION

The chapter suggests a structured approach that uses the vision of the organisation to determine the projects that it must implement. The approach makes use of strategy maps and balanced scorecards to determine the strategies, business objectives, measurement criteria and targets. These are then linked to projects, programmes and portfolios. The suggested approach, although conceptual in nature, provides a holistic view of how to turn vision into projects. Many literature sources state that it must be done, but do not provide any guidance on how to do it.

The main benefit of this approach is that it is generic and can therefore be used by any organisation within any industry. Secondly, the selected projects are directly related to the vision, which eliminates projects that do not contribute towards realising it. Thirdly, the approach is based on existing, proven techniques and best practices such as balanced scorecards and the PMBOK® Guide and therefore does not suggest a drastic departure from current thinking.

One of the limitations of the suggested approach is that it can be applied only to organisations that have already reached a certain degree of maturity in project management. Project management forms the foundation of both programme and portfolio management. Another limitation is that it is currently conceptual in nature, and so does not take into consideration the inherent limitations and flaws of existing techniques and best practices.

A literature survey proved the fact that there is no scientific method to determine if an ERP system must be implemented or not. This is applicable only once the organisation has made the decision to implement an ERP system. There are various techniques that can be used to select an ERP system, which include scoring, ranking, mathematical optimisation and multi-criteria decision analysis. The issue with these selection methods is that an ERP system will be implemented for the wrong reasons if it is not derived from the organisational vision and strategies.

The Vision-to-Project Framework provides an organisation with a process to derive projects and programmes from the vision and strategies. If the strategies indicate that an ERP system must be implemented, then the ERP system will underwrite the vision and strategies of the organisation. If it is not done, then the ERP system will add no value to the organisation and does not underwrite the vision and strategies of the organisation.

This chapter discussed portfolio management and how it can be used to implement organisational strategies.

Portfolio management deals extensively with how a portfolio can be constructed. This construction of a portfolio is done with the aid of a strategy map and balanced scorecards. A strategy map will provide the organisation with business objectives. The balanced scorecards will attach fixed and measurable aspects to these business objectives. The combination of a strategy map and a balanced scorecard will provide an organisation with a method to

describe the strategies and to measure them. This then makes it easy for the portfolio manager to measure the success of the portfolio.

The benefit of the introduction of a portfolio is that it follows a top-down approach to determine the programmes that must be executed. This also ties in with the organisational strategy map and relevant balanced scorecard, which also follow a top-down approach. The organisational strategies determine the way that the organisation wants to move and place itself within the market. The portfolio uses these criteria to derive and implement programmes. The programmes are directly derived from the organisational strategies.

The advantage of this methodology is that all programmes and subsequent projects are started with the blessing of the organisational strategy. The bottom-up approach will initiate projects and programmes at will. Once these projects and programmes have been running for a while, they are scrutinised to determine if they form part of the organisational strategy. If the programme or project is then terminated, a lot of valuable resources are wasted.

The top-down approach eliminates this waste of resources and provides a sense of belonging to everyone that is part of the portfolio. This sense of belonging is a direct result of the programme because everyone will know that they are part of the organisation's success because they are implementing the organisational strategies.

This framework provides organisations with a better decision-making process. Directors and managers within the organisation can determine which projects must be initiated to provide the optimum results for the organisation. This also leads to the fact that there is a clear understanding of the responsibilities and accountabilities of individuals within the organisation. Project managers are responsible and accountable for the delivery of projects, whereas programme managers are responsible and accountable for the delivery of programmes. The PO is then responsible and accountable for the implementation of the organisational strategies through the management of the portfolio.

The framework also instils better corporate governance as each level adheres to the various standards, frameworks and best practices such as SOX, CobiT and ITIL.

8 CHAPTER 8: VALIDATING THE V2P FRAMEWORK – THE APPROACH

8.1 INTRODUCTION

The previous chapters provided the platform for scientific research to determine why ERP projects fail.

The goal of this chapter is to select a research methodology that can be used to test, verify and enhance the V2P Framework. This research methodology is used as the platform for the scientific research that is conducted. In order to achieve this goal, the following objectives must be met:

- The first objective of the chapter is to select a research methodology to test the theoretical V2P Framework. By comparing different approaches, the most suitable approach can be selected.
- The second objective is to apply the research methodology to the V2P Framework. This provides a set of processes that should be introduced and followed to validate and optimise the framework.

The structure of the chapter is based on these objectives where the first section of the chapter identifies and analyses various research methodologies. The second section illustrates the application or mapping of the chosen research methodology onto the framework and provides a graphical explanation of the process that is followed to describe the actions to optimise the framework.

8.2 RESEARCH CONTEXTUALISED

According to Denscombe (2007:3), researchers are faced with a variety of options and alternatives and the researcher must make strategic decisions about which option or alternative to use. The research approach that needs to be applied is based on the fact that the V2P Framework needs to be validated.

Zuber-Skerritt (2001:4) states that the researcher must first of all define the paradigm and make it explicit. The reason for this is that the reader/examiner can evaluate the process, methods and outcomes within the specific paradigm. The methods play a secondary role (Zuber-Skerritt, 2001:5).

8.2.1 RESEARCH PARADIGMS

A paradigm can be defined as the generally accepted perspective of a particular discipline at a given time. There are several research paradigms, for example:

- ***Positivism:*** Positivism has been associated with the question concerning the relative values of scientific versus humanistic approaches (Hjørland, 2005). The gaining of knowledge is based on the experience of senses and through observation and experiments. Positivistic thinkers adopt this scientific method as a means of knowledge

generation. Hence, it has to be understood within the framework of the principles and assumptions of science (Dash, 2005).

- ***Hermeneutics:*** Olivier (2006:115) defines hermeneutics as an attempt to interpret text from the point of view of its author. To understand the author's intent, the context in which the document was written must also be understood.
- ***Critical theory:*** Critical theory has a twofold meaning where the first is a school of thought and the second meaning implies a self-conscious critique (Carr, 2000; Ogbor, 2001). "Critical theory aims to produce a particular form of knowledge that seeks to realize an emancipatory interest, specifically through a critique of consciousness and ideology. It separates itself from both functionalist/objective and interpretive/practical sciences through a critical epistemology that rejects the self-evident nature of reality and acknowledges the various ways in which reality is distorted" (Carr, 2000).
- ***Constructivism:*** Constructivism refers to the construction of new meanings or knowledge by learners themselves (Brown, 2006). Jackson and Klobas (2008) define constructivism as the sets of beliefs or mental models people use to interpret actions and events in the world.
- ***Phenomenology:*** This is an approach that focuses on how life is experienced (Denscombe, 2007:76). It is not primarily concerned with explaining the causes of things, but tries to provide a description of how things are experienced firsthand by those involved.

The above paradigms are not a complete list but reflect the major research paradigms that can direct a researcher. Once the researcher has established the paradigm in which the research falls, the next logical step is to determine the method or approach (Zuber-Skerritt, 2001:5). The research approach is determined by the paradigm as certain paradigms promote the qualitative approach and others promote the quantitative approach.

8.2.2 RESEARCH APPROACH

The research approach can be categorised into two approaches, i.e. quantitative and qualitative approaches.

8.2.2.1 The Qualitative Approach

Hoepfl (1997) defines qualitative research as any kind of research that produces findings not arrived at by means of statistical procedures or other means of quantification. The qualitative approach underpins the fact that there are definable and quantifiable facts (Burns, 2000). Where quantitative researchers seek causal determination, prediction and generalisation of findings, qualitative researchers seek illumination, understanding and the extrapolation to similar situations. Qualitative analysis results in a different type of knowledge than does quantitative inquiry.

8.2.2.2 The Quantitative Approach

Quantitative researchers collect facts and study the relationship of one set of facts to another (Bell, 2007:7). They use techniques that are likely to produce quantified and generalisable conclusions. Creswell (2003) concludes that the quantitative research approach does not objectively translate theoretical ideas about constructs and processes into meaning-free language about procedures. Instead, interpretation also plays a crucial role.

8.2.2.3 The Mixed Approach

The mixed approach makes use of both the qualitative and the quantitative approaches to gather data and analyse these data (Creswell, 2003). Bell (2007) stipulates that the approach does not matter but that the researcher must understand the intent of each approach as well as its advantages and disadvantages.

The purpose of this study is not to determine the difference between these approaches, but to determine which approach is best to validate the V2P Framework. The research approach in turn determines the research method, and a few methods are described in the next section (Dash, 2005).

8.2.3 RESEARCH METHODS

Different research methods with their relevant advantages and disadvantages are shown in table 8-1 (Crabtree & Miller, 1999:337; Balnaves & Caputi, 2001:231; Coghlan & Brannick, 2001:7; Bertrand & Fransoo, 2002; Durling, 2002; Shaw & Green, 2002; Wilson, 2002; Radford & Goldstein, 2002; Blaikie, 2003:47; Denzin & Lincoln, 2003:167; Olivier, 2006:99; Rowley, 2004; Brynard & Hanekom, 2006:36; Hofstee; 2006:132; Denscombe, 2007:131).

METHOD	OVERALL PURPOSE	ADVANTAGES	DISADVANTAGES
Questionnaires (quantitative)	When a large amount of information needs to be gathered from people quickly and easily in a non-threatening way	• Can complete anonymously • Inexpensive to administer • Easy to compare and analyse • Administer to many subjects • Can collect a large amount of data	• Might not get careful feedback • Wording can bias subjects' responses • Impersonal • Do not provide full details and complete picture
Interviews (qualitative)	To fully understand a subject's experiences or learn more about their answers to questionnaires	• Get full range and depth of information • Develop relationship with subjects • Can be flexible with subjects	• Time-intensive • Can be difficult to analyse and compare • Can be costly
Documentation review (quantitative)	Documents can be treated as a source of data	• Get comprehensive and historical information • Information already exists • Few biases about information • Cost-effective • Permanence of data	• Time-consuming • Information may be incomplete • Credibility of source • Not flexible means to get data • Social constructions
Observation (quantitative/qualitative)	A distinct way of collecting data and based on the premise that it is best to observe what actually happens	• Can adapt events as they occur • Basic equipment is needed as researcher is the main equipment	• Difficult to interpret seen behaviours • Complex to categorise

		• Non-interference • Provides platform for gaining rich insights • Participant observation offers holistic explanations	observations • Expensive
Case studies (qualitative)	To fully understand or depict subject's experiences and conduct comprehensive examination through cross-comparison of cases	• Fully depict subject's experience in programme input, process & results • Powerful means to portray programme to outsiders	• Time-consuming to collect, organise and describe the data • Represent depth of information rather than breadth
Action research (qualitative)	To optimise a process through repetition based on a scientific study	• Involves everyone in the research • Repeatable • Addresses practical problems in a positive way by feeding the results of research directly back into practice • Provides personal benefits to the researcher as it contributes to professional self-development	• Time-consuming • Limits the scope and scale of the research • Limits the feasibility of exercising controls over factors of relevance • Constrained by what is permissible and ethical within the workplace setting • Ownership of research process becomes contestable • The action researcher is unlikely to be detached and impartial

Table 8-1: Different research methodologies

The information provided in the previous sections clearly indicates that there is a relationship between a research paradigm, the research approach and then finally the research method itself. This relationship is depicted in figure 8-1.

Figure 8-1: Contextualising research

The different research methodologies can all be applied to extract some information from an organisation regarding its process on how it goes about selecting projects. The purpose of this research is to determine if the V2P Framework can be utilised within an organisation to derive projects from the vision. The process depicted in figure 8-1 is applied to determine the research method that can be followed to validate the V2P Framework.

The research paradigm for this study that was best suited is phenomenology as it focuses on how life is experienced and this can then determine how the V2P Framework is experienced

by an organisation. The other paradigms do not tend towards experiencing the V2P Framework from a practical perspective and thus add no value.

The paradigm of phenomenology dictates that a qualitative research approach must be followed as per the definition of the qualitative research approach in section 8.2.2.1. The purpose of qualitative research is to understand a situation, and in this case the workings and processes involved in the V2P Framework need to be understood.

A few research methods fall under the qualitative research approach, for example action research, interviews and observation. Interviews were not suitable for this study, since the framework is theoretical and no observation can be made on the theoretical framework. Action research, by contrast, was suitable since it optimises processes and can thus be used to optimise the processes within the V2P Framework.

In conclusion, it can be said that the phenomenology paradigm determined a qualitative research approach. The reason for this is that this paradigm focuses on how life is experienced and experience itself is measured most of the time qualitatively. It is true that quantitative methods can be used but it does not provide the first hand experience by those involved. Based on the fact that the methodology is going to be qualitative, only methods that are qualitative by nature, can used and the best suited research method was action research.

The following section defines and describes action research and why it can be used as a research methodology.

8.3 ACTION RESEARCH DEFINED

Action research is known by many other names including participatory research, collaborative inquiry, emancipatory research, action learning and contextual action research, but all are variations on a theme (O'Brien, 1998; Coghlan & Brannick, 2001). Put simply, action research is "learning by doing". A group of people identify a problem, do something to resolve it, see how successful their efforts were and, if they are not satisfied, try again (McKernan, 1996; Balnaves & Caputi, 2001).

What separates this type of research from general professional practices, consulting or daily problem-solving is the emphasis on scientific study. This means the researcher studies the problem systematically and ensures that the intervention is informed by theoretical considerations. Much of the researcher's time is spent on refining the methodological tools to suit the exigencies of the situation, and on collecting, analysing and presenting data on an ongoing, cyclical basis.

A more appropriate definition for IT action research can be drawn from the published characteristics of action research in social science literature. These definitions tend to emphasise action research characteristics based on goals and objectives rather than characteristics of the process. According to Baskerville (1999), four major characteristics of IT action research are distinguishable:

- ***Increased understanding:*** Action research aims at an increased understanding of an immediate social situation with emphasis on the complex and multivariate nature of this social setting in the IT domain.
- ***Dual purpose:*** Action research simultaneously assists in practical problem-solving and expands scientific knowledge. This goal extends into two important process characteristics, namely that (i) there are highly interpretive assumptions being made about observation and (ii) the researcher intervenes in the problem setting.
- ***Involvement:*** Action research is performed collaboratively and enhances the competencies of the respective actors. A process of participatory observation is implied by this goal. Enhanced competencies are relative to the previous competencies of the researchers and subjects, and the degree to which this is a goal, and its balance between the actors, will depend upon the setting.
- ***Change:*** Action research is primarily applicable for the understanding of change processes in social systems.

The next section focuses on how these characteristics are applied to the V2P Framework.

8.3.1 CHARACTERISTICS OF ACTION RESEARCH

The characteristics of action research as per Baskerville (1999) underline the purpose and use of the framework. The following explains how IT action research can be applied to the V2P Framework:

- ***Increased understanding:*** The V2P Framework will enable organisations to understand that the projects are derived from the vision and will demystify the complex nature of linking projects to the vision of the organisation.
- ***Dual purpose:*** The first purpose is to define the problem, i.e. that an organisation has no structured method to derive projects from the vision. Based on this problem, the second purpose of IT action research is that it provides the organisation with the V2P Framework based on the knowledge gained.
- ***Involvement:*** The V2P Framework involves everyone in the organisation and everyone involved in projects knows exactly the benefit and contribution of the specific project to the vision of the organisation.
- ***Change:*** Implementing the vision of the organisation will bring about change and action research will allow the organisation to understand the process of organisational change.

Given the logic above, action research can be used to implement, validate and optimise the V2P Framework. The following section focuses on how action research functions and the processes involved.

8.3.2 THE ACTION RESEARCH APPROACH

The most prevalent action research description details a five-phase cyclical process as illustrated in figure 8-2 (Stringer, 1996; Coghlan & Brannick, 2001:17).

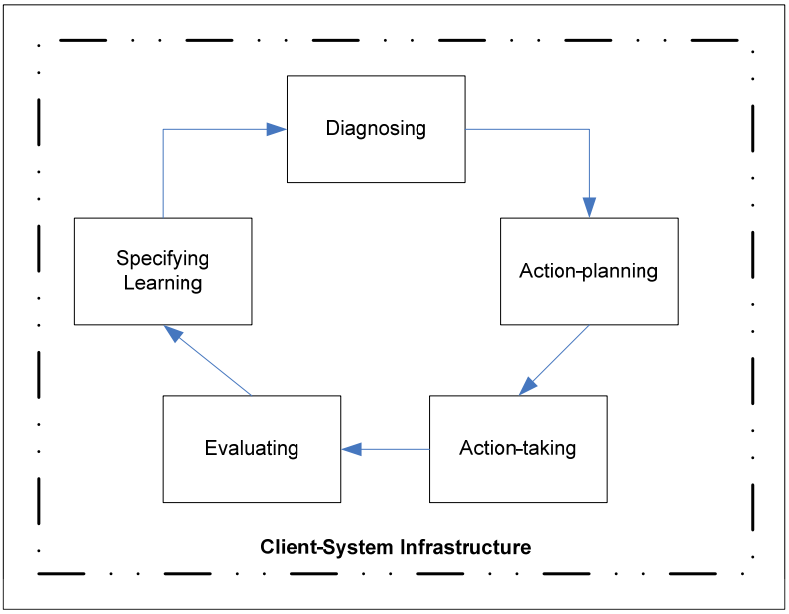

Figure 8-2: Action research cycle

The approach first requires the establishment of a client-system infrastructure or research environment. The client-system infrastructure is the specification and agreement that constitutes the research environment. It provides the authority under which the researchers and host practitioners may specify actions. It also legitimates those actions with the express expectation that eventually these will prove beneficial to the client or host organisation. Considerations found within the agreement may include the boundaries of the research domain, and the entry and exit of the researchers. It may also recognise the latitude of the researchers to disseminate the learning that is gained in the research. This infrastructure should also define the responsibilities of the client and the researchers to one another. For example, the infrastructure will probably assume that the researchers do not purposely specify actions that are harmful to the organisation.

Then, five identifiable phases are iterated:

8.3.2.1 Diagnosing Phase

The diagnosing phase corresponds to the identification of the primary problems that are the underlying causes of the organisation's desire for change. Diagnosing involves self-interpretation of the complex organisational problem, not through reduction and simplification, but rather in a holistic fashion. This diagnosis develops certain theoretical assumptions (i.e. a working hypothesis) about the nature of the organisation and its problem domain.

8.3.2.2 Action-planning Phase

Researchers and participants then collaborate in the next activity called action planning. This activity specifies organisational actions that should relieve or improve these primary problems. The discovery of the planned actions is guided by the theoretical framework, which indicates both some desired future state for the organisation, and the changes that would achieve such a state. The plan establishes the target for change and the approach to change.

8.3.2.3 Action-taking Phase

The action-taking phase implements the planned action as defined in the previous phase. The researchers and participants collaborate in the active intervention into the client organisation, causing certain changes to be made. Several forms of intervention strategy can be adopted. The intervention might be directive, in which the research "directs" the change, or non-directive, in which the change is sought indirectly. Intervention tactics can also be adopted such as recruiting intelligent laypersons as change catalysts and pacemakers.

8.3.2.4 Evaluating Phase

After the actions are completed, the collaborative researchers and practitioners evaluate the outcomes. Evaluation includes determining whether the theoretical effects of the action were realised and whether these effects relieved the problems. Where the change was successful, the evaluation must critically question whether the action undertaken, among the myriad routine and non-routine organisational actions, was the sole cause of success. Where the change was unsuccessful, some framework for the next iteration of the action research cycle (including adjusting the hypotheses) should be established.

8.3.2.5 Specifying Learning

While the activity of specifying learning is formally undertaken last, it is usually an ongoing process. The knowledge gained in the action research (whether the action was successful or unsuccessful) can be directed to three audiences:

- First, what is called "double-loop learning", the restructuring of organisational norms to reflect the new knowledge gained by the organisation during the research.
- Second, where the change was unsuccessful, the additional knowledge may provide foundations for diagnosing in preparation for further action research interventions.
- Finally, the success or failure of the theoretical framework provides important knowledge to the scientific community for dealing with future research settings.

The action research cycle can continue, whether the action proved successful or not, to develop further knowledge about the organisation and the validity of relevant theoretical frameworks. As a result of the studies, the organisation thus learns more about its nature and

environment, and the constellation of theoretical elements of the scientific community continues to benefit and evolve (McNiff & Whitehead, 2006:65).

Given the information provided, it is possible that action research can be used to apply the V2P Framework within an organisation. The results of the action research will enable the organisation to optimise the framework and get everyone involved. This is based on the scientific evidence provided by the action research cycle. The framework can only be implemented based on scientific proof and the proof will be provided by the outcomes of each phase within the cycle.

The next section discusses the usage of action research to test and optimise the V2P Framework. This is done based on the definitions and process of action research discussed in this section.

8.4 ACTION RESEARCH AND THE VISION-TO-PROJECT FRAMEWORK

The purpose of the V2P Framework is to implement the vision of the organisation through projects. This will bring about change within the organisation as the vision and projects are synonymous with change. Action research, on the other hand, embodies a strategy for studying change in organisations (Baskerville & Pries-Heje, 1999; Altrichter et al., 2002).

Given the definition above, action research can be used to study the change within the organisation. The change within the organisation will be initiated by the vision and implemented by the different projects. The vision and strategies are implemented through the identified projects that will enable the organisation to implement change.

The V2P Framework is illustrated in figure 8-3 for easy reference. The original diagram has been adapted to illustrate the different action research cycles. Each process of the framework goes through the action research cycle and is indicated in three different colours to distinguish the different action research cycles. The overlapping of the three action research cycles is indicated in yellow. This illustrates that each subsequent action research is dependent on the outcome of the previous action research and that it involves the whole organisation and not just certain divisions or individuals.

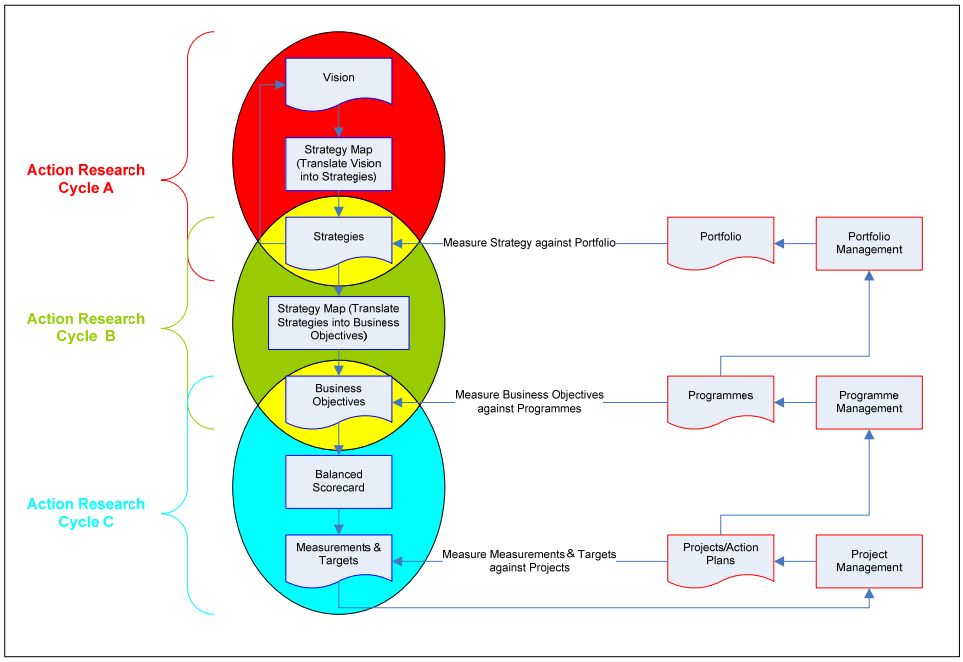

Figure 8-3: V2P Framework with action research cycles

The purpose of the framework is to assist organisations in using the vision and strategies to derive projects and thus improve the way that organisations work and function. Action research is about the way organisations improve their work through a fairly systematic research approach (McNiff, 2000; Zuber-Skerritt, 2002):

- The organisation reaches a critical point.
- The organisation feels the need to act.
- A course of direction is taken.
- The course of action is monitored and evaluated.
- The direction of the actions is changed based on the evaluations.

The research for this study breaks the framework down into manageable and measurable sections. Each section goes through the process of action research as illustrated in section 8.3. The sections are as follows:

- Using a strategy map to derive the strategies from the vision. This process will be refined until the strategy map process is optimised in order to derive strategies from the vision. This is action research cycle A as indicated in figure 8-3.
- The second process uses the strategy map again, but this time the focus is on how to derive business objectives from the strategies. The action research cycle B process facilitates this process.
- The third process is to use the balanced scorecard to assign targets and measurements to each business objective. This is action research cycle C as indicated in figure 8-3.

The action research stops at this specific process and does not continue with the process of project, programme and portfolio management. The reason for this is that these processes are well defined and have been explained in previous chapters. This means that the action research will deal only with the process of deriving projects from the vision and not grouping the projects into programmes and the programmes into a portfolio.

Another point of consideration is that each process must be optimised before the next process or section can be addressed. This means that the process of refining and optimising the strategy maps must be completed before the balanced scorecard process can be addressed.

The following section discusses the client-system infrastructure, as it is important for the research to define the boundaries of the action research.

8.4.1 CLIENT-SYSTEM INFRASTRUCTURE

The action research cycle illustrated in figure 8-2 is applied to the processes to define the vision, strategies, business objectives and measurements and targets. Each cycle begins with a diagnosing phase and finishes with the specifying learning phase (Marnewick & Labuschagne, 2006). Once the researchers are satisfied with the results, action research will be done on the next process.

The action research cycle continues until the end of all the defined processes. The next sections briefly discuss what is needed at every process based on the action research cycle.

8.4.2 ACTION RESEARCH CYCLE A: STRATEGY MAP (TRANSLATE VISION INTO STRATEGIES)

The purpose of this process is to use the vision of the organisation and to break it down into strategies. This is action research cycle A as illustrated in figure 8-3. The strategies of the organisation can be divided into two main streams, namely the productivity and growth strategies using a strategy map as illustrated in figure 7-5.

Each of these strategies can be subdivided into two substrategies, i.e. the productivity strategy can be subdivided into the “improve cost structure” and “increase asset utilisation” strategies, and the growth strategy can be subdivided into the “expand revenue opportunities” and “enhance customer value” strategies.

These strategies deal with the financial aspect of the organisation and with long-term shareholder value and are discussed in detail in section 7.3.2.

The outcome of this process is a defined methodology or process called strategy maps that can be used to derive strategies from the organisational vision.

The action research cycle is used to improve this process.

8.4.2.1 Diagnosing Phase

The first hypothesis is that organisations experience difficulty in deriving strategies from the vision. If such a process does exist, it is not repeatable and strategies are often loosely related to the vision of the organisation.

The desire to change is to use strategy maps to derive strategies from the vision of the organisation. The strategy maps are put through the cycle of action research to validate the process and to determine the inherent flaws of strategy maps, if any.

The outcomes of this phase are the following:

- The vision of the organisation
- The list of strategies that should be followed to implement the vision
- A description of the method or way that was followed to derive the strategies from the vision

Feedback should be provided back to the organisation to ensure that everyone involved is satisfied with the information portrayed. This will eliminate any discrepancies later on through the research.

8.4.2.2 Action-planning Phase

The discovery of the planned actions is guided by the theoretical V2P Framework, which indicates both some desired future state for the organisation, and the changes that would achieve such a state.

The future state is that the organisation uses a strategy map to derive the strategies from the vision. The changes that the organisation must put in place are the following:

- A vision must be defined by the organisation. An existing vision must conform to the definition of a vision as stated in section 7.3.1.
- The first level of strategies must be derived based on productivity and growth.
- The second level strategies must be derived based on the substrategies of productivity and growth.

The customer strategies must be derived based on the financial strategies.
These changes will be put in place using a strategy map. This involves the top management of an organisation. The benefits are that top management agrees on the vision and strategies and that everyone is committed to ensure the implementation of these strategies.

The outcomes of this phase are as follows:

- An agreement on the way that the strategies will be derived from the vision. This is based on a workshop where the framework is explained to the directors of the organisation.
- The current state is documented based on the findings of the diagnosing phase.

- The future state is documented based on the framework and highlights the difference between the original strategies and the new strategies based on the framework.

The strategy map process is also documented to determine if there are any changes that can be made to the theoretical strategy map to improve the strategy map process.

8.4.2.3 Action-taking Phase

The changes and action plans decided on in the previous phase are implemented. The changes should be implemented by top management as they are responsible and accountable for the implementation of the vision and strategies.

They can employ or second a person to facilitate the process if they do not have the knowledge to derive the strategies.

There are two actions that the organisation can take at this stage. The first action is to cancel the implementation of all current strategies and implement the new strategies based on the action-planning phase. The second action is to adopt strategy maps as a methodology for future use.

The outcome of this phase is as follows:

- Document the intention of the organisation in relation to the adoption of strategy maps and the implementation of the new strategies.

8.4.2.4 Evaluating Phase

This phase is used to marry the planned changes and the actual changes. Evaluation includes determining whether the anticipated effects of the action were realised and whether these effects relieved the problems.

Where the anticipated effects of an action did achieve the required outcome, the change must either be permanent or a decision must be taken that the change will be left and that it cannot be altered. Changes that did not fulfil expectations will be addressed in the next phase.

The outcomes of this phase are as follows:

- Document planned and actual changes. This provides the action researcher with information if the framework did relieve some of the problems within the organisation.
- Document changes that did not work for the organisation. These changes are either refined or left alone.
- The overall impression of the participants involved can also be documented to determine how the action research can be enhanced or changed for better results.

8.4.2.5 Specifying Research Phase

This phase acts as a stop-go phase. The go part of this phase will take the unresolved changes of the action research cycle and reintroduce them into the cycle to resolve the issue and problems relating to the specific changes.

The stop part of the phase will acknowledge the fact that the action research cycle did complete and that the desired outcome was achieved. The desired outcome of this specific action research cycle is that the vision of the organisation is broken down into strategies based on the financial and customer perspectives. These strategies dictate the direction of the organisation and are used to determine the business objectives of the organisation.

The outcome of this phase is either a stop or go-ahead decision. The aim of this phase is to stop the action research cycle as this means that all the issues and plans have been resolved satisfactorily.

8.4.3 ACTION RESEARCH CYCLE B: STRATEGY MAP (TRANSLATE STRATEGIES INTO BUSINESS OBJECTIVES)

The previous process determined the strategies based on the vision of the organisation. The translation of strategies into business objectives can take place only once the process of deriving strategies from the vision has been completed and improved based on the action research cycle described in the previous section.

The purpose of this process is to use the strategies of the organisation and to break them down into business objectives. This is illustrated as action research cycle B in figure 8-3. The business objectives of the organisation can be divided into two main perspectives: the internal and learning and growth perspectives, discussed in detail in section 7.3.4.

The processes determine the business objectives and link directly to the strategies derived from the vision. This means that a line can be drawn from each business objective back to the vision of the organisation.

As with the previous process, the action research cycle is used to validate this process of deriving business objectives from the organisational strategies.

The outcomes of this phase are the following:

- The strategies based on the strategy map
- The list of business objectives
- A description of the method or way that was followed to derive the business objectives from the strategies

Feedback must be provided to the organisation to ensure that everyone involved is satisfied with the information portrayed. This will eliminate any discrepancies later on through the research.

8.4.3.1 Diagnosing Phase

The second hypothesis is that there is no direct link between the business objectives and the strategies of the organisation. If there is a direct link, it is not derived based on a repeatable methodology and the business objectives are loosely linked to the strategies of the organisation.

The desire to change is to use strategy maps again as a vehicle to derive business objectives from the strategies of the organisation. The strategy map will be put through the cycle of action research to validate the process and to determine the inherent flaws of strategy maps based on how to derive business objectives from the strategies.

The outcomes of this phase are as follows:

- An agreement on the way that the business objectives are to be derived from the strategies. This is based on a workshop where the framework will be explained to the directors of the organisation.
- The current state is documented based on the findings of the diagnosing phase.
- The future state is documented based on the framework and highlights the difference between the original business objectives and the new business objectives based on the framework.
- The strategy map process is also documented to determine if there are any changes that can be made to the theoretical strategy map to improve the strategy map process.

8.4.3.2 Action-planning Phase

The discovery of the planned actions is guided by the theoretical framework, which indicates both some desired future state for the organisation, and the changes that would achieve such a state.

The future state is that the organisation uses a strategy map to derive the business objectives from the strategies. The changes that the organisation must put in place are the following:

- Strategies must exist based on the strategy map on how to derive strategies from the vision.
- Determine the business objectives that support and implement the four processes of operations management. These business objectives are directly linked to the strategies based upon price, quality, availability and selection.
- Determine the business objectives that support and implement the four processes of customer management. These business objectives are directly linked to the strategies based upon service, partnership and brand.
- Determine the business objectives that support and implement the four processes of innovation. These business objectives are directly linked to the strategies based upon selection and functionality.

- Determine the business objectives that support and implement the four processes of regulatory and social management. These business objectives are directly linked to the strategies based upon brand.

It is possible and might sometimes happen that some of the business objectives do address the same strategy, e.g. the business objective of customer management is linked to the brand of the organisation, but the brand of the organisation also determines the business objective of the regulatory and social management perspective.

The change invoked by the action research cycle also focuses on the following intangible assets of the organisation:

- ***Human capital readiness:*** The business objectives must implement skills, knowledge and values based on the vision and strategies of the organisation.
- ***Information capital readiness:*** The business objectives derived must ensure that the organisation's information technology addresses and supports the vision, strategies and business objectives.
- ***Organisational capital readiness:*** The business objectives must ensure that a certain culture is instilled amongst workers, leadership is cultivated and teamwork is promoted within the organisation.

The changes to derive business objectives from the strategies are done based on the strategy map. This involves middle management within the organisation because middle management are responsible for ensuring that the strategies are implemented through the business objectives. Top management is also involved by taking accountability of the business objectives. The benefits are that middle and to a lesser degree top management buy into the business objectives and that everybody is committed to ensure the implementation of these business objectives and ultimately the strategies and vision.

The outcomes of this phase are as follows:

- An agreement on the way that the business objectives are derived from the strategies. This is based on a workshop where the framework is explained to the directors of the organisation.
- The current state is documented based on the findings of the diagnosing phase.
- The future state is documented based on the framework and highlights the difference between the original business objectives and the new business objectives based on the theoretical V2P Framework.
- The strategy map process is also documented to determine if there are any changes that can be made to the theoretical strategy map to improve the strategy map process.

8.4.3.3 Action-taking Phase

The changes and action plans decided on in the previous phase are implemented. The changes should be implemented by middle management as they are responsible for the implementation of the business objectives.

As with top management, middle management can employ a second a person to facilitate the process if they do not have the knowledge to derive the business objectives from the organisational strategies.

The outcome of this phase is as follows:

- Document the intention of the organisation in relation to the adoption of strategy maps and the implementation of the new business objectives.

8.4.3.4 Evaluating Phase

This phase is used to marry the planned changes and the actual changes. Evaluation includes determining whether the theoretical effects of the action were realised and whether these effects relieved the problems.

Changes that did achieve the required outcome must either be changed or a decision must be taken that the change will be left and that it cannot be altered. Changes that did not fulfil expectations will be addressed in the next phase.

The outcomes of this phase are as follows:

- Compare and document the planned and actual changes. This provides the action researcher with information if the framework did relieve some of the problems within the organisation.
- Document the changes that did not work for the organisation. These changes are either refined or left alone.
- The overall feeling of the people involved can also be documented to determine how the action research can be enhanced or changed for better results.

8.4.3.5 Specifying Research Phase

This phase acts as a stop-go phase. The go part of this phase takes the unresolved changes of the action research cycle and reintroduces them into the cycle to resolve the issue and problems relating to the specific changes.

The stop part of the phase acknowledges the fact that the action research cycle did complete and that the desired outcome was achieved. The desired outcome of this specific action research cycle is that the strategies are broken down into business objectives.

Once the strategies and business objectives have been defined, the next step in the theoretical V2P Framework is to link targets and measurements to each business objective and strategy.

The balanced scorecard is used to determine the targets and measurements.

8.4.4 ACTION RESEARCH CYCLE C: BALANCED SCORECARD

The outcome of the previous two action research cycles produces strategies and business objectives that the organisation uses to implement the vision.

The purpose of a balanced scorecard is to measure the strategies and business objectives (Kaplan & Norton, 1996). The action research cycle for the balanced scorecard assigns a target and measure to each strategy and business objective. This process is illustrated in figure 8-3 as action research cycle C.

Action research cycle C is used to optimise this process.

8.4.4.1 Diagnosing Phase

The third hypothesis is that organisations do not know how to determine and assign targets and measurements to the strategies and business objectives.

The desire to change is to use a balanced scorecard to determine the targets and measurements for each strategy and business objective. The outcomes of this phase are as follows:

- An agreement on the way that the measurements and targets are to be derived from the business objectives. This is based on a workshop where the theoretical V2P Framework is explained to the directors of the organisation.
- The current state is documented based on the findings of the diagnosing phase.
- The future state is documented based on the framework and highlights the difference between the original measurements and targets and the new measurements and targets based on the framework.
- Document any changes that can be made to the theoretical balanced scorecard to improve the balanced scorecard process.

8.4.4.2 Action-planning Phase

The current state is that there is no process to apply measurements to strategies and business objectives. The future state would be to define and implement a process to apply measurements to the strategies and business objectives of the organisation.

The change from the current state to the future state is accomplished with the assistance of a balanced scorecard. Every employee is involved in determining the measurements. Top management determines the measurements for the strategies, and lower management and ordinary employees determine the measurements for the business objectives.

The outcomes of this phase are as follows:

- An agreement on the way that the measurements and targets are derived from the business objectives. This is based on a workshop where the theoretical V2P Framework is explained to the directors of the organisation.
- The current state is documented based on the findings of the diagnosing phase.
- The future state is documented based on the framework and highlights the difference between the original measurements and targets and the new measurements and targets based on the framework.
- Document any changes that can be made to the theoretical balanced scorecard to improve the balanced scorecard process.

8.4.4.3 Action-taking Phase

A balanced scorecard is implemented. The balanced scorecard is determined by everyone within the organisation because everyone is responsible for ensuring that the targets and measurements are achieved.

The outcome of this phase is as follows:

- Document the intention of the organisation in relation to the adoption of a balanced scorecard and the implementation of the new measurements and targets.

8.4.4.4 Evaluating Phase

This phase is used to map the targets and measurements to the strategies and business objectives. Evaluation includes determining whether the theoretical effects of the action were realised and whether these effects relieved the problems.

Where the anticipated changes did achieve the required outcome, they must either be permanent or a decision must be taken that the change will be left and that it cannot be altered. Changes that did not fulfil expectations will be addressed in the next phase.

The outcomes of this phase are as follows:

- Compare and document the planned and actual changes. This provides the action researcher with information if the framework did relieve some of the problems within the organisation.
- Document the changes that did not work for the organisation. These changes are either refined or left alone.
- The overall feeling of the people involved can also be documented to determine how the action research can be enhanced or changed for better results.

8.4.4.5 Specifying Research Phase

This phase acts as a stop-go phase. The go part of this phase takes the unresolved changes of the action research cycle and reintroduces them into the cycle to resolve the issue and problems relating to the specific changes.

The stop part of the phase acknowledges the fact that the action research cycle did complete and that the desired outcome was achieved. The desired outcome of this specific action research cycle is that targets and measurements are assigned to each strategy and business objective.

8.5 CONCLUSION

The chapter discussed various research methodologies to determine which methodology was better suited to validate the theoretical V2P Framework. Action research is a better research approach and it can be used to validate the theoretical framework. The processes involved in action research were described, as well as the application of the action research cycle to the individual processes of the V2P Framework.

Based on the information in the chapter, it is clear that action research can be used as a research methodology to validate the framework. The validation can be done on every section of the V2P Framework and thus provides a comprehensive validation.

It is possible to involve everyone within the organisation as well as facilitate the change involved by implementing the framework. This research methodology is more suitable than other research methodologies such as questionnaires to implement the framework. Any quantitative approach to validate the V2P Framework would not be able to provide the same results as the participants are not involved in the process. It also limits the researcher to check the truthfulness of the answers provided by participants.

The benefit of this chapter is that it provides evidence that action research is a valid research methodology and that it can be applied in the environment of IT project management. The research provides for similar or other research to be done on IT project management using action research.

The following chapter expands on the implementation of the action research cycle within an organisation. The results will be evaluated based on the action research cycle.

9 CHAPTER 9: VALIDATING THE V2P FRAMEWORK – THE RESULTS

Action research as a research method and how a researcher must go about doing action research was described in the previous chapter. Action research was also applied to the Vision-to-Project Framework to determine the inputs and outputs of each phase within action research.

The goal of this chapter is to apply the V2P Framework to an organisation using action research as a method. This is done to determine any inherent flaws within the theoretical framework and also to determine if projects can be derived from the vision based on the framework. In order to achieve this goal, the following objectives must be met:

- The first objective is to find an organisation that would be willing to participate in the research. This is based on specific selection criteria.
- The second objective is to apply the framework to the organisation using action research. This is done to determine the strategies and ultimately the projects of the organisation. This objective determines any problems or issues within the theoretical framework.
- The third objective is to provide the validated V2P Framework. The results illustrate if the V2P Framework does have any inherent flaws and problems and if any changes must be made to the model.

The structure of the chapter is based on these objectives, where the first section of the chapter describes the selected organisation and its background. The second section documents the results of the action research process and provides as an output the selected organisation's strategy map. The third section shows the validated V2P Framework based on the results of the action research.

9.1 SELECTION CRITERIA

The first objective of the chapter is to find an organisation that would be willing to participate in the research. The organisation that participates needs to conform to the following selection criteria:

1. The organisation should comprise at least 50 people. The reason for this is that all the employees need to be involved in the compilation of the business strategies and the business objectives, thereby representing different views and stakeholders.
2. The organisation must have internal projects that enable them to realise organisational benefits.
3. The organisation should not yet have a process in place for deriving projects from the vision and strategies. This is because the action research process may be manipulated by the participants to deliver a predetermined result.
4. The organisation must believe that the research will be advantageous to it as well. A lack of confidence in the action research process would negate the validity of the results.

Based on the above selection criteria, a South African organisation called Organisation SA (for reasons of anonymity) was selected. Organisation SA conforms to the selection criteria in the following ways:

1. The Democratic Republic of the Congo (DRC) has issued a decree that constitutes the rebuilding of the country in such a way that will enable the country to build and maintain support centres throughout the DRC (O'Connor, 2007). A support centre is defined by the DRC as a town with its entire supporting infrastructure including agricultural and environmental activities. This decree is attached as appendix C. A governmental department, the *Service National*, was formed to oversee the implementation of these support centres. Organisation SA was selected by *Service National* to implement four of these support centres in the south-west of the DRC (Combrinck, 2007). Organisation SA consists of a managerial component in South Africa and an operational section based in the DRC. The total staff complement is more than 50. Organisation SA must implement various projects across various divisions to ensure the realisation of *Service National's* decree or vision.
2. Organisation SA has various internal projects such as setting up a mine in the DRC, building roads and implementing an ERP system to manage the organisation as an entity.
3. Since Organisation SA is a new organisation, it is not hampered by any previous decisions and no processes are in place to derive projects from the vision.
4. The CEO recognised the importance of the research as it would be mutually beneficial to both Organisation SA and the action researcher.

Based on the above, the first objective of the chapter was achieved and the next objective can be addressed. This is done by using action research to apply the framework to the organisation.

9.2 ACTION RESEARCH IN MOTION

The goal of this study is to establish why some implementations of ERP systems are perceived as failures. The first set of hypotheses were that organisations do not understand ERP systems, the underlying ERP technology is immature and ERP systems are perceived as insecure systems in which to transact. This was researched in chapters 2 – 4 and the conclusion was that ERP is a mature environment.

The fourth and fifth hypotheses were that ERP systems cannot be implement using existing project and programme management standards. Based on the research done in chapters 5 and 6, it was concluded that project and programme management are mature concepts as well.

This led to hypothesis 6 that ERP initiatives are selected and initiated for the wrong reasons. The V2P Framework was developed to overcome this problem. The framework was described in section 7.3 . This means that the vision of the organisation must be used to

derive projects. This includes information technology projects such as the implementation of an ERP system.

The process that was followed to do the research was to ensure first of all that Organisation SA had a vision based on the criteria described in section 7.1.

The next step in the process was to determine the business strategies based on the vision. The business strategies were derived from the vision using strategy maps as explained in section 7.3.2 of chapter 7. The third step was to use strategy maps to derive business objectives from the strategies. This provided a list of business objectives that had to be measureable and targets associated with them. This process was explained in section 7.3.4 of chapter 7.

The fourth step was to use a balanced scorecard to link measurements and targets to the business objectives as explained in section 7.3.6 of chapter 7.

The action research cycle was used through each step to test and optimise the V2P Framework. The following section explains in detail the process that was followed and this is based on the action research approach described in section 8.3 of chapter 8.

Action research requires the establishment of a client-system infrastructure or research environment. This client-system infrastructure specifies the agreement that constitutes the research environment, including the subject of the study, the processes, the objective and the agreed-upon outputs.

9.3 CLIENT-SYSTEM INFRASTRUCTURE

The main activity in this stage was to define the roles and responsibilities, the resources needed and the principles of operation.

At the start of the research Organisation SA had no clear vision and strategies. The only things that were in place were a budget and a business plan. At an initial meeting that was held with Organisation SA, it was decided that the core of the research group would constitute the CEO, Enterprise Director and the external researcher. A confidentiality agreement was put in place that all information related to *Service National* would be treated as confidential, otherwise this might jeopardise the relationship between *Service National* and Organisation SA. Information related to Organisation SA itself is not covered by this agreement.

9.3.1 THE SUBJECT OF THE STUDY

The subject of the study is a pragmatic framework that can be used to derive projects from the organisation's vision (Marnewick & Labuschagne, 2006).

9.3.2 PROCESSES

As indicated previously in sections 7.3.2 and 7.3.6, the processes used were strategy maps and balanced scorecards. These processes are used to deconstruct the organisational vision into strategies, business objectives and associated measurements and targets.

9.3.3 OBJECTIVE

The objective of the research was to validate the V2P Framework by determining if it could be used to derive projects from the vision of the organisation and therefore ensure the alignment of projects with the vision. This alignment would, in turn, ensure that valuable organisational resources were not wasted on projects that did not contribute to the realisation of the vision.

9.3.4 AGREED UPON OUTPUTS

The outputs that were agreed upon between Organisation SA and the action researcher are as follows:

- The vision of the organisation
- The strategies and business objectives
- The projects that had to be initiated to ensure the successful implementation of the business objectives and strategies. The successful implementation of these objectives and strategies could lead to the successful implementation of the organisational vision.

The concept of action research was illustrated and described to Organisation SA. This was done for everyone involved to understand the process as well as how the action research would proceed.

The next step was to determine who was responsible for what during the action research and this is documented in the next section.

9.3.5 ROLES AND RESPONSIBILITIES

At an initial meeting held with Organisation SA, it was decided that the core research team would include the following three members:

- The CEO of Organisation SA
- The Enterprise Director, who was a board member
- The action researcher

The CEO provided all the information needed by all the relevant parties. He also approved the vision, strategies and business objectives that were derived from the V2P Framework. Another responsibility of the CEO was to ensure that all the relevant people that were needed for the research were available to the research group. He recognised the importance of the research as it was mutually beneficial to both Organisation SA and the action research group.

The roles and responsibilities of the Enterprise Director can be defined as follows:

- Acted as liaison between the action research group and Organisation SA.

- Assisted in the action research in an active way by providing input and all relevant documentation needed to derive the strategies and business objectives.

The agreement was made that the action researcher was the main responsible person for initiating all the necessary meetings and for the documentation of the research. The roles and responsibilities of the action researcher can be defined as follows:

- Ensured that the process of action research was followed throughout the process.
- Ensured that everyone involve understood the concepts of strategy maps and a balanced scorecard, as these were the concepts that would be tested and refined during the action research process.
- Observed the action research cycle and documented all changes in it.
- Documented all the processes, including the results of the action research. The documentation was twofold: The first would be the research for the purpose of these studies. As an added benefit, the second would be the vision, strategies and business objectives in such a way that they could be used by Organisation SA.

Based on the client-system infrastructure, it was agreed that the research could continue and the next step in the process was to follow the five phases of action research. These phases were applied to the following sections of the V2P Framework:

- Deriving strategies from the vision. Refer to section 7.3.2 of chapter 7 for more details.
- Deriving business objectives from the strategies. Section 7.3.4 of chapter 7 defines the outputs of this cycle.
- Assigning measures and targets to the strategies and business objectives. Refer to section 7.3.6 of chapter 7 for more details.

The following section uses the five phases of the action research process to determine if the process of deriving strategies from the vision based on strategy maps was foolproof or in need of enhancements.

For ease of reference, the action research cycles applied to the Vision-to-Project Framework are illustrated in figure 9-1.

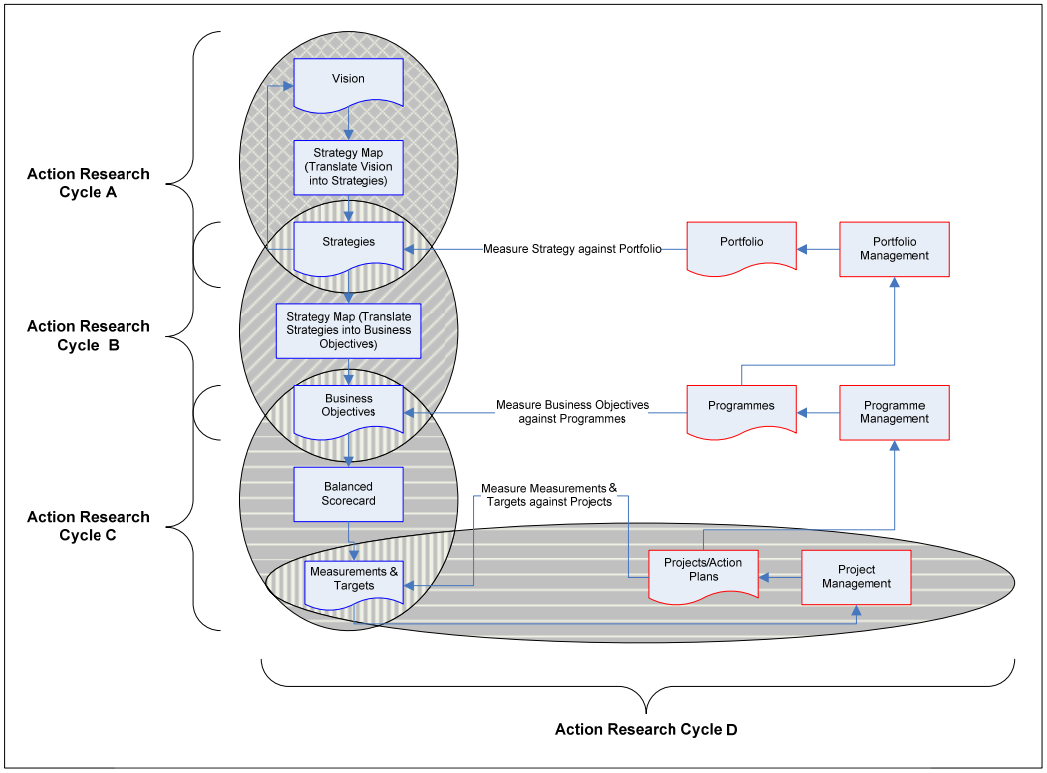

Figure 9-1: Action research cycle applied to the V2P Framework

Each AR cycle is discussed in the following sections:

9.4 ACTION RESEARCH CYCLE A: STRATEGY MAP (TRANSLATING THE VISION INTO STRATEGIES)

The purpose of this process is to use the vision of the organisation and to break it down into strategies.

9.4.1 DIAGNOSING PHASE

The hypothesis was that Organisation SA had difficulty in deriving strategies from the vision. Organisation SA did not have a process in place to derive any strategies from the vision and the V2P Framework was thus the ideal method to do so.

The current state as depicted by the diagnosing phase was that Organisation SA did have a vision, a mission and a business objective. These three elements were not related to one another and the implementation of a strategy map would be used to provide a link between the vision and the business objective. There were no strategies in place.

Outcomes of the Diagnosing Phase

The desired outcomes of this phase are described in section 8.4.2.1 of chapter 8. Based on information received from the CEO of Organisation SA, the outcomes of this phase were as follows:

- Vision: A vision was defined but did not conform to the definition of a vision as stated in section 7.1. The vision is documented in table 9-1.
- List of strategies: There were no defined strategies and only two business objectives as documented in table 9-1.
- Method used to derive strategies from the vision: No method was followed as there were no strategies. The mission and business objective seemed to function as strategies. This means that the process was not repeatable and strategies were loosely related to the vision.

The state prior to the research was thus that a vision and business objectives did exist but that there was no link between them. The vision did not conform to the definition of a strategy either, as explained earlier. The original vision, strategies and business objectives are tabled in table 9-1.

Vision	Strategies	Business Objectives
To mine the most sought-after diamonds: • Acting with integrity in everything done • Valuing our employees and their diversity • Establishing long term relationships with our customers • Creating value for our customers • Become a model organization in the community in which we operate	None	• The recovery of the most sought-after diamonds in the concession diamond deposits • Investing in the growth in human capital within its community and the broader society

Table 9-1: Original vision, strategies and business objectives

The first requirement in using the V2P Framework is that a vision must be in place before the framework can be used. Based on this, it is clear that the framework forces an organisation to evaluate its vision according to the guidelines as set out in section 7.1 of chapter 7. The first section of the framework thus works and no change is needed.

The next phase within the action research cycle is the action-planning phase.

9.4.2 ACTION-PLANNING PHASE

The action-planning phase addresses the future state. The future state can be described as where the organisation makes use of a strategy map to derive the strategies from the vision. Based on this assumption, the first problem was the fact that Organisation SA did not have a vision that conformed to the definition, as stated before. The first thing that had to be done was to define a vision for Organisation SA. A vision was determined for Organisation SA that conformed to the definition of a vision as per table 9-2.

Vision	Strategies	Business Objectives
To be *Service National*'s partner of choice for the implementation of a sustainable first-class infrastructure	• Productivity Strategy o (F1): Maximize the use of existing and new assets o (F2): The mining operation must be cost effective • Growth Strategy o (F3): Revenue from new customers i.e. *Service National* o (F4): Increase the account share with *Service National* o (F5): Offer products and services that are consistent, timely and low-cost o (F6): Products and services that expand existing performance boundaries into the highly desirable o (F7): Provide the best solution to *Service National* • Customer Strategy o (C1): Low cost supplier o (C2): Perfect quality o (C3): Speedy purchase o (C4): Appropriate selection	None

Table 9-2: Revised vision and strategies

A mind mapping application was used to document the process of the strategy map and changes and/or additions to the strategies were made in a live environment where the management of Organisation SA could see the changes as they took place.

Outcomes of the Action-planning Phase

Agreement on Strategy Maps

A meeting was held between the researcher and the management of Organisation SA. The purpose of the meeting was to illustrate the concept of strategy maps to the management. The presentation focused on the benefits of strategy maps for Organisation SA in determining its strategies based on the new vision that was formulated. It was also made clear that the strategy map is a methodology that is used worldwide and that various organisations within various sectors use strategy maps.

It was agreed upon that a strategy map would be used to derive the strategies from the vision of Organisation SA. Based on this agreement, the future state as shown in table 9-3 was documented.

Current State versus Future State

One of the outcomes of the action-planning phase is to document the current state. Another outcome is the documentation of the future state after the application of the V2P Framework

to the current state. The current and future states are shown in table 9-3. A clear and significant difference can be seen between the current and future states.

Current State	
Vision	**Strategies**
To mine the most sought-after diamonds: • Acting with integrity in everything done • Valuing our employees and their diversity • Establishing long term relationships with our customers • Creating value for our customers • Become a model organization in the community in which we operate	None
Future State	
Vision	**Strategies**
To be *Service National*'s partner of choice for the implementation of a sustainable first-class infrastructure	• Productivity Strategy o (F1): Maximize the use of existing and new assets o (F2): The mining operation must be cost effective • Growth Strategy o (F3): Revenue from new customers i.e. *Service National* o (F4): Increase the account share with *Service National* o (F5): Offer products and services that are consistent, timely and low-cost o (F6): Products and services that expand existing performance boundaries into the highly desirable o (F7): Provide the best solution to *Service National* • Customer Strategy o (C1): Low cost supplier o (C2): Perfect quality o (C3): Speedy purchase o (C4): Appropriate selection

Table 9-3: Vision and strategies (current and future states)

The difference between the current and future states is in the way that the strategies have been derived from the vision of the organisation. It is clear from the current state that the vision did not adhere to the rules as previously explained, there were no strategies derived from the vision and only two business objectives were specified. Based on this information of the current state, the organisation would have found it impossible to define any projects and programmes that could be managed to implement the vision of the organisation.

The future state, on the other hand, already provided the organisation with a better vision as well as 11 different strategies that could be implemented to ensure the fulfilment of the vision.

Documentation of Process

The first step in the process was to redefine the vision of Organisation SA, as the original vision as per the business plan did not conform to the definition as per section 7.1 of chapter 7. A new vision was defined and documented (table 9-3). This vision was adopted by the management of Organisation SA.

The second step was to classify the strategies either as a productivity or growth strategy. Since Organisation SA was a new organisation, it was agreed that there would be more growth strategies than productivity strategies. Productivity strategies would have to be in place to ensure the optimal usage and functioning of the assets. This phenomenon can be seen in table 9-3, where there are two productivity strategies and five growth strategies.

The process followed the logic of strategy maps and the productivity strategy was broken down into its two components, i.e. the improvement of the cost structure and increasing the current asset utilisation.

The same process was followed with the growth strategy. This was the focal point of Organisation SA, since it wanted to grow and become the partner of choice to *Service National* in the DRC. Five strategies were derived based on the two components of expanding revenue opportunities and enhancing the customer value.

It was made clear by the researcher to the management of Organisation SA that the process of strategy maps was not a once-off process and that the process must be done at least twice a year to ensure that the strategies are still needed. The reason is that new strategies could have emerged or some of the strategies could have been fulfilled or terminated.

The two components, productivity and growth strategies, addressed the needs of the Organisation SA management and there was no need to change the theoretical strategy map as stated.

The next step was to derive the second level of strategies from the financial strategies. These strategies address the customer perspective within the strategy map and focus on the customer strategies.

Additional strategies were derived based on the components within the customer perspective such as customer profitability, market share and customer acquisition and retention. Each component was scrutinised by the research team to determine what strategies had to be in place to ensure growth.

Based on the outcomes of this phase, i.e. the newly defined strategies, it can be said that the process within the strategy map works. The process of deriving strategies from the vision using a strategy map does not need to be altered.

The next phase focused on the implementation of strategy maps and the strategies as a continued solution to Organisation SA.

9.4.3 ACTION-TAKING PHASE

The action-taking phase implemented the changes and action plans that were decided on in the previous phase. This meant that Organisation SA agreed to concentrate on the new vision and strategies that were derived using the strategy map. Based on this commitment from Organisation SA to the new vision and the use of the strategy map, additional strategies were derived and some strategies' wording was changed. Please refer to table 9-3.

Outcomes of the Action-taking Phase

Based on the comments above, Organisation SA committed itself to use strategy maps as a way and method of deriving strategies from its vision. Organisation SA also acknowledged the fact that this was a continuous process as it would have to revisit the productivity strategy once the organisation was up and running and in full production.

No evaluation of the framework needed to take place at this stage as the only outcome was a commitment from the organisation to implement the new strategies derived from the vision.

9.4.4 EVALUATING PHASE

The evaluating phase is used to marry the planned changes and the actual changes. The planned change was to derive and implement new strategies based on the vision. The process of using a strategy map was applied to determine the planned changes to the organisational strategies. The actual change was to determine if new or different strategies were derived from the vision using a strategy map.

Outcomes of the Evaluating Phase

Organisation SA's day-to-day operating was not impacted at all by the new vision and strategies. This was due to the fact that Organisation SA was in a start-up mode and actually benefited upfront by using the process of deriving business strategies from the vision. This exercise saved money and organisational re-engineering for the future because the strategies were aligned with the vision. If Organisation SA had implemented its original vision, re-engineering would have had to take place to save costs as it would have embarked on projects that were not aligned to the vision and strategies.

The only change was that Organisation SA did not make use of all the components within the customer perspective of the strategy map. The reason for this was that it is not always possible or even necessary to accommodate every component of the strategy map. The beauty of the strategy map is that it is flexible to adapt to the needs of an organisation. Components of the strategy map can be added or deleted as it suits the organisation.

9.4.5 SPECIFYING RESEARCH PHASE

This phase acts as a stop-go phase. Since there were no unresolved changes, it was not necessary to reintroduce any change to the action research cycle. The action research cycle went into a stop phase.

Outcomes of the Specifying Research Phase

The outcome of this phase was the decision by all the role players that the action research cycle could stop as the desired outcome had been achieved. The desired outcome of this specific action research cycle within the V2P Framework was that the vision was broken down into strategies based on the financial and customer perspectives of the strategy map.

Based on the above outcomes of the action research cycle, it is clear that the process of strategy maps can be used to derive strategies from the vision of the organisation. There are no inherent problems or issues with the strategy map. This means that the first part of the V2P Framework, namely to translate the vision into strategies based on the use of a strategy map, can be used.

The next section will continue to use the action research cycle to determine if a strategy map can be used to derive business objectives from the organisational strategies. This is the second process within the V2P Framework.

9.5 ACTION RESEARCH CYCLE B: STRATEGY MAPS (TRANSLATING STRATEGIES INTO BUSINESS OBJECTIVES)

The purpose of this process within the V2P Framework is to use the strategies of the organisation and to break them down into business objectives.

9.5.1 DIAGNOSING PHASE

The hypothesis was that there was no direct link between the business objectives and the strategies of Organisation SA. Organisation SA did not have a process in place to derive any business objectives from the strategies and the V2P Framework was the ideal method to do so.

The current state as depicted by the diagnosing phase was that Organisation SA did have two business objectives as shown in table 9-1. The implementation of a strategy map would be used to provide a link between the strategies and the business objectives. There were no original strategies in place. New strategies were derived only once a strategy map was applied to the vision as described in the previous section.

Outcomes of the Diagnosing Phase

The desired outcomes of this phase are described in section 8.4.3.1 of chapter 8. The outcomes of this phase were as follows:

- Method used to derive business objectives from the strategies: No method was originally followed to determine the current business objectives as depicted in the business plan. This meant that the process was not repeatable and business objectives were loosely related to the vision and not to the strategies.
- The current state was that a vision and business objectives did exist but that there was no link between them. These business objectives are listed in table 9-1.

The second step in the V2P Framework, after the vision has been defined, is that strategies must be in place before the framework can be used. Based on this, it is clear that the framework forces an organisation to define its strategies before moving onto the definition of business objectives. It is not possible for an organisation to skip the introduction of strategies. Section 7.1 clearly states that business objectives address the tactical level of an

organisation and it does not make logical sense to jump from the vision to a tactical level without defining any strategies to link the vision and business objectives.

The next phase within the action research cycle is the action-planning phase.

9.5.2 ACTION-PLANNING PHASE

The business objectives can be divided into the four processes of the strategy map, i.e. operations management, customer management, innovation and regulatory/social management. For the purpose of the research it was decided that only one process would be applied to the strategy map to derive business objectives. The process chosen was the operations management process since it is the first process of the strategy map.

The business objectives of the operations management process were classified into four groups: (i) develop supplier relationships, (ii) produce products and services, (iii) distribute to customers and (iv) management of risk. These newly defined business objectives are shown in table 9-4.

Vision	Strategies	Business Objectives
To be *Service National*'s partner of choice for the implementation of a sustainable first-class infrastructure	• Productivity Strategy o (F1): Maximize the use of existing and new assets o (F2): The mining operation must be cost effective	• (BO1) Lower cost of ownership (F1) • (BO2) Achieve Just-in-Time supplier capability (C3) • (BO3) Develop high-quality supplier capability (F1, F5, C2, C5) • (BO4) Use new ideas from suppliers (F1, F2, F5) • (BO5) Achieve supplier partnerships (F2, F5, C2, C5) • (BO6) Lower the cost of production (F1, F2, F5, C1, C6) • (BO7) Continuous improvement (F1, F2, F6) • (BO8) Improve process cycle time (F1, F2, F5, F6, C2) • (BO9) Improve fixed asset utilization ((F1, F2, C3) • (BO10) Responsive delivery time (F6, C2, C3) ** The number in brackets at the end of each business objective shows to which specific strategy it links*
	• Growth Strategy o (F3): Revenue from new customers i.e. *Service National* o (F4): Increase the account share with *Service National* o (F5): Offer products and services that are consistent, timely and low-cost o (F6): Products and services that expand existing performance boundaries into the highly desirable o (F7): Provide the best solution to *Service National*	
	• Customer Strategy o (C1): Low cost supplier o (C2): Perfect quality o (C3): Speedy purchase o (C4): Appropriate selection	

Table 9-4: Business objectives of the operations management process

Outcomes of the Action-planning Phase

Agreement on Strategy Maps

Based on the value of using strategy maps to derive strategies from the vision, it was agreed that strategy maps would also be used to derive the business objectives from the strategies. The future state as shown in table 9-4 was documented.

Current State versus Future State

One of the outcomes of the action-planning phase is to document the current state. Another outcome is the documentation of the future state after the application of the V2P Framework to the current state. The current and future states are shown in table 9-5. Table 9-5 only illustrates the business objectives of the operations management process. A clear and significant difference can be seen between the current and future states.

Current State	
Strategies	**Business Objectives**
None	None
Future State	
Strategies	**Business Objectives**
• Productivity Strategy o (F1): Maximize the use of existing and new assets o (F2): The mining operation must be cost effective • Growth Strategy o (F3): Revenue from new customers i.e. *Service National* o (F4): Increase the account share with *Service National* o (F5): Offer products and services that are consistent, timely and low-cost o (F6): Products and services that expand existing performance boundaries into the highly desirable o (F7): Provide the best solution to *Service National* • Customer Strategy o (C1): Low cost supplier o (C2): Perfect quality o (C3): Speedy purchase o (C4): Appropriate selection	• (BO1) Lower cost of ownership (F1) • (BO2) Achieve Just-in-Time supplier capability (C3) • (BO3) Develop high-quality supplier capability (F1, F5, C2, C5) • (BO4) Use new ideas from suppliers (F1, F2, F5) • (BO5) Achieve supplier partnerships (F2, F5, C2, C5) • (BO6) Lower the cost of production (F1, F2, F5, C1, C6) • (BO7) Continuous improvement (F1, F2, F6) • (BO8) Improve process cycle time (F1, F2, F5, F6, C2) • (BO9) Improve fixed asset utilization (F1, F2, C3) • (BO10) Responsive delivery time (F6, C2, C3) ** The number in brackets at the end of each business objective shows to which specific strategy it links*

Table 9-5: Business objectives (current and future states)

The difference between the current and future states is in the way that the business objectives were derived from the newly defined strategies of the organisation. It is clear from the current state that no process or methodology was used to determine the business objectives of the organisation. Based on this information of the current state, the organisation would have found it impossible to define any programmes that could be used to implement the business objectives of the organisation.

The future state makes use of a methodology to determine the business objectives and ten business objectives were defined – substantially more than the two business objectives defined in the current state. It must also be noted that these business objectives are only for the operations management process.

Documentation of Process

The first step in the process was to focus on one of the processes of the strategy map, and the operations management process was selected. The newly defined strategies of Organisation SA were used to determine the business objectives. Each business objective has to be related to a strategy to ensure that it supports and implements a business strategy.

Secondly, the operations management process was divided into two perspectives, i.e. the internal perspective and learning and growth perspective to classify the business objectives. The process followed the logic of strategy maps, and the business objectives of the operations management process were broken down into their two perspectives. The internal perspective's business objectives were classified into four groups: (i) the development of supplier relationships, (ii) the production of products and services, (iii) distribution to customers and (iv) the management of risk.

The same process was followed with the learning and growth perspective and the business objectives were grouped into three: (i) human capital, (ii) information capital and (iii) organisational business objectives.

It was observed that the management of Organisation SA had difficulty in determining the business objectives and linking them to the individual strategies. This issue will be addressed in the evaluate phase.

It was made clear by the researcher to the management of Organisation SA that the process of strategy maps was not a once-off process and that the process must be done at least twice a year to ensure that the business objectives are still needed. The reason is that new business objectives could have emerged or some of the business objectives could have been fulfilled as the strategies changed.

Based on the outcomes of this phase, i.e. the newly defined business objectives, it can be said that the process within the strategy map works. The process of deriving business objectives from the business strategies using a strategy map does not need to be altered.

The next phase dealt with the implementation of the business objectives as a continued solution to Organisation SA.

9.5.3 ACTION-TAKING PHASE

The action-taking phase implemented the changes and action plans that were decided on in the previous phase. This meant that Organisation SA agreed to concentrate on the business objectives that were derived using the strategy map.

Outcomes of the Action-taking Phase

Based on the comments above, Organisation SA committed itself to use strategy maps as a way and method of deriving business objectives from its business strategies. Organisation SA also acknowledged the fact that this was a continuous process as it would have to revisit the business objectives once the organisation was up and running and in full production.

9.5.4 EVALUATING PHASE

The evaluating phase is used to marry the planned changes and the actual changes. The planned change was to derive and implement new business objectives based on the strategies. The process of using a strategy map was applied to determine the planned changes to the organisational business objectives. The actual change was to determine if new or different business objectives were derived from the strategies using a strategy map.

Outcomes of the Evaluating Phase

Organisation SA's day-to-day operating was not impacted at all by the new business objectives. This was due to the fact that Organisation SA was in a start-up mode and actually benefited upfront by using the process of deriving business objectives from the vision. This exercise saved money and organisational re-engineering for the future because the business objectives were aligned with the strategies.

The only change was that Organisation SA did not make use of all the components within the operations management process. The reason for this was that it is not always possible or even necessary to accommodate each component of the strategy map. One of the advantages of the strategy map is that it is flexible to adapt to the needs of an organisation. Components of the strategy map can be added or deleted as it suits the organisation.

The issue that had to be addressed was the difficulty that the management had in determining the business objectives. A session was held with the managers to determine the reason for this. It became clear during this session that they had difficulty in determining the business objectives without relating them to operational measurements. Linking measurements and targets is the third phase within the V2P Framework and it seems that this has to be altered.

The conclusion was that the strategy map works to determine the business objectives but that the balanced scorecard must be used in conjunction to determine the measurements and targets and not as a separate process.

Based on this information, a go decision was made and the balanced scorecard will be introduced into the life cycle. The customer management process of the strategy map will be used and is described in the next section.

Based on the above lessons, the action research cycles were adapted as depicted in figure 9-2.

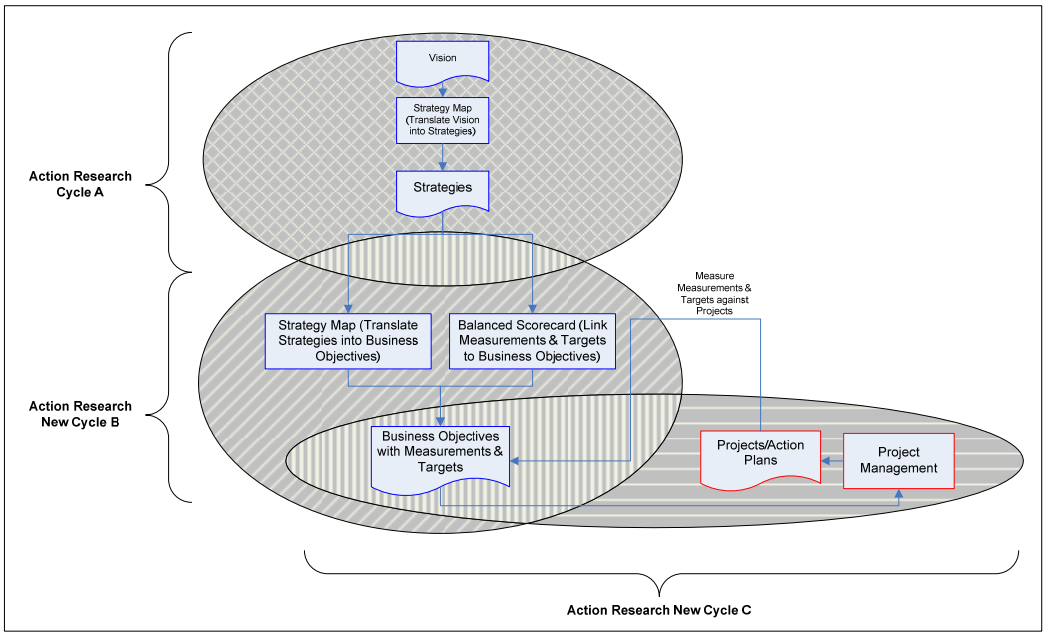

Figure 9-2: Adapted action research cycles

The new cycle B is discussed in the following section.

9.6 ACTION RESEARCH NEW CYCLE B: STRATEGY MAPS (TRANSLATING STRATEGIES INTO BUSINESS OBJECTIVES AND BALANCED SCORECARD)

The purpose of this revised process within the V2P Framework is to use the strategies of the organisation and to break them down into business objectives and link measurements and targets to the business objectives using a balanced scorecard.

The same process will be used as in section 9.5 but the balanced scorecard will be added using the customer management process of the strategy map. The reason for selecting a different process is twofold:

- The introduction of the balanced scorecard does not necessarily mean that new business objectives will have been identified. New business objectives could be identified because the managers are comfortable with the process and have thought about the business objectives after the initial sessions.
- The initial problem was not identifying business objectives, but the difficulty that the managers experienced in determining the business objectives. A new business process provides the managers with the opportunity to determine new business objectives using both the strategy map as well as the balanced scorecard.

9.6.1 DIAGNOSING PHASE

The hypothesis was that there was no direct link between the business objectives and the strategies of Organisation SA and that Organisation SA did not know how to determine and assign measurements and targets to the business objectives. Organisation SA did not have a

process in place to derive any business objectives and their related measurements and targets from the strategies.

The current state as depicted by the diagnosing phase was that Organisation SA did have two business objectives, as shown in table 9-1, with no measurements and targets linked to them. The implementation of a strategy map would be used to provide a link between the strategies and the business objectives and a balanced scorecard would be used to assign measurements and targets to the newly defined business objectives.

Outcomes of the Diagnosing Phase

The desired outcomes of this phase are described in sections 8.4.3.1 and 8.4.4.1 of chapter 8. The outcomes of this phase are the same as described in section 0 of this chapter. The only additional outcome is as follows:

- Another dimension of the current state is that no measurements and targets were in place for the business objectives. No attention was given to the measurement of these business objectives and it would have been difficult for Organisation SA to determine the success of the defined business objectives.

The next phase within the action research cycle is the action-planning phase.

9.6.2 ACTION-PLANNING PHASE

The business objectives can be divided into the four processes of the strategy map, i.e. operations management, customer management, innovation and regulatory/social management. For the purpose of linking measurement and targets to the business objectives, it was decided that only one process would be applied to the strategy map and balanced scorecard to link the measurements and targets to the derived business objectives. The process chosen was the customer management process as the operations management process had already been used in the previous cycle of action research.

The business objectives of the customer management process were divided into four groups: (i) customer growth, (ii) customer selection, (iii) customer acquisition and (iv) customer retention. These newly defined business objectives are shown in table 9-6.

Vision	Strategies	Business Objectives
To be *Service National*'s partner of choice for the implementation of a sustainable first-class infrastructure	• Productivity Strategy o (F1): Maximize the use of existing and new assets o (F2): The mining operation must be cost effective	• (BO11) Cross-selling of customers (C3, C4) • (BO12) Partnering with customers (C2, C5) • (BO13) Understand segments (F2, F6) • (BO14) Target high-value customers (F3, C2, C5) • (BO15) Manage the brand (F5, F6, C2, C5, C6) • (BO16) Communicate value proposition (F5,
	• Growth Strategy o (F3): Revenue from new customers i.e. *Service National* o (F4): Increase the account share with *Service National*	

	o (F5): Offer products and services that are consistent, timely and low-cost o (F6): Products and services that expand existing performance boundaries into the highly desirable o (F7): Provide the best solution to *Service National*	F6, C1, C2, C6) • (BO17) Develop dealer networks (F3, F5, C1, C3, C4, C6) • (BO18) Attract and retain top talent (F4, F6, F7) • (BO19) Develop strategic CRM portfolio (C1,C3, C4) • (BO20) Increase knowledge sharing (F6, F7) ** The number in brackets at the end of each business objective shows to which specific strategy it links*
	• Customer Strategy o (C1): Low cost supplier o (C2): Perfect quality o (C3): Speedy purchase o (C4): Appropriate selection	

Table 9-6: Business objectives of the customer management process

Outcomes of the Action-planning Phase

Agreement on Strategy Maps and Balanced Scorecards

Based on the value of using strategy maps to derive strategies from the vision, it was agreed that strategy maps would also be used to derive the business objectives from the strategies. It was also agreed that the concept of a balanced scorecard would be used to link measurements and targets to the derived business objectives.

Current State versus Future State

One of the outcomes of the action-planning phase is to document the current state. Another outcome is the documentation of the future state. The current and future states are shown in table 9-7. Table 9-7 only illustrates the business objectives of the customer management process. A clear and significant difference can be seen between the current and future states.

Current State		
Business Objective	**Measurement**	**Target**
The recovery of the most sought after diamonds in the concession diamond deposits	None	None
Investing in the growth of human capital within its community and the broader society	None	None
Future State		
Business Objective	**Measurement**	**Target**
Cross-selling of customers	• Number of products per customers • Cross-market revenues, revenues generated in markets or products beyond the entry-level product	• >2 • > R50 million
Partnering with customers	• Number of sole-source contracts • Number of gain-sharing agreements	• > 10 • 4 • R10 million

	• Money earned from gain-sharing agreements • Number of hours spent with customers	• 1 hour per week
Understand segments	• Profit contribution by segment • Market share in targeted segments	• 10% • 15%
Target high-value customers	• Number of strategic accounts	• 5
Manage the brand	• Customer survey on brand awareness and preference	• Twice a year
Communicate value proposition	• Brand awareness	• 70% of market share
Develop dealer networks	• Dealer scorecard • Dealer survey feedback	• < 6 months • Twice a year
Attract and retain top talent	• Turnover of key personnel	• <5%
Develop strategic CRM portfolio	• Customer application portfolio readiness	• < 1 year
Increase knowledge sharing	• Extent of use of knowledge management system	• All personnel
Create customer-focused culture	• Employee culture survey	• Twice a year
Create personal goal alignment	• Percent of employee linked to BSC customer process and outcome measures	• 100%

Table 9-7: Business objectives with measurements and targets (current and future states)

The targets were determined in a consensus process between the managers of Organisation SA. There is no process in place that can determine the targets automatically for an organisation. The managers of the organisation must determine the targets through a workshop and, based on consensus, agree to the targets.

The difference between the current and future states is in the way that the business objectives were derived from the newly defined strategies of the organisation as well as the linking of measurements and targets to these business objectives. It is clear from the current state that no process or methodology was used to determine the business objectives and subsequent measurements and targets of the organisation. Based on this information of the current state, the organisation would have found it impossible to define any programmes and projects that could be used to implement the business objectives of the organisation.

The future state makes use of a methodology to determine the business objectives and 12 business objectives were defined. An additional 18 measurements and targets were defined to measure the success of the business objectives – substantially more than the two business objectives defined in the current state. It must also be noted that these business objectives are only for the customer management process.

Documentation of Process

The first step in the process was to focus on one of the processes of the strategy map, and the customer management process was selected. The newly defined strategies of

Organisation SA were used to determine the business objectives. Each business objective has to be related to a strategy to ensure that it supports and implements a business strategy.

Secondly, the customer management process was divided into two perspectives, i.e. the internal perspective and learning and growth perspective to classify the business objectives. The process followed the logic of strategy maps, and the business objectives of the customer management process were broken down into their two perspectives. The internal perspective's business objectives were classified into four groups: (i) customer growth, (ii) customer selection, (iii) customer acquisition and (iv) customer retention.

The same process was followed with the learning and growth perspective and the business objectives were grouped into three: (i) human capital, (ii) information capital and (iii) organisational business objectives.

During the process of determining the business objectives, the change was made from the previous action research cycle to add the balanced scorecard. This enabled the managers to link measurements and criteria to the business objectives as they defined the business objectives. The benefit was that they could immediately relate the business objectives and measurements to the tactical level in which they operated.

Based on the outcomes of this phase, i.e. the newly defined business objectives and their linked measurements, it can be said that the process within the strategy map works. The process of deriving business objectives from the business strategies using a strategy map need not be altered. The balanced scorecard is used to link measurements and targets to the business objectives and this process does not need to change either.

The next phase focused on the implementation of the business objectives as a continued solution to Organisation SA.

9.6.3 ACTION-TAKING PHASE

The action-taking phase implemented the changes and action plans that were decided on in the previous phase. This meant that Organisation SA agreed to concentrate on the business objectives and measurements that were derived using the strategy map.

Outcomes of the Action-taking Phase

Based on the comments above, Organisation SA committed itself to use strategy maps as a way and method of deriving business objectives from its business strategies. It also committed to use a balanced scorecard to link measurements and targets to the business objectives. Organisation SA acknowledged the fact that this was a continuous process as it would have to revisit the business objectives once the organisation was up and running and in full production.

9.6.4 EVALUATING PHASE

The evaluating phase is used to marry the planned changes and the actual changes. The planned change was to derive and implement new business objectives based on the strategies. The process of using a strategy map was used to determine the planned changes to the organisational business objectives. The actual change was to determine if new or different business objectives were derived from the strategies using a strategy map.

A second planned change was to determine measurements and targets for each business objective. A balanced scorecard was used to determine the measurements and targets and the actual change was to determine if new or different measurements and targets were derived from the business objectives.

Outcomes of the Evaluating Phase

Organisation SA's day-to-day operating was not impacted at all by the new business objectives and measurements. This was due to the fact that Organisation SA was in a start-up mode and actually benefited upfront by using the process of deriving business objectives from the vision. This exercise saved money and organisational re-engineering for the future because the business objectives were aligned with the strategies. The measurements and targets also provided the added benefit that it could measure the success of every business objective at a regular interval.

The only change was that Organisation SA did not make use of all the components within the customer management process. The reason for this is that it is not always possible or even necessary to accommodate each component of the strategy map. The beauty of the strategy map is that it is flexible to adapt to the needs of an organisation. Components of the strategy map can be added or deleted as it suits the organisation.

The conclusion was made that the strategy map works to determine the business objectives, but that the balanced scorecard must be used in conjunction to determine the measurements and targets and not as a separate process.

Based on this information, a stop decision was made. The processes of the strategy map and balanced scorecard do not have to change as they provide the results required. Changes must, however, be made to the V2P Framework to incorporate the balanced scorecard during the defining of the business objectives.

9.7 ACTION RESEARCH NEW CYCLE C: DETERMINING PROJECTS

The next step in the process is to determine which projects the organisation must initiate to ensure that the business objectives and strategies are met.

According to the PMI (2003), two methods can be used to determine the projects. The first is requirements management and the second is project integration management.

The former, requirements management, covers the process of defining the business and technical requirements in a solution-free way (Powell & Buede, 2006). The requirements should be specified in a manner that allows the solutions that are subsequently proposed to be traced to the requirements in a structured way and to be tested against the requirements. The use of requirements management ensures that the resulting specifications are typically of a higher quality than those done on an ad hoc basis (McKay, De Pennington & Baxter, 2001). The latter method or mechanism, project integration management, covers the processes used to identify projects that will address specific needs (PMI, 2004a), the primary goal being to successfully manage stakeholder expectations and to meet requirements.

Based on discussions with the managers of Organisation SA, it became clear that requirements management was the better option to use. This decision was based on the following:

- Before any project can be scoped as per the PMBOK® Guide, the project must be defined or initiated.
- During the action research process of determining the business objectives, measurements and targets, it became clear that the different managers had different ideas as to which project was to be initiated to implement the business objectives.
- A workshop was held to discuss what had to be implemented to ensure the implementation of the business objectives.

The introduction of requirements management made the managers think of what they actually wanted from the ideas and/or suggestions. For example, Organisation SA had to have a financial system to invoice customers. A fairly easy-to-use financial package would suffice but would it address all the needs of Organisation SA and would it integrate with the rest of the initiatives? Organisation SA also had to implement a CRM system for the business objective of “Develop strategic CRM portfolio”. Based on this, the requirements for the financial applications changed, as Organisation SA wanted to integrate the financial package with the CRM system. Then it became logical based on the requirements that an ERP system might address Organisation SA’s requirements in the future.

The ERP system also provides Organisation SA with SCM and SRM systems that implement some of the business objectives as illustrated in tables 9-5 and 9-7. Based on requirements management, the requirement was defined as “Implement an ERP system”. The process of requirements management will continue by defining the business and technical requirements.

Based on requirements management, the managers of Organisation SA determined the projects necessary to implement the business objectives.

The advantages of using requirements management are as follows:

- The process is repeatable. This means that Organisation SA should be able to determine the same projects every time that it goes through the process of requirements management.
- The requirements are measurable and the delivered product and/or service can be measured against the original requirements.
- It eliminates any personal preferences as it is a scientific process.

An additional step must be built into the V2P Framework to allow for the introduction of requirements management. The following section discusses the changes to the theoretical V2P Framework.

9.8 VISION-TO-PROJECT FRAMEWORK CHANGES

The V2P Framework must be altered to take the results of the action research into consideration. The only change to the framework at this stage is that the business objectives, measurements and targets must be grouped together and not managed as separate entities. This means that the strategy map must be used in conjunction with the balanced scorecard to determine the different business objectives and their associated measurements and targets. The rest of the process will stay as is and the strategy map will be used on its own to derive the strategies from the vision.

A second change to the framework is the introduction of requirements management. Requirements management will determine the requirements for the service and/or product that must be implemented to ensure the fulfilment of the business objectives.

The altered framework is illustrated in figure 9-3.

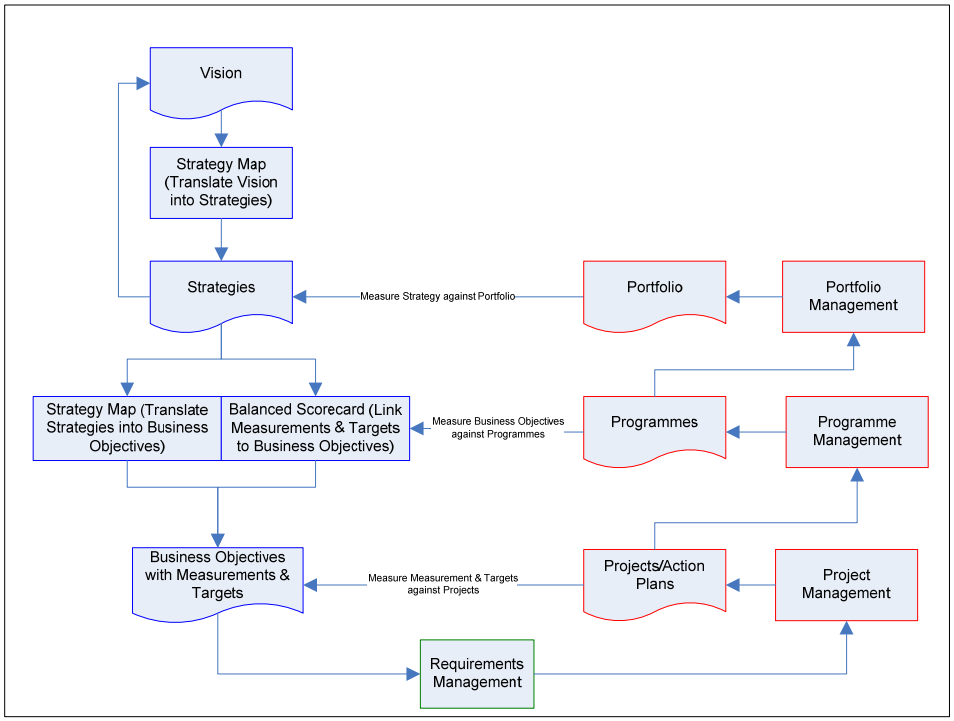

Figure 9-3: Altered V2P framework

It is not anticipated that the framework will change again, although only a part of the framework was subjected to action research. The grouping of projects into programmes and programmes into a portfolio will continue.

9.9 CONCLUSION

The Vision-to-Project Framework was designed to enable an organisation to derive projects from the vision of the organisation. This framework was applied by an organisation called Organisation SA and the process of action research was implemented to determine any inherent flaws within the framework.

Action research as a research methodology worked well in this instance as it involved all the role players of Organisation SA to determine the strategies and business objectives. Based on the results of the action research, the following comments about or changes can be made to the V2P Framework:

- The concepts of the strategy map and balanced scorecard do not have to change. These concepts provided the anticipated results and there is no valid reason why these concepts must be changed or even replaced.
- The framework itself must be adjusted to group the business objectives and balanced scorecard together. It was made clear by the managers of Organisation SA that it is difficult to determine the business objectives in isolation without taking the measurements and targets into consideration.

The V2P Framework was altered to take these changes into consideration and a revised framework was constructed.

The results of the action research are currently used by Organisation SA in an operational aspect. Organisation SA adopted the strategies and business objectives and is currently managing the organisation based on these strategies and business objectives.

Two conclusions can be drawn from this research:

- Firstly, the validated revised V2P Framework can indeed be used in practice to derive projects from the vision of the organisation. This implies that organisations do not have to tolerate projects that are not directly linked to the vision and strategies of the organisation and those projects should be terminated immediately by the organisation.
- Secondly, action research can be used in the project management field to test and validate frameworks and concepts. There is a definite connection between action research and project management in that both bring about change and follow a life cycle. Project managers can therefore easily relate to action research as a research methodology to enhance methods or frameworks.

The value of the validated V2P Framework lies in the fact that organisations do have a framework and processes that can be followed to derive projects from the organisational vision. The framework has been validated, implying that it evolved from a theoretical to a validated framework that can add value to any organisation.

The following chapter concludes this research and provides a summary of the main research findings as well as further research that might follow.

10 CHAPTER 10: CONCLUSION

The research for this thesis was initiated based on the goal statement to provide organisations with ways to gain the maximum value from an ERP initiative. The goal of this chapter is to determine if this research goal was achieved and this is done through the following objectives:

- The first objective is to determine if the various hypotheses documented in chapter 1 were addressed through the research done in this thesis.
- The second objective is to conclude the findings that can be deduced from the thesis and this is related to the goal and problem statements of chapter 1.
- The third objective is to summarise the contributions of this research.
- The final objective is to suggest further research.

The layout of this chapter is based on these objectives where each objective is discussed in different sections. The first section revisits the goal and problem statement and determines whether the thesis addressed the hypotheses. The second section focuses on the conclusions that can be made from the research and the value they provide to organisations. The third section covers new knowledge that can be added as well as the implications of this new knowledge. The last section mentions further research that stems from the current research.

10.1 SUMMARY OF FINDINGS

This section provides the reader with a brief overview of the various findings that came to light during this research.

10.1.1 ENTERPRISE RESOURCE PLANNING SYSTEMS

The focus of this section was to determine if organisations understand ERP systems and the impact and effect they have on organisations per se. The major finding was that there are several definitions of ERP. These definitions lead to confusion and a generic ERP model was constructed to assist organisations in understanding ERP systems and the various components of such a system.

The advantages and disadvantages of ERP were also explained to provide the overall picture. This enables an organisation to make an informed decision before implementing an ERP system.

10.1.2 MATURITY OF ERP SYSTEMS

The ERP market is dominated by three vendors in the industry and these vendors' products and services cover all industries. There are also some second- and third-tier vendors but these were not the focus of this research, as their combined market share does not warrant an in-depth study. The vendors offer similar services to organisations.

The ERP industry is not a stagnant industry as improvements are continually taking place. These improvements are necessary to ensure the survival of the vendors but also that of their respective customers. Improvements and enhancements include embracing Internet technology such as B2B and B2C. This brings with it the additional effort of always being available to customers and suppliers.

10.1.3 ERP SYSTEMS AND SECURITY

The main finding in this section was that security cannot be added as an afterthought to an ERP system, but that it needs to be incorporated in the design and implementation of an ERP system. A framework was provided to highlight the different aspects that must be incorporated into an ERP system to ensure that security forms an integral part of an ERP system.

Another finding was that ERP systems and therefore the security of such systems form an integral part of the organisation and cannot be treated as a stand-alone topic. They must be governed by the policies and procedures of the organisation.

It can be concluded from the above findings that the operational side of ERP initiatives is not a problem and that perceived problems can be attributed to the organisation itself.

10.1.4 IMPLEMENTING ERP SYSTEMS USING PROJECT MANAGEMENT

The focus moves from the operational side to the implementation side of ERP initiatives.

The purpose was to determine if project management can be used to implement ERP systems. The first finding was that there are various standards and methodologies within the discipline of project management and that there is a relationship between a standard and a methodology within the project management discipline.

Another finding was that project management as a discipline is mature as it conforms to all the criteria for a mature discipline. Based on the maturity of the project management discipline, the finding was that project management can be used to implement ERP systems. However, project management does not ensure that organisations realise the optimal benefits of an ERP implementation.

10.1.5 IMPLEMENTING ERP SYSTEMS USING PROGRAMME MANAGEMENT

The goal was to determine if programme management can be used to implement ERP systems and provide better value to an organisation. The first finding was that programme management is a relatively mature discipline. This was determined using the same criteria as for project management to ensure a scientific comparison and the conclusion is that programme management is not as mature as project management.

The major finding is that programme management can be used to implement an ERP initiative and thus provide organisations with a way to determine the benefits of an ERP initiative. The problem remains that organisations do not achieve the envisaged ROI.

10.1.6 INITIATING ERP SYSTEMS

The finding is that through strategy maps and balanced scorecards organisations can determine the projects that are needed to implement their vision and strategies.

Based on this finding, subsequent findings are as follows:

- Portfolio management can be used to manage the programmes of an organisation and the portfolio is used to ensure that the vision and strategies of the organisation are implemented.
- Programme management can be used to manage the projects of an organisation and programmes are used to implement the various business objectives that were derived from the strategies.

Another finding is that organisations can determine if an ERP initiative is needed. If this is the case, it can be directly linked to one or more business objectives and these objectives are linked to strategies and ultimately to the vision. This implies that organisations can determine if ERP initiatives contribute to the realisation of the organisational vision and strategies.

This section highlighted the main findings of the research and is only a brief summary. Based on these findings, the following section provides the conclusions that can be derived from these findings.

10.2 CONCLUSIONS

The goal statement of the thesis was to ***provide organisations with ways to gain the maximum value from an ERP initiative***. This was achieved through two problem statements, where the first problem statement focused on the success rate of ERP implementations and the second on the ROI achieved by such implementations.

The remainder of the section deals with conclusions based on the research that can be made regarding the ways that organisations can gain maximum value from an ERP initiative.

The first conclusion is that ERP systems are not to blame for poor implementation success rates, nor for not achieving the desired ROI. The issue is that organisations do not have a clear understanding of what an ERP system is and what it consists of. If organisations understand an ERP system and its respective components, then the planning and execution of the implementation can be improved. The lack of understanding ensures that not all the components and aspects are addressed during the initiation of an ERP initiative. This leads to the scope not being defined properly, which ensures that there will be scope changes. These scope changes will have an effect on the time and cost of the ERP implementation and underlines the first problem statement where ERP initiatives are late and over budget. This can be addressed if organisations understand the complexity of an ERP system and manage its implementation according to best practices.

The second conclusion is that the ERP software or vendors are not to be blamed for organisations' failure to gain maximum value. The various ERP vendors and their products

and offerings are mature and address a wide range of problems and industries to ensure that organisations gain value from these ERP initiatives. Organisations sometimes cannot afford the best solution owing to financial constraints. These organisations are then forced to consider less expensive and maybe less comprehensive solutions from second- and third-tier vendors. This then leads to the point where organisations must either forfeit some functionality or buy additional third-party products to ensure functionality. This leads again to additional costing.

Based on the above, it can be concluded that ERP systems as such are not to blame for the reasons why organisations cannot gain maximum value. It is true that bugs and system errors will occur but these are not the reason why organisations cannot gain maximum value.

Security is a major concern for ERP systems as it covers all aspects of the organisation from orders to suppliers and customers. ERP systems also collaborate with other organisations through the Internet and it is therefore vital that security be in place. Security must be incorporated into the design of an ERP system and must be governed by the policies and procedures of the organisation as well as CobiT and ITIL. If this is not the case, then organisations will be faced with two issues: the first issue is that security will be added as an afterthought, leading to additional costing, and the second is that because security is not an integral part of the organisation, it is much easier to gain illicit access to the ERP system, causing partners and suppliers to lose confidence in the organisation. If organisations understand the reasons for having a secure ERP environment, then they can ensure that the ERP system is governed by the organisational polices and procedures and international standards. This ensures that there is no additional costing or timing issues as these will form part of the original planning.

One of the problem statements is that 60% of ERP implementations achieve partial implementation or are failures. It can be concluded that if the standards and methodologies within the project management discipline are followed and adhered to, then the success rate can be increased. Project management is a mature discipline, implying that the discipline itself is not to blame for ERP implementation failure rates, but rather the blame falls on the application of the standards and methodologies. If organisations understand the totality of ERP systems plus the application of proper project management, then through proper scoping, planning and costing, the success rate of ERP implementations can be improved. Although the ERP implementation can be perceived as successful, it does not necessarily mean that the ERP system will provide the desired business value that the organisation requires.

The fifth conclusion is that to achieve the promised ROI and benefits of an ERP implementation, organisations can use programme management. Programme management is also a mature discipline in that it offers standards and methodologies that can be used to implement an ERP initiative. The benefit of using programme management is that it utilises the principles of project management to ensure that all the subsequent projects are

successful, but it also provides an organisation with a way to determine if a positive or negative ROI is achieved through the ERP initiative. This addresses the problem statement that ERP initiatives do not achieve the promised ROI. Although programme management can determine the ROI, it does not determine the strategic value of the ERP implementation. ROI is just one measurement that can be used to determine the value of an ERP implementation, but for this research to add value, we must look beyond ROI and determine the strategic value of an ERP initiative and, for that matter, all projects that are initiated by an organisation.

The sixth conclusion is that for projects to add value to organisations, they must be derived from the organisational vision and subsequent strategies. The introduction of the Vision-to-Project (V2P) Framework provides organisations with such a vehicle. The framework is based on existing theories and practices that are accepted throughout the business world. By using strategy maps and balanced scorecards, projects can be derived from the vision. Portfolio and programme management means that there are always measures in place to ensure that the derived projects constantly strive to realise the vision. This implies that the V2P Framework goes beyond the problem statement and not only addresses the issues of the problem statement, but also ensures that ERP initiatives or, for that matter, any initiatives provide value to the organisation as they underwrite the vision of the organisation.

10.3 SUMMARY OF CONTRIBUTIONS

The first contribution is the design of the ERP model. The ERP model adds new knowledge to the ERP industry since it conceptualises ERP and the various components that constitute an ERP system (Marnewick & Labuschagne, 2005a). The implication of this is that any organisation wanting to implement an ERP system can use the ERP model to understand the various components as well as the relationship between them. This ensures that the organisation will start an ERP implementation on the right footing as the ERP model provides the foundation for any ERP implementation. It ensures that organisations take all the components into consideration when they do the scoping, planning and costing of the ERP implementation.

Another contribution of this research is the analysis of the ERP vendors. This analysis provided an unbiased view of the products and services that the top three vendors provide to organisations. Organisations can use these comparisons as a baseline to weigh up the various products and services of the vendors and make an informed decision on which vendor to choose. The decision will then be based on an unbiased analysis that is not distorted by either the organisation itself or by the vendors.

The third contribution is the ERP security framework, which enables an organisation to ensure that security is part of the ERP implementation from the initiation (Marnewick & Labuschagne, 2005b). The implication is that if organisations make use of the ERP security framework, then by default the ERP system will adhere to international standards and best practices such as CobiT, ITIL and ISO 17799. This, in turn, will ensure that the organisation can confidently

transact over the Internet using B2B and B2C technologies. It will also ensure that the ERP system complies with corporate governance.

The fourth contribution is that it was determined that project management can be used to implement an ERP initiative successfully (Marnewick & Labuschagne, 2004). This is based on the understanding that the scope was done properly for the implementation of the ERP initiative. This implies that if organisations do have certified project managers or even experienced project managers that adhere to the standards and methodologies within the project management discipline, then there should not be any reason for ERP implementations to be perceived as failures. It eliminates the perception that an ERP system is too huge to be implemented using project management.

The fifth contribution is that in order to determine the value that ERP initiatives provide in monetary values, programme management can be used to determine the positive or negative ROI. Programme management groups all the relevant projects together and provides a holistic view of how the processes within an organisation must change to the overall benefit of the organisation and not just that of a particular department or section. Programme management thus provides organisations with a way to determine the benefits of a particular initiative. This goes beyond the traditional evaluation of the triple constraint and adds an additional layer on top of the triple constraint.

The most important contribution of this research is the Vision-to-Project Framework (Marnewick & Labuschagne, 2006). The new knowledge that came from this framework is that there is in actual fact a methodology that can be followed to derive projects from the vision and strategies of the organisation. The same framework can also be used to manage these projects in programme management and a portfolio to ensure that there is continuous evaluation of the projects to check that they still realise the vision and strategies. The benefit to organisations is that all projects within an organisation should now be linked and related to one or more strategies. The second benefit is that resources are not wasted on projects that do not contribute to the vision and strategies of the organisation. This means that in the current economic environment, organisations can actually optimise their allocation of resources. Another benefit is the fact that projects can be terminated once the vision changes. The termination of projects is now more dependent on the strategic value of the individual project than on the achievement of the triple constraints. This implies that projects might be over budget or time but would continue to be implemented based on the strategic value of that particular project.

The final contribution of this research is that action research can be used in the disciplines of programme and project management (Marnewick & Labuschagne, 2008). This contribution is of benefit to researchers in the discipline of project management. Although other researchers have also used action research in the project management discipline, this is further proof that action research can be used. The implication is that researchers are not dependent on quantitative research alone, but that they can apply action research to real-life scenarios as

was indicated by this research. Researchers therefore have several methods and techniques available to do research in the project and programme management disciplines.

10.4 RESEARCH LIMITATIONS

Although the research provided several outputs and valuable contributions to the research field and discipline, there are a few limitations.

The first limitation is that the theoretical V2P Framework was validated using a fairly small organisation. Large organisations might have reacted differently to the theoretical V2P framework and as a result the validated V2P Framework could have been different. Further research is needed to validate the framework within large organisations.

The second limitation is that Organisation SA is a South African organisation. The question arises whether non-South African organisations would have responded differently to the theoretical V2P Framework. The action researcher did not have the luxury of validating the theoretical framework though a non-South African organisation.

The third limitation is that the V2P Framework is only applicable to organisations that use internal projects to implement the vision and strategies. It is not applicable to consulting firms or service-providing organisations, as these organisations do projects on behalf of customers.

These limitations will be addressed in future research to provide a comprehensive V2P Framework.

10.5 SUGGESTIONS FOR FURTHER RESEARCH

This section briefly discusses some possible future research areas.

10.5.1 CONVERTING THE V2P FRAMEWORK TO A GENERALISED V2P FRAMEWORK

The focus of this research programme would be to provide organisations with a generalised framework that can be used to manage the strategies and business objectives of the organisation. The strategic importance of this research programme is that it addresses the following subthemes:

- It will assist organisations with the management of the organisation in the future. Organisations need to become more project-focused to become competitive.
- It will also lead to the optimal use of resources within the organisation since every resource will be utilised to ensure the implementation of the vision and strategies. This means that scarce and skilled resources are utilised optimally, which is especially important in South Africa, where there is a shortage of skilled professionals.
- It will provide organisations with drivers, i.e. frameworks and processes, to improve productivity and performance.

10.5.2 THE IMPLEMENTATION OF THE 3P USING THE V2P FRAMEWORK

This research programme focuses on the implementation and day-to-day management of the 3P's within the organisation using the V2P Framework. The focus will be on how and which

supporting processes must be in place to ensure the optimised functioning of the 3P's. These supporting processes include the management of project, programme and portfolio offices. The purpose of these offices is to ensure that the vision and strategies of the organisation are achieved. The optimised management of the 3P's ensures that the vision and strategies of the organisations are successfully implemented and managed.

The strategic importance of the implementation of the 3P's is that it addresses the following subthemes:

- It introduces new business systems within the organisation such as portfolio, programme and project offices. These offices will ensure the alignment of projects and programmes with the vision and strategies of the organisation.
- Organisations can be more productive and perform optimally as the resources are better managed.

10.5.3 EPILOGUE

"Research is to see what everybody else has seen,
and to think what nobody else has thought" – Albert Szent-Gyorgyi

This quote from Szent-Gyorgyi summarises this study. Problems regarding the implementation of ERP systems and the benefit realisation of such ERP systems are presented since the 1990's.

Everybody recognises the problem that ERP systems did not address the organisational needs as planned and that these systems are continuously poorly implemented. The thinking process in this thesis was different: the problem was analysed scientifically and addressed in sections following a systems theory approach. The problem is too large to address at once and various solutions are provided to address the issue at hand.

Although the solution might not be earth shattering, the thinking process was different in that nobody previously thought about it in the way that the thesis provided the scientific evidence and solution.

New knowledge was gained through the alternative thinking and this is the ultimate goal of research: provide new knowledge to the community in order to enhance the wider community in general. The knowledge gained in this study provides the wider community with ways to optimise ERP systems and the implementation thereof. This in return provides the optimisation of organisational and country resources.

"There is nothing like looking, if you want to find something.
You certainly usually find something, if you look, but it is not always quite the something you were after." – J.R.R. Tolkien

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11 APPENDIX A.1 – BRIGHAM'S ICE CREAM

CUSTOMER TESTIMONIAL: Manufacturing

Brigham's Ice Cream

- In operation for over 80 years in the New England region
- Operates over 30 restaurants in the greater Boston area
- Operations encompass corporate offices, production plant, warehouse, and distribution center, as well as restaurants

"WTS has a long history and experience with J.D. Edwards, and I would recommend both companies. By outsourcing to WTS, we achieved our objectives of reducing capital investments and system support costs, while also greatly improving system speed and efficiency. WTS is very service oriented, and outsourcing was a great move for us."

Shelley Terrizzi, Controller
Brigham's Ice Cream

April 2002

For Brigham's Ice Cream, Outsourcing Makes the J.D. Edwards Solution Even Sweeter

Business Drivers: *Delivering Benefits of Superior Information Technology Without the Costs*

For over 80 years, Brigham's Ice Cream has manufactured and distributed its products in the New England region. Brigham's operations encompass its corporate offices, production plant, warehouse, and distribution center, as well as over 30 restaurants in the greater Boston area.

To enhance the efficiencies that had helped the company succeed, Brigham's implemented J.D. Edwards software in 1991. J.D. Edwards helped Brigham's streamline financial reporting, manufacturing, shipping, and order processing.

BUSINESS DRIVERS

- Lower overhead costs
- Increased productivity
- Faster response

In 1998, Brigham's faced a turning point in its information systems environment. A necessary hardware upgrade presented a significant financial investment, while maintaining the IBM® AS/400® and a growing internal network called for expanded technical staff. Brigham's management addressed outsourcing with its J.D. Edwards account executive, and the Brigham's team was introduced to World Technology Services (WTS).

"WTS has a long history and experience with J.D. Edwards, and I would recommend both companies. By outsourcing to WTS, we achieved our objectives of reducing capital investments and system support costs while also greatly improving system speed and efficiency. WTS is very service oriented, and outsourcing was a great move for us," says Shelley Terrizzi, controller, Brigham's Ice Cream.

Results: *Significant Cost Reduction*

Since 1998, WTS has handled Brigham's AS/400 operations and has hosted and managed its J.D. Edwards financial, distribution, and manufacturing software applications.

RESULTS

- 25% savings in operational expenses
- Predictable information systems costs
- IT staff focus on core business initiatives
- Enhanced data speed and security

By outsourcing to WTS, Brigham's saved approximately 25 percent in operational costs, according to Terrizzi. The impact on TCO was immediate and significant, since outsourcing to WTS eliminated a major capital investment in new hardware for Brigham's. Because Brigham's staff could focus its efforts on core business initiatives, system support costs were cut, leaving the AS/400 and J.D. Edwards systems to the experts at WTS.

"J.D. Edwards had already improved our information processing — it was much more efficient, more automated, and that meant cost savings. When we went to WTS, cost predictability was another benefit, because WTS provides their services to Brigham for a flat, monthly fee," says Terrizzi.

JDEDWARDS®

"We've relied on J.D. Edwards since 1991 to help track our daily business. We've experienced efficiencies in every area where we've applied it — and that includes financials, manufacturing, shipping, and order processing. Now that we've outsourced to WTS, we have many added advantages, including increased processing speed, enhanced security, and cost predictability."

Shelley Terrizzi, Controller
Brigham's Ice Cream

How Brigham's Got There: ***Partnering with J.D. Edwards and WTS for Data Speed and Security***

Brigham's also noticed a dramatic increase in data processing speed after the move to WTS. "We had expected greater system reliability and scalability with WTS, but were pleasantly surprised by how quickly data was processed. WTS has the information storage and processing capabilities to make things happen in seconds that had taken minutes before," says Terrizzi.

HOW BRIGHAM'S GOT THERE:
- J.D. Edwards collaborative software:
  - Distribution/Logistics
  - Manufacturing
  - Financials
- Platform/Environment: IBM, AS/400
- Outsource partner: WTS

A key criterion for outsourcing was data security. Brigham's needed to ensure that no one outside the company could access its highly competitive and confidential financial and manufacturing data. WTS provides firewall and internal security programs augmented by off-site data storage, strict back-up policies, and redundancy procedures for disaster control.

"We've relied on J.D. Edwards since 1991 to help track our daily business. We've experienced efficiencies in every area where we've applied it — and that includes financials, manufacturing, shipping, and order processing. Now that we've outsourced to WTS, we have many added advantages, including increased processing speed, enhanced security, and cost predictability," says Terrizzi.

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April 2002

BUSINESS DRIVERS	SOLUTION	RESULTS
■ Lower overhead costs ■ Increased productivity ■ Faster response	■ J.D. Edwards collaborative software: • Distribution/Logistics • Manufacturing • Financials ■ Platform/Environment: IBM, AS/400 ■ Outsource partner: WTS	■ 25% savings in operational expenses ■ Predictable information systems costs ■ IT staff focus on core business initiatives ■ Enhanced data speed and security

JDEDWARDS

12 APPENDIX A.2 – HOFFMAN ENCLOSURES

CUSTOMER TESTIMONIAL:
Industrial Fabrication and Assembly

Hoffman Enclosures

- Division of Pentair, Inc.
- Based in Anoka, Minnesota
- Leading North American producer of industrial enclosures
- Over $650 million in annual sales
- Shipment volume of about 10 million products annually

"There's no question we're in the best control of our business — in terms of our cost measurements, our financial controls, and inventory management — than we have ever been, and the J.D. Edwards system has been part of that success."

Del Nickel, President
Hoffman Enclosures

August 2002

Hoffman Slashes Inventory and Manufacturing Cycle Times

Business Driver: *Building a Foundation for Growth*

Part of the Electronic Enclosures Group of Pentair, Inc., Hoffman Enclosures is the leading North American producer of industrial enclosures that protect sensitive controls and components. With over $650 million in annual sales, Hoffman markets to the construction, plant maintenance, and repair industries, as well as original equipment manufacturers.

Hoffman has a long-standing culture of technology, innovation, and excellence. It is the first North American enclosure manufacturer to achieve ISO 9001 certification.

BUSINESS DRIVERS
- Global presence
- Flexible response
- Cost control

In 1996, it was apparent that Hoffman's legacy IT systems were becoming outdated, and Hoffman began the process of selecting an ERP vendor. Building a foundation for growth was a key goal of the Hoffman initiative.

Hoffman selected J.D. Edwards based on its lower cost of implementation, system flexibility, and international presence. Another key factor was the strength of the J.D. Edwards partner relationships with other software firms, which offered additional functionality.

"Our objectives were to get rolling and serve our customers well, without significant investments of time or money. That's exactly what we got with J.D. Edwards," says Gerry Wilichowski, vice president of Business Development and Quality.

Results: *Strong Performance Gains Across the Entire Organization*

Within the first three years of the system implementation, Hoffman has seen major improvements in a host of key business metrics. Most notably, there has been a 20 percent increase in productivity in the Hoffman distribution process, with financial close time falling from seven days to three-and-one-half days. Hoffman ships nearly ten million products to customers each year, so the 20 percent increase has a significant financial impact.

RESULTS
- 20% increase in productivity
- Inventory accuracy increase from 97% to 99%
- 20% reduction in finished goods inventory
- 50% to 60% decrease in cycle time

Inventory accuracy is another impacted area, with an increase from 97 to 99 percent. Finished goods inventory was reduced by 20 percent, without sacrificing availability levels for customers. In the manufacturing area, the cycle time for making standard product has dropped 60 percent, and the cycle time for custom products has been cut by more than half.

Because integration issues are critical at Hoffman, the cross-functional integration of the J.D. Edwards system and the speed with which information is available are major advantages. "J.D. Edwards does an excellent job of providing the data I need and tying to financials," says Ray Elwell, director of Hoffman's Wall Mount Business Unit. "I can get financial data now in a few days, rather than waiting a month. This truly lets me manage the business a lot better."

JDEDWARDS

"There was no gap between sales hype and reality. The J.D. Edwards product delivered on all of the promises. Since we implemented J.D. Edwards, we have never had a significant failure. This is a real testament of the stability of J.D. Edwards products."

Gerry Wilichowski
V.P. Business Development and Quality
Hoffman Enclosures

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August 2002

How Hoffman Got There: *Smooth Implementation and System Change with the Help of J.D. Edwards Customer Services*

After a smooth, phased implementation, Hoffman had fully deployed the J.D. Edwards solution at its four North American sites by May 1997. In 2000, Hoffman implemented a coexistent environment between WorldSoftware™ and OneWorld®. This is going well, as Hoffman is leveraging the additional OneWorld functionality.

In addition to the strong impact on business metrics, the J.D. Edwards solutions have provided a major strategic benefit. Hoffman can now make systems changes quickly in response to business needs, with minimum IT support. For example, Hoffman has moved from a make-to-stock to more of a make-to-order environment, and the J.D. Edwards solutions helped the Hoffman business users make this type of system change themselves.

"There was no gap between sales hype and reality. The J.D. Edwards product delivered on all of the promises. Since we implemented J.D. Edwards, we have never had a significant failure. This is a real testament to the stability of J.D. Edwards products," says Wilichowski.

HOW HOFFMAN GOT THERE
- J.D. Edwards collaborative enterprise solutions
  - Foundation
  - Financials
  - Logistics/Distribution
  - Manufacturing
  - Advanced Planning
- Environment/Database: IBM® AS/400, DB2/400 environment
- Implementation partner: J.D. Edwards
- Education and Support partner: J.D. Edwards

"For our initial implementation, we used J.D. Edwards for the project management side," says John Salaski, manager of Application Development for Hoffman. "The team did a great job with timely reports and regular updates. There were no glitches and they worked really well with the J.D. Edwards partner who did the actual implementation. We found that J.D. Edwards was very open and willing to communicate and follow through on issues."

"In March 2001, we implemented Strategic Network Optimization (SNO), a piece of APS, using J.D. Edwards," Salaski says. "We had interviewed a number of other consulting companies and found that, because we were really looking for something so specific, J.D. Edwards was the only one who really understood what we wanted and could deliver it. They listened to us and did what we needed. In six weeks we were up and running on the SNO application. We were very impressed. We wanted ownership of it after the implementation was completed so we did not have to keep running back to them when we needed something else done. J.D. Edwards gave us the self-sufficiency we were looking for."

"Looking forward, we will always use J.D. Edwards when we are implementing or working with really technical needs, issues, or new solutions (Advanced Order Configurator/SNO). We would rather pay more to get the right answers and be able to work through issues with consultants who are knowledgeable. Besides using the services, we are looking for a mentor so that we can come away with a solid understanding that we might not get otherwise. J.D. Edwards has done that for us," says Salaski. As far as Support and Education Services, Salaski says that Hoffman sends employees to training and takes advantage of the support offered.

The Future: *Fine-tuning for Optimum Business Efficiency*

Hoffman is using the Strategic Network Optimization modeling capability — part of J.D. Edwards Advanced Planning — to fine-tune its North American distribution strategy. Today, Hoffman ships products from two manufacturing sites and is seeking the most advantageous location(s) to better serve customer needs and to reduce logistics costs.

In addition, Hoffman is using the Strategic Network Optimization model to determine what products should be stored at specific locations, identify stocking levels for those products, and estimate the costs of the resulting configurations for each location.

"There's no question we're in the best control of our business, in terms of our cost measurements, our financial controls, and inventory management, than we have ever been, and the J.D. Edwards systems has been part of that success," says Del Nickel, Hoffman's president.

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13 APPENDIX A.3 – BATESVILLE CASKET COMPANY

CUSTOMER TESTIMONIAL:
Industrial Fabrication and Assembly

Batesville Casket Company

- Manufacturer of metal and hardwood burial caskets and cremation urns
- Provider of burial and funeral support services
- Headquartered in Batesville, Indiana
- Six plants in five states, field locations in the United States and Canada
- Approximately 3,500 employees

"Batesville brought in IBM Global Services to identify our critical business processes and analyze who would be the best partner for us. One of our issues was who could we expect to treat us in the fashion that we treat our own customers and allow us to serve our customers in the manner they need to be served? It was clear that we would be an important customer to J.D. Edwards and IBM, and that would help us support our customers even more reliably and efficiently."

Kim Dennis
VP of Business Information Systems
Batesville Casket Company

October 2002

Enhanced Service to Customers Through Improved Efficiency

Business Drivers: *Informed Decision Making*

Batesville Casket Company was founded in 1906 in Batesville, Indiana, and is still headquartered there today. Batesville is the leading manufacturer of metal and hardwood burial caskets and a leading provider of cremation urns and caskets. Burial and funeral support services are also important elements of Batesville's service to its customers.

BUSINESS DRIVERS
- Business process efficiency
- Product availability
- Inventory control
- Company-wide integration

With six plants in the United States, field locations across the United States and Canada, and approximately 3,500 employees, Batesville was looking for ways to enhance efficiency. "Our primary concern is continuing to serve our customers in a quality manner, dependably. We began to carefully analyze business changes that could enhance our service," says Kim Dennis, V.P. of Business Information Systems, Batesville Casket Company.

Batesville chose IBM® Global Services Consulting to assist with the evaluation phase. "IBM helped us determine the critical processes we have as a company. We then went through an extensive RFP process. In April 2000, we selected J.D. Edwards as the best fit for our requirements," says Dennis.

"When a customer wants a specific product, we have a very small window of time in which to make decisions and help them fulfill that need, so product availability is one of the most critical business drivers," says Dennis. "For this reason, product availability across the country was key in our selection process, as were real-time inventory capabilities — for visibility into the manufacturing process and the pipeline — and company-wide integration."

Results: *Unified Data for Collaboration and Decision Making*

"Before J.D. Edwards and IBM, when we looked at new processes that we might implement, or ways the business might change or grow, the legacy software that we had in place held us back. For example, we were not able to provide our employees real-time access to information. Complex interfaces and other limitations of the system started to preclude some of the initiatives that we wanted to implement," says Dennis.

RESULTS
- Internal collaboration
- Real-time inventory information
- Optimized product flow

Working with J.D. Edwards and IBM, Batesville implemented a single, cohesive repository of corporate data that could be shared for decision making, financial reporting, and improved operations. The company moved to a real-time system, replacing the previous monthly batch process. Visibility of inventory and demand across the organization improved procurement effectiveness and inventory level management.

"With the J.D. Edwards integration, now we are able to collaborate better within the company to understand where things stand across the organization in terms of orders, inventory, and financial matters," says Dennis.

Real-time inventory availability has been an important benefit of J.D. Edwards, says Dennis. "Because we have access to product availability on a nationwide basis, our service center managers can locate products without making multiple calls to multiple service centers."

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"In the evaluation phase, we liked the flexibility of the J.D. Edwards software, and that has been true as we implemented. Working with IBM, we identified a number of critical business processes — things we needed to continue and improve upon to serve our customers well — and we've been able to configure those without hard coding."

Kim Dennis
V.P. of Business Information Systems
Batesville Casket Company

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October 2002

Using the IBM Turbo BLUE Methodology, Batesville had identified approximately eight business processes that were critical differentiators, and the implementation focused on these. "We looked at a lot of alternatives, for instance, in our replenishment process. The velocity at which we can move product through the pipeline and the visibility of product in that pipeline has improved," says Dennis.

"Prior to J.D. Edwards, we had schedulers making decisions on product flow, based on limited information. Now, utilizing the J.D. Edwards optimization capabilities, we've built rules that help us to better make decisions about how product will flow," says Dennis.

How Batesville Casket is Getting There: *J.D. Edwards Collaborative Enterprise Solutions*

Batesville has implemented J.D. Edwards Foundation, Financials, Human Resources, Payroll, Logistics/Distribution, Warehouse Management, and Advanced Planning. IBM Global Services helped Batesville move from an environment of multiple servers (half on mainframe, others on pSeries) to a consolidated approach, so that applications run at the enterprise level rather than on shared machines.

HOW BATESVILLE CASKET IS GETTING THERE

- J.D. Edwards collaborative enterprise solutions
  - Financials
  - Logistics/Distribution
  - Manufacturing
  - Human Resources
  - Advanced Planning
  - Strategic Network Optimization
  - Production and Distribution Planning
- Environment/Database: IBM RS/6000®, Oracle® AIX, Citrix® for remote access
- Implementation partner: IBM Global Services Consulting and J.D. Edwards
- Training and Support partner: IBM Global Services Consulting and J.D. Edwards

The first phase implementation was completed in approximately six months. "IBM was there around-the-clock working with J.D. Edwards and Batesville during phase one. They were there whenever we needed them, and really went above and beyond what we expected," says Dennis.

Batesville went live with the first site for manufacturing in the third quarter of 2002, and plans to implement Customer Relationship Management (CRM) next.

IBM Global Services Consulting and J.D. Edwards provided implementation and training support. "Both IBM and J.D. Edwards responded from a resource and project management perspective, but they allowed us to own the project at Batesville, and we appreciated that," says Dennis.

J.D. Edwards training was provided to all full-time Batesville team members in advance of the implementation. "Our people were up to speed faster in terms of being active participants in the decisions about configuring the software. We also used J.D. Edwards for some specific training, and we found them to be good trainers."

"Regarding J.D. Edwards, one of the most significant things it provides to Batesville is its level of partnership. There is good, candid communication between the two companies, both when things need to be improved and when things are going well," says Dennis.

The Future: *CRM for Remote Sales Force*

Batesville has purchased J.D. Edwards Customer Relationship Management software and plans to implement it beginning in 2003 to support its field sales force.

"Our field salespeople are not taking orders, they are business consultants to our funeral director customers. For example, Batesville salespeople help these customers in merchandising; they share industry information and trends with them. CRM will be an information portal for our sales force, to help in that process," says Dennis.

"CRM will also be a basic system for our field sales forces to help make estimates and forecasts based on what they're seeing in the market. Batesville serves only licensed funeral directors and operating-licensed funeral homes. That's a very concentrated customer base, and we want to be very aware of these customers' requirements so that we can continue to help them to the best of our abilities," says Dennis.

JDEDWARDS

14 APPENDIX A.4 – KOMATSU

KOMATSU

Case Study

iBaan B2B Server drives online procurement for leading construction and mining equipment manufacturer

Komatsu Mining implements e-procurement solution to establish private exchange - reduces PO placement lead times from five days to a fraction of a day

Customer Profile

Name of customer	Komatsu Mining Systems Inc.
Country	United States
Name of Baan reseller	Direct sale
Customer industry	Production of mining equipment
Customer revenue	$275 million
Number of employees	750
Web address	www.komatsumining.com

Business Problems

Komatsu Mining Systems was established in 1997 to focus exclusively on the specific needs and applications of the mining industry. As a major manufacturer of a vast range of mining equipment, from hydraulic excavators to off-highway mining trucks, the purchasing of supplies is central to the entire production process. Komatsu's purchasing process was very traditional – forecast reports and Purchase Orders (POs) were printed and faxed to suppliers.

The backend ERP system generated exception messages that required action from the buyers before PO changes could be sent. On average it took one week from the Requirements Planning run until the PO reached the supplier. Receiving up-to-date documentation from suppliers also had its problems, with suppliers often incorrectly recording specific details at shipment time.

Consequently, Komatsu needed to make its internal generation of POs more efficient and at the same time, implement more discipline among its supplier base. The disciplined procedures had to be applied carefully because many of the company's strategic suppliers are small companies that cannot afford a major supply chain overhaul. Komatsu set out to find a solution to these challenges with several key business goals in mind, including reducing order lead-time, purchasing's cost of doing business and inventory, and establishing better connections with its network of suppliers.

Solution

To enhance communication and to support collaborative commerce with over 400 existing core suppliers, Komatsu Mining selected Baan's Internet-enabled iBaan B2B Server solution, together with an advanced third party automation tool. Kevin Casey, Office of the Vice President of Komatsu Mining explains the functionality requirements that led to this decision: `By integrating iBaan B2B Server with our existing iBaan system, we were looking to synchronise and accelerate our purchase order business process across the entire extended supply chain.

"Our customers look to us for the latest developments, by combining ground-breaking technology and human-first engineering. Komatsu Mining is a pioneer of low-cost, highly effective collaboration with suppliers, and Baan's advanced technology has enabled us to enhance the visiblity of information across the supply chain, helping us to improve and reduce the cost of the procurement process while improving accuracy and speed."

Kevin Casey, Office of the Vice President of Komatsu Mining

`Our expectations included increasing the velocity of orders and information across the organisation, reducing paperwork, and most critically, automating the procurement process through the iBaan ERP Purchase module to enable transacting business over the Web – reducing inventory and procurement costs,` continues Kevin Casey.

Komatsu found that by using iBaan B2B Server as a private exchange, the company can send and receive XML-based transactions over the Internet. This enables more automated suppliers to directly send and receive documents, and supports user download for the less automated business partners. The iBaan B2B Server solution also serves as the basis for Komatsu's supplier portal, where suppliers come to browse and download transactions.

Implementation

Komatsu Mining went into full production with its iBaan B2B Server in September 2000 and by the year-end, surpassed its goal of 12 suppliers and instead had 104 suppliers collaborating via its new E-Purchasing portal. From concept proposal to project launch, the project took just 33 weeks – 12 weeks from software selection to a live system.

The implementation covered a range of business processes including forecast collaboration and the purchase order cycle from sending the PO. Komatsu can now communicate outstanding and open purchase orders over the Internet, enabling its suppliers to automatically update information on estimated deliveries and availability, raising information visibility and speeding cycle times.

Benefits

Since implementing the iBaan B2B Server solution, Komatsu has achieved a large number of quantifiable and performance-related business benefits including:

- PO placement lead time has been reduced from five days to a fraction of a day
- Over two-thirds of core suppliers' lead times have dropped from over 60 working days to 30 days or less
- Contract personnel supporting clerical tasks have been allocated to other tasks, saving approximately 100-150 hours per week
- Telecommunications costs related to supplier support have been drastically reduced

iBaaN

- Printing and faxing savings have been achieved in the region of 3,000 pages per month
- Suppliers now have the ability to update PO acknowledgements and shipping information into the iBaan ERP system directly from an e-commerce web interface
- Update transactions can now be processed with no data entry by Komatsu employees – currently saving 10 hours of clerical time per week with an estimated additional 10 hours per week savings as additional suppliers begin to use this feature
- Communication delays of requirements to suppliers, and supplier delivery commitments to Komatsu have been eliminated
- Buyers are managing the exceptions directly, providing Komatsu with more time to improve the quality of its supply base and identify cost reduction opportunities
- Some suppliers are able to save up to 20 hours per week by downloading Komatsu's forecast into their systems instead of keeping it in by hand
- Web-based purchasing collaboration with suppliers has provided other benefits such as:
  - Significant improvement in the accuracy and velocity of information flow between Komatsu and its suppliers – for example, Komatsu is preparing to roll out a label printing self-service module for its suppliers to prepare and send shipment information that exactly meet Komatsu's needs
  - Reduced total order cycle time
  - Increased flexibility and ability to handle customers' shifting demands, since Komatsu now has less purchasing process lead-time
  - Notification of alerts pushed to browser and/or e-mail has enabled better synchronisation with trading partners and an improved business partner service

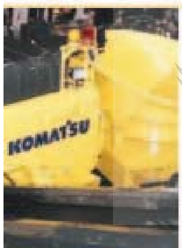
Future

Kevin Casey summarises Komatsu's future strategy: 'We continue to find ways to benefit from iBaan B2B Server. In addition to our plans to deploy shipping and label printing self-service, there are also plans in place for Komatsu to further automate its PO receipt processes with 24-hour-a-day, Radio Frequency (RF) scanning. With most of our suppliers sending bar-coded labels, the investment in an RF-receiving project will help establish a streamlined and virtually error-free receiving process that will enable Komatsu's suppliers to pay-on-receipt.

Ernie Eichenbaum, Vice President B2B Marketing at Baan concludes: 'The experience gained in this private exchange project will prepare Komatsu Mining as they look to move to the next level of collaborative commerce, which will be supported with iBaan Collaboration. This provides state-of-the-art collaboration capabilities that leading manufacturers such as Komatsu are increasingly demanding to extend the visibility of their fast-moving supply chains and drive the business forwards.'

Komatsu infrastructure

Software	iBaan B2B Server
Hardware	HP and EMC
Number of seats	100 concurrent
Operating platform	Microsoft Windows NT
Database	Microsoft Windows NT, SQL 7
Customisations/extensions	In house – Text to Excel



About Baan

Baan helps companies to compete in the 'networked economy' with its ever-increasing demands for more information, integration and collaboration. Through its powerful new iBaan suite of Internet-enabled solutions, Baan is ideally placed to support organisations in the manufacturing, logistics, service and engineering industries as they move towards tighter integration of their complex processes, closer collaboration with customers and partners, and providing employees with build-to-order shop floor data and supply information. Baan has more than 15,000 customer sites worldwide, and is part of the Invensys Software Systems Division - a global leader in the provision of e-business/automation solutions. For more information, please visit http://www.baan.com

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15 APPENDIX A.5 – EURAMAX COATED PRODUCTS

Case Study **Transforming the production process at Euramax**

Euramax Coated Products BV

How the leading producer of pre-coated aluminum and steel implemented Baan Dimensions from the iBaan for Metals solution suite to help achieve more accurate costing, improved planning, reduced inventory and increased customer satisfaction

Customer Profile

Name of customer	Euramax Coated Products B.V.
Country	The Netherlands
Customer industry	Metals
Number of employees	180
Web address	http://www.euramax.nl

Business Challenges

Euramax Coated Products (ECP) B.V. is a subsidiary of Euramax International, Inc., the leading international producer of aluminum and steel products for original equipment manufacturers, distributors, contractors and home centers in the US and Western Europe. ECP BV is based in the Netherlands and specializes in pre-coated aluminum and steel for the caravan, industrial, architectural, building and transportation industries in Central and Western Europe, and increasingly in Asia.

ECP prides itself on offering its customers flexibility, quality and speed – supplying all standard and non-standard colors, shapes or textures of coating to the highest levels of quality to short delivery times and in short production runs. The company's existing manufacturing system, however, didn't offer it the functionality or flexibility to cope with the many order criteria involved; nor did it integrate with ECP's back-office and legacy systems. To address these issues, ECP began to evaluate new ERP packages.

Solution

After an exhaustive evaluation process, ECP selected a metals industry-specific solution from a Baan-aligned software vendor, that later became part of the Baan Process Solutions business unit of Baan, the global provider of B2B collaborative commerce solutions and part of Invensys plc.

Peter Wijers, Project Manager at ECP, takes up the story: "Baan Dimensions, the ERP component of the iBaan for Metals solution suite, was the clear choice because it was developed specifically for our industry, and addressed our particular requirements."

The iBaan for Metals solution supports the whole enterprise in controlling metal product inventories, attribute order entry, planning, actual costing, complex pricing by attribute, and transforming products from one shape into another.

Peter Wijers continues: "We sell a portfolio of basic products that undergo a range of customer-specified processes – for example, altering length, width, gauge, quality, texture and color. As the core of iBaan for Metals, Baan Dimensions is different from ERP packages designed for discrete manufacturers, because it gives us full control and visibility of the transformation operations, the materials needed and the costs involved."

Implementation

ECP began implementation of Baan Dimensions from the iBaan for Metals suite in 1998, with dedicated support from Baan Process Solutions and implementation alliance CSC. Paul Henckens, IT Manager at ECP, comments: "The implementation involved full testing and integration of all the iBaan modules across our planning, purchasing, manufacturing, and financial systems. The level of integration that we have achieved so far surpasses our previous ERP solution, which used to require us to copy data between modules manually.

"Overall, the solution fits in very well with our existing operations – from the factory floor to the office and administration workers. It links with the legacy systems that it needs to, and caused us very little disruption during deployment," Paul Henckens continues.

iBaan

Benefits

The first benefit that ECP enjoyed from the iBaan solution was tracing source materials through the entire production process. Peter Wijers explains: "We deployed iBaan for Metals on the production floor, so our workers can input specific information on when they run a job, how long it takes them or exactly what materials they use. This means we can calculate the actual cost of the source material, and then track it through any transformation processes, monitoring the added costs to a very high degree of accuracy and isolating them at any point. This makes customer billing more transparent, accurate and efficient and improves our bottom line."

"iBaan for Metals has also greatly improved our planning procedures. It used to take us three or four days to convert sales orders into production orders, and then bills of materials. With iBaan for Metals, we can now do this within the hour, evaluating what materials are needed in real-time as the sales order automatically integrates into our production applications and generates the process flow and material lists needed to begin production."

"This has reduced the amount of time taken to complete a project, from order intake to production, by approximately 50 per cent. We are also able to plan production around 14 days into the future and to cut inventory levels considerably, because our buyers know what materials they will need, and when. We have also cut the stream of paper that used to circulate between different departments by at least 25 per cent!" Peter Wijers adds.

Infrastructure

Software	Baan Dimensions ERP from iBaan for Metals
Hardware	HP 9000
Number of seats	85
Operating platform	HPUX 11
Database	Informix 9.2
Customizations/ extensions	Customized GUI for data entry
Implementation alliance	CSC

Future

"The iBaan solutions enable us to give our customers what they want, when they want it," adds Paul Henckens. "That is cost-effective and speedy delivery on their orders, and information on the status of their order at all times. ECP's management can also monitor operations through the iBaan solutions and extract real-time information on production, for improved reporting, planning and forecasting, as and when they need it.

"We are always considering how to extend and add value to our enterprise systems, and are considering what the iBaan for Metals solutions can offer in areas such as e-procurement and e-commerce. Our relationship with Baan Process Solutions has been a great success so far, and we look forward to continuing it as the industry evolves – because we know that with the iBaan solutions we are well positioned to address our needs in the process sector, as they change in the future," Paul Henckens concludes.

About Baan Process Solutions

Baan Process Solutions, a business unit of Baan and part of the Production Management division of Invensys PLC., is the world's largest enterprise software supplier focused entirely on the process and hybrid industries. A unique combination of deep industry knowledge, patented production modeling, and the powerful new iBaan suite of Internet-enabled products makes it a natural fit for customers desiring to achieve effective cost management across the value chain. Customers include world-class manufacturers from the chemicals, food and beverage, metals, pulp and paper, pharmaceuticals, wire and cable industries. Baan Process Solutions helps these companies to compete in the 'networked economy' with its ever-increasing demand for information, integration and collaboration. For more information please visit http://www.baanprocess.com

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BAAN

Invensys

16 APPENDIX A.6 – AZIENDA MILANESE SERVIZI AMBIENTALI

Oracle Customer Snapshot

Azienda Milanese Servizi Ambientali S.p.A. (Amsa)
Milan, Italy
www.amsa.it

Industry:
Utilities

Annual Revenue:
US$300 million

Employees:
3,147

Oracle Products & Services:
Oracle Database
Oracle Application Server
Oracle Integration

Oracle Partner:
Etnoteam S.p.A.
www.etnoteam.it

"Oracle technology has permitted the creation of a robust, secure, dependable system in which all processes focus on the ability of data from heterogeneous systems to transact." – Mario Pagani, Chief Information Officer, Amsa S.p.A.

Azienda Milanese Servizi Ambientali Optimizes Work Scheduling and Vehicle Dispatch for Improved Service to the City of Milan

Azienda Milanese Servizi Ambientali S.p.A. (Amsa) is a group of companies providing environmental and waste services to the city of Milan and neighboring communities. The company provides more than 60 services, from street cleaning and waste management to planning emergency procedures in the event of an environmental threat.

Challenges

- Improve the efficiency of Amsa's business processes and its ability to plan and schedule work efficiently
- Track the status of work in progress and gain insight into the company's operations
- Improve the level of service that Amsa delivers to the citizens of Milan
- Determine optimum routes and dispatch schedules for Amsa vehicles

Solution

- Improved operational efficiency by creating a centralized data repository as the core of a modern IT infrastructure based on a single instance of Oracle Database 10g
- Gained the ability to respond more promptly to demands for Amsa services
- Automated previously disjointed business processes by integrating data from applications based on heterogeneous operating systems and databases, using Oracle Integration and Oracle Application Server 10g
- Gained the ability to plan and track the itinerary and location of vehicles and equipment by using Oracle's support for mapping data, radio frequency identification (RFID), and global positioning system (GPS) technologies
- Enabled hundreds of thousands of transactions to be processed efficiently every day
- Created a reliable and scalable information-driven operational management system
- Worked with Etnoteam to reduce risk and accelerate implementation

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ORACLE

17 APPENDIX B – COMPANY A'S STRATEGY MAP

	STRATEGIES	BUSINESS OBJECTIVES	MEASUREMENT CRITERIA	TARGET	PROJECTS
FINANCIAL PERSPECTIVE	***Productivity Strategy*** F1: Become industry cost leader F2: Maximise use of existing assets ***Revenue Growth Strategy*** F3: Revenues from new customers F4: Increase customers' account share		F1.1: Net cash flow F2.1: EBIT F3.1: Increase market share F4.1: Increase expenditure from existing customers	> R158 million > R141 million 30% growth 45% growth in expenditure	
CUSTOMER PERSPECTIVE	***Offer Products & Services that are consistent, timely and low-cost*** C1: Lowest cost supplier C2: Perfect quality C3: Speedy purchase C4: Appropriate selection		C1.1: Production cost C2.1: Product returns C3.1: Delivery speed of ingredients C4.1: Customer demography	-25% in production cost 5% return on products Delivery within 24 hours 80% black 20% white	
INTERNAL PROCESSES PERSPECTIVE		***Operations Management*** I1: Outstanding supplier relationships I2: Efficient time distribution I3: Produce goods & services: cost, quality & time I4: Provide ongoing service ***Customer Management*** I5: Provide convenient order-handling processes I6: Provide desired variety of products ***Innovation*** I7: Process innovation I8: Manage capital projects ***Regulatory & social*** I9: Contribute to communities I10: Fulfil Electronic and Communications Transactions Act requirements	I1.1: Preferred supplier I2.1: Time to deliver product I3.1: TQM I3.2: Contractual relationship I4.1: Execution & delivery I5.1: Number of mistakes when placing an order I6.1: Category profile/channel I7.1: Process time I8.1: ROI I9.1: Donations & sponsorship	I1.1: 80% first choice I2.1: < 8 hours I3.1: 1% defect I4.1: 100% customer satisfaction I5.1: <1% on order total I6.1: 80% wheat/maize products 20% confectionary I7.1: Production time - 25% I8.1: 70% ROI I9.1: 10% of profit	Implement SRM Implement SCM Implement quality control Implement CRM & service delivery Implement financial system Implement BI Implement SCM Implement fixed assets tracking Implement CRM
COMPETENCE PERSPECTIVE		***Information Capital*** L1: Create electronic supplier & customer relationships L2: Process improvement	L1.1: Information availability of customer & suppliers L2.1: Time to process order L2.2: Time to provide product	L1.1: Immediate access to Information L2.1: 2 min for 5 line order L2.2: <24 hours	Implement BI Implement ERP Cycle-time optimisation

18 APPENDIX C – DECREE OF THE DEMOCRATIC REPUBLIC OF THE CONGO

INTRODUCTION

Decree law number 032 in connection with the intension of the "Service Nationale" in summarized form.

Referring to the declaration of the alliance de Forces Démocratiques pour la Lebération du Congo (A.F.D.L.) of 17 may 1997:

Referring to the constitutional decree-law number 003 of 27 May 1997 articles 3, 5 and 6.

DECREE

Article 1

A specialized public organisation, named the "Service National" is created. It has administrative and financial autonomy.

Article 2

The "Service National" is under the authority of the president.

Article 3

The "Service National" is a paramilitary organisation of education, supervision and mobilization of civilian and patriotic action with the vision of reconstructing our country.

The goals are:

- Organisation, throughout the country, supervision centres for young, jobless girls and boys, for young people in the final stages of their secondary or tertiary education, with the vision to instill a civil and patriotic education and to introduce them to work in the agricultural sector, followed by a possible profession and to give them a paramilitary and self-defense education.
- To progressively transform every centre in such a way that it gives technical and material support to all surrounding villages.
- To transform these production and support centres into a melting pot/source of civil and patriotic values by using intermingling / integration of the young people coming from different social and ethnic backgrounds. To instill in them socio-cultural values, love for the country, solidarity, tolerance, justice and equality, in spite of the diversity of their origin.
- To transform these production and support centres into a breeding ground of future agents of an integrated development. Giving them a taste of productive work, readying them to defend the interests of our country by all means, including by war, if necessary.
- To transform these production and support centres into a laboratory where there will be experimented with every recipe, idea and theory to the development of our country.
- To transform these production and support centres into catalysts of urban de-population where the young people will discover the hidden treasure and the charm of the country

life, and the necessity to save our villages and country sides from where a stable development must start.

- To transform these production and support centres into an ideal setting where inhibited talents can blossom even when their condition of life, in their country sides, renders them insecure.
- To supervise the military at the end of their careers with the vision of integrating different poles of development and their participation in production and reconstruction.
- To recruit in the civil centre, graduates from institutions of higher education and universities with a vision of serving disadvantaged communities of the country where there is a shortage of doctors, teachers and other professionals.

Article 4

The organs of the "Service National" are

The Central Command (structure)

The 11 provincial branches (regional)

Article 5

The Central Command is situated in Kinshasa and consists of

The Department of Conscience (awareness)

The Department of Vigilance

The Department of Civil Defense

Article 6

The 11 provincial/regional branches will be established in every province.

Article 7

At the head of the "Service National" is the Commandant. He is appointed and his functions are determined by the president. The Commandant has three departmental heads:

The head of the Department of Conscience

The head of the Department of Vigilance

The head of the Department of Civil Defense.

Article 8

The Commandant is assisted in performing his duties by a board of advisors, secretary general and 11 eleven provincial coordinators which he nominates after approval by the president.

Article 9

its internal law determines the practical details and functioning of the "Service National" which are not foreseen by the decree-law.

Article 10

the present decree-law will be enforced at the date of its signing. This was signed on the 15th of October 1997.

19 APPENDIX D – PROJECT MANAGEMENT PROCESSES

19.1 A GUIDE TO THE PROJECT MANAGEMENT BODY OF KNOWLEDGE (PMBOK® GUIDE)

A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Third Edition is a basic reference for the project management profession. The PMBOK® Guide is an inclusive term that describes the sum of knowledge within the profession of project management. It also identifies and describes the subset of principles and practices within the PMBOK® that are generally accepted and applicable to most projects most of the time.

The PMBOK® Guide is a set of techniques and standards that provide the project manager with planning and control techniques. The following sections describe the nine knowledge areas as explained by the PMBOK® Guide and are illustrated in figure 19-1.

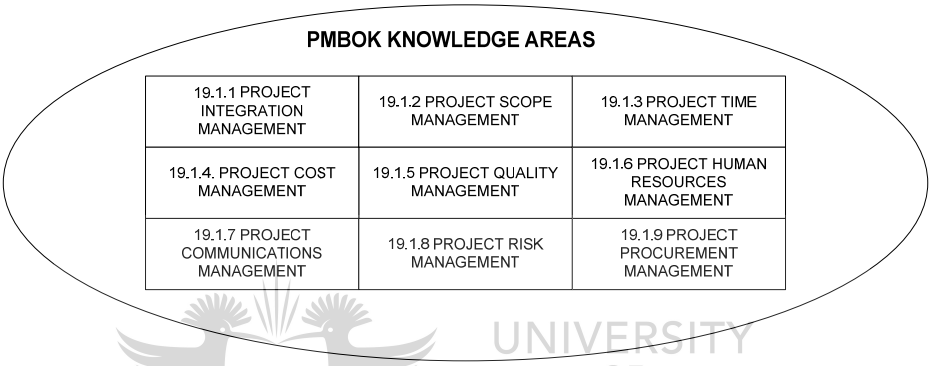

Figure 19-1: PMBOK® Guide knowledge areas

The nine knowledge areas will be discussed individually and how they assist in the implementation of an ERP system is determined.

19.1.1 PROJECT INTEGRATION MANAGEMENT

Project integration management includes all the processes that are required to ensure that the various elements of the project are properly coordinated (Morris, 2001). This means that trade-offs must be made between competing objectives and alternatives to meet the deliverables of the project.

Figure 19-2 shows the processes of project integration management.

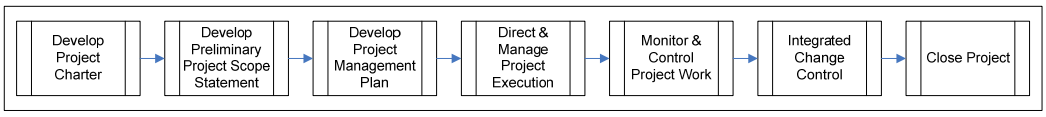

Figure 19-2: Project integration management processes

Each of these processes occurs at least once during a project.

19.1.1.1 Develop Project Charter

A project is formally authorised by a project charter. It provides the project manager with the authority to apply organisational resources to any of the project activities. A project is linked to the ongoing work and processes of an organisation by the project charter. Developing the project charter is concerned with documenting business needs, project justification and the new product and/or service that will delivered by the project.

The project charter of an ERP implementation will indicate the business needs that will be satisfied by the implementation of an ERP system, the justification of the associated cost as well as the perceived benefits or ROI that the organisation will receive from the ERP system.

19.1.1.2 Develop Preliminary Project Scope Statement

This process defines what needs to be accomplished by the project. It addresses the characteristics and boundaries of the project as well as the methods of acceptance and scope control. In the case of an ERP implementation, it will dictate what software modules must be implemented, the customisations needed and integrations with other systems.

19.1.1.3 Develop Project Management Plan

This process includes activities that will define, integrate and coordinate all relevant plans within the project management plan (Hayes, 2000). This plan defines the governance of the project, i.e. the execution, monitoring, controlling and closing of the project.

19.1.1.4 Direct and Manage Project Execution

This process requires the project manager and project team to perform multiple actions to ensure that the project deliverables are implemented according to the project plan (Robertson & Williams, 2006). The deliverables can be either user training or the implementation of the finance component of the ERP model. The project manager will take scope changes and risks into consideration to ensure the successful management of the project execution.

19.1.1.5 Monitor and Control Project Work

This process is the one that carries out the project plan and the project manager must coordinate and direct the various technical and organisational interfaces in the project. The performance of the project must be continually monitored against the baseline in order to take corrective actions based on actual performance against the project plan (Rozenes, Vitner & Spraggett, 2006). The project plan that was developed by the project team must be managed by the project manager for it to be of any value to the project itself. This means that during the implementation of the ERP system, the project manager must manage each task and activity to determine if it is on schedule and what the impact of the activity will be on the project itself if it is delayed or even ahead of schedule.

19.1.1.6 Integrated Change Control

This process is primarily concerned with changes to the project plan and managing the influences of these changes to the project plan (Legris & Collerette, 2006). The original defined project scope and the project baseline must be maintained by continuously managing changes to the baseline. This can be achieved by either declining any new changes or by accepting the changes and incorporating them into a revised project plan and baseline. This process is important for the implementation of an ERP system because failures, as per Yu (2005), can be attributed to changes.

19.1.1.7 Close Project

The process involves performing the closure portion of the project management plan. It transfers the product or service that the project delivered from transfer mode to production mode. In the case of an ERP implementation, the closure will involve the sign-off of all software components and ensuring that security has been implemented as per the ERP security framework. The ERP system will be a production system forming part of all the other IT systems and will be governed by the various processes of ITIL.

19.1.2 PROJECT SCOPE MANAGEMENT

Project scope management includes the processes required to ensure that the project includes all the work required, and only the work required to complete a project successfully. Completion of the project scope is measured against the project plan.

Project scope management consists of the following five processes:

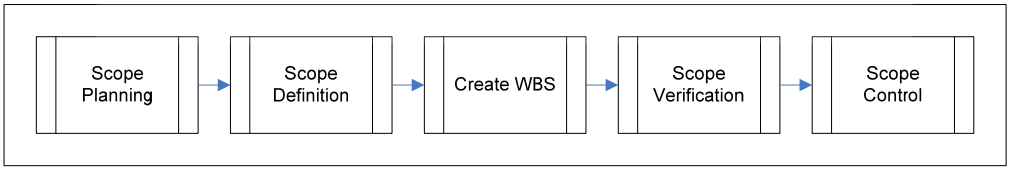

Figure 19-3: Project scope management process

19.1.2.1 Scope Planning

The project work that needs to be done to produce the product or deliverable of the project is documented and elaborated on. This process is called the scope planning process (Hayes, 2000). This process makes use of the project charter to produce the scope statement and the scope management plan. The scope statement forms the basis for an agreement between the project and the customer, and identifies the project objectives and the project deliverables.

The scope management plan describes how the scope will be managed and how changes to the scope will be incorporated into the project.

Scope planning in an ERP project is very important and can cause many problems and delays to the ERP project if it is not done properly. The deliverables of the ERP system are

defined and elaborated on, for example that the system must produce financial reports or that management information must be available using business intelligence's data warehousing.

19.1.2.2 Scope Definition

A detailed project scope statement is critical to any project success and is built upon the major project deliverables, constraints and assumptions that are documented during the initial phases of the project (Woolshlager, 1986). This process is used to ensure that all the customer expectations are documented and, where possible, integrated into the project plan and system requirements.

19.1.2.3 Create WBS

During this process, the major project deliverables are subdivided into smaller and more manageable components. This process is critical for the success of the project.

This breakdown of the deliverables into smaller components is done using the work breakdown structure (WBS). The WBS organises the components of the project and these components define the total scope of the project (Rozenes, Vitner & Spraggett, 2006). Work that does not form part of the WBS is outside the scope of the project.

Each deliverable of the ERP system is broken down into smaller sections. For example, the financial reports can be subdivided into general ledger reports, sales reports or reports per region. It is important for the outcome of the ERP system that the scope definition be done properly and thoroughly. Any deliverable that is not listed will cause the ERP implementation to miss the deadlines specified in the project plan.

19.1.2.4 Scope Verification

Formal acceptance of the project scope by the stakeholders is obtained during this process. This requires the deliverables of the project to be reviewed to ensure that all the scheduled tasks and work were completed correctly and satisfactorily. Documentation that the customer has accepted the deliverables must be prepared, distributed and signed. This is necessary to prevent any future disputes.

ERP implementations are by nature large and it is therefore necessary that the scope of the project be tied down and defined before the commencement of the implementation. Any deviation to the deliverables can and will cause the ERP system to be late, over budget and will reinforce the overall impression that the ERP system is a failure.

19.1.2.5 Scope Control

All projects are subjected to scope changes at some time during the project life cycle. The scope change control process is a system designed to manage the change of the scope effectively. It identifies and manages changes to the deliverables of the project. It also ensures that the proposed changes are necessary and appropriate and that the integrity of the project is maintained at all times (Legris & Collerette, 2006).

Project scope management plays a vital role during the pre-implementation phase of the ERP methodology and it is crucial to an ERP project. The scope of the project must be defined beforehand and any changes must be managed to ensure that the project finishes on time and within budget.

It is very easy for scope changes to arise during the implementation of the ERP system. Scope changes can arise through the newly defined business processes that do not align with the ERP software. They can also be caused by the enhancements that are only recognised after the users start working on the system. It is important that records be kept of these changes and that the consequence of these changes be communicated to the customer. These scope changes also form part of the ERP model.

19.1.3 PROJECT TIME MANAGEMENT

An ERP system must be delivered on time to ensure that the product is relevant to the organisation and to save the organisation additional costs if the implementation overruns on time.

Project time management involves the processes that are required to ensure that a project is completed on time. The time management process is shown in figure 19-4.

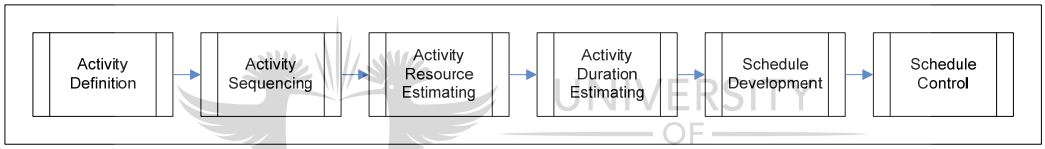

Figure 19-4: Project time management process

19.1.3.1 Activity Definition

All the activities that are needed to ensure that the project objective is met must be identified and documented. The project team can use the WBS and the scope statement to identify all the necessary activities (Cardinal & Marle, 2006).

It also makes sense for the project team to decompose the entire project into smaller manageable entities. The project team will produce an activity list that will include all the activities that will be performed on the project. The project team must take care not to include any activities that are not part of the project scope.

The project team must break the ERP system down into manageable components and subdivide these components into all the activities that are needed to complete and fulfil the component. For instance, the finance component can be divided into the different software modules of the ERP model. All the activities must be identified and listed to implement the finance component.

19.1.3.2 Activity Sequencing

All the activities identified by the project team need to be sequenced in logical order. The sequencing is necessary to develop a project plan and to indicate the relationship between the different activities (Nagarajan, 2005).

The project team can use different techniques to do the sequencing of the activities. These techniques include the arrow diagramming method (ADM) and network templates. Based on this information, a project network diagram is produced and is the result of activity sequencing. It is a schematic display of the activities and the logical dependencies between them. The network diagram should be accompanied by a summary document that describes the basic sequencing approach (Cohen, Mandelbaum & Shtub, 2004).

The activities that were listed must be put in the correct sequence. The sequence of activities is important because the outcome of the ERP project depends on the correct sequence. For example, the layout of the general ledger reports can be determined only once the general ledger codes are defined, as these codes are used in the report.

19.1.3.3 Activity Resource Estimating

The third process is to determine the physical resources that are needed and what quantities of each should be used. The WBS provides the project team with this information and identifies the project deliverables and processes that will need resources. This is the primary input of resource planning. Knowledge of what resources are potentially available is necessary for resource planning.

The output of the resource planning process is a description of what types of resources are required and in what quantities. These resources will be obtained either through staff acquisition or procurement.

It is important to select the right people to do the job because they will form the core of the project team. As illustrated in section 2.4.4.2 in chapter 2, the project team is of the utmost importance and forms one of the building blocks of the proposed ERP model. These resources will come from within the organisation and from the consultants who will implement the ERP system. This pool of resources will give the project team a balance of product and industry knowledge.

19.1.3.4 Activity Duration Estimating

How long each activity will take to complete needs to be calculated. The person in the project team who is most familiar with the nature of a specific activity should make the estimate duration. The project team will use the activity list and the resource requirements to estimate the duration of the activities.

The project team will produce an activity duration estimate at the end of the exercise. These estimates are quantitative assessments of the likely number of work periods that will be required to complete an activity.

It is important that the estimating of the activities be as accurate as possible. It will be of benefit to the project team if the estimating is done by the expert that will be involved in the execution and completion of the activity. In an ERP implementation, the infrastructure specialists will provide the estimation of the infrastructure implementation, whereas the report writers will provide the estimates for the reports.

19.1.3.5 Schedule Development

After all the activities and their respective durations have been listed, the start and finish dates of each activity must be determined. These dates must be as realistic as possible to ensure that the overall project time is realistic.

With the use of project management software, the project team can produce a project schedule. The project schedule will include a start and finish date for each activity after all the above inputs were taken into consideration.

The start and finish dates are influenced by the organisation's financial cycles. For example, the implementation of the financial component can be done after month-end only, and not over a financial year-end. These dependencies must be taken into consideration when the schedule is developed.

19.1.3.6 Schedule Control

Schedule control is concerned with the factors that cause changes to the schedule as well as managing the actual changes as and when they occur (Kuehn, 2006).

The project team will use a variety of tools and techniques to produce updates and changes to the project schedule. Updates to the schedule are any modifications to the schedule information that is used to manage the project. Corrective action needs to be taken by the project team to bring expected future schedule performance in line with the project plan.

19.1.4 PROJECT COST MANAGEMENT

The cost of the project is just as important as scope and time are to the project outcome. The cost of the project is usually dependent on the scope and time of the project. If any one of the two processes is prolonged or extended, it will definitely influence the cost of the project (Kuehn, 2006).

The process that is required to ensure that the project is completed within the approved budget is included in project cost management. Project cost management is concerned with the cost of the resources needed to complete the project activities. It also focuses on the cost effect of the decisions made by the project team.

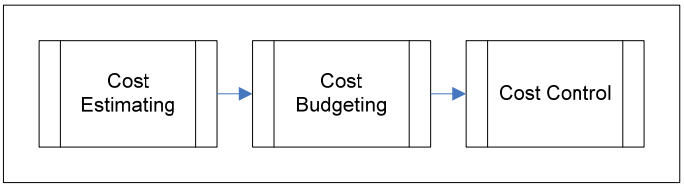

Figure 19-5: Project cost management process

19.1.4.1 Cost Estimating

Developing an estimate of the costs of the resources needed to complete the project activities is the first step in the project cost management process (Kinsella, 2002).

Costs must be estimated for all resources that will be charged to the project and are usually expressed in units of currency. A cost management plan will be formulated and describes how cost variances will be managed within the project.

Cost will influence the success of the ERP implementation. It is important to know exactly what each resource will cost and, even more important, what the resource will cost if the project is running behind schedule.

19.1.4.2 Cost Budgeting

Once the project team has done the cost estimating, they need to allocate the overall cost estimates to individual activities (Harris, 2000). This needs to be done to establish a cost baseline to measure the project performance.

The cost baseline is a time-phased budget and it will be used to measure and monitor cost performance on the project. The cost baseline is developed by adding the estimated costs per period.

An organisation budgets a certain amount of money for the implementation of the ERP system and it is responsible for ensuring that the ERP system is implemented within the budget. As each milestone is reached, the organisation must determine if the ERP implementation is still within the budget constraints and what corrective actions must be taken to ensure that the ERP implementation stays within the allocated budget.

19.1.4.3 Cost Control

Cost control is concerned with the following:

- Influencing the factors that create changes to the cost baseline
- Determining that the cost baseline has changed
- Managing the actual changes as and when they occur

Various techniques are used to manage the above points (Ansari, Bell & Swenson, 2006). A cost change control system defines the procedures by which the cost baseline may be changed. This change control forms part of the bigger scope management of the project.

An important part of cost control is to determine what causes the variance and then to decide if the variance needs any attention. The earned value integrates the project's cost and time information (Bonnal, De Jonghe & Ferguson, 2006). Earned value provides visibility to the critical areas and identifies the need for further attention.

Once the project team has been through the exercise of determining the critical areas, they must revise the cost estimates. These are modifications to the cost information used to manage the project. The project team must then also update the project budget to reflect the revised cost estimates.

19.1.5 PROJECT QUALITY MANAGEMENT

Although scope, time and cost play an important role in the duration of the project and if the project is perceived as successful, the quality of the product or system cannot be ignored (Conti, 2006). If the users of the new ERP system perceive that the system is below standard or does not meet their needs, then the system has failed. The user attitude is important to the outcome of the project as stated in chapter 2.

The quality of a product and service will determine the long-term success of the project. The PMBOK® Guide defines project quality management as the processes required to ensure that the project will satisfy the needs for which it was undertaken by addressing the management of the project as well as the product of the project (PMI, 2004a).

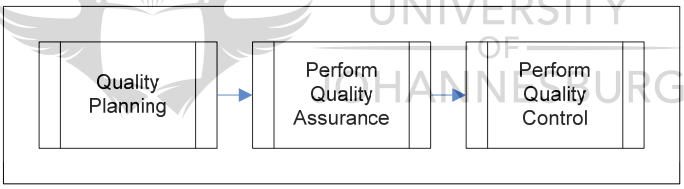

Figure 19-6: Project quality management process

19.1.5.1 Quality Planning

Quality planning identifies which quality standards are relevant to the project and determines how to satisfy these quality standards. Quality planning is one of the key facilitating processes during project planning and should be performed regularly and in parallel with the other project planning processes (Zwikael & Globerson, 2006).

Various documentation and processes form the basis of the quality planning process. The scope statement is a key input to quality planning since it documents all the major project deliverables.

The quality planning process must weigh up the benefit against the cost. The primary benefit of meeting the quality requirements is that rework is minimised, which in turn means higher productivity and lower costs for the project team.

The quality management plan will provide the project team input to the overall project plan and must address quality control, quality assurance and quality improvement for the project.

The project team will also define the operational issues such as what and how something is measured by the quality control process.

19.1.5.2 Perform Quality Assurance

Quality assurance should be performed throughout the project. It is the systematic process of defining, planning, implementing and reviewing the management processes within an organisation in order to provide adequate confidence that the product or service is adhering to the required condition (Cicmil, 2000).

This process will make use of the quality management plan and will seek continued improvement of the quality. It will increase the effectiveness and efficiency of the project.

Quality assurance in an ERP system is important. The quality of the ERP systems will determine the success of the project. For instance, the financial component must balance at all times and transactions cannot be lost or misallocated to the wrong accounts.

19.1.5.3 Perform Quality Control

Quality control is the process organisations go through to confirm that the product or service has reached the required condition. It defines the methods of inspection, in-process inspection and the final inspection to confirm that the product or service has met the required condition.

The required condition of the delivered product or service is laid down in the scope of work, specifications and the project quality plan. It must be noted that quality control includes the product results as well as the project management results such as cost and schedule performance (Winters, 2001).

In an ERP system the quality is fairly easy to control and manage. For each financial transaction, a paper trail is available and it is easy enough to match the financial system to the paper trail.

19.1.6 PROJECT HUMAN RESOURCES MANAGEMENT

Project human resources management is a vital link in project management. The selection of team members and the development of the team are crucial to the success of the project. One of the components of the ERP model is the customer mindset. The customer mindset is influenced by the team as described in section 2.4.4.2 of chapter 2.

Project human resources management revolves around the processes required to make the most effective use of the people involved in the project. The process is illustrated in figure 19-7.

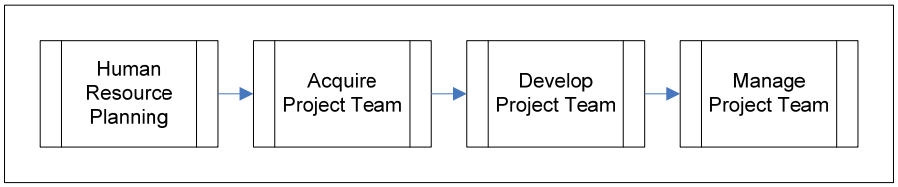

Figure 19-7: Project human resources management process

19.1.6.1 Human Resource Planning

This step involves the identification, documentation and assignment of project roles and responsibilities to the team members. It also identifies the reporting structure and relationships amongst the team members.

The individuals and groups may be part of the organisation or they may be external to the organisation, such as consultants. A typical ERP project team will consist of internal individuals who know the organisation and its processes, as well as the ERP consultants (Brown, 2000) who will be external to the organisation and will bring ERP expertise to the project team.

Project roles (who does what) and project responsibilities (who decides what) must be assigned to the individual team members. These responsibilities and roles are linked to the project scope. The organisation itself plays a vital role in the selection of the team members and the way the organisation deals with the team members. This influence is illustrated in section 2.4.4.3 of chapter 2.

19.1.6.2 Acquire Project Team

Once the roles and responsibilities have been defined, the next step is to employ the necessary human resources (Baiden, Price & Dainty, 2006). These selected resources must meet the project requirements.

The members selected to form part of the project team must as far as possible be people who are experts in their identified fields and must have experience. Although this is not always possible, it will reduce the risk of the ERP implementation running late or over budget. Experienced people know the shortcuts and they will complete an activity in a shorter time frame and the quality of the product will be better.

19.1.6.3 Develop Project Team

Team development includes (i) enhancing the individual's contribution to the team as well as (ii) enhancing the ability of the team to function as a team. The development as a team is a critical to the project's ability to meet its objectives (Rose, 2003).

Several strategies can be applied to strengthen the team as a unit. These strategies include team-building activities and collocation where the entire team is located on the same premises.

A well-functioning team's performance will improve. This improvement can be reached by improving either the individual members' skills or the team's behaviour. Improvement in the team's performance will help in the identification and development of better ways of doing the activities assigned to the team.

Team development is a crucial aspect of an ERP project since it is such a large project and includes a lot of people from different divisions, organisations and cultures. It is the responsibility of the project manager to develop and coerce the individuals into a strong team with one aim. This aim is to implement the ERP system on time, within budget and to deliver a quality product.

19.1.6.4 Manage Project Team

This process determines the impact of the individual resource on the performance of the team. The influence and attitude of the user is one of the modules of the ERP model discussed in chapter 2. This process tracks the performance of the individual team member, resolves conflict situations between the team members and provides feedback to all the members.

Team dynamics are of the utmost importance during the implementation of an ERP system. This is due to the duration of the project as well as the stress and long working hours involved during the implementation. It is the responsibility of the project manager to ensure that individual team members do not upset the performance of the project team as a unit.

19.1.7 PROJECT COMMUNICATIONS MANAGEMENT

The PMBOK® Guide (PMI, 2004a) defines project communications management as the processes required to ensure timely and appropriate generation, collection, dissemination, storage and ultimate disposal of project information. It provides the critical links among people, ideas and any information necessary for the success of the project. The following figure shows the project communications management process:

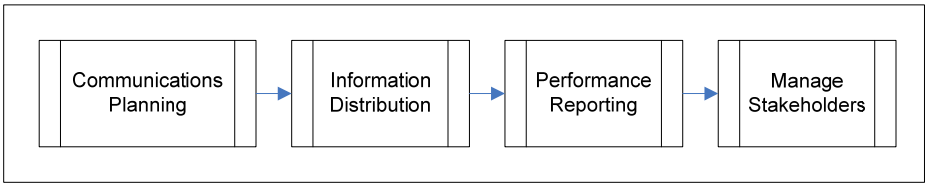

Figure 19-8: Project communications management process

19.1.7.1 Communications Planning

The first step is to determine the type of information and communication channels that must be sent and used by the project team. It is important to decide who needs what kind of information, when they will need it and how it will be given to them.

The project manager and project office are at the heart of the project's information control system. It is the project manager's responsibility to develop the project's lines of

communication. Every effort should be made to include all the key people in the project's line of communication. Excluding someone will limit their knowledge of the project and result in a hostile and negative attitude to the project.

The communication within an ERP project must be distributed to everyone on the team as well as to the project sponsor. Communication is vital because the ERP team involves a lot of people and their actions and activities influence the organisation as a whole. The project office as the central point of the ERP system implementation must distribute the information to the relevant role players.

19.1.7.2 Information Distribution

Once the desired lines of communication are established, it must be decided how and what will be communicated to the individual members of the project team. Project information may be distributed using a variety of methods. The method of distribution will depend on the type of information being distributed as well as who will receive the information (Vathanophas & Liang, 2006).

Information can be distributed electronically to the different team members because of the size and logistics of the ERP project team. It is, however, also important that regular project meetings be held to keep the personal touch and involvement. Team members will become distanced from the project if they receive all communication via an electronic format.

The project manager must also realise that all the information relating to the ERP implementation cannot be sent and distributed to all the project members. It must be clear who will receive what kind of information. The project sponsor can receive only the overall status of the project such as the time and budget implications. It is important that all the information be kept at a central place and that any member of the team can access it. This will prevent that the team members from feeling excluded from some of the information and becoming suspicious and negative towards the project.

19.1.7.3 Performance Reporting

It is important for the project team to report on the status of the project (Kay, 2002). This report will include the current status of the project, progress made by the project team and forecasting. The forecasting will predict the project status and progress made.

Progress reporting in an ERP implementation must be done on a regular basis and any deviances from the project baseline must be addressed to ensure that the project keeps on track. The size of the project and the team again plays a role. Some members of the team might think they are on track while they are actually influencing other members to be late. The project manager must communicate this progress to all the team members as well as the influence of each group in the team on the performance of other groups.

19.1.7.4 Manage Stakeholders

The management of stakeholders is the responsibility of the project manager. He/she manages any communications between the stakeholders and resolves any issues with the stakeholders. If the ERP implementation forms part of the bigger picture of the organisation, then there are several stakeholders that the project manager must keep satisfied and informed. The stakeholders will range from the organisational directors down to the users that will use the ERP system on a daily basis.

19.1.8 PROJECT RISK MANAGEMENT

Project risk is an uncertain event or condition that has a positive or a negative effect on a project objective if it happens. In other words, any event that prevents or limits the achievement of the project's objectives as defined at the outset of the project is a project risk. Project risk management is the systematic process of identifying, analysing and responding to project risk. This means that the consequence of positive events must be maximised and that of negative events minimised. The organisation must be committed to address risk management throughout the project. Figure 19-9 shows the processes that the project team must entertain to identify and manage the risks.

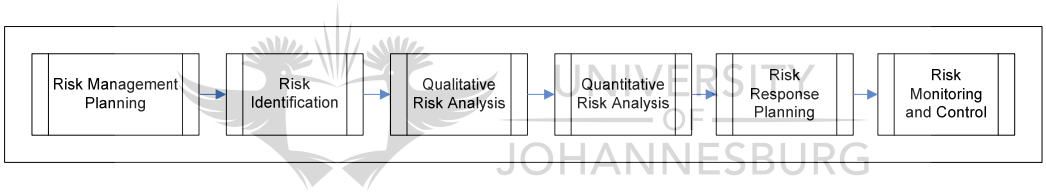

Figure 19-9: Project risk management process

19.1.8.1 Risk Management Planning

Risk management planning is the process of deciding how to approach and plan the risk management activities for a project. It is up to the project team to develop the risk management plan, which will describe how risk will be identified, what the response will be and how it will be monitored and controlled. This process will be performed throughout the project life cycle. The objective of risk management planning is to plan to prevent failure.

Risk is part of any project but is more of an issue in an ERP environment owing to the nature of ERP projects. The size and complexity of the ERP project ensures that there are more risks involved and it is necessary to have an all-encompassing risk management plan.

19.1.8.2 Risk Identification

Risk identification is probably the most important part of the risk management process because any risk that the project team cannot identify will be excluded from further analysis. The process of risk identification is a continuous one and several techniques can be used to identify risks.

According to Fajardo (2005), the following are some risks specific to an ERP implementation:

- ***Inadequate "as-is" documentation:*** Information is omitted during the analysis phase (section 2.4.6.2 of chapter 2) and the new ERP system is designed based on available documentation. The completed ERP system will not address the organisational needs, as information was omitted.
- ***The requirements are not scrubbed:*** Organisations that implement ERP solutions normally draft the requirements ahead of making a decision to implement an ERP system. The requirements are then incongruent with the capabilities of an ERP system.
- ***No scope verification:*** The organisation implementing the ERP system feels that the ERP solution does not address all of its business needs based on the documented scope and that the end-users cannot perform tasks that were easily executed within the legacy systems.
- ***Knowledge disappears:*** Although a high team resource turnover is inevitable in most ERP implementations, there are some pointers that can be used to mitigate the damage that the departing resources cause to the project.
- ***Neglecting the end-user:*** The delivery of integrated data by the ERP system deprives the end-users of making data adjustments or on-the-fly changes that were common with legacy applications. Other common problems that ERP end-users face are finding data, producing the right reports and increased complexity owing to the integration.

19.1.8.3 Qualitative Risk Analysis

The next step after identifying all the risks is to qualify the probability of the risk occurring and the likely impact of the risk on the project. Risk qualification determines what areas of risk warrant a response and then prioritises the risks.

The identification and qualification of risk in an ERP project can lead to the downfall of an organisation if the risks were not properly identified. For instance, failure to implement the CRM module will be a risk to the organisation, but the influence on the organisation is not that high because the organisation can live without it for a month. Invoicing and paying of accounts is crucial to the organisation and will have a severe impact if the organisation cannot invoice for its services and products delivered.

19.1.8.4 Quantitative Risk Analysis

The analysis is performed on risks that have been prioritised by the qualitative risk analysis process. The process analyses the effect of the prioritised risks and assigns a numerical rating to the risks. This process uses techniques such as Monte Carlo simulation (Williams, 2004) and decision tree analysis.

19.1.8.5 Risk Response Planning

The project team needs to develop a risk response plan which defines ways to address adverse risk and enhance opportunities before they occur. According to Taylor (2006),

project managers must handle project risks and problems arising in ERP implementations proactively. Risk response planning must take place during the initial phases of the ERP implementation and is part of the pre-analysis and analysis phases of the ERP methodology.

19.1.8.6 Risk Monitoring and Control

A process must be in place to keep track of the identified risks, monitor residual risks and identify new risks as they come along. Risk monitoring and control are ongoing processes for the life of the project. Risk control may involve choosing alternative strategies and implementing a contingency plan.

Controlling and managing the risks will influence the outcome of the ERP project. The project manager must ensure that close controls are put on each of the risks that were identified. Even the lesser risks can grow to huge risks if they are not managed well.

The next knowledge area is the procurement of resources for a project.

19.1.9 PROJECT PROCUREMENT MANAGEMENT

Although procurement is not included in the ERP business model, it forms part of the software component and is essential for the SCM process.

Project procurement management deals with the acquisition of goods and services required to perform the project's scope of work (PMI, 2004a). This could be drawings, materials, equipment or professional services. It is important to identify the items which have a long lead time.

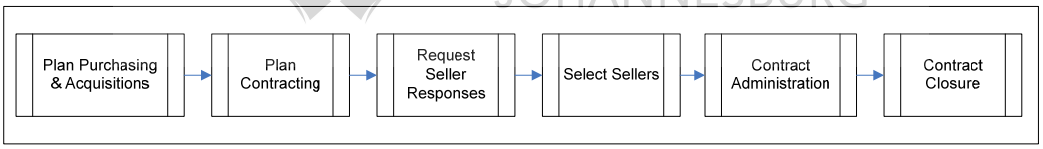

Figure 19-10: Project procurement management process

19.1.9.1 Plan Purchasing and Acquisitions

This is the process of identifying what products and services are best procured outside the project organisation. The project team will end up with a procurement management plan that will describe how the remaining procurement processes will be managed.

A lot of procurement is involved during the initial stages of an ERP implementation. This procurement can be to obtain certain skills that the project team does not have or the procurement of hardware and software for the ERP system.

19.1.9.2 Plan Contracting

This step in the procurement management process will provide guidelines on how the solicitation process will proceed.

Two criteria are of importance to the project team:

- ***Procurement documents:*** These documents are used to solicit proposals from prospective sellers. They should be structured to facilitate accurate and complete responses from the prospective sellers. The documents should always include the relevant statement of work (SOW), a description of the desired response and any contractual provisions.
- ***Evaluation criteria:*** The evaluation criteria will be used to rate or score the proposals. They are often included in the procurement documents. The project team must decide on the evaluation criteria.

19.1.9.3 Request Seller Responses

This process involves obtaining bids and proposals from sellers. Most of the work is done by the sellers and with no cost to the project. Once the sellers have read and understood the procurement document provided to them by the project team, they will in return provide the project team with a proposal.

This proposal will describe the ability and willingness to provide the requested product or service. These proposals are in accordance with the standards and methods stipulated in the procurement document. This process is managed by the supplier relationship management module of the ERP system and is described in section 2.4.2.5 of chapter 2.

19.1.9.4 Select Sellers

Once all the proposals have been received, the project team must make a decision on who will provide the necessary product or service. Many factors play a role in the decision process and price is but one of these. The evaluation criteria that formed part of the procurement document will form the basis of the selection process.

A contract will be signed with the preferred supplier. The contract will force the provider to provide the specified product and it obliges the project team to pay for the product or service.

19.1.9.5 Contract Administration

This is the process of ensuring that the provider's performance meets the contractual requirements. It means that the provider must deliver the right product, at the right price, at the right date and time.

The provider will be monitored closely during this process and performance reporting will indicate how effectively the provider is achieving the contractual objectives. The payment performance of the project team is also measured as the opposite part of the contract. Payments to the supplier must be made as stipulated in the contract.

19.1.9.6 Contract Closure

This process deals with the closure of all contracts and goes hand in hand with the close-out project process of project integration. It includes resolving open items and closing each contract as it is applicable to a certain phase in the project or the project as a whole.

20 APPENDIX E – COMPARISON BETWEEN PRINCE2 AND PMBOK® GUIDE

According to Furlonger (2002) and Pudusserry (2006), the following table illustrates the major differences between PRINCE2 and the PMBOK® Guide.

	PRINCE2	PMBOK® Guide
Approach	Based on what a project manager should do during a project.	Based on what a project manager should know.
Style	Less prescriptive. Specifies what project managers should do but leaves the how more open to interpretation according to circumstances.	More prescriptive. It expects project managers to perform certain tasks in the course of conducting the project using specified tools and techniques.
Project control	Less rigorous approach.	More rigorous approach by using earned value management.
Business case	Starts from the business case for the project. All projects should be driven by the business case for implementation.	Focuses more on knowledge than on the application of knowledge. It focuses less on initial and continuing assessment of the business case.
Project structure	Emphasises the project structure. Sets out the terms of reference for a project board to control the project and says who should sit on the board. This is designed to minimise scope creep, give the project manager a clear reporting line and reduce project risk.	No formal project structure description.
Deliverables	• Concentrates on the deliverables for a project. • Omits aspects of project management such as contract management and people management because they are less about deliverable production and more to do with the general skills of management.	• Less concerned with deliverables. • Covers aspects of project management such as contract management and people management.

Table 20-1: Differences between PRINCE2 and the PMBOK® Guide (Adapted from Furlonger (2002) & Pudusserry (2006))

The differences that are listed in table 20-1 illustrate that PRINCE2 deals with the way a project should be run but the PMBOK® Guide deals with the skills of the project manager and what should be done.

Wideman (2002) agrees with Furlonger (2002) but adds some additional differences as he believes that there are more differences than just the ones Furlonger (2002) mentions. Table 20-2 illustrates the additional differences between PRINCE2 and the PMBOK® Guide:

	PRINCE2	PMBOK® Guide
Project life cycle		
Management levels & responsibilities	• A project manager is the person given the authority and responsibility to manage the project on a day-to-day	• A project manager is someone who is responsible for managing a project. • Does not recognise the term “project

	basis to deliver the required products within the constraints agreed with the project board. • The overall responsibility lies with the project board, which is chaired by a person called the executive. The executive ensures that the project maintains its business focus and that the work is actively managed.	board" but uses the term "sponsor". The sponsor is one of the project's stakeholders and is defined as the individual or group within or external to the performing organisation that provides the financial resources, in cash or in kind for the project. It can be concluded that it is the project manager who is firmly in charge.
Authority documentation	• PRINCE2 tends to be heavy on documentation. The first document is the project mandate that authorises the cost and resource usage associated with the size and type of project. The project mandate is converted into the project brief once the "Starting up a Project" process begins. The project brief feeds into the "Initiating a Project" process and a "Project Initiation Document" or PID is generated.	• The PMBOK® Guide does not recognise either the business case or the project brief. • The PMBOK® Guide's equivalent of the PID is the project charter. The PMBOK® Guide defines a project charter as a document issued by senior management that formally authorises the existence of a project and it provides the project manager with the authority to apply organisational resources to project activities.
Special management roles	• Does not define management jobs but prefers to define roles that may be allocated, shared, divided or combined according to the project's needs. • Introduces a number of other distinctive roles to facilitate its methodology. • Does not discuss the subject of people management. • Describes in detail the responsibilities of ten project management team roles.	• Discusses the topic of people management.
Document description outlines	• Includes descriptions of 33 standard management products that are invoked through the PRINCE2 methodology.	• The PMBOK® Guide does not describe any document except the lessons learned document. This document is also part of the PRINCE2 documentation.
Planning & scheduling	• Product-based planning is a key feature that provides a focus on the products that must be delivered and their quality. It forms an integral part of the planning process and leads to the use of other generic techniques such as network planning and Gantt charts.	• Planning is seen as part of key general management skills and is one of the five process groups applied to each phase. It is therefore recognised as an ongoing effort throughout the life of the project.
Control	• Control of the technical work is exercised through the authorisation of work packages. Control is all about decision-making and is central to project management. • Change control is a procedure designed	• Change control is discussed as part of project integration management, and, like planning, is referenced in many of the other chapters.

	to ensure that the processing of all project issues is controlled, including submission, analysis and decision-making.	

Table 20-2: Additional differences between PRINCE2 and the PMBOK® Guide (Adapted from Wideman (2002) and Furlonger (2002))

21 APPENDIX F – ARTICLE PRESENTED AT *PMSA INTERNATIONAL CONFERENCE 2004*

Marnewick, C. & Labuschagne, L. (2004). *A Framework for aligning projects to organisational strategies*. Conference proceedings of the PMSA International Conference. Conducted by Project Management South Africa. Johannesburg: PMSA.

A FRAMEWORK FOR ALIGNING PROJECTS TO ORGANISATIONAL STRATEGIES

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ABSTRACT

This article suggests a framework to align projects to organisational strategies. The aim and purpose of the framework is to ensure that the right projects are initiated and that they are aligned to the organisational strategies. The first objective is to determine who in the organisation is accountable and responsible for the initiation of projects and what the impact on the organisation is, if these projects are failures. The second objective is to classify new initiatives as these new initiatives might be a project or a programme. The question that must be answered is how to classify new initiatives and this framework will suggest such a classification. The third objective is to provide a method for selecting the right projects to ensure that they form part of the organisational strategies. The framework will enable managers to distinguish between the different strategies within the organisation and to align projects to these strategies. The value of the framework is two-fold: firstly it is important to realise that there are different strategies within an organisation and that projects and programmes can be used to fulfil these strategies and that it is not just the responsibility of the directors to determine and implement strategies. The second benefit is that managers realise that they are accountable for the decisions that they make. If a project is not aligned to the organisational strategies, then they must take the penalties that go with the project or programme failure.

Keywords: Organisational strategies, portfolio management, programme management, project management, framework.

INTRODUCTION

This article will provide middle and top management with a framework that will enable them to align all projects within the organisation to the strategies of the organisation.

Such a framework is important to an organisation because one out of four ERP projects is over budget and some twenty percent are terminated before completion. ERP projects fail to achieve business objectives even a year after the system was implemented. The Return-on-Investment (ROI) also takes six months longer than expected. This is caused by projects that are not aligned to the strategies within the organisation [1]. Projects are often started and cancelled without any consideration if these projects are in alignment with the organisational strategies.

The idea of a framework came to the foreground after reading about how many projects do fail and through personal experience in the field of ERP projects that are late and do not meet the criteria defined upfront. The failure rate in ERP projects is noted throughout and many articles were written and research done to address the issue, but still ERP projects are classified as failures. The idea of the framework is to align ERP projects to the vision and strategies of an organisation and to determine if ERP projects should be managed in a different way.

The framework is built on two legs: the one being the different strategies within an organisation and the second focusing on portfolio, programme and project management. These two legs are joined at the hip by the alignment of portfolio, programme and project management to the organisational strategies.

DECISION-MAKING HIERARCHY

To deal effectively with everything that affects the growth and profitability of an organisation, executives employ management processes that will position the organisation as optimally as possible in its competitive environment by maximising the anticipation of environmental changes and of unexpected internal and competitive demands.

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This approach is known as strategic management. Strategic management is defined as the set of decisions and actions that result in the formulation and implementation of strategies designed to achieve an organisation's objectives[ii]. A strategy is a large-scale, future-oriented plan for interacting with the competitive environment to achieve the organisation's objectives.

According to Pierce and Robinson[1] the decision-making hierarchy of an organisation contains three levels. The fourth level that is added, is one on which the strategies of the organisation are executed, at the operational level. The three levels of Pierce and Robinson plus the additional fourth level must all form part of the organisational vision, illustrated in figure 1.

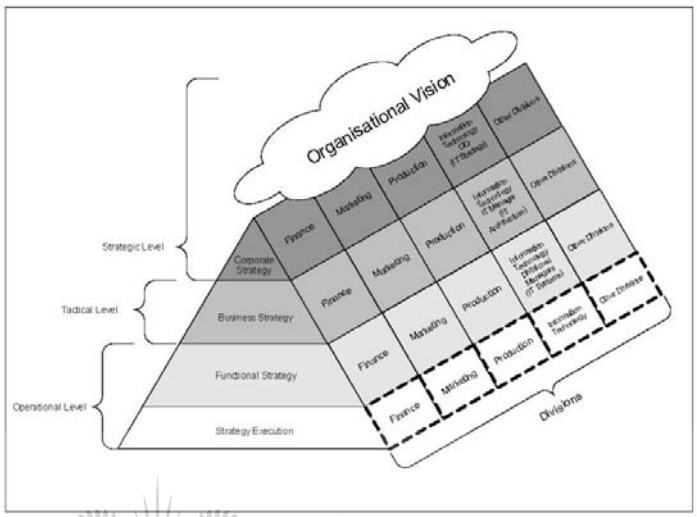

Figure 1. Decision-Making Levels.

The organisational vision describes the objectives of the organisation and together with the corporate strategy of each division, will form the strategic level of the organisation. It is clear from figure 1 that each division within the organisation will have its own corporate strategy that will be derived from the vision of the organisation. Multiple strategies, therefore, exist, for example a financial corporate strategy and a marketing corporate strategy. The same applies to the business and functional strategies. Each division within the organisation will have more that one business strategy to implement the division's corporate strategy and there will be many functional strategies within a division that will be used to implement the business strategies of a division. For the purpose of this article, we will be focusing on the Information Technology division within the organisation.

The relationship between the different levels is a one-to-many relationship where, for example, one corporate strategy will lead to several business strategies and more than one functional strategy is necessary to accomplish a specific business strategy.

The different strategic levels are determined by the vision of the organisation. The implication of this is that strategic levels are not without any foundation but are upheld by the organisational vision. Each of these strategic levels will be discussed to explain how they are tied together.

Organisational Vision

The vision of an organisation is a statement by the organisation regarding where it sees itself in three to five years. This is a subjective statement and may refer to market share or positioning within the industry. The vision of an organisation can, for example, be that it wants to be the number one food company in Africa, or to be a leading food commodity business. The objective of the organisation is thus to become the number one food company in Africa and this objective is implemented by means of corporate strategies for example the financial, marketing or production strategies. These different strategies have one purpose and that is to

execute and fulfil the organisational vision.

Corporate Strategy
Each division will have its own corporate strategy and this is at the top of the hierarchy level. Corporate strategies are determined by the board and these strategies span the activities and functional areas of the organisation. The board of directors exploits its organisation's distinctive competencies by adopting a portfolio approach to the management of its businesses and by developing long-term plans[2].

Each division within the organisation will have a corporate strategy that is formulated from the vision of the organisation. This corporate strategy will address the objectives of the organisation as set out in the vision. The corporate strategy of every division will form part of the organisation's overall vision. The outcome and results of decisions that are taken at this level can only be measured over a number of years. This means that the corporate strategy of a division has a long-term focus.

The members of the board are accountable for decisions taken at this level. This means that the CIO as an individual would be accountable and liable for any failures within the organisation if the corporate IT strategy that he envisioned did not benefit the organisation. The question that the CIO should ask himself is what his division must do to help achieve the organisation's objective? This can, for example, be achieved by having all information technology systems integrated and standardised in order to access information timeously.

Each divisional corporate strategy must be broken down into manageable and tangible strategies and it is the purpose of the business strategies to fulfil this function. The IT manager, for example, might be responsible for performing this function and he will break the corporate IT strategy into smaller sections to form the different business strategies of the IT division.

Business Strategy
In the middle of the decision-making hierarchy is the business level composed of business division managers. These managers must translate the corporate strategies into concrete objectives and strategies for their individual business divisions. The business managers determine how the organisation will compete in the selected market. They will strive to identify and secure the most promising market segment within that arena. This segment is the piece of the total market that the organisation can claim and defend because of its competitive advantages.

The outcome of decisions at this level will be measured over a medium term period. The people involved in the decision-making process can only be evaluated at the end of this period. Since the corporate to business strategy ratio is a one-to-many relationship, a few business strategies will be devised to fulfil the corporate strategy of a division. Given the example above of the IT strategy, the IT manager might have a business strategy to implement an Enterprise Resource system (ERP) to achieve the integration of all information systems. He might also have another business strategy to standardise on a specific software platform to ensure uniformity within the organisation. These business strategies must be complimentary and support the corporate IT strategy.

The third level within the decision-making hierarchy is the functional strategy. Together with the strategy execution level, it is also known as the operational level of the organisation.

Functional Strategy
Managers at this level develop annual objectives and short-term strategies. Their principal responsibility is to implement the functional strategies of a specific division and they use project management as a methodology to implement these functional strategies. Whereas corporate and business level managers center their attention on doing the right things, managers at the functional level focus their attention on doing things the right way. The functional level within the IT division will focus on, for example, the implementation of the different components of the ERP system such as the software and change management components.

The results of decisions can be seen in a short time frame and mistakes or poor decisions can also be rectified within a shorter time frame. The sectional managers within the IT division are the people responsible for the functional strategies and they will implement the functional IT strategies in the organisation. They are the people in charge of the hardware or networking sections. They will, for example, implement the hardware as well as the topology of the network that is needed for the ERP system. This level is where the management of the implementation happens. The sectional managers will use the principle of project management to implement these functional strategies.

The section managers involved in the decision making process will only be responsible for the outcome of the decisions and will not be accountable for the decisions made.

Strategy Execution
This is the level on which people will do the physical work i.e. the projects as decided on by the sectional managers and the completion of the work will fulfil the functional strategy of the division. The people at this level are responsible for the work that they do and their performance will be measured against the standards of the organisation.

On this level, the ultimate success or failure of the divisional corporate strategy is determined. If this is not executed according to the functional strategies, the product or service that forms part of the divisional corporate strategy will be a failure.

This level is also the level on which project execution takes place. The functional strategy level is the level where the project management of the functional strategies takes place but the project execution takes place at the fourth level. Specialised project management might be utilised for the execution of the projects. Software project management might be used to implement the software component of the ERP system. The project management methodology that will suit the implementation the best must be used to ensure success.

Project management is used to implement the functional strategies of the organisation. The question that must be answered is what management principles can be used to implement corporate and business strategies. This brings portfolio and programme management into the equation. Portfolio, programme and project management should be aligned to the three organisational levels. This cannot be done without understanding the different decision-making levels and the responsibilities that go with it. It will also provide the link between corporate decision-making processes and the management of projects.

THE 3P'S: PORTFOLIO, PROGRAMME AND PROJECT MANAGEMENT

The management of projects can also be divided into three management and decision-making levels. These three levels are portfolio, programme and project management. The Concise Oxford Dictionary[5] defines the terminology as follows:

Portfolio - A range of investments held by a person or company. An organisation will have multiple investments such as a product or service offering. These investments will be part of the portfolio of the organisation. A portfolio manager will manage the investments within the portfolio.

Programme – An undertaking by an organisation to achieve business actions [5]. An organisation will have multiple business actions for example the opening of a new mine or the launch of a new product or service. A programme manager will look after each of these business actions to ensure that they are implemented.

Project – a plan or a scheme or a planned undertaking

A portfolio within an organisation will focus on the different investments of the organisation and will analyse and manage these investments to achieve the optimum investment for the organisation. Business actions can be used to implement an investment such as the establishment of a new product or service. A group of business actions will be used to implement an investment within the portfolio. A business action will be to market the new product and another business action will be the delivery of the product to distribution points. The related business actions will be grouped in a programme and a programme manager will oversee the execution of these business actions. A plan of action – a project - is needed by a programme manager to execute these business actions. A programme will have many projects and the projects will focus on the execution of many tasks.

These definitions of portfolio, programme and project can be related back to project management. A project could, for example, be the implementation of the software component of an ERP system, the installation of the network environment or the customisation of the software itself. All these projects will form part of one IT programme and the purpose of this programme is to implement an ERP system. The programme itself will form part of the IT portfolio because it is an investment by the organisation in technology.

This one-to-may relationship between portfolio, programmes and projects is illustrated in figure 2.

The following section will explain portfolio, programme and project management in detail and will show how these management techniques can help an organisation to fulfil the various strategies of the organisation.

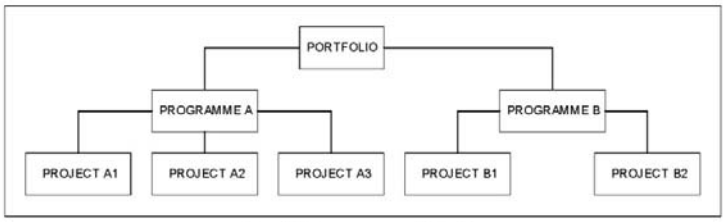

Figure 2. Management relationship.

PORTFOLIO MANAGEMENT

Portfolio management within the IT division provides a holistic view of the IT portfolio across the enterprise and the alignment of IT with the organisation's vision[6].

Portfolio management can also help an organisation gain control of its IT projects and deliver meaningful value to the business [7]. The IT portfolio is managed like a financial portfolio: riskier strategic investments (high-growth stocks) are balanced with more conservative investments (cash funds) and the mix is constantly monitored to assess which investment are on track, which need help and which should be shut down. The IT portfolio will comprise riskier strategies such as the implementation of e-commerce and more conservative investments e.g. to standardise on a specific vendor's products and technologies. Different methods and tools can be used to determine if a strategy will be riskier or more conservative such as Net Present Value, Payback Analysis, Expected Monetary Value and Return on Investment. Portfolios are based on two criteria: the strategic value to the organisation and the return-on-investment. These two criteria will form the y-axis and x-axis and if a portfolio is of high strategic value and will produce a good return-on-investment, then the portfolio will be executed [8]. This principle applies to IT portfolios as well. The opposite is also true where a portfolio does not provide a strategic value or a good return-on-investment. Such a portfolio should be examined.

Standards for Portfolio Management

There is currently no internationally accepted standard for portfolio management. The Project Management Institute (PMI) is busy with the development of such a standard that will incorporate portfolio and programme management[10]. Due to the absence of an internationally accepted standard, different models have been developed to allow organisations to implement and utilise portfolio management.

Portfolio Management Redefined

There is currently no consensus on what portfolio management is and what it is supposed to achieve. Portfolio management, for the purposes of the suggested framework is defined as follows:

Portfolio management is the management of multiple related programmes with the purpose of executing and controlling the corporate strategy of an organisation.

Portfolio management, as defined above, does not involve any projects but rather, focuses on programmes that are used to implement the corporate strategy.

Roles and Functions of a Portfolio Manager

The portfolio manager might, for example, be the director of a division within the organisation. The IT portfolio manager may be, for example, the CIO and will be responsible for the IT portfolio. Investments made within the IT portfolio might be to provide an integrated information system and the standardisation of the IT hardware and software.

The most important responsibility of the portfolio manager is to have a framework in place to define, evaluate and initiate new programmes. This should be the primary role of the portfolio manager because he will be ultimately responsible and accountable for each individual programme within the portfolio.

The portfolio manager is also responsible for the overall health of his portfolio and will report periodically on the status of the portfolio to the board. The portfolio manager could use a digital dashboard that will show each programme's status related to programme constraints as well as a summary of each programme.

Another responsibility is the appointment and management of the programme managers and he must ensure that qualified and capable people are appointed.

Benefits of Portfolio Management

Portfolio management must have concrete benefits for the organisation to justify the role of portfolio management.

Strong portfolio management allows the following:

- Maximises the value of IT investments while minimising the risk. This is accomplished by aligning the IT portfolio with the corporate IT strategy. This will eliminate programmes that do not form part of the overall corporate IT strategy [5]. It will ensure a balance avoiding too many risky programmes within the portfolio. It might be that all the risky programmes fulfill the corporate strategy but will be accommodated due to its risk.
- Encourages the board of directors to think "team," not "me," and to take responsibility for portfolios. Corporate governance dictates that directors are held personally accountable for the success or failure of an organisation. In South Africa, the King II report states this very clearly. It must be noted that a portfolio is dynamic and will always have new programmes that start and existing ones that finish[10].
- Makes it easier to kill programmes. A programme can be terminated at any time if it no longer meets the criteria of the portfolio and, in the long run, the different corporate strategies of the organisation.

PROGRAMME MANAGEMENT

The second level within the 3Ps is programme management and forms part of a portfolio within a division.

There are many definitions for programme management but all have one thing in common: programmes are concerned with managing a collection of projects[11].

Standards for Programme Management

PMI's Core Standard, A Guide to the Project Management Body of Knowledge (PMBoK), focuses on managing one project. Programme management evolved from project management and is all about the management of a collection of different, yet related, projects. Knowledge of the PMBoK will be an advantage to the programme manager but this knowledge is not enough to manage a programme.

Different models have been developed by various people and organisations to fill the need for programme management. These models are widespread and are often only used by the specific developer.

Programme Management Redefined

There is still no consensus on what programme management is so, in light of the proposed framework, it is necessary to define programme management as follows:

Programme management is the management of a collection of related projects with the purpose of executing and controlling the business strategy of an organisation.

According to this definition, programme management involves projects and the successful combination and integration of these projects.

Roles and Functions of a Programme Manager

Given the definition of programme management, a programme within the IT division will determine the best way to implement the business strategies. The role of programme manager might be filled by the IT manager and he will be responsible, for example, for the implementation of the ERP system as a whole.

The programme manager must ensure that the programme is aligned to the business strategies within the corporate strategy. This will ensure that the programme's outcome will be in line with the corporate strategy and will help with the success of the organisation.

The programme manager is responsible for the overall health of each project and will report on the status of the programme to the portfolio manager. The programme manager will be responsible for the success or failure of the programme. At the end of the programme, some projects might be over budget and others under budget but the overall programme could still be within the budget.

The programme manager might implement the use of a digital dashboard to assist him with the management of the programme. The digital dashboard will consist of each individual project within the programme and will show the status of each project using the project success criteria. The programme manager will have an eagle's view of the programme and he can zoom into each and every project to determine its progress.

Another responsibility is the appointment and managing of project managers. He must ensure that qualified and knowledgeable people are appointed as project managers. The project managers will be responsible for individual projects within the programme.

Benefits of Programme Management

The main benefit an organisation can expect from programme management is that large-scale changes within the organisation, is too complex for one person to manage in one project for example the implementation of an ERP system[7]. Risk of failure is directly proportional to size and complexity.

Whilst a project creates a deliverable, programme management is the orchestration of business results.

It can be said that programme management benefits the organisation on the:

- Delivery of change - organisational change can be made more effective because changes can be planned and implemented in a holistic and integrated fashion without jeopardising current business activities[12].
- Alignment between business and corporate strategies - programme management processes act as a glue that binds the business and corporate strategies to avoid the traditional gaps most organisations fall into.
- Resource management - the programme manager will have an eagle's view of the resources within the programme and the individual projects within the programme. The programme manager will be at liberty to re-allocate resources to individual projects to ensure that they are successfully completed [13].
- Infrastructure - by establishing a Programme Support Office, the programme manager will be able to have all the projects managed in the same way. The same methods and standards can be used throughout the organisation and the criteria for success can be universal. This could provide a basis for a measurement standard for project success.
- No duplicate projects – programme management ensures that all projects are unique within the organisation. This is possible because all projects must be defined by a programme.

Examples of programmes within the IT portfolio will be the implementation of the ERP system or the enabling of e-commerce for the organisation.

Projects form the basis of programme management and the next section focuses on project management and the role it plays in the fulfilment of functional strategies.

PROJECT MANAGEMENT

The difference between project management and general management lies in the definition of a project and what the project intends to deliver to the organisation and its stakeholders. The PMBoK defines a project as "a temporary endeavour undertaken to create a unique product or service[14]." According to PRINCE2, a project is "a temporary organisation that is needed to produce a unique and predefined outcome or result at a prespecified time using predetermined resources"[15].

The Association for Project Management's Body of Knowledge (APMBoK) in turn defines project management as "the discipline of managing projects successfully". "It comprises the management of all that is involved in achieving the project objectives safely within agreed time, cost, technical, quality and other performance criteria" [16].

It is clear from the above definitions that there is agreement on what project management is and it is therefore not necessary to derive a new definition for project management.

Standards for Project Management

The standard that is used in the Americas, South Africa and Australasia is the Project Management Institutes' Guide to the Project Management Body of Knowledge (PMBoK). The PMBoK is an inclusive term that describes the sum of knowledge within the profession of project management. It identifies and describes the subset of principles and practices that are generally accepted and applicable to most projects most of the time.

Roles and Functions of a Project Manager

The project manager's role and functions can be divided into two sections [17]. The first section is the performance competencies that the project manager must be able to master.

The second section is the personal competencies that a project manager must convey.

- Performance Competencies
  The PMBoK is divided into nine knowledge areas. Each knowledge area describes a portion within a project, for example, scope management or cost management. The project manager must have the competency to understand and be able to apply each knowledge area.
- Personal Competencies
  A project manager can have all the technical and theoretical knowledge of project management but this is of no use if it is not supplemented with personal competencies. These competencies entail issues such as assisting when one of the team members is trailing behind due to personal problems. Another example of a personal competency is to keep the project team focused for the duration of the project. Projects sometimes take a long time to implement and the team members might lose focus.

Benefits of Project Management

The benefits of using a project management approach follows on from addressing the needs of the project. The project manager is responsible for the development of a plan through which the project can be tracked and controlled to ensure that the project meets the preset objectives. To do this effectively, the project manager requires accurate and timely information. This information should be supplied by the planning system which outlines the scope of work and measures performance against the original plan.

The following are benefits of project management[xi]:

- Better allocation of resources. Resources can be re-allocated to other projects while waiting for the completion of an activity. This ensures that resources are not idle and are used optimally.
- Sense of belonging. The project team knows that the project they are working on supports the overall strategy of the organisation and that the success of the project will lead to the ultimate success of the organisation.
- From the sense of belonging flows motivation. The team members might be better motivated during the course of the project, making it easier for the project manager to maintain high levels of productivity.
- It provides an adequate definition and acceptance of project management roles and responsibilities and this, in turn, provides direction and solid decision-making.
- Confusion over what the project is expected to achieve is eliminated because sufficient definition of the required outcome is documented.

The 3Ps were described and definitions for these concepts provided to make a distinction between portfolio, programme and project management. Despite this, there might still be some confusion as the three do overlap. For this reason, a comparison of the 3Ps is given to provide an overview of their similarities and differences.

Comparing the 3Ps

Figure 2 illustrates the relationship between portfolio, programme and project management. From this figure it is clear that project management is the lowest entity in the relationship. Project management is used to implement a project on time, in budget and with a certain quality. Programme management is used to implement a group of projects that accomplish a business strategy such as the implementation of an ERP system. Portfolio management includes the management of all programmes within an organisation to achieve the organisational strategies.

Table 1. Comparison between Portfolio, Programme and Project Management.

DESCRIPTION OF COMPARISON	PORTFOLIO MANAGEMENT	PROGRAMME MANAGEMENT	PROJECT MANAGEMENT
STRATEGY	Aligned to the corporate strategy	Aligned to the business strategy	Aligned to the functional strategy
CONCLUSION	No defined end date. Portfolio will continue to introduce new programmes	Less well defined end date. Programme will continue until a defined organisational state has been reached.	Defined start and end date
DELIVERY FOCUS	Focuses on delivering benefits that will meet the corporate strategy	Focuses on delivering benefits and requires involvement after projects has ended. Every programme must directly benefit the business strategy in some way.	Focuses on delivering products.

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Table 1 continued

COMPLEXITY	High complexity. Interfaces with the corporate strategy and contains many programmes.	Medium complexity. Interfaces with the business strategy and contains many projects.	Low complexity. Focuses only on delivering defined products.
CHANGE	External environment. Need to constantly monitor and re-align the corporate strategy. The impact on the portfolio and programmes must be controlled and managed. .	External and internal environment. Exists in a world that is constantly changing. These changes need to be constantly monitored and their impact on the programme and its projects controlled and managed.	Internal environment. Projects have well defined borders. Change control is more structured and easier to control.
VIEW	Macro View. Considers the combined effect of a portfolio of programmes which produces synergistic benefits.	Mini View. Considers the combined effect of a programme of projects which produces synergistic benefits.	Micro View. Concerned with completing tasks that have been defined, on time, in budget and to acceptable quality.
TIME FRAME FOR RESULTS	The results and benefits are visible only after several years.	The results and benefits are visible after one to five years	The results are visible within a year.
RESPONSIBLE PERSON IN IT	The CIO will typically be the person performing the function of portfolio manager	The IT manager will typically be the person responsible for the function of programme manager	The divisional managers will typically be the persons responsible for the project management
ACCOUNTABILITY AND RESPONSIBILITY	The portfolio manager is personally accountable for the success or failure of the portfolio	The programme manager is responsible for the success or failure of the programme	The project manager is responsible for the success or failure of the project
FINANCIAL CONTROL	Approval of expenditure will be granted based on the viability of the investment.	Programme management will have a budget to execute the programme	Specific costs are allocated to a project and must be managed accordingly
INTERNATIONAL STANDARDS	No international standards available	No international standards available	PMBoK, APMBoK, PRINCE2
SKILLS REQUIRED	Strategic management, business management, portfolio management and programme management.	Business management, programme management and project management	Project management and application area skills.

At this point the 3Ps as well as the different strategy levels have been explained. The next section draws a parallel between these concepts and provides the framework for the implementation of strategies through the 3Ps.

RELATIONSHIP BETWEEN ORGANISATIONAL DECISION-MAKING PROCESSES AND MANAGEMENT OF PROJECTS

Figure 3 below illustrates the relationship between the 3Ps and the strategy levels within the organisation.

Each division within the organisation will have its own corporate, business and functional strategies. Each division will also have its own portfolio, programmes and projects.

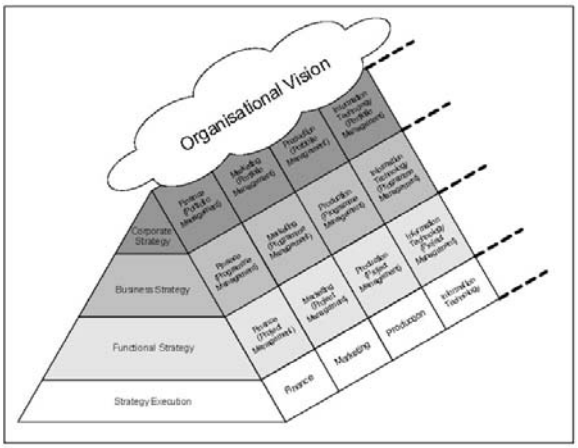

Figure 3. Relationship Model.

Portfolio Management and Corporate Strategy

The corporate IT strategy decides on the type and the scale of the portfolio. The purpose of the corporate IT strategy is to address the objectives defined by the organisational vision using a portfolio approach[iii]. Portfolio management on the other hand focuses extensively on the management of portfolios and to ensure that objectives and investments within the IT portfolio are well balanced. The corporate IT strategy will be managed by means of portfolio management to achieve the objectives of the organisational vision.

Each division within the organisation should have a portfolio and should be managed by the director of the division. The CIO should manage the IT portfolio and should ensure that the IT portfolio is in line with the corporate IT strategy. It is important that these are aligned otherwise discrepancies could start to emerge that might cause the corporate strategy to fail. The CIO should align this strategy with the portfolio and a programme manager should be appointed to implement this strategy.

Programme Management and Business Strategies

Business IT strategies are derived from the corporate IT strategy as explained earlier and translated into concrete objectives. The aim of programme management is to achieve business actions. The only way to achieve the objectives defined by the business IT strategies is to use programme management that will achieve these business actions. Each objective should be defined as a programme. The programme manager should determine the best ERP solution for the organisation.

Programme managers should manage the programmes within the portfolio. The programme manager should focus on a particular programme itself and should be responsible for the success of this programme. This implies that the programmes should consist of all the business strategies and that the execution and management of the programmes should ensure the successful fulfilment of the business strategies.

Project Management and Functional Strategies

Each business strategy within the IT division should be broken down into functional strategies that should set the annual objectives. These annual objectives should be classified as projects and be managed using project management.

The projects should then, by default, be aligned to the functional strategy and the successful completion of the projects should ensure that the functional strategy of the division is implemented as defined. The business strategy decided on the type of ERP system to implement and it is the functional strategies that should implement the ERP system. This implementation should be done using project management and different projects should be chartered to implement the different components of the ERP system.

The management of each project forms part of programme management and should be managed by individual project managers, but the overall success of the programme should be the responsibility of the programme manager. With the introduction of portfolio management to an organisation, projects cannot be undertaken within an organisation if they do not form part of the portfolio of the organisation. This should ensure that all projects within the organisation have a better chance of being successful, not just because they are on time and within budget, but because they support the corporate strategy in the long run.

CONCLUSION

The opening statement of this article is that most ERP projects are late and do not deliver the return-on-investment anticipated by the organisation. The framework discussed in this article is an attempt to provide an organisation with the means to align ERP projects to the business strategies and determine if this really is what the organisation needs.

The main benefit of the framework is that it provides the organisation with a top-down approach when selecting projects. This means that all projects must flow from the strategies of the organisation preventing rogue projects. The corporate strategy dictates the portfolio and what programmes and projects are, in turn, needed to fulfil the corporate strategy. No single project can be started without any consideration to the vision and strategies of the organisation. .

Another benefit the framework delivers is how initiatives are classified. ERP system implementations are often classified as projects but the sheer magnitude and strategic importance of the ERP system dictates that it should be managed as a programme. The framework helps with the correct classification of initiatives as either programmes or projects and this classification can only be done using the top-down approach.

More organisations are starting to realise the benefit of following a structured approach to executing projects. Project Management as a discipline has matured over the years. The next step for those organisations that have achieved maturity is programme and ultimately portfolio management.

Future research will focus on the establishment of a Portfolio Office that will support and coordinate the portfolios of each division in the organisation. This will also help to ensure that there are no duplicate portfolios within the organisation itself and that common standards are adhered to. Another area that requires research is the quantification and measurement of success criteria for the 3Ps.

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22 APPENDIX G – ARTICLE PUBLISHED IN *INFORMATION MANAGEMENT AND COMPUTER SECURITY*

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A conceptual model for enterprise resource planning (ERP)

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Abstract

Purpose This article seeks to provide a conceptual model that explains the complexity of an enterprise resource planning (ERP) system to general and project managers in a non-technical manner that is easily understood.

Design/methodology/approach The 4Ps business model serves as a starting point to derive the ERP model because most managers are familiar with it and can therefore relate to it with ease. An ERP system is divided into four major components, namely, the software, the customer mindset, change management, and the flow of processes within it. A fifth component, methodology, encircles these four components to ensure that they are integrated and implemented in an organised manner.

Findings ERP is more than just software. Unless a clear understanding exists of the different components and their integration, ERP projects will continue to be plagued by failure. This model is applicable to any ERP system as it is generic and vendor-independent and helps in determining the scope of an ERP project.

Research limitations/implications The suggested model is conceptual in nature and provides a holistic view of ERP. It does not attempt to provide a detailed, step-by-step approach for implementing an ERP system.

Originality/value The conceptual model enables general and project managers to understand ERP systems better without becoming overwhelmed by product or technical detail. This will facilitate the successful implementation of ERP systems, thus ensuring project success and, ultimately, organisational success.

Keywords Manufacturing resource planning, Modelling, Project management

Paper type Research paper

Introduction

Most organisations realise the potential of enterprise resource planning (ERP) systems, yet struggle to materialise real benefits. One out of four ERP projects is over budget and some 20 per cent are terminated before completion. ERP projects often fail to achieve business objectives even a year after the system has been implemented. The return on investment (ROI) also takes six months longer than expected. There are many reasons that contribute to the low success rates, yet one common aspect that prevails is a misunderstanding of what ERP entails (*ComputerWorld*, 2001).

The purpose of this article is to provide a high-level conceptual framework that will assist in understanding what ERP is and how to go about implementing it. It is important for general and project managers to understand what ERP is and what the impact is on the organisation when implementing an ERP system. Since it is a high-level conceptual model, it will be used by middle to top management as well as project managers that need to implement an ERP system.

The article starts with a definition of ERP and this definition will be used as the basis of the conceptual model. An ERP system will be explained by dividing it into four components and by describing a methodology on how to implement it.

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What is ERP?

Despite the numerous definitions that can be found in literature, many people still battle to understand what ERP is. ERP can be defined as:

> A packaged business software system that lets an organisation automate and integrate the majority of its business processes, share common data and practices across the enterprise and produce and access information in a real-time environment. The ultimate goal of an ERP system is that information must only be entered once.

It is therefore clear from the above that an ERP system is more than just a product or software. Based on the definition of ERP, the following section illustrates the four conceptual components that make up an ERP system.

An ERP model

Nowhere in current literature does a high-level model exist that explains ERP in an easily understandable format. Many vendors have in-depth brochures and white papers that explain what their products are capable of, yet some still battle to comprehend fully what it is. Many people, however, are familiar with the 4Ps marketing model. The 4Ps marketing model was a general marketing model where the Ps originally stood for people, product, promotion and price (Alexandrou, 2002). This model was used extensively during the 1980s and 1990s. Over the years, this model has been changed to become a business model and was modified by replacing promotion and price with process and performance. This modified 4P business model was used to construct the proposed conceptual ERP model because most of the people in management are familiar with the concept of the 4Ps.

Conceptual components of ERP

The ERP model consists of four components that are implemented through a methodology. Figure 1 illustrates the integration between the components.

A clear mapping results, as can be seen in Table I, when this conceptual model is compared to the 4Ps model.

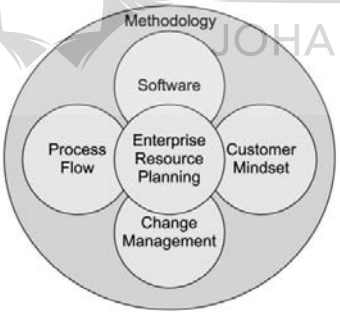

Figure 1.
Conceptual components of ERP

Methodology encircles all four of the components to illustrate that each component is addressed and implemented in an integrated manner. The next section briefly describes each of the four components.

The software component

The software component of the ERP model is the component that is most visible to the users and is therefore seen as the ERP product. It consists of several generic modules, some of which are listed below:

(1) *Finance*. The finance module is usually the backbone of the ERP system. It includes concepts such as the general ledger, accounts receivable, accounts payable, fixed assets and inventory control.

(2) *Human resources (HR)*. HR forms an integral part of an ERP system. HR administration automates personnel management processes, including payroll, recruitment, business travel and vacation allotments. It focuses on the automation of HR tasks from the employer's viewpoint. The focus of the administration function is to empower employees to manage their own employment terms and conditions. Mundane tasks like the allocation of leave days to an employee can be predetermined and assigned to an employee.

The payroll is usually integrated with the finance module and handles all the accounting issues and preparation of cheques related to employee salaries, wages and bonuses.

(3) *Supply chain management (SCM)*. SCM is the oversight of materials, information and finances as they move in a process from supplier to manufacturer to wholesaler to retailer to consumer (Alexandrou, 2002). SCM involves coordinating and integrating these flows both within and among companies.

SCM flows can be divided into three main flows:

- the product flow;
- the information flow; and
- the finances flow.

The product flow includes the movement of goods from a supplier to a customer, as well as any customer returns or service needs. The information flow involves transmitting orders and updating the status of delivery. The financial flow consists of credit terms, payment schedules, and consignment and title ownership arrangements.

(4) *Supplier relationship management (SRM)*. With an increasing reliance on contractors and suppliers for material, logistics and manufacturing capacity, the ability to manage these relationships has become critical. To maximise

Table I.
Applying the 4P model to the ERP model

The 4Ps	ERP conceptual model
People	Customer mindset
Product	Software
Process	Change management
Performance	Process flow

profitability, companies must be able to select the right suppliers quickly, establish strategic relationships and effectively collaborate with them as they help meet business goals. SRM describes the practices needed to establish the business rules for extended interaction with the suppliers of products and services. SRM enables companies and their suppliers to collaborate on strategic sourcing and procurement, while managing the overall process from an enterprise-wide perspective (Ganeshan and Harrison, 1995).

(5) *Customer relationship management (CRM).* CRM is a term for methodologies, software and usually internet capabilities that help an enterprise manage customer relationships in an organised and efficient manner (Lalakota and Robinson, 1999). An enterprise builds a database about its customers. This database describes relationships in sufficient detail so that management, salespeople and customer service representatives can access information, match customer needs with product plans and offerings, remind customers of service requirements and know what other products a customer had purchased.

(6) *Business intelligence (BI).* BI applications are decision support tools that enable real-time, interactive access, analysis and manipulation of mission-critical corporate information (Cherry Tree & Co., 2002). Users are able to access and leverage vast amounts of information to analyse relationships and understand trends that ultimately support business decisions. These tools prevent the potential loss of knowledge within the enterprise that results from massive information accumulation that is not readily accessible or in usable form.

The different software components of an ERP system illustrate clearly that an ERP system is more than just the financial side, but includes components such as CRM and SCM.

Process flow

The second component in the conceptual model is the process flow within an ERP system.

Process flow deals with the way in which the information flows among the different modules within an ERP system. This forms a very important part of understanding ERP systems. Figure 2 illustrates the master process flow, showing how information flows within and between the different modules.

Before an ERP system can be implemented in an organisation, the business processes must be modelled and, if need be, reengineered to allow smooth integration. The implementation of ERP systems can often be compared to the proverbial square peg in a round hole situation. The following are some examples to illustrate the process flow within each of the software components:

- *Finance.* An organisation places an order using the purchase order process. The stock or goods purchased through the purchase order process are delivered to the organisation and are allocated as stock in the inventory. If a purchase is a capital expense, such as vehicles or buildings, the item will be transferred to fixed assets.

  The stock items in the inventory can be sold to a customer. The process is the sales order process. The inventory levels are adjusted as stock flows in and out. A sales invoice is generated and accompanies the goods to the customer. This invoice will be the proof that the customer received the delivered goods and owes the company money.

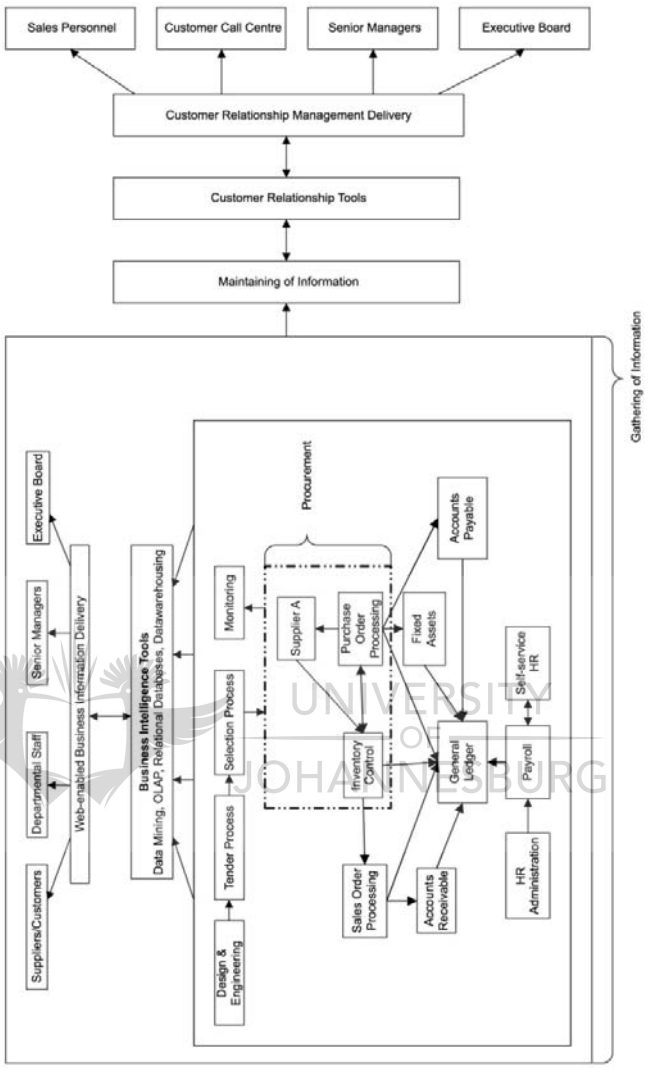

Figure 2.
Master process flow diagram

The above-mentioned process also forms part of the SCM component. The organisation needs to pay its creditors for the goods it received and the organisation must also make sure that it collects its debt from its debtors. All the entries of the modules described above will be made in the general ledger.

- *HR.* HR administration involves the organisation's internal activities. Information gathered from HR administration is populated into the payroll system itself. This information, as well as that gathered from the self-service HR module, influences the payroll. Information such as a new employee's salary package will be pulled from the HR administration module. Changes made by the employee in the self-service HR module are also reflected in the payroll module. Interaction between the payroll and the self-service HR module is a continuous process.
- *SCM.* The stock levels in the inventory control trigger the generation of a purchase order. The stock levels are determined through demand planning. An order for the required stock is placed with the supplier. This order placement can be a physical order or an e-commerce transaction between the organisation and the supplier.

  The supplier delivers the required stock to the organisation and uses supply and transportation planning to optimise delivery to the organisation. The stock from the supplier will be delivered at a predetermined price, as negotiated in the SRM component. The delivery time and duration will also be governed by the SRM component.
- *SRM.* The SRM process begins with a design and engineering phase. This phase establishes the minimum requirements and specifications of a product. It also defines the criteria the supplier must fulfil. These criteria form the basis for the tendering process. Different suppliers will tender and submit documentation based on the criteria. A selection will be made and a preferred supplier chosen.

  A contract is drafted between the parties. The procurement process is determined and forms part of the bigger SCM process. Ongoing management of the supplier and its services will continue and adjustments will be made to accommodate changes and shortfalls.
- *CRM.* The first and most important process within CRM is to gather all relevant information for a specific customer. This process is tedious and cumbersome and involves sources such as spreadsheets and users' personal information management utilities. Business decisions will be based on this information.

  Once all the relevant information has been gathered, it needs to be maintained. This is crucial, as no organisation can afford to make decisions based on old and wrong information. A central database is instituted where all the information is stored and maintained through a chosen CRM tool.

  The CRM tool organises the information in a structured way so that the information is easily accessible. The information can be viewed using either web interface or a client-server application. The information related to a specific customer will be viewed differently by each user, for example the customer call centre will want to view the problem history of a specific customer, whereas the salespeople will want to see all products sold to a customer.
- *BI.* A vast amount of data are stored within the organisation and can be found within the ERP system itself or within planning and forecasting, which forms

part of SCM. The main purpose of BI is to accumulate the data and process it into useful information. The data are accumulated through different BI tools, such as data mining and data warehousing.

The information is stored in a presentable manner and the relevant people access it using an interface that is easy to use, such as a web-based or graphical interface. The information can be viewed from the internet or within the company.

Figure 2 clearly shows that all the software components of an ERP system are integrated and that the information flows from one software component to another. It is also clear that a vast amount of information flows between the different modules. It is easy for a user of the ERP system to make errors. The advantage of an ERP system is that information is entered only once. This minimises the risk of human error.

Customer mindset

The third proposed component of the ERP model is the customer's mindset. Resistance kills many ERP projects. A proposed ERP system may hold great promise, but often fails to consider how the users are likely to view this so-called improvement (Maurer, 2002). ERP systems remove the old tried-and-true ways of working which users understand and are comfortable with, even though some of these existing, cobbled-together legacy systems are not all that good. When users are asked to give up what they know and what they can rely on, they will resist. For any ERP project to succeed, the users must buy into the new ERP system. A paradigm shift or customer mindset change must be achieved. This has to be done at three levels (Swartz and Orgill, 2000):

(1) *User influence*. To ensure that the users fully understand the necessity of using the system correctly all the time, a needs analysis should be done to evaluate the users' technical skills, their existing job processes and the impact the system will have on their jobs (Fister Gale, 2002). Training should include information about their new roles and responsibilities, the business objectives of the initiative and the projected benefit to the company. According to Fister Gale (2002), ERP is more than a new software system. It is a culture change. If training does not cover why each task is important and how every transaction is part of a larger process, then the users are less likely to use the system correctly or consistently. Training plays a major role in the operation of the ERP system after implementation. One of the major advantages of an ERP system is increased productivity. This can only be acquired once the user is trained sufficiently on the use of the ERP system. Users should not be expected to be able to perform immediately at the same level of productivity as on the old legacy system.

(2) *Team influence*. A typical ERP project involves internal people from a number of departments within an organisation, as well as many external people in the form of consultants and vendors. A primary reason for unsuccessful ERP implementations is the inability of this disparate group to come together in a focused, team-oriented manner. All too often the team membership polarises into "us-versus-them" factions and the project degenerates into mass finger pointing. A successful ERP project will require that the functional and technical leadership

and teams develop a strong partnership and a shared commitment to the success of the ERP implementation. Without this joint commitment to work together, any attempt to implement an ERP system will result in failure (Web, 1998).

Consultants play a major role and key partnerships at every level will be required to maintain the cohesiveness of the team. When possible, the consultants should be incorporated directly into the team. This requires major trust on the part of the organisation.

(3) *Organisational influence.* The users will be expected to work twice as hard during the implementation of the system. They still need to do their normal operational work to make sure the business continues to run smoothly and they need to give inputs to the different project teams of which they are a part. This causes the users to become overworked, tired and stressed. It must be pointed out to the users right at the start what the issues will be during implementation, and the rewards must be clearly stated. It will be necessary to remind the users regularly of the benefits of installing the ERP system (Urwin, 2001).

The culture within an organisation also plays a major role and influences the individual user. ERP systems break down all functional barriers within an organisation and users are required to be multi-skilled and multi-managed. This means that it is often difficult to implement an ERP system in an organisation with strict hierarchical structures and line reporting. The culture of the organisation must first be changed for the ERP system to be successful.

Change management

Change management plays a major role in the successful implementation of an ERP system and is the fourth component in the ERP model. Change needs to be managed at several levels.

User attitude

Resistance to change is one of the major issues that all ERP projects will face (Fister Gale, 2002). It is important to get the users to buy into the ERP project if it is to succeed. It is also a reality that not everyone will be delighted with this new project. User attitude change management focuses on managing the users' expectations and on converting the non-believers to believers and supporters of the system. What the organisation needs is people to understand what it is all about, to like the new system, to take part in making it a success and to have confidence in the project team.

This means creating strategies that speak to the employees in their own language to help them understand why the changes are necessary to the organisation. More time should be spent in communicating to the employees the business case for the change than on the often mind-numbing details of the ERP process itself.

Project changes

All ERP projects are subject to scope change at some time during the lifecycle. The key to successful ERP implementation is to manage the change of scope process effectively (Project Management Institute, 2000).

The Project Management Body of Knowledge (PMBOK) defines scope change control as:

- influencing the factors which create scope changes to ensure that changes are beneficial;
- determining that a scope change has occurred; and
- managing the actual changes when and if they occur.

A project scope change control will define the procedures by which the project scope may be changed. These scope changes must go through a system of approval against the original ERP modelling and design. This ensures that the proposed changes are necessary and appropriate and that the integrity of the ERP system is maintained.

These changes may have an impact on the contractual time and budget agreements. It is therefore crucial for every ERP project to have sign-off of the deliverables. Any changes to these deliverables can and will have an impact on the project itself.

Business process changes

ERP systems bring with them business process changes. The key business drivers forcing business process changes are replacing legacy systems, gaining greater control and managing globalisation across the enterprise. The change must happen for three reasons: stringent business conditions accentuated by channel and brand proliferation, the pressures of managing globally and the intense service demands by customers. With globalisation has come price pressure, as customers insist that manufacturers produce higher-quality goods with shorter delivery times and lower prices. Companies must have a more accurate and timely information flow to meet these demands (Hooks, 2002).

The organisation must keep in mind that the business processes will be under constant change. The business processes will change as the ERP system is installed and also as the ERP system evolves and matures. The business processes will also change as the users become familiar with the system.

System changes

The fourth module in the change management component involves the review of current version management. Most organisations have implemented some form of version management processes to preserve the integrity of custom software developed within an organisation. At the same time, organisations have established a formal promotion protocol to manage the testing and release of custom-developed software. When ERP applications are introduced, a number of new change management issues are encountered that are associated with maintaining and reconciling custom and packaged applications.

Generally speaking, version management helps an organisation to manage effectively version control and security issues that are typical to a software development and maintenance project.

An effective change management strategy will improve an organisation's change analysis capabilities and provide more fluid and efficient change implementation/migration processes.

ERP methodology

Methodology refers to a systematic approach to implement an ERP system that will ensure the proper integration of the four components illustrated in Figure 1. The ERP methodology component builds on the theory that an enterprise can maximise its returns by maximising the utilisation of its fixed supply of resources (Bruges, 2002).

The five steps that make up the ERP methodology are: pre-implementation, analysis, design, construction and implementation. These five steps transcend the program management, change management, system installation and process redesign needs, and are illustrated in Figure 3.

The following is a brief discussion on each of the steps.

Pre-implementation phase

Pre-implementation planning helps to identify the operational needs, business drivers, strategic plans and other factors that will define the scope and objective of the ERP solution. During the pre-implementation planning process, expectations for benefits realisation, magnitude of change, change ownership, process redesign and functionality delivery options are identified.

Analysis phase

The analysis phase evaluates the organisational baselines that form the foundation for process redesign, the system build and change management. A system build determines the software components of the ERP system and how these components interact with each other. Business processes are analysed to understand the current conditions. Functional and technical requirements are reviewed to determine the system build needs. Cultural and workforce skill evaluations are performed to identify workforce transition requirements.

Design phase

The design phase incorporates direction-setting information from the pre-implementation phase and baseline information from the analysis phase to create new designs for a desired future state.

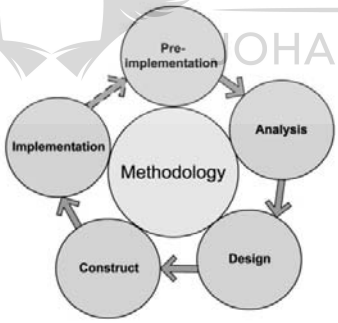

Figure 3.
ERP methodology

Construction phase

The construction phase takes products from the design process to create tangible operational processes and information system support. As the process model begins to crystallise, the process model and the information system build are evaluated against each other.

Implementation phase

The implementation phase prepares for the final ERP solution deployment. Final changes are made to business processes, policies, and procedures and system builds to prepare for a go-live. Go-live occurs when the ERP system is used within the organisation as the system to perform all the duties and processes as determined by the design phase. Once a go-live occurs, a post-implementation audit is performed to measure the effectiveness of the ERP solution in meeting its goals and objectives.

A measuring mechanism must be in place to measure the result of the implementation phase against the aims and goals of the pre-implementation phase. This measuring tool is the link between the pre-implementation phase and the implementation phase.

The methodology comes full circle when the inputs of the first phase influence the results of the implementation phase.

Conclusion

It is important for general and project managers to understand ERP and the impact of ERP systems on the organisation. This conceptual model provides management with a basic and high-level model that explains the different components of an ERP model as well as a methodology to implement an ERP system. This model can be applied to any ERP system and the ERP vendor is irrelevant.

The value of this conceptual model is that it simplifies ERP and reduces ERP systems to manageable and understandable components. This simplicity will enable project managers to focus their attention on all four components and not just the software component. This is very important because the software component is often perceived as the whole ERP system. This is one of the reasons why ERP projects fail.

It must be noted that the conceptual model focuses only on current ERP systems and does not take into account the ERP II or any development beyond ERP. By nature of being a conceptual model, this model does not provide any in-depth analysis of ERP systems.

It is clear from the current research that there is a need for a framework to implement ERP systems. Future research by the authors will focus on linking ERP projects to organisational strategies and devising a framework for the implementation of ERP systems using portfolio and program management.

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23 APPENDIX H – ARTICLE PRESENTED AT *ISSA 2005*

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A SECURITY FRAMEWORK FOR AN ERP SYSTEM

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ABSTRACT

This article provides an information security framework that can become an integrated process within an ERP system to support corporate governance.

A generic information security framework serves as a starting point to develop a specific ERP security framework because most security managers are familiar with the framework. The generic information security framework consists of three components: people, policy and technology. These three components are extended and enhanced to better fit ERP systems. The ERP security framework is applied to an ERP model to illustrate how the three components can be incorporated into it.

The ERP security framework guides management in integrating information security into the ERP system. This security framework is both product and vendor independent.

The ERP security framework ensures that information security forms an integral part of the design, implementation and operation of an ERP system, so the information provided by the system is reliable.

KEYWORDS

Information security, Enterprise resource planning, ERP model, ERP security framework.

A SECURITY FRAMEWORK FOR AN ERP SYSTEM

1 INTRODUCTION

Information is one of the most important assets of any organisation, so it should be appropriately protected[i]. Information security combines systems, operations and internal controls to ensure the integrity and confidentiality of data and operation procedures in an organisation. Availability of the information is also important to the organisation[ii]. If the integrity of the information is above board and the information is confidential, but it is not available to authorised users, it is of no use.

Enterprise resource planning (ERP) system security must be governed by the same principles as conventional information security. An ERP system controls all the business related information of an organisation as well as information relating to customers and suppliers. It is necessary to protect this information from the opposition as well as to ensure that the information within the ERP system conforms to auditing standards such as Sarbanes-Oxley[iii]. The security and protection of the information within the ERP system is therefore crucial to the existence of the organisation. The purpose of this article is to provide an ERP security framework that will enable an organisation to include security as an integral part of an ERP system and not as an afterthought.

According to Dhillon[iv], information security has traditionally been an afterthought, even within ERP systems. Because of businesses' increased dependence on information, security is increasingly being considered proactively[v]. While designing, developing and implementing systems, there are enthusiastic discussions of the relevance of certain controls and the hindrance of such controls to the conduct of business and the efficiency of certain security tools. Many ERP systems ultimately do not conform to corporate and IT governance requirements.

The process used to provide a solution to the above problem is as follows:

1) A generic security framework is analysed to determine the aspects that are applicable to ERP systems.
2) The shortcomings of this security framework are identified in the context of an ERP system.
3) An ERP security framework is developed that conforms to corporate and IT governance requirements.

The first section of the article focuses on the generic security framework and the three components that form part of this framework. The components are discussed with regard to how they relate to each other, IT and corporate governance. In the second section of the article, the security framework is mapped to an ERP model. This is done to determine the shortfalls of the security framework. The third and last section of the article provides an ERP security framework that can be used to ensure that security is integral to an ERP system and not just an add-on.

2 THE GENERIC SECURITY FRAMEWORK

Figure 1 below shows a generic information security framework. The framework is divided into three components: people, technology and policy, which are interdependent[vi]. Any change to one of these components will affect the other two.

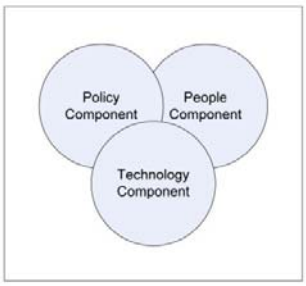

Figure 1. Security framework

2.1 People Component

The people component is divided into two groups. The first group comprises people who put security in place and support the process. A few key roles include senior management, security administrators, IT administrators and auditors. The second group is the actual users of the systems. They must be aware of the reasons why security is in place as well as the consequences if they breach the security.

According to Martins[vii], the people component can be divided into nine aspects:

- Policy and procedures – The information security policy dictates employee behaviour and states what is expected of employees, which in time becomes part of the information security culture.
- Benchmarking – Guidelines on information security processes can be promoted in the organisation through benchmarking. This will enable the organisation to compare itself to other similar organisations and to international standards.
- Risk analysis – Through risk analysis, threats to organisational assets and security measures can be identified to develop the information security policy.
- Budget – A financial plan is necessary to implement the issues concerning an information security culture. For instance, employees need training, technical controls need to be implemented and teams need to be enabled to assess the security of networks.
- Management – Management is responsible for information security. Management develops an organisation's vision and strategy, which are required to protect information assets and which are implemented in the organisation.
- Trust – Information security is important in instilling trust in an IT environment. It is easier to implement new procedures and guide employees through changes of behaviour regarding information security if management and employees trust one another.
- Awareness – Since the effectiveness of information security controls depends on the people who are implementing and using them, employees need to be enabled through awareness and training to behave according to what is expected of them to ensure the security of information assets.
- Ethical conduct – Good practices form part of the culture established throughout the organisation. Employees need to incorporate ethical conduct or behaviour relating to information security as part of their everyday life in the organisation.

- Change – Technology changes involve challenges to ensure secure communication and secure use. These changes need to be managed and accepted positively in the organisation. Implementing an information security policy could also mean that employees need to change their working practices to ensure the effective implementation of information security.

These nine aspects form the basis of the people component and are comprehensive enough to address all people related issues within an ERP system.

2.2 Policy Component

Information security is a key aspect of information technology governance[viii]. Various methods are available to an organisation to make information security part of corporate governance such as international standards that include CobiT, ITIL and ISO 17799.

Figure 2 illustrates the breakdown of the policy component as guided by corporate governance requirements into the three levels of IT governance, IT management and information security management, supported by CobiT, ITIL and ISO 17799, respectively.

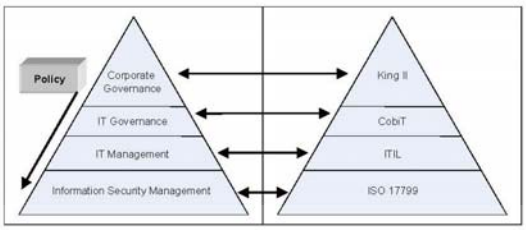

Figure 2. Policy component

- King II – The King Report on Corporate Governance for South Africa 2002[ix] is a corporate governance recommendation report published by the King Committee. It addresses the management accountability and responsibilities of organisations towards their shareholders. The King II Report covers diverse topics such as boards and directors, risk management, internal audit, integrated sustainability reporting, accounting and auditing, and compliance and enforcement.
- CobiT – CobiT is an IT governance control framework and maturity model that ensures that IT resources are aligned with the organisational vision and strategies. CobiT does not, however, include control guidelines or practices which are the next level of detail nor the process steps and tasks because it is a control framework rather than a process framework[x]. CobiT focuses on what organisations need to do, not how to do it.
- ITIL – ITIL describes and defines key processes such as problem, change and configuration management. It also provides a framework for managing the processes. By forcing a focus toward aligning and defining a specific process, the IT department can identify opportunities for improvements in efficiency which can result in the improved ability to better manage service delivery and support.
- ISO 17799 – ISO 17799 is a *de facto* international standard that provides guidelines and recommendations for security management[xi]. ISO 17799 is divided into 10 modules that are used to implement security.

King II states what must be done by the organisation, CobiT states what must be done by IT, ITIL states how it must be done and ISO 17799 focuses specifically on the detail of implementing and managing information security. These four frameworks can be used to address all policy related issues within an ERP system.

2.3 Technology Component

The technology component of information security can be broken down into five pillars[xii].

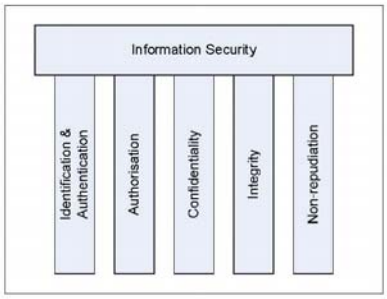

Figure 3. Five pillars of information security

- Identification and authentication – The first responsibility of information security within an ERP system is to ensure that the ERP system is only accessed by legitimate, authorised users[xiii].
- Authorisation – One of the most critical aspects to consider within ERP security is to restrict the access rights and actions of the users within the ERP system[xiv]. The access rights of a user are controlled by the authority assigned to the user ID.
- Confidentiality – Protecting the confidentiality of data implies the assurance that only authorised people are able to view specific data sets[xv].
- Integrity – Integrity means that only authorised users can modify the data of the ERP system. Modification refers to the update, deletion and creating of data within the ERP system.
- Non-repudiation – The organisation ensures that a transaction that is done is legitimate and can be proven as such in case of a query or dispute. Organisations can make use of digital signatures or public key encryption to enforce valid and legal transactions[xvi].

The five pillars of Von Solms and Eloff do not address the following two specific issues within an ERP system:

- Availability – ERP systems need to remain available 24/7 for business continuity. Organisations must be prepared to restore the system and data and reduce the need for system downtime, maintenance and management. Particular problems include scheduling background jobs, distributing and balancing workloads, monitoring the performance of ERP applications, databases, operating systems and networks, generating alerts and customer-tailored performance thresholds and analysing exceptions.
- Auditing – System design auditing should be performed as early in an ERP implementation as possible. When resources are stretched and deadlines short, audit issues can easily be overlooked. Unfortunately, this can lead to an insecure system

with poorly designed controls. Once the system is deployed, auditing requires a risk-based systems review supported by detailed checklists and practical experience in designing controls. This sort of review will not only uncover weaknesses but also support a redesign, if necessary, to improve security levels.

The five pillars can be extended to seven pillars to include the issues of availability and the auditing of the system. Figure 4 below illustrates the seven security pillars in relation to an ERP system.

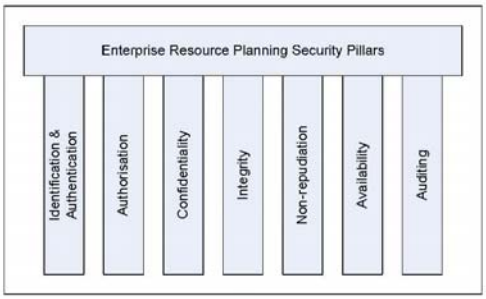

Figure 4. Seven pillars of ERP security

The next section links the above ERP security framework to a generic ERP.

3 INTEGRATING INFORMATION SECURITY WITHIN AN ERP SYSTEM

It is important to understand how an ERP system is structured. This will ensure that the adapted security framework is mapped in a proper and consistent manner onto the ERP model. The ERP model consists of four components that are implemented through a methodology and is illustrated in figure 5[xvii].

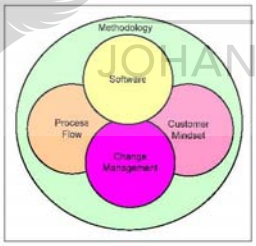

Figure 5. ERP model

- The software component – The software component of the ERP model is the most visible to the users and is often seen as the ERP product. This includes modules such as General Ledger, Supply Chain Management and Customer Relationship Management.
- Process flow – The second component is the process flow within an ERP system. Process flow deals with the way in which the information flows among the different

modules within an ERP system. This forms a very important part of understanding ERP systems.

- Customer mindset – The third component addresses the resistance to change that could kill an ERP project. A proposed ERP system may hold great promise, but often fails to consider how the users are likely to view this so-called improvement[xviii].
- Change management – Change management plays a major role in the successful implementation of an ERP system and is the fourth component in the ERP model. Change needs to be managed at all levels of the organisation.
- ERP methodology – Methodology refers to a systematic approach to implement an ERP system that will ensure the proper integration of the four components.

The alignment of the ERP model and the security framework will enable an organisation to implement an ERP system that will conform to international security standards. It will also ensure that once security is implemented, it will be an ongoing function within the ERP system and will not be neglected.

The next section focuses on mapping the ERP security framework onto the ERP model components.

3.1 Software Component of the ERP model

3.1.1 Policy Component of the Security Framework

The policy component focuses on the policies and procedures that must be in place to manage and enforce security. Although the software component only deals with the software modules within an ERP system, CobiT and ITIL guide how the software is to be implemented. CobiT dictates to the Supplier Relationship Management (SRM) module how security must be managed with a customer. ISO 17799 affects the software module as follows:

- Security policy – A policy needs to be defined on how the ERP system will function and will include all relevant information.
- Asset classification and control – Although an ERP system is perceived as software, it also includes hardware and networking infrastructure. All these assets need to be classified and controlled. It also includes intellectual capital such as customisation of the ERP system.
- Physical and environmental security – The physical ERP servers need to be hosted in a secure environment. Access to the system and premises must be controlled.
- Communications and operations – Operational procedures must be in place, e.g. the frequency of backups and the protection of the ERP system against unlawful access.
- Information access control – Access to the ERP system and even some modules and functions must be controlled.
- System development and maintenance – This module will define the security within each software module and how the data will be encrypted.
- Business continuity – The ERP system must be available for transacting and business continuity plans must be defined and tested to ensure that the ERP system can function in the event of a disaster.
- Compliance – The ERP system must comply with standards and legislation.

Almost all the aspects of ISO 17799 must be taken into consideration except personnel security. The software component does not dictate who gets employed by the organisation.

3.1.2 People Component of the Security Framework

Although people are going to use the ERP system and will be affected by the security surrounding it, the software component is not affected that much by the people component. The issues influencing the people component are mostly soft issues such as trust and ethical conduct. The following are some of the hard issues involved:

- Budget – The organisation must spend money on training to ensure that the users of the ERP system understand how it works, the effect of security on their work and the issues surrounding ERP security.
- Management – The users of the ERP system will only enforce security if it is encouraged by management.
- Change – The implementation of the ERP system will have an effect on the users since it will bring change into their lives. The organisation must know how to deal with this change.

3.1.3 Technology Component of the Security Framework

The seven pillars can be applied to the software component. The identification and authentication pillar determines who has access to the software components, while the authorisation pillar determines the type of access and the modules within the software component to which access is granted. The information supplied to the user by the software modules must be integrated as well as confidential. This means that information must flow from one side of the ERP system - such as the SRM module - right through to the printing of the invoice without any user intervention. It also means that special deals loaded by the supplier, for example, are not visible to outsiders and thus remain confidential.

Non-repudiation plays an important role, especially in the SRM and Supply Chain Management (SCM) modules. All the software modules must always be available, especially for the interaction and flow of information between the different modules, as well as for customer and supplier convenience. All aspects must be auditable and it is very important that the software comply with auditing standards.

The second component of the ERP model is the customer mindset component. This deals with how the users perceive the ERP system: typically as either a threat or a mechanism to assist them in their work.

3.2 Customer Mindset Component of the ERP Model

3.2.1 Policy Component of the Security Framework

The policies and standards of the organisation will have an effect on how users perceive the ERP system. The users should not perceive security as a burden, but rather as a necessity to ensure the integrity and confidentiality of information. A few modules of ISO 17799 play a role in the customer mindset component. One is the security organisation that determines the roles and responsibilities within the organisation. Another is the personnel security module that determines who gets employed.

3.2.2 People Component of the Security Framework

The people component and the customer mindset both deal with the way the user interacts with the ERP system. These two components influence each other and are interdependent. A comparison of the two follows:

- Policy and procedures – The policy and procedures instilled by the organisation will influence the employees of the organisation. The way they work will be governed by the policies and procedures.

- Benchmarking – The organisation can use benchmarking to compare itself to other organisations. This comparison will enable the organisation to determine where it is lacking in security and how it measures as an organisation in terms of the rest of the industry.
- Risk analysis – The employees of the organisation must be involved in the day-to-day risk analysis. This will ensure that security policies are up to date and will make users aware of any security breaches.
- Budget – The organisation must train the users in the impact of security on their lives and the way they work. The implementation of security affects the way users work and interact with the ERP system, so the budget should allow for education in this regard.
- Management – The management of the organisation should make security a way of life by enforcing and implementing it themselves.
- Trust – The users of the ERP system must be trusted by the organisation to interact with the ERP system and to enforce the security rules and regulations.
- Awareness – The users must be aware of how confidentiality, integrity and availability are impacted if they do not abide by security policies.
- Ethical conduct – The integrity of the ERP system will be affected by the ethical code and conduct instilled by the organisation. For example, users must be aware that they cannot work on the information from home.

These aspects of the people component will influence the way users interact with the security surrounding the ERP system. The next component is the technology component and the impact it has on the users' mindset.

3.2.3 Technology Component of the Security Framework

Identification and authentication play a vital role in the customer mindset component. If the users do not abide by the rules of the technology component, the security will have no effect. For example, the users must understand what the consequences are if they pass their username and password on to someone else. This also affects the authorisation pillar and the consequences can be far-reaching. The ERP system must also be audited to ensure that the users comply with the policies and procedures of the organisation.

The ERP system cannot be implemented within an organisation if change does not take place. The following section will discuss the change management component of the ERP model.

3.3 Change Management Component of the ERP System

Change management not only deals with the changes that the ERP system enforces on the organisation, but also with system changes once the system is implemented and business process changes.

3.3.1 Policy Component of the Security Framework

Changes to the ERP system cannot be made without considering the policies and standards of the organisation. The deployment of new versions of software will be managed by ITIL, which will ensure a smooth upgrade. During the lifetime of an ERP system, the business process will change, having an impact on security. Certain aspects of security might change and this should take CobiT into consideration. ISO 17799 plays a role in the implementation of the ERP system and will manage the security aspects during the changes that are instilled by the system. Changes to the security policies will be addressed by the security policy component and the new roles and responsibilities will be addressed by the security organisation component.

3.3.2 People Component of the Security Framework

Certain aspects of the people component have an impact on the change component of the ERP model. Policies and procedures will change during the implementation of an ERP system and awareness regarding the system will change to accommodate new ways of doing things. The management of the organisation must also ensure that the users are aware of these changes to the policies and the necessary education must be provided.

3.3.3 Technology Component of the Security Framework

System and business process changes have an effect on the following four pillars:

- Confidentiality – The system or business process changes must not affect confidentiality. The information must still only be accessible to authorised users.
- Integrity – The information must not be compromised during changes and must still be intact after the changes to the ERP system.
- Availability – The ERP system must be available for transacting, which makes it difficult for system administrators to implement changes. Careful planning is needed to minimise the effect of downtime.
- Auditing – After system or business process changes, the ERP system must still pass all audits.

3.4 Process Flow Component of the ERP System

The process flow component of the ERP system deals with the way information flows between the different software modules.

3.4.1 Policy Component of the Security Framework

ISO 17799 will affect the way the different components interact with each other. It will also determine the level of information that flows between the different software components.

- Asset classification and control – This component will determine the protection between the different modules and will ensure that the different software modules do not influence each other in a negative way.
- Communications and operations – During the flow of information between the different modules, this component will provide the guidelines to ensure that the information is intact and not tampered with.

An aspect that must be considered during the process flow is the access control and the system maintenance of the ERP system.

3.4.2 People Component of the Security Framework

The people component does not play a significant role because all information flow happens in the background of the ERP system. The only aspect that must be taken into consideration is that the users must be aware of how the system works and the impact their actions might have later on.

3.4.3 Technology Component of the Security Framework

The flow of information between the different software components must be controlled by the following pillars:

- Confidentiality – Information should remain confidential as no user directly interacts with the information as it flows from one module to another. The less user interaction, the better the confidentiality of the information.

- Integrity – The information that flows from one software module or even within a module must be the same when it reaches its destination. The information must not be altered during the process flow.
- Availability – The ERP system must be available to ensure that information can flow between the different modules. If some modules are not available, it can lead to corrupt data or the recapture of data.

The next section addresses the integration of information security into the ERP methodology.

3.5 Methodology Component of the ERP System

3.5.1 Policy Component of the Security Framework

It is the responsibility of the programme manager to ensure that CobiT and ITIL are adhered to during and after the implementation of the ERP system. This adherence to international standards and guidelines ensures that customers are content to deal with the organisation because they know that the organisation and systems are adhering to the standards. The policies of the organisation take precedence over the policies of the ERP system, that is, the ERP system must be adapted to accommodate the policies of organisation and not the other way around.

3.5.2 People Component of the Security Framework

The people component will determine who within the organisation is responsible for the security aspects of the ERP system. These responsibilities will be derived from the overall people component of the security framework and will be incorporated into the ERP system security. If a person's responsibility is to implement password policies for the organisation, then that same person must be responsible for the password policies of the ERP system. The programme manager responsible for the implementation of the ERP system must ensure that all the relevant people are involved and incorporated into the project team. This will facilitate security being implemented from the beginning of the implementation and not just as an afterthought[xix].

3.5.3 Technology Component of the Security Framework

The seven pillars of ERP security must be incorporated in the ERP system. These pillars form the foundation of ERP security and determine what users and customers are allowed to do within the system. These pillars also ensure that the confidentiality, integrity and availability of the information are above suspicion. The programme manager must ensure that these pillars are addressed during the design of the ERP system and that they form part of the overall project plan. The seven pillars must be part of the design and process flows of information between the different software modules.

The above sections mapped the ERP model to the ERP security framework to determine how it can be used to implement and manage security within an ERP system.

Table 1 provides a summary of this mapping process.

Table 1. Mapping of ERP model to security framework

	Policy Component	People Component	Technology Component

Software Component	• CobiT
	• ITIL
	• ISO 17799
	  ○ Security policy
	  ○ Asset classification & control
	  ○ Physical & environmental security
	  ○ Communications & operations
	  ○ Information access control
	  ○ System development & maintenance
		• Budget
		• Management
		• Change
			• Identification & authentication
			• Authorisation
			• Confidentiality
			• Integrity
			• Non-repudiation
			• Availability
			• Auditing

	○ Business continuity ○ Compliance		
Customer Mindset	• CobiT • ITIL • ISO 17799 ○ Security organisation ○ Personnel security	• Policy & procedures • Benchmarking • Risk analysis • Budget • Management • Trust • Awareness • Ethical conduct • Change	• Identification & authentication • Authorisation • Auditing of the people
Change Management	• CobiT • ITIL • ISO 17799 ○ Security policy ○ Security organisation ○ Communications & operations ○ Information access control ○ System development & maintenance	• Policy & procedures • Budget • Management • Awareness • Change	• Confidentiality • Integrity • Availability • Auditing
Process Flow	• ISO 17799 ○ Asset classification & control ○ Communications & operations ○ Information access control ○ System development & maintenance ○ Compliance	• Awareness	• Integrity • Availability • Confidentiality
Methodology	• ITIL • ISO 17799 ○ Personnel security ○ Communications & operations	• Policy & procedures • Risk analysis • Management • Awareness • Change	• Identification & authentication • Authorisation • Confidentiality • Integrity • Non-repudiation • Availability • Auditing

It is clear from table 1 above that an ERP system cannot be implemented or managed without taking the security framework into consideration. The security framework provides the project manager and system administrator with guidelines, policies and standards to implement and manage the ERP system.

The advantage of the ERP security framework is that it provides an organisation with a framework to ensure that security forms an integral part of the ERP system right from the start. The main disadvantage is that organisations that use any other standard must build their specific standards into the framework as the framework does not cater for them.

4 CONCLUSION

The article focuses on security within an ERP system. It provides a security framework that can be used to address all relevant security aspects within an organisation and to ensure that it forms an integral part of an ERP system. The security framework is mapped onto the ERP model to provide the organisation with a clear understanding of which security issues must be addressed within which ERP component.

It is clear given the above that security must form an integral part of an ERP system and that it will be difficult to add it on once the ERP system is already implemented. If security is added after implementation, the ERP system will have difficulty adhering to IT and corporate governance requirements. An ERP system is also an integral part of the organisation and cannot be treated as an independent system without taking the organisation's policies and procedures into consideration.

This article provides an organisation with a framework to ensure that all aspects surrounding IT and corporate security are built into an ERP system. The organisation can quickly determine

where the ERP system is at fault regarding security and this fault can be rectified before it causes major problems.

Another aspect that must not be forgotten is that ERP security is an ongoing process. The official process starts with the pre-implementation phase where security is designed and built into the ERP system. The official process stops with the implementation of the ERP system. However, this is not where everyone's responsibilities end. As the system is kept up to date and new technologies emerge, security must be addressed as an everyday event to keep the information intact.

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24 APPENDIX I: ARTICLE PRESENTED AT *PMI RESEARCH CONFERENCE 2006*

Marnewick, C. & Labuschagne, L. (2006). *A structured approach to derive projects from the organisational vision.* Conference proceedings of the PMI Research Conference 2006. Conducted by Project Management International. Montreal: PMI.

A STRUCTURED APPROACH TO DERIVE PROJECTS FROM THE ORGANISATIONAL VISION

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Introduction

Many literature sources agree that projects enable and facilitate the implementation of the organisational vision (Cohen & Graham, 2001; Kendall & Rollins, 2003; Phillips J.J., 2002). The Project Management Institute's *Organizational Project Management Maturity Model* (*OPM3*®) states that "projects help organizations deliver desired strategic changes in a changing world" (2003). It also states that "this is true whether the goal is the development of a new software product, implementation of new systems in an organization, or designing and building a bridge".

Although the OPM3 recognises the fact that the vision and strategies of an organisation are implemented by means of projects, it does not provide a clear approach for proceeding from the vision to the projects. According to PriceWaterhouseCoopers, "any project undertaken by a company should be driven by business objectives" (Peterson, 2002). They also state that many organisations lack a structured process through which to derive projects from the business objectives. Longman and Mullins (2004) also acknowledge the fact that an organisation's strategy should provide the boundaries for projects. They further state that "installing effective project management includes putting a mechanism in place to evaluate every project for its fit with the strategy before implementation" Longman & Mullins, 2004).

The purpose of this article is to suggest a structured, holistic process for deriving projects from organisational vision and strategies using a top-to-bottom approach. It also attempts to provide organisations with a process to link projects back to the vision to directly measure and monitor its contribution using a bottom-to-top approach. This bottom-to-top approach is directly linked to the top-to-bottom approach, and the two complement one another as illustrated in figure 1. The process suggested uses a normative approach and is based on a combination of existing methods and techniques.

The value of such a process is twofold. Firstly, it ensures that only projects that fulfil the organisational vision and strategies are initiated. Secondly, it provides project teams in the organisation with a sense of direction because the projects they work on directly contribute to the success of the organisation.

The first part of the article focuses on deriving projects from the vision and strategies of the organisation. The second part focuses on how to quantitatively link the progress of projects back to the achievement of the vision.

Organisational Success and Survival

All organisations have to plan for the future. This is called strategic planning, a well documented management discipline (Gupta, Boyd, & Sussman, 2004). The primary responsibility of a board of directors is to set a vision and then to determine high-level strategies for achieving the necessary changes within a predetermined time frame (Lint & Pennings, 1999; Spanner, Nuno, & Chandra, 1993). These changes are usually brought about by projects (Voropajev, 1998).

Despite this, there is seldom a structured process for deriving projects from the organisational vision. One of the main reasons for this is the way that new projects are recognised. Often, projects are driven bottom-to-top; that is, a need is recognised at a lower level in the organisation, and then permission and funding are sought at a higher level to address the need (Phillips, 2002; Comprehensive Solutions, 2001). This is especially true for information technology (IT) projects, as some senior managers are not aware of the value that new technology could have for the organisation. In some cases this might be necessary, but in the past, this often became the norm for IT projects. It is difficult to directly link this kind of project to the vision of the organisation, which makes a holistic view of projects nearly impossible. It is also difficult to quantify the contribution that a project makes towards achieving the organisational vision, as well as measuring and managing the expected benefits. This does not mean that a project has no value when considered in isolation but, rather, that when looking at it in a holistic context, other projects might have been more appropriate in achieving the vision (Walls, 2004; Szymczak & Walker, 2003). It further prevents a more consolidated approach to managing all the projects within an organisation, which sometimes results in duplicated projects.

The next section suggests a process through which to derive projects from the vision that directly support it.

From Vision to Projects

As mentioned before, several sources suggest that an organisation's vision statement should give rise to projects. Figure 1 suggests a structured, conceptual process that might be useful in deriving projects from the organisational vision and continuously monitoring the contribution that these projects make towards achieving the vision.

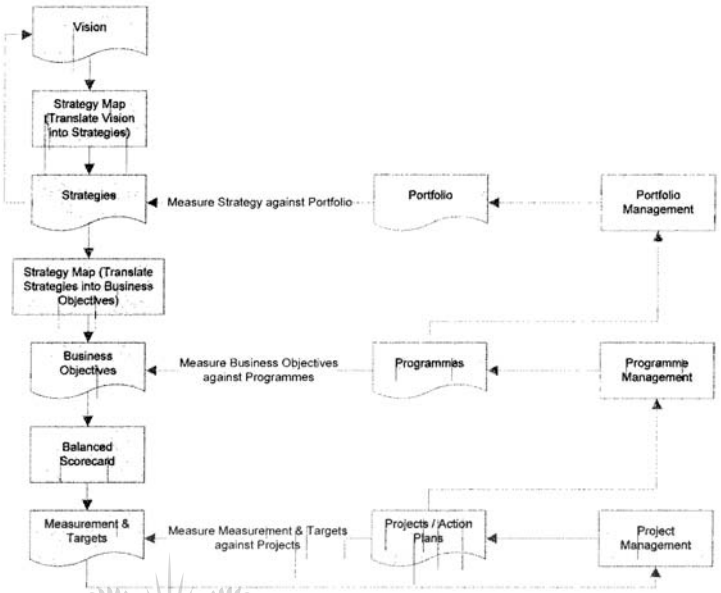

Figure 1: Structured approach

The starting point of the process is the vision statement.

Organisational Vision

A vision is a concrete idea that describes what needs to be achieved by the organisation's members (Norton, 2004). It is vitally important that a vision be based on reality, and discussed and shared by key stakeholders associated with the organisation (Bogler & Nir, 2005; Pearce & Robinson, 2000).

Formulating a vision is a very complex task, especially if the CEO of the organisation intends to improve the effectiveness of the organisation. A vision that is consistently or overly vague may be difficult for people to follow as it lacks a well-defined direction. It is therefore very important that a vision be articulated explicitly, and that it generates enthusiasm (Testa, 1999). The task is made even more difficult as the CEO needs to have both a well-defined idea of the vision and how to reach it, and the rhetorical and communicative skills to express it. To achieve a vision that is a "mental image" of a desirable future position of an organisation, leaders need to describe it using identifiable metaphors and concepts that unveil the direction for the future, and articulate defined mission statements along with the possibly vague ideas (Lynn & Akgün, 2001). The most important characteristics of the vision are that it is realistic and credible, and that it projects a future attractive enough to convince the followers to invest effort in pursuing it, rather than simply maintaining the status quo.

If the vision is vague or incorrect, it could severely impact the types of projects derived from it.

Strategy maps (Kaplan & Norton, 2004) can be used to derive business strategies from the vision and are briefly explained in the next section.

Using Strategy Maps to Translate Vision into Strategy

Strategy mapping is a method used to describe the vision and strategies of the organisation by means of processes and intangible assets (Marr & Adams, 2004; Kaplan & Norton, 2004, p. 10). It is used to align intangible assets such as information technology with the organisational strategies and ultimately the vision of the organisation. Intangible assets can be described as knowledge that exists in an organisation to create differential advantage (Eckstein, 2004). Differential advantage can formally be defined as "an advantage unique to an organization; an advantage extremely difficult to match by a competitor" (American Marketing Association, 2005). Figure 2 illustrates the strategy maps framework together with the four perspectives of the balanced scorecard (Kaplan & Norton, 2004). Strategy maps are used to describe and visualise the vision and strategies of an organisation in terms of objectives, whereas the balanced scorecard is used to measure the achievement of these objectives.

A structured approach to derive projects from the organisational vision

Figure 2: Strategy map – Adapted from Kaplan and Norton, 2004

The strategy map starts with a vision and follows a V approach, which is top-to-bottom followed by bottom-to-top. The top-to-bottom approach means that the vision dictates to all the lower levels in the organisation, while the bottom-to-top approach enables the organisation to link activities back to the vision. Each of the perspectives can be viewed as a level, as each perspective is dependent on the one above it. The top-to-bottom flow enables an organisation to take the vision and break it down into its different components, as shown in figure 2 above, and eventually into different projects. It must be made clear that not all the components need to be incorporated into the strategy. The four perspectives on the left-hand side of figure 2 above provide the different focal points of the strategy map, namely Financial, Customer, Internal Process and Learning & Growth. The main reason for using strategy maps is that they take a broader view than just the financial perspective. For more detailed information on Strategy Maps, refer to Kaplan and Norton, 2004.

In the next section, the strategy map is discussed using these four perspectives. The Financial and Customer perspectives deliver the organisational strategies, whereas the Internal Process and Learning & Growth perspectives deliver the business objectives.

Financial Perspective

Financial strategies relate to profitability and return on investment (ROI) and focus on the way that organisations become more profitable by increasing income or decreasing expenditure (Randoy, Oxelheim, & Stonehill, 2001). For non-profit organisations, profitability would equate to self-sufficiency, as money will always be a scarce resource. The financial performance of an organisation is improved through two basic strategies:

Growth Strategy

Organisations generate profitable revenue growth by enhancing and strengthening relationships with customers. This enables the organisation to sell more of its existing products or services or any new and additional products or services. Organisations can also generate growth by selling entirely new products, or by delivering products and services to an entirely new market segment.

Productivity Strategy

The productivity of an organisation can be addressed in two ways. The first is to lower the production/operational costs by reducing the direct and indirect expenses which will enable an organisation to produce the same quantity of outputs while utilising fewer resources. The second is to utilise existing financial and physical assets more efficiently. The working capital needed to support a given level of business can, therefore, be reduced.

The financial strategies, therefore, focus on how the organisation can increase profitability and ROI (Thackray, 1995). However, this is not possible without a complementary strategy for satisfying the needs of prospective customers.

Customer Perspective

The organisation identifies the targeted customer segments in which it wants to operate or compete. The customer strategies focus on customer satisfaction, retention, acquisition, profitability, and market share. These focus areas are interrelated as one will lead to the next.

The productivity and growth strategies derived from the vision are used to develop the financial and customer strategies, and provide the link between the vision and these strategies. The realisation of the strategies ultimately ensures the success of the organisation as they are linked to the organisational vision.

By applying strategy maps, organisations derive a set of strategies from the organisational vision that is unique to the organisation.

Strategies

Strategic management is defined as "the set of decisions and actions that result in the formulation and implementation of strategies designed to achieve an organisation's objectives" (Pearce & Robinson, 2000). A strategy is a large-scale, future-oriented plan for interacting with the competitive environment to achieve the organisation's business objectives (Baets, 1992). This plan does not detail all future deployments, but it does provide a framework for managerial decisions at all lower levels. An example of a strategy might be "to become the industry cost leader." This strategy implies that the product or service provided by the organisation is able to dictate the pricing of the competitors' products or services as well. To be able to do this, it must be of better quality and at a lower price than the competitors'. This strategy will be listed under the Financial perspective and will provide the organisation with a productivity strategy.

The organisation can have strategies for all or only some of the components within the Financial and Customer perspectives. The chosen strategies within the Financial and Customer perspectives provide the cornerstone for further actions taken by the organisation. These strategies determine the business objectives that, in turn, determine the projects needed to achieve them.

The next section focuses on business objectives and how they are used to describe the vision and strategies of the organisation in a tangible way.

Using Strategy Maps to Translate Strategies into Business Objectives

Once the strategies are developed, the third and fourth perspectives of the strategy map are applied to the strategies to determine the business objectives. A business objective describes what an organisation must accomplish to achieve the results envisaged by the vision and strategies (Kaplan & Norton, 2004). An objective is, therefore, the quantification of a strategy.

By quantifying the strategies, the business objectives provide the organisation with measurement criteria; that is, what is to be measured.

These two perspectives are illustrated in figure 2 above. The business objectives are directly derived from the strategies, and focus on the Internal Process as well as the Learning & Growth perspectives of the organisation.

Internal Process Perspective

From the Internal Process perspective, managers identify the processes that are most critical for achieving the financial and customer strategies. This enables an organisation to focus on those internal business processes that will be most successful in delivering the determined strategies. Two different processes may support the same business objective, but one process might be more appropriate than the other and, therefore, considered to be the better option.

The following four processes are used to support the business objectives needed to fulfil the vision and strategies.

- **Operations management processes** – These processes produce and deliver the organisation's products and services.
- **Customer management processes** – These processes focus on managing customer relationships.
- **Innovation processes** - Sustaining competitive advantage requires that organisations continually innovate to create new products, services, and processes. Successful innovation drives customer acquisition and growth, margin enhancement, and customer loyalty.
- **Regulatory and social processes** - Organisations must earn the right to operate in the communities and countries in which they sell. International, national, and local regulations impose standards on an organisation's operations. Organisations must comply with all these regulations.

Learning & Growth Perspective

This perspective, together with the Internal Process perspective, forms the basis of the business objectives, as illustrated in Figure 2. The Learning & Growth perspective highlights the role of aligning the organisation's intangible assets with its strategy. It also spans the four processes of the Internal Process perspective to indicate that intangible assets are incorporated throughout the organisation. Intangible assets are organised into three categories:

- **Human capital** - focuses on the availability of skills, talent, and know-how;
- **Information capital** - focuses on the availability of information systems, networks, and infrastructure; and
- **Organisational capital** - focuses on the ability of the organisation to mobilise and sustain the process of change.

Business objectives are developed by applying the four processes of the Internal Process perspective, as well as the three categories of the Learning & Growth perspective to the business strategies. These processes and categories enable the organisation to determine what is required to realise the vision and strategies.

Although the strategy map is a generic process that can be used by any organisation, the strategies and business objectives derived from strategy maps are unique to each organisation. The result is thus a set of unique business objectives for the organisation based on the business strategies that were derived from the vision statement.

Business Objectives

The main purpose of the business objectives is linking quantitative measurement criteria, to which employees can relate, to the strategies. Based on the example strategy of "becoming the industry cost leader," the business objectives will be to lower production costs and to enhance the quality of the product or service. These business objectives form part of the Operations Management process.

At this point in the process, the organisation has a set of business objectives that is used to describe and visualise the vision and strategies.

Once the business objectives are determined, a measurement criterion is applied to each. The balanced scorecard is used for this purpose.

Balanced Scorecard

The balanced scorecard is a method that provides executives with a comprehensive framework to measure the achievement of business objectives by linking measurement criteria and targets to them (Kaplan & Norton, 1996). The balanced scorecard was developed by Kaplan and Norton, and is also organised into the same four perspectives as the strategy maps namely:

- Financial perspective
- Customer perspective
- Internal Process perspective
- Learning & Growth perspective.

Although the different perspectives are tied to specific levels within the strategy map, as illustrated in figure 1, there is coherence among the perspectives and the strategies and business objectives of the organisation.

Linking Business Objectives to Measurement Criteria and Targets

Applying the balanced scorecard to the defined strategies and business objectives as discussed above means that measurement criteria to quantify them are defined. If a strategy or business objective cannot be measured, then it cannot be used to monitor the achievement of the vision.

Once the organisation has defined what the measured criteria must be to realise the strategies and business objectives, it must determine the targets for them. Each and every measurement criterion must be associated with a quantitative value.

The balanced scorecard enables targets to be defined for each business objective that are both quantifiable and measurable; for example, to acquire 10,000 new customers in the first quarter of the financial year. This differs from the business objective, which only qualitatively states "to acquire new customers."

The next step in the process is to take the measurement criteria and targets, and further break them down into potential projects. A project is the vehicle for implementing a product and/or service with its success measured against a set target. The projects are managed using generally accepted project management principles (Programme Management Definitions, 2005).

Using Project Management to Select Projects

At this point in the process, the initial phase of the project life cycle is entered into (Zandona, 2001). During this phase, various techniques can be used to convert the measurement criteria and targets into potential projects. These are collectively called the initiating process group, which forms part of the project management process groups.

This usually begins with a feasibility study to determine which potential projects would be appropriate. The measurement criteria and targets are used in formulating the scope statement.

Various techniques can then be used to determine the best project from a collection of potential projects. Some of the financial analysis techniques include net present value (NPV; Law, 2004), internal rate of return (IRR; Burke, 1999), and payback analysis (Levine, 2001). Non-financial techniques include weighted scoring and categorisation schemes (Schwalbe, 2004). The measurement criteria and targets might indicate two potential projects that will achieve the same result. The above mentioned techniques can be used to determine the better of the two projects. The result is a collection of projects that will best achieve the set targets for the strategies and objectives.

The next step in the process is to assemble the projects in logical groups, called programmes. This is achieved through methods used in the programme management discipline.

Using Programme Management to Develop Programmes

There are several definitions for programme management (Reiss, 2005), but most have one thing in common: programmes are concerned with managing a collection of projects (AIM Academy, 2005).

The management of a collection of projects requires a macro view, and, as such, differs significantly from managing single projects, which requires a micro view. Various methods and techniques have been developed in response to this difference in management approach. Programmes are managed to produce results such as profitability, market share, value, and customer satisfaction, and shift the focus to delivering outcomes rather than just completing the project. A different set of dynamics is, therefore, put into motion (Lycett, 2004; Thiry 2002).

Once a collection of projects is identified, duplicate projects need to be removed and complementary projects integrated. Duplicate projects are a result of the different measurement criteria. It might happen that the same project was identified to satisfy two different measurement criteria. The main purpose of programme management is to identify and consolidate these duplicate projects. This is a very important part

of the process, as there are limited resources available to execute these projects. The resulting projects are then formally initiated using the traditional project management processes.

By grouping projects together, the programme manager can share resources across projects, thus lowering costs. It also provides synergy among the projects because all projects within a programme focus on the same business objective. The result is a set of programmes each containing a set of projects.

Programmes

Programmes should be related to the processes of the Internal Process and Learning & Growth perspectives of the strategy map to enable the organisation to link projects directly to the strategies. This means that all the projects that form part of the operations management process should be grouped together into an operations management programme. This is very important as the cumulative results of the related projects determine the success of the programme.

Figure 3 shows how different projects can be grouped into the different programmes using existing programme management techniques.

Figure 3: Grouping projects into programmes

The programmes are based on the seven elements of the balanced scorecard. By allocating all projects to the seven proposed programmes, an organisation can relate and link these back to the business objectives and strategies.

The programmes form the basis of strategy implementation. The strategies of the organisation can be implemented through the seven programmes, and measured against the business objectives using the measurement criteria and targets.

Organisations might not require all these programmes and the composition of the programmes might change if the vision of the organisation changes. The number of projects within a programme can also change as the business objectives change.

The next step in the process is to consolidate the set of programmes, as illustrated in figure 3, to optimise resources and achieve the best possible rate of return. Portfolio management is used for this purpose.

Using Portfolio Management to Consolidate Programmes

Portfolio management is defined as "the management of a portfolio in such a way that the organisational strategies are implemented and the vision is realised optimally" (Lyn & Hsieh, 2004). The portfolio manager, therefore, manages and makes decisions on the priority of the programmes that it comprises.

The management of the portfolio takes place at two levels. The first level involves operational management, which ensures that the programmes within the portfolio achieve the set measurement criteria and targets. The second level involves strategic management, which ensures that the vision and strategies of the organisation are being achieved through the cumulative execution of programmes. The portfolio manager can, therefore, terminate a programme if it no longer contributes to the realisation of the vision and strategies.

In principle, this portfolio is similar to that of a financial portfolio (Leake, 2000). The organisation will have a combination of high-, moderate-, and low-risk programmes to realise the vision and strategies of the organisation. This principle assists the portfolio manager in putting together a portfolio that has a balanced spread of risk.

Portfolio

A portfolio is defined as "a collection of projects and/or programmes and other work grouped together to facilitate effective management of that work to meet strategies" (Mikkola, 2001).

The purpose of a portfolio is:

- To have an integrated view of programmes or projects at a strategic level; and
- To monitor the achievement of the organisational strategy and vision.

A typical portfolio, based on the approach suggested above, is illustrated in figure 4 and can consist of up to seven programmes. This portfolio is based on the Internal Process and Learning & Growth perspectives of the balanced scorecard as discussed above.

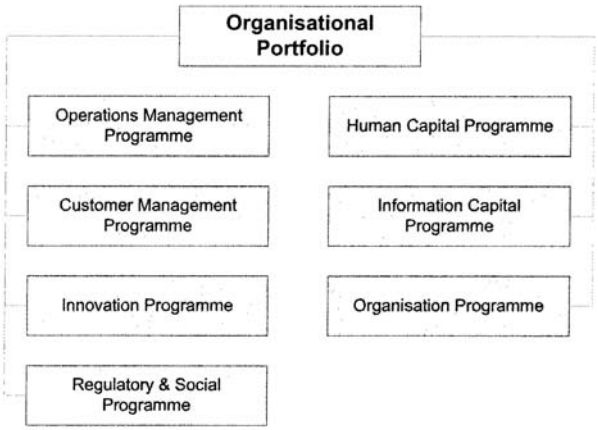

Figure 4: Typical organisational portfolio

The success of the portfolio is indicative of the successful implementation of the strategies and, ultimately, the vision of the organisation.

From Project back to Vision

In the previous section, a top-to-bottom process was proposed to turn the vision into projects. In this section, a bottom-to-top process is proposed to monitor the achievement of the vision by measuring project performance and progress.

The organisation must monitor the progress towards achieving the vision and strategies on a regular basis to ensure that the selected projects produce the expected results. Any deviations need to be addressed by taking corrective action.

Monitoring takes place at three levels:

- The measurement criteria and targets enable the organisation to monitor individual projects. It is the project manager's duty to ensure that the projects achieve these targets.
- The achievement of business objectives is monitored through the implementation of programmes, as every programme is linked to a business objective. The programme manager must ensure that the programmes achieve these objectives.
- The successful deployment of strategies depends on the execution of the portfolio. If the portfolio is managed successfully, the organisational strategies will be achieved. The portfolio manager must ensure that this is achieved.

If all the organisational strategies are achieved, then the vision of the organisation is realised. Figure 5 illustrates the relationship between and dependency of the vision and the strategies. The vision determines the strategies, and the strategies determine the success of the vision.

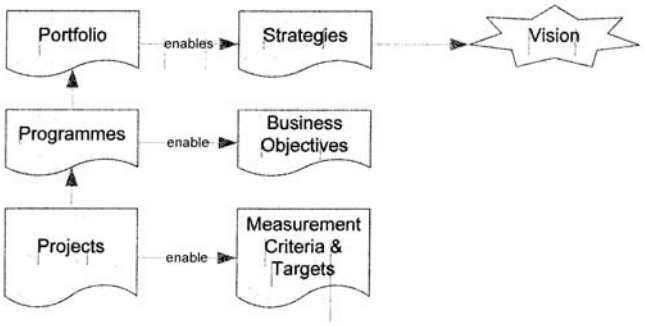

Figure 5: Interrelation between vision and strategies

The vision takes a long-term view of the organisation, while projects take a shorter-term view. This process enables the organisation to focus on the shorter term—that is, the projects—while the success of the short-term projects results in the success of the long-term vision and strategies.

Conclusion

The article suggests a structured approach that uses the vision of the organisation to determine the projects that it must implement. The approach makes use of strategy maps and balanced scorecards to determine the strategies, business objectives, measurement criteria, and targets. These are then linked to projects, programmes and portfolios. The suggested approach, although conceptual in nature, provides a holistic view of how to turn vision into projects. Many literature sources state that it must be done, but do not provide any guidance on how to do it.

The main benefit of this approach is that it is generic and can, therefore, be used by any organisation within any industry. Secondly, the selected projects are directly related to the vision, which eliminates pet projects and projects that do not contribute towards realising it. Thirdly, the approach is based on existing, proven techniques and best practices such as balanced scorecards and the PMBOK® Guide and, therefore, does not suggest a drastic departure from current thinking.

One of the limitations of the suggested approach is that it can only be applied to organisations that have already reached a certain degree of maturity in project management. Project management forms the foundation of both programme and portfolio management. Another limitation is that it is currently conceptual in nature, and so does not take into consideration the inherent limitations and flaws of existing techniques and best practices.

There is a void in the current literature when it comes to holistic approaches for implementing organisational vision and strategy using project management. This article attempts to fill the void by providing a possible approach. From this conceptual approach, it is hoped that a more pragmatic approach can be developed.

Future research is aimed at applying the approach to organisations in order to test it. The practical application of the approach will indicate shortcomings that can be used to improve it.

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25 APPENDIX J: ARTICLE PRESENTED AT *PMI RESEARCH CONFERENCE 2008*

Marnewick, C. & Labuschagne, L. (2008). *The substantiation of the Vision-to-Project (V2P) framework through action research.* Conference proceedings of the PMI Research Conference 2008. Conducted by Project Management International. Warsaw: PMI.

THE SUBSTANTIATION OF THE VISION-TO-PROJECTS (V2P) FRAMEWORK THROUGH ACTION RESEARCH

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Introduction: The Vision-to-Projects

Many literature sources agree that projects enable and facilitate the implementation of an organisational vision (Cohen & Graham, 2001; Phillips, 2002; Kendall & Rollins, 2003). The Project Management Institute's (PMI) Organisational Project Management Maturity Model (OPM3®) stated that "projects help organisations deliver desired strategic changes in a changing world" (2003). It also stated that "this is true whether the goal is the development of a new software product, implementation of new systems in an organization, or designing and building a bridge." Although the OPM3 recognized the fact that the vision and strategies of an organization are implemented by means of projects, it did not provide a lucid approach for proceeding from the vision to the projects. According to Peterson (2002), "any project undertaken by a company should be driven by business objectives." Sources in the literature have also stated that many organisations lack a structured process through which to derive projects from the business objectives. Longman and Mullins (2004) also acknowledged that an organization's strategy should provide the boundaries for projects, and note that "installing effective project management includes putting a mechanism in place to evaluate every project for its fit with the strategy before implementation."

Despite this, however, there is seldom a structured, formal process for deriving projects from the organisational vision. One of the main reasons for this is the way new projects are identified. Often, projects are driven from the bottom up; that is, a need is recognized at a lower organisational level, and then authorization and funding are sought at a higher level (Comprehensive Consulting Solutions, Inc., 2001; Phillips, 2002). The bottom-up approach might be necessary in some cases, but in the past this has often become the norm. Linking projects to the vision of the organization becomes a challenge, which makes an holistic view of projects almost impossible. It further makes it difficult to quantify the contribution that a specific project makes toward achieving the organisational vision, and measuring and managing the expected benefits. This does not mean these projects have no extrinsic value but that, rather, when looking at them in an holistic context, other ones might have been better suited to achieving the vision (Szymczak & Walker, 2003; Walls, 2004). The bottom-up approach prevents a more consolidated one to collectively managing all the projects within an organization, sometimes resulting in their being duplicated. Based on this, Marnewick and Labuschagne (2006) developed the Vision-to-Projects (V2P) framework, using the vision of the organization as a starting point from which to derive the projects needed to implement it.

The first two steps are to deconstruct the vision into strategies, using "Strategy Maps," which are in turn deconstructed into business objectives (Kaplan & Norton, 2004a). The third step involves assigning measurements and targets to each business objective with a Balanced Scorecard (Kaplan & Norton, 1996). Each of these business objectives, with its associated targets and measurements, is then further deconstructed as projects and/or action items using principles from the project integration management knowledge area. The projects are then grouped together, where appropriate, into programmes related to the business objectives; that is, each business objective will be aligned to a programme or, at least, a project. The final step involves grouping together the programmes into a portfolio that is aligned to the strategies of the organization.

This essence of the V2P framework is illustrated in Figure 1, starting with the vision.

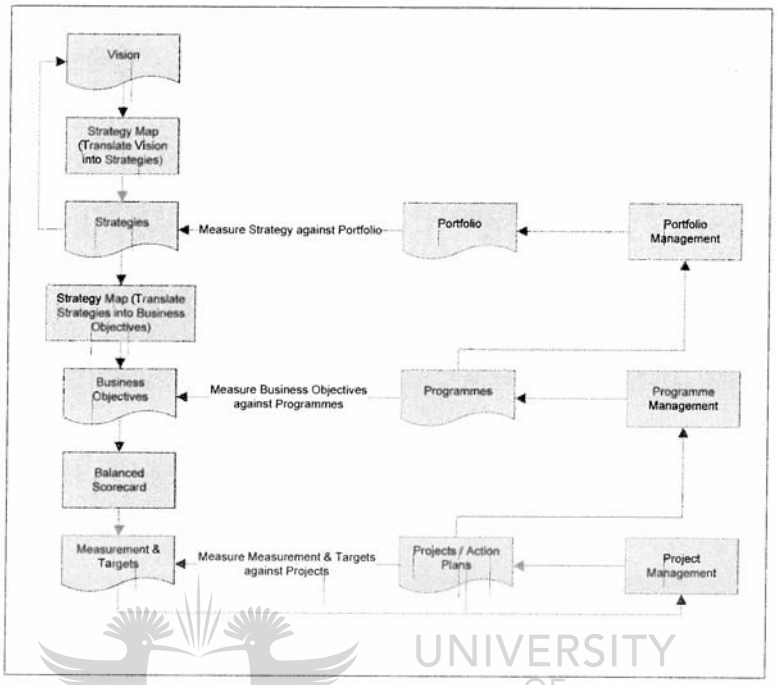

Figure 1. Vision-to-Projects (V2P) Framework (Marnewick & Labuschagne, 2006)

This theoretical framework was developed as a generalization model, using deductive reasoning based on an extensive literature survey. This paper reports on further investigation, through action research (AR), into the practicality of this framework. According to McNiff and Whitehead (2006), AR as a research methodology is appropriate when attempting to improve the understanding of something. In this case, AR was used to improve the understanding of, and to refine, the V2P framework. The paper is divided into four sections, with the first providing a brief overview of AR; the second focusing on the application of AR to the V2P framework; the third discussing the results; and the fourth comprising a conclusion.

Action Research

AR is known by many other names, including participatory research, collaborative inquiry, emancipatory research, action learning, and contextual action research, but all are variations on the same theme (O'Brien, 1998). The focus of AR is to involve practical problem-solving that has theoretical relevance (McKernan, 1996; Mumford, 2001). AR is a phenomenological paradigm, as the focus is on knowledge-creation based on the personal and professional experience of the action researcher (Avison, Baskerville, & Myers, 2001; Zuber-Skerrit & Fletcher, 2007).

What separates this type of research from general professional consulting practices or daily problem-solving is the emphasis on scientific study (Avison, Baskerville, & Myers, 2001; Coughlan & Coghlan, 2002). This means the

researcher studies the problem systematically and ensures that intervention is informed by theoretical considerations. AR is considered a legitimate research method in the social sciences and is slowly reaching acceptance in the project management domain (Parker & Mobey, 2004; Whitehead, 2005). The following section briefly explains the AR process.

The Action Research Approach

The most prevalent AR description details a five-phase cyclical process, as illustrated in Figure 2 (Stringer, 1996; Avison, Baskerville, & Myers, 2001; Earl-Slater, 2002; McNiff & Whitehead, 2006; Zuber-Skerrit & Fletcher, 2007).

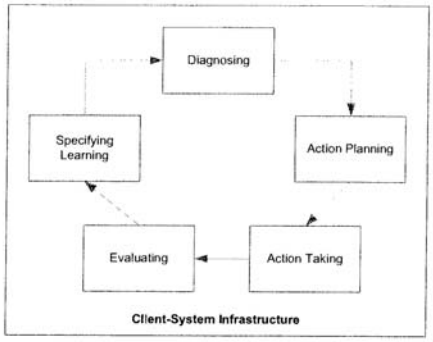

Figure 2. Action Research Cycle

The approach first requires the establishment of a Client-System Infrastructure, that is the specification and agreement that constitutes the research environment. It provides the authority under which the researchers and host practitioners may specify actions and it also legitimises those actions with the express expectation that eventually they will prove beneficial to the client or host organization. This is followed by the five identifiable phases shown in Table 1.

Table 1. Phases within Action Research

Diagnosing Phase	The diagnosing phase corresponds to the identification of the primary problems that are the underlying causes of the organization's desire for change.
Action Planning Phase	Researchers and practitioners collaborate on this activity to specify organisational actions that should relieve or improve these primary problems.
Action Taking Phase	The researchers and practitioners collaborate on the active intervention into the client organization, causing certain changes to be made.
Evaluating Phase	Evaluation includes determining whether the anticipated theoretical effects of the action were realized and whether these effects relieved the primary problems.
Specifying Learning	The purpose of this phase is to determine if the organisational actions must be modified to rectify the primary problems. This is based on the evidence from the Evaluating Phase. While the activity of specifying learning is formally undertaken last, it is usually an ongoing process.

The action research cycle can continue, whether the action proved successful or not, to develop further knowledge about the organization and the validity of relevant theoretical frameworks (Daniel & Wilson, 2004). As a result of the studies, the organization thus learns more about its nature and environment (Zuber-Skerrit & Perry, 2002).

Applying Action Research to the Vision-to-Project Framework

Different AR cycles were applied to the V2P framework, as illustrated in Figure 3. The overlapping of the three AR cycles is indicated by a pattern of vertical lines, illustrating that each subsequent AR cycle is dependant on the outcome of the previous one and that it involves the whole organization.

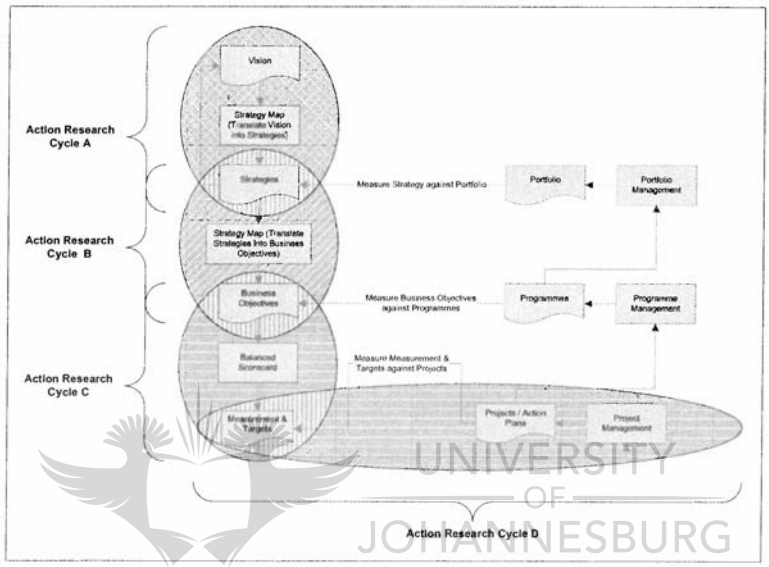

Figure 3. Action Research Cycles applied to the Vision-to-Project Framework

Research Methodology

Based on the practice of McNiff (2000), the V2P framework was broken down into manageable and measurable sections, each of which then went through the AR process and cycles previously described. The main sections were:

- Using a Strategy Map to derive the strategies from the vision (Action Research Cycle A).
- Using Strategy Maps again, but this time focusing on deriving business objectives from the strategies (Action Research Cycle B).
- Using the Balanced Scorecard to assign targets and measurements to each business objective (Action Research Cycle C).
- Using project integration management methods to identify projects to achieve the targets and measurements (Action Research Cycle D).

The following case study explains the application of AR to the V2P framework.

Case Study

Background

The Democratic Republic of the Congo (DRC) issued a decree that constituted rebuilding the country in a way that would enable it to build and maintain support centres throughout (O'Connor, 2007). The DRC defined a support centre as a town with an entire supporting infrastructure, including agricultural and environmental activities. A governmental department, Service National (Combrinck, 2007), was formed to oversee the implementation of these support centres, and its first objective was to select an organization that would implement four of the support centres in the southwest region of the DRC. The organization would be required to implement several projects across various divisions and so ensure the realization of Service National's decree or vision.

Selecting the Organization

The authors used the following criteria for selecting the research organization, which must:

1. Comprise more than 50 full-time staff. The reason for this is that everyone should be involved in the compilation of the business strategies and the business objectives, thereby representing different views and stakeholders.
2. Use projects as a vehicle for implementing its vision. This is to be able to link projects to specific business objectives.
3. Not yet have a process in place for deriving projects from the vision and strategies. This is because the AR process may be manipulated by the participants to deliver a predetermined result, thereby losing objectivity.
4. Believe that the research will be advantageous to the organization itself. A lack of confidence in the AR process would negate the validity of the results.

Based on these selection criteria, a South African (SA) organization was selected (referred to as "Organisation SA" for reasons of anonymity). This organization conformed to the selection criteria listed in Table 2.

Table 2. Selection of Organization

Selection Criteria	Conformation to Selection Criteria
Number of full-time staff > 50	Organisation SA has a staff of 90. The organization is split into two sections, where the managerial section is situated in SA and the operational section is based in the DRC. The managerial section is 16 staff members and the operational section is 74 staff members.
Deploys internal projects	Organisation SA has various internal projects, including setting up a mine in the DRC, building roads, and implementing an ERP system to manage the organization as an entity.
No vision to project process in place	Organisation SA is a new organization, so does not yet have a process in place.
Supports research	Organisation SA's CEO recognized the importance of the research, as it is mutually-beneficial to both Organisation SA and the AR group.

The next step in the AR process was to formalize the Client-System Infrastructure, which determines the subject of the study, the processes, the objective, and the agreed-upon outputs.

Subject of the Study

The subject of the study is a pragmatic framework that can be used to derive projects from the organisational vision (Marnewick & Labuschagne, 2006).

Processes

As indicated above, the processes that are used are Strategy Maps (Kaplan & Norton, 2004b) and Balanced Scorecards (Kaplan & Norton, 1996). These processes are used to deconstruct the organisational vision into strategies, business objectives, measures and targets.

Objective

The objective of the research is to determine if the V2P framework can be used to derive projects from the vision and therefore ensure alignment. This alignment would in turn ensure that valuable organisational resources are not wasted on projects that do not contribute to the realization of the vision.

Agreed-Upon Outputs

The outputs that were agreed upon for this research were:

- The vision of the organization
- The strategies and business objectives
- The projects that must be initiated to ensure the successful implementation of the business strategies and objectives, and, ultimately, the organisational vision.

In order to conduct AR successfully, all participants had to understand the process and their responsibilities.

Team Structure

At an initial meeting held with Organisation SA, it was decided that the core of the research group would include the following three members:

- An executive of the organization
- A board member
- The action researcher

Roles and Responsibilities

The roles and responsibilities of the executive were defined as follows:

- Provide all the necessary information according to the needs of all relevant parties
- Approve the vision, strategies and business objectives derived from the V2P framework
- Ensure that all the relevant staff needed to participate were available to the action researcher

The roles and responsibilities of the board member were defined as follows:

- Act as liaison between the action researchers and Organisation SA
- Assist in the AR process in an active way by providing input and all relevant documentation needed to derive the strategies and business objectives

The roles and responsibilities of the action researcher were defined as follows:

- Ensure that the process of AR was followed properly
- Ensure that everyone involved understood the concepts of Strategy Maps and Balanced Scorecards
- Observe the AR cycles and document all changes
- Document all the processes, including the results

The agreed-upon processes, objectives, and outputs were communicated to all participants to ensure that no ambiguity could arise.

Once the Client-System Infrastructure was determined, the phases of the action research (Figure 2) could be applied within all three cycles.

Action Research Cycle A

The first cycle in the case study was to determine if the process of Strategy Maps could be used to derive strategies from the organisational vision. This was done through a series of workshops, including in their make-up several members of the executive management of the organization.

explained the process of Strategy Maps. Due to space constraints, the strategies in Table 3 are only for the Operations Management Processes within Strategy Maps.

The inputs for each of the strategies were provided by the executive management team that participated in the workshops. Based on these workshops, the executive management team defined three major strategies: productivity, growth, and customer (see Table 3).

The following lessons were learned during this cycle:

- The vision must be well-constructed for the V2P framework to be useful. If the vision is not well-constructed the subsequent strategies would also be poorly constructed and could place the organization on the wrong course.
- Strategy Maps (Kaplan & Norton, 2004b) can be used as a method to derive strategies from the vision.

The output from this cycle was a business strategy and a go-decision to continue to the next.

Action Research Cycle B

The focus of cycle B was again to use Strategy Maps, but this time to derive business objectives from the newly defined strategies. The action researcher scheduled various workshops, the participants of which were the operational management team, as they were responsible for the production and delivery of the goods and services. The only person attending the workshops from the executive management team was a board member who acted as the liaison between the action researchers and the organization.

The starting point of these workshops was an explanation on how Strategy Maps worked and an overview of the revised business strategies. Data from the various workshops was gathered and documented, later to be confirmed by participants as a true reflection of the meetings held. The outcome of these workshops is shown in Table 4. The purpose of the Operations Management Processes is to produce and deliver goods and services to the customers (Kaplan & Norton, 2004a). It is one of four processes, with the others being Customer Management, Innovation, and Regulatory and Social. These are not shown here due to space constraints.

Table 4. Business Objectives of the Operations Management Processes

AFTER		
Vision	**Strategies**	**Business Objectives**
To be Service National's partner of choice for the implementation of a sustainable first-class infrastructure	• Productivity Strategy ○ (F1): Maximize the use of existing and new assets ○ (F2): The mining operation must be cost-effective	• (BO1) Lower cost of ownership (F1) • (BO2) Achieve Just-in-Time supplier capability (C3) • (BO3) Develop high-quality supplier capability (F1, F5, C2, C5)
	• Growth Strategy ○ (F3): Revenue from new customers, that is, Service National ○ (F4): Increase the account share with Service National ○ (F5): Offer products and services that are consistent, timely, and low-cost ○ (F6): Products and services that expand existing performance boundaries into the highly desirable ○ (F7): Provide the best solution to Service National	• (BO4) Use new ideas from suppliers (F1, F2, F5) • (BO5) Achieve supplier partnerships (F2, F5, C2, C5) • (BO6) Lower the cost of production (F1, F2, F5, C1, C6) • (BO7) Continuous improvement (F1, F2, F6) • (BO8) Improve process cycle time (F1, F2, F5, F6, C2) • (BO9) Improve fixed asset

AFTER		
Vision	**Strategies**	**Business Objectives**
	• Customer Strategy ○ (C1): Low-cost supplier ○ (C2): Perfect quality ○ (C3): Speedy purchase ○ (C4): Appropriate selection	utilization ((F1, F2, C3) • (BO10) Responsive delivery time (F6, C2, C3) ** The number in brackets at the end of each business objective shows to which specific strategy it links.*

The original business objectives listed in Table 3 are substantially different from the ones listed in Table 4, because a structured methodology was now being used to assist the organization in deriving business objectives from the strategies.

An observation was made that the executive management and operational team had difficulty determining the business objectives. A working session was held with these managers to determine the reason for this. It became clear during this session that they had difficulty determining the business objectives without relating them to operational measurements. Linking measurements and targets was only supposed to be done in the third cycle, within the original V2P framework, and was not addressed in cycle B.

The following lessons were learned during this cycle:

- Business objectives should be developed in conjunction with the measures and targets.
- Strategy Maps (Kaplan & Norton, 2004a) can be used as a method to derive business objectives from the strategies, but the Balanced Scorecard must also be used simultaneously, to determine the measurements and targets.
- The processes of the Strategy Map and Balanced Scorecard do not have to change as they provide the results required. Changes must, however, be made to the V2P framework to incorporate the Balanced Scorecard during the defining of the business objectives.

Based on the above lessons, the AR cycles were adapted, as depicted in Figure 4.

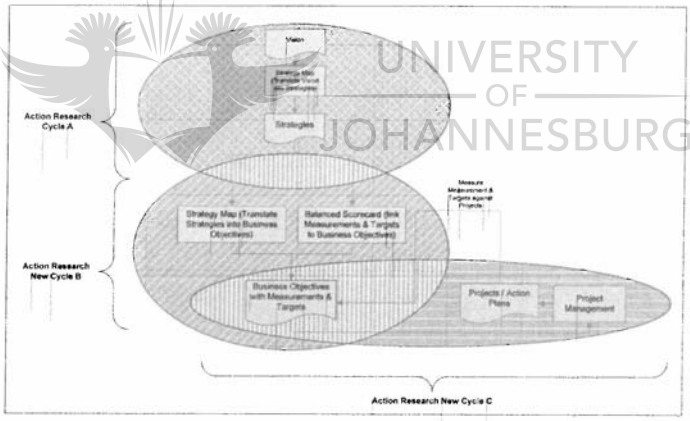

Figure 4. Adapted Action Research Cycles

Due to this change, cycle B had to be repeated.

Action Research New Cycle B

Based on the above information, the Balanced Scorecard was introduced into the new cycle B. The Operations Management process of the Strategy Map was used again. The implication is that AR cycles B and C, as shown in Figure 3, merged into AR new cycle B, as shown in Figure 4. Using this altered process, the identified business objectives, targets and measurements are listed in Table 5.

Table 5: Business Objectives, Targets and Measurements for Customer Management Process

Business Objective	Measurement	Target
(BO1) Lower cost of ownership	• Cost of purchasing as percentage of total purchase price • Percentage of purchases made electronically	• < 10% • > 90%
(BO2) Achieve Just-in-Time supplier capability	• Lead time from order to receipt • On-time delivery percentage • Percentage late orders • Percentage of orders delivered directly to production process by suppliers	• < 2 days • 100% • < 5% • 80%
(BO3) Develop high-quality supplier capability	• Percentage of defects, incoming orders • Percentage of suppliers qualified to deliver without incoming inspection • Percentage of orders received	• 5% • 80% • > 95%
(BO4) Use new ideas from suppliers	• Number of innovations from suppliers	• 5
(BO5) Achieve supplier partnerships	• Number of suppliers providing services directly to customers	• 3
(BO6) Lower the cost of production	• Cost per unit of output • Marketing, selling, distribution, and administrative costs as percentage of total costs	• R9 500 • < 20%
(BO7) Continuous improvement	• Number of processes with substantial improvements • Number of inefficient or non-value added processes eliminated • Scrap and waste percentage	• 15 • < 5 • 12%
(BO8) Improve process cycle time	• Cycle time (from start of production until product completed) • Process time (time the product is actually being processed)	• 10 days • 2 days
(BO9) Improve fixed asset utilization	• Percentage capacity utilization • Equipment reliability (percentage of time available for production) • Number and percentage of breakdowns	• > 90% • > 95% • < 5%
(BO10) Responsive delivery time	• Lead times: from order to delivery • On-time delivery percentage	• < 24 hours • 100%

The output from this new cycle was measurements and targets that were directly linked to the business objectives that, in turn, were directly linked to the business strategy. A go-decision to continue on to the next cycle (new cycle C) was made, which involves transforming the above into projects.

Action Research New Cycle C

According to PMI (2003), two methods or mechanisms can be used to identify potential projects, the first being Requirements Management and the second Project Integration Management. The former, Requirements Management, covers the process of defining the business and technical requirements in a solution-free way (Powell & Buede, 2006). The requirements should be specified in a manner that allows the solutions that are subsequently proposed to be traced back to the requirements in a structured way and to be tested against the requirements. The use of requirements management ensures that the resulting specifications are typically of a higher quality than those done on an ad-hoc basis (McKay, de Pennington, & Baxter, 2001). The latter method or mechanism, Project Integration Management, covers the processes used to identify projects that will address specific needs (Project Management Institute, 2004), the primary goal being to successfully manage stakeholder expectations and to meet requirements.

Based on discussions with the managers of Organisation SA, the decision was made that requirements management was preferred. It must be noted that AR was not applied to the Requirements Management process, as it was outside the scope of the original Research Environment, as depicted in Figure 2. This decision led to another adaptation of the AR cycles. Requirements management was now included in AR cycle C, as shown in Figure 5.

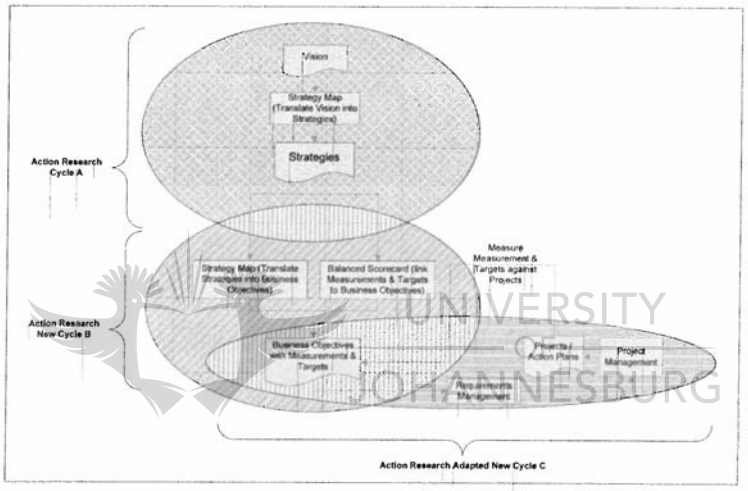

Figure 5. Adapted Action Research Cycles

Based on this change, cycle C had to be repeated. A workshop was held to identify projects that would potentially achieve the business targets.

Action Research Adapted New Cycle C

The introduction of requirements management made the executive and operational managers think of what they actually needed. As an example, Organisation SA needed to invoice customers. A basic financial package would have sufficed, but the question arose: would it address all the other needs of Organisation SA, as well as integrate with the rest of the initiatives? Organisation SA also had a need for a Supply Chain Management (SCM) system to

address the business objectives of responsive delivery time (BO10), as well as improving the process cycle time (BO8). Based on this, the requirements for the financial applications changed, as Organisation SA needed to integrate the financial package with the SCM system. Based on these requirements, an ERP system could address Organisation SA's immediate and future needs.

The ERP system could also provide them with Customer Relationship Management (CRM) and Supplier Relationship Management (SRM) systems, that could achieve some of the other business objectives (BO2, BO4, BO5) as illustrated in Table 5. Using requirements management, the requirement was stated as "Implement a total IT solution." The process of requirements management continued by defining additional business and technical requirements.

Using requirements management, the executive and operational managers of Organisation SA determined the projects necessary to implement the business objectives.

The advantages realized by Organisation SA having used requirements management are listed below:

- The process is repeatable. This means that Organisation SA should be able to identify the same projects every time they go through the process of requirements management.
- The requirements are measurable and the delivered product and/or service can be linked back to the original requirements.
- Any personal preferences are eliminated, as it is a structured process.

The following lessons were learned during this cycle:

- Requirements Management can be used to identify projects from measures and targets.
- An additional step must be included in the V2P framework to allow for the introduction of Requirements Management.

Results

The application of AR to the V2P framework highlighted several required changes.

The first change to the framework is that the processes for developing business objectives and measurements and targets must be grouped together. This means that Strategy Maps can be used in conjunction with the Balanced Scorecard to determine the different business objectives and their associated measurements and targets.

The second change to the framework is the introduction of Requirements Management. This is added after setting the business objectives with its associated measures and targets.

The revised framework is illustrated in Figure 6.

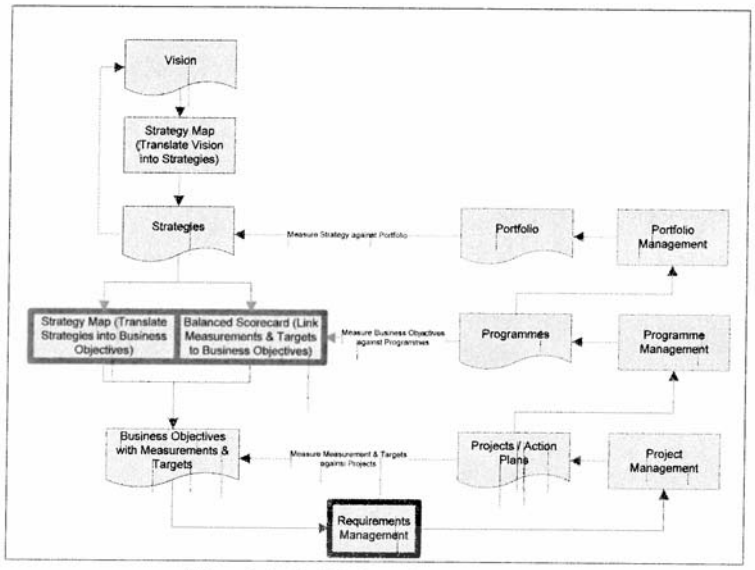

Figure 6. Revised Vision-to-Project Framework

Despite the positive results achieved, there are some limitations that need to be taken into consideration.

Limitations of This Study

The first major limitation of this study is that it was conducted on a relatively small organization in South Africa. This highlights two considerations:

- A non-South African organization may respond differently to the process that was followed, due to cultural differences.
- The size of the organization might influence the process. Future research will test the framework on larger organisations.

The second limitation is that the V2P framework is limited to organisations that make their own internal projects. The framework has not yet been applied to an organization that provides project management as a service to others.

Conclusion

This paper provided a brief overview of the V2P framework, as well as an introduction to AR and how it can be used to bring about change. The V2P framework is a holistic framework that can be used to derive projects from the organisational vision and strategies. The framework consists of proven methods and tools such as Strategy Maps, Balanced Scorecards, and Requirements Management. Through the application of AR, the framework was revised to be more pragmatic.

The first finding is that the format of the vision statement is crucial in applying Strategy Maps and the Balanced Scorecard.

The second finding is that the linear approach of the original V2P framework had certain inefficiencies. Humans are capable of complex thinking and processing multiple thoughts simultaneously. This led to the adaptation of the original model to have parallel processes and to bring in a new process that would facilitate turning needs into requirements.

Two conclusions can be drawn from this research. Firstly, AR can be used in the project management field to test and validate frameworks and concepts. There is a definite connection between AR and project management in that both bring about change and follow a life cycle. Project managers can therefore easily relate to AR as a research methodology to enhance methods or frameworks. Secondly, the revised V2P framework can indeed be used in practice to derive projects from the vision of the organization.

Future research is aimed at applying AR to other organisations that differ in context and size, as well as to organisations that provide project management as an external service.

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