Department of Information Systems

**Research Proposal
for Master of Commerce
by coursework**

An Analysis of the Impact of IT Software Architecture on Business
Transformation Strategy

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DECLARATION

I declare that this research report is my own, unaided work. It is submitted in partial fulfilment of the requirements of the degree of Master of Commerce in the University of the Witwatersrand, Johann..sburg. It has not been submitted before for any degree or examination in any other University.

Sharon D. Jackson

30 November, 1997

DEDICATION

To my son, Grant,
It has been a long year, I know!

ACKNOWLEDGEMENTS

ABSTRACT

Managers are increasingly aware that they need to leverage their company's resources in order to deal with the challenges of the changing business world in the 90's and the coming millennium. The aim of this research is to evaluate how organisations are utilising enterprise wide packaged software applications in order to achieve strategic and transformational benefits for their organisations.

The relentless change in the business landscape has meant that organisations have needed to respond in increasingly innovative ways to stay in business. This has been more so for South African organisations which have now been accepted back into the world community after years of isolation due to the country's political policy of apartheid. The watershed years of the early 1990's opened up once forbidden markets to South African organisations and in doing so launched these organisations into a global competitive environment. To compete effectively in these newly opened and changed markets, companies have sought to reposition themselves. Since information technology is clearly embedded in many of these organisations they are increasingly turning to information technology to underpin their new businesses strategies. The relevance of the information architecture an organisation chooses will also be explored in this research, as the flexibility and structure of the architecture will determine what strategic options are available to the company.

Many organisations are implementing software packages as opposed to writing their own software to fit unique processes. This trend is strengthened by advancements on the technological front, the disappointment of cost overruns with previously in-house written applications, and the critical shortage of experienced IT (information technology) skills in the country. Business can no longer wait years for a system to be developed. The implementation of enterprise wide packaged software applications facilitates integration and process transformation which many organisations see as fundamental to their new strategies to remain competitive.

This research showed that the implementation of enterprise wide packaged software applications forces change on an organisation in that a number of domains within the organisation are challenged. Processes need revisiting, human resources undergo a change and teamwork is facilitated. There is a new sharing of knowledge and information within the organisation, and such information systems are deployed rapidly and with the business objectives firmly in place. Whilst there were strategic and transformational benefits, there were also a number of unexpected benefits. The changes brought about by such implementations were largely underestimated by managers within these organisations.

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CHAPTER 1

1.0 INTRODUCTION

This chapter presents a brief overview of the research problem as well as the research process, and introduces the reader to a number of subjects relevant to the research.

1.1 OVERVIEW

In recent years, trends in the usage of information technology has changed dramatically. This change in direction needs to be examined in conjunction with an overview of how business and organisations have changed over the past few decades. The growth of the significance of 'information' can be attributed to the shift from the activities of the industrial era to the information handling functions of the modern organisation. The industrial revolution paved the way for specialisation in the work place - many people contributed to the end product; which has meant that there had to be a passing along of information. That many people contributed to the end product introduced a level of complexity, which in turn drove the demand for greater efficiency and more information. Whilst this trend took decades to develop, as the complexity of the production cycle increased, so the demand for more information increased. Linked to this gradual change in the organisation of the workplace, came the successful inventions in the field of electronics.

1.1.1 The evolution of I.T.

In the early 1950's computers were used mainly in the areas of scientific and mathematical research. These machines were large, complex and difficult to program. The emphasis was on their processing capability. Management had very little to do with these computers and they were left to the technologists to handle.

By the 1960's the need had arisen for the automation of routine tasks within business organisations. These computers were seen as a means to store and retrieve information. They were expensive machines which were controlled by centralised data processing departments. These systems were initially justified to save money, as headcounts could be significantly reduced. As the focus was more on storage and retrieval of data, the specification for software was unique to the organisations' requirements. The programs written were to automate existing manual systems within the organisation. The business climate was insular with markets clearly defined. Of great importance to the company in this decade, was efficiency. The time it took to develop these new systems received little focus. Because of the technology, and management's discomfort with this technology, acceptance of development time for automating software was the norm. This was the latest state of the art technology, which was perceived to be adding value in that it

automated office tasks, and saved money in terms of people overheads. If a system added to efficiency and was seen to be able to contribute to cutting costs, it was embraced.

The 70's saw the advent of terminals throughout the organisation. Whilst in the 60's computers stood apart from the rest of the organisation, the 70's ended the isolation of the computer department. The computer moved from batch processing to interactive processing. The automation of office activities was slowly changing. Information technology was seen to be able to enhance product lines and contribute to process improvements. This contributed to more complex software specifications. Owing to the fact that the computer industry (information industry) had grown so quickly, skills were both difficult to come by, and expensive. Added to this it was perceived that software had to be written to suit the organisation's needs, thus most software was written in-house. Speed and capacity of computers had grown which allowed for the broader application of software. Information was becoming an economic commodity. This further contributed to increased specialisation and was seen by organisations as specific to their business.

By the 1980's IT was central to the organisation. IT touched every part of the business, and had penetrated deeply into the value chain. IT was now viewed as capable of being integral to the business strategy. The advent of the personal computer changed the relationship between IT and the company. IT was now no longer seen in a supportive role, but rather as a commodity that could also be exploited. The continuous evolutionary changes in technology led to greater expectations of what it could deliver.

The 1980's was also the decade that led to the greatest criticism of IT in that it was seen as not being able to deliver on promised business benefits. Critical in-house written systems were expensive to maintain and, in some cases, impossible to replace without severe disturbance and risk to the organisation. In this decade the demographics of organisations were also changing from command and control organisations to information-based organisations. The accelerating pace of industry change demanded more from IT. Markets became fragmented, product life cycles accelerated and the globalisation of industries meant that competitors were multiplying. This led to organisations looking for software that could reshape their business – thus the need for integrated software to assist the organisation in attaining or maintaining competitive advantage. Software development needed to be rapid. Companies turned to software packages in the need for rapid new implementations. Previously there was a need for software to automate current processes hence unique 'in-house' written systems written to specification, were adequate. However, the rapidly changing demands of business, which transcended barriers of time and distance, and the required integration of the multiple facets of an organisation led to the perception that in-house written systems took too much time to write and were costly to maintain. Toffler (1990) points to the fact that there has been a powershift from slow to fast.

By the 1990's organisations were undergoing huge changes directly attributable to information technology. Davenport & Short (1990) submit that information technology and business process reengineering began transforming organisations. The locus of

knowledge and hence power had changed. Information and its technology had moved in responsibility to line managers. IT was now breaking down barriers between industries and creating new opportunities for competitive advantage. The rise of enterprise resource planning (ERP) software was prominent. Throughout the 80's and the 90's there was a significant shift in the way some organisations structured their businesses - the influence of business process reengineering had contributed to a concentration on processes, which resulted in a shift away from functional departments. It was evident that the structure of these organisa, one are changing - structures were becoming flatter.

In this decade the evolution of computer architecture has had a significant impact Integrated packages were seen as being a better solution to legacy systems owing to the speed of business changes. Business demanded systems that would respond to change rapidly, and without software changes. Integrated packages now covered a variety of functional models, including general accounting, manufacturing, distribution, logistics and human resources. These reduced the need to reconcile data across modules, they supported more detailed drill down analysis and allowed for maintenance activities without changing the code. ERP software was now not relegated to the backoffice but was being viewed as part of the business strategy. IT was being increasingly involved in the business strategy of the organisation. It was in this decade that South African organisations were accepted back into the world community, after years of isolation.

1.1.2 IT and Business Strategy

Perhaps one of the more significant developments in IT was the shift in recognising that IT could assist in changing the way an organisation does business.(Venkatraman,1991; Hammer & Champy,1995; Davenport & Short, 1990). IT was seen to be able to enhance an organisation's strategy, and in some cases change the strategic options available to the organisation.

The quest for competitive advantage saw companies turning to IT to leverage their resources. (Rockart & Short, 1989; Short & Venkatraman, 1992) Competitive advantage was seen to grow out of an entire system of activities with IT being incorporated. IT could no longer be static - systems needed to be dynamic. This in turn led to a focus on processes - to exploit technology, an analysis of how the organisation actually does its work was undertaken. This led to a number of approaches, amongst them being business process reengineering, total quality management, building competencies and capabilities.

Integrated information systems were seen as a method to enable the organisation to attain its vision or strategy. However, this technology could not be the organisation's primary solution, because competitors could copy those solutions, so the advantage given to the organisation could be short lived.

It is widely recognised that information technology fundamentally changes what knowledge is useful, where the knowledge is located, who has access to this information and how it gets applied. (Clarke, 1989). Galliers, (1994) draws a distinction between strategic information systems and competitive information systems. Strategic Information

Systems (SIS) directly support the creation and implementation of an organisation's strategic plan. Competitive information systems support the execution of strategy by improving the value relationships of the firm in its competitive environment.

The role of IT has shifted from its traditional backoffice support role towards being part of the organisation's strategy. Allen & Scott Morton (1994) point to strategic management falling into three categories:

- Corporate strategy: being the interrelationships among businesses
- Business strategy: which maximises the best organisational advantages to compete in the marketplace
- Functional strategy: which reflects the efficient allocation of resources allocated to a particular function.

IT strategy usually occurs at the functional level, in order to support the chosen business strategy. But IT can be used to influence markets as well as shape the basis of competition. The role of IT has important implications for organisational transformation. Successful companies can be distinguished by their abilities to use IT to transform their businesses. Transformational strategies will be dealt with in section 2.3.

1.1.3 Software Packages

Few organisations can claim that their legacy systems do not present a problem. For many companies the inability to change these systems quickly to fit with changed business requirements has driven a new scrutiny of their information systems. Given that there is a critical shortage of IT skills in South Africa and given that traditional systems have brought cost overruns and failed system expectations including that they are slow to develop, many organisations are investigating enterprise wide packaged software applications to deliver the value they are seeking. In the past most companies wrote their own software, but with the increased complexity of business environments and the increased pace at which these systems are expected to be developed, software packages have become an attractive alternative for organisations. Added to this is the knowledge that traditional approaches to software development can mean that the application can easily become obsolete before the application is delivered.

Many organisations seek to revitalise their strategies to deal with the changing world and packages offer a solution. It is widely recognised (Hammer & Champy 1995; Venkatraman, 1991; Galliers, 1994) that the power of technology enables organisations to break old rules and create new ways of working. It is precisely this shift together with advanced technical architectures that has raised the expectation that ERP software can deliver the benefits that legacy systems couldn't.

According to the annual Worldwide Software Revue and Forecast published by International Data Corp.(Computing SA, July 1997) the packaged software market grew an estimated 14,7% in 1996. Application markets showed vendor revenues of $42,9 billion in 1995 and is expected to grow to $78 billion by the year 2000.

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The four companies selected for this research have chosen to use a software package as a tool to assist in transforming their organisations. Each of these companies have in the past made extensive use of information technology, and all have made the move from having legacy systems to packaged software, thus none of the companies have a clean slate from which to move as advocated by Hammer & Champy. (1995)   Nolan's Stage Model (1979) provides a framework for understanding at what stage of change each organisation was at. Figure 1.1 depicts Nolan's Stage Model.

Transition Point

Stage 1	Stage 2	Stage 3	Stage 4	Stage 5	Stage 6
Initiation	Contagion	Control	Integration	Data Integration	Maturity
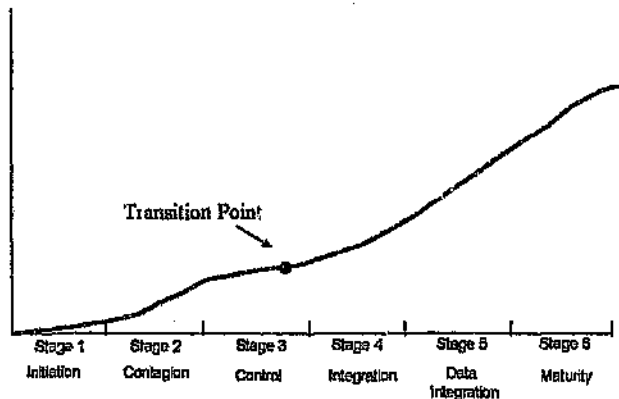
Figure 1.1 - Nolan's Stage Model

At stage one there is low control, some slack and little or no information systems planning.   At stage two there is greater slack in order to encourage use and lack of planning.   Costs rise and costs from lack of integration become visible.   Stage three presents with high level of controls.   Information systems planning is given increased emphasis.   There is emphasis on integration at stage four together with more emphasis on user control of information system costs and the use of databases.   At stage five the focus is on data administration.   There is some slack to encourage development of systems which contribute to strategic advantage of the organisation.   Application portfolio is complete and matches organisational objectives at stage six.

All four of the companies have felt that their legacy systems were an inhibitor to change and to meeting the changing business needs of the 90's and the future.   Each of the organisations is at a different stage of their projects.

The organisations selected for research purposes are all implementing the same suite of software.   As there are a number of variables (social, economic and political) within each

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organisation, it was decided to keep one of the variables the same. The common element in all cases was that an enterprise wide packaged software application, known as JD Edwards, was used. The framework of JD Edwards (JDE) World System Architecture is presented in Figure 1.2

Figure 1.2 - The Framework of JDE's World System Architecture.

JD Edwards (JDE), an enterprise resource planning (ERP) system, comprises applications such as financial accounting, distribution, logistics, manufacturing and human resources. The software has been ranked as the third largest ERP solutions provider in the world. The company has customers in 90 countries around the world. JDE has two technologies to deliver their enterprise applications. WorldSoftware (along with its client/server counterpart WorldVision) is an RPG solution that runs on an IBM AS400. They also have 'OneWorld' which is a multi-platform distributed object, open systems solution that coexists with WorldSoftware. OneWorld runs on a heterogeneous network. JDE maintains that their flexible software upgrades to new releases quickly and encourages quick translation of business needs to sound business practices. Their 'Configurable Network Computing' architecture accommodates the Internet, intranets and extranets. JDE offers a co-existence architecture in that customers can have their host-centric (WorldSoftware), client/server (WorldVision) and configurable network computing (OneWorld) solutions running on the same AS400, sharing the same data, and interacting with each other to support integrated business processes.

In order to examine how organisations are utilizing this package to achieve strategic and transformational benefits, the relevant literature has been reviewed. This is presented in the following chapter.

2.0 LITERATURE REVIEW

In this chapter, models of strategy in relation to Porter, and Treacy and Wiersema will be presented. Organisational transformation models, including Business Process Reengineering, Core Competencies and Capabilities will also be presented. Attention will also be drawn to literature relating to Information Systems Architecture and Software Packages.

2.1 INTRODUCTION

As global competition becomes a reality for South African organisations, these companies are responding by rethinking their business strategies. To reposition themselves either to maintain their competitive advantage or to obtain a competitive advantage, many organisations are seeking from information technology (IT) to support them in this endeavour. Prager et al. (1996) argues that in the changing world of business the IT function can no longer create and manage static systems as business is changing too rapidly. IT leveraged to support the new business strategies can be flexible and integrated largely due to technology advancements, hence its importance to organisations seeking advantage over other companies in their industry.

In this chapter the following themes will be presented:

2.2 MODELS OF STRATEGY

Balancing the needs of today with the plans of the future will always be the ultimate challenge for management. The complexity of this challenge and the disparity between current capabilities and future objectives has led to many interpretations and models of strategy. Normann and Ramirez (1993) define strategy as the way a company defines its business and links together knowledge and relationships. Porter (1996) expands on this by submitting that the essence of strategy is the activities of the organisation - that is, choosing to perform activities differently or to perform different activities from it's rivals.

2.2.1 Porter's Five Forces Model
Porter (1985), in his work 'Competitive Advantage, Creating and Sustaining Superior Advantage' identified five competitive drives on an organisation and within these five forces a number of factors that influenced their importance. The five forces include:

- Potential entrants, where the structure of competition can be changed by the threat of new entrants to the market. Even if new entrants are unsuccessful, they can alter the framework within which existing rivals compete.
- The bargaining power of suppliers where suppliers affect the forces of competition through their pricing and negotiating strengths.

- The b... ...g power of purchasers where the choices that customers make, and their resultant bargaining power also affects competition.
- The threat of product substitution due to price performance of alternative inputs; the costs of switching to alternative input products; differentiation between alternative inputs; environmenta. pressures and the willingness of the buyer to change source is an alternative form of competition.
- Rivalry between existing competitors gives rise to an impact on each others competitive positions and their adopted strategies.

Porter maintained that a business has to be aware of these factors in analysing it's competitive position and in defining it's strategies. He stressed that these five factors would be different in varying industries and even with different companies in the same industry.
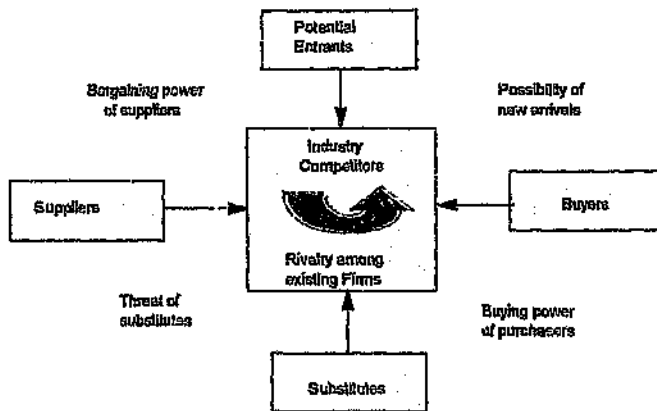
Figure 2.1 - Porter's Five Forces Model.

According to Ward et al (1990) the activities of designing, producing, marketing, delivering and supporting its product (i.e. the value chain) can only be understood in the context of the business unit. For overall performance to be achieved states Ward, these are the things a business must do to exist -- and they must be carried out effectively and linked together efficiently. The secondary activities add value indirectly but that value is only realisable through primary activity results. Thus the basic value chain model is a form of business activity analysis - a way of breaking down a complex enterprise into its component parts.

Lindsay (1996) asserts that Porter's analysis gives insufficient attention to the role of information systems in changing the boundaries of intra-industry competition. He views the five forces model as a useful check on what business an organisation is in and who their competitors are. Further to this, McNurlin and Sprague (1996) add that there are four supporting activities that underlie the entire the entire value chain. They identify them as organisational infrastructure, human resources management, technology development and procurement. McNurlin and Sprague add that by

studying how a firm performs (i.e. inbound logistics, operations, outbound logistics, marketing and sales, and service) a company could explore how it could add more value at every activity. Citing Rayport and Sviolka, McNurlin and Sprague suggest that companies treat information as a support element and not as a source of value itself. Further to this, they add that to take advantage of business changes requires a shift in focus from the value chain where 'make and sell' is the focus (i.e. supply side thinking) to 'demand-side' thinking where companies can 'sense and respond'.

2.2.2 Porter's Generic Strategies
Building on his Five Forces Model, Porter and Millar (1985) claimed that there are only three generic strategies, the three strategies being cost leadership, differentiation and focus.

The objective of a cost leadership strategy is to become the low cost supplier in the organisation's industry. Price will be the determining factor where products or services are similar. Other criteria's of value to the customer should not however be discounted. Ward et al (1990) make the point that the emphasis (with a low cost strategy) on process efficiency and tight control systems, facilitates taking advantage of technology to increase profitability. Information then, is not seen as a key resource for exploitation, but as an overhead cost that needs to be processed efficiently.

When an organisation distinguishes itself from its competitors Porter & Miller (1985) define this as 'differentiation'. In this way the organisation can attract a premium price for its products or services. This unparalleled product or service is embodied in an image for which customers will pay a premium. In the instance of differentiation, Ward et al (1990) suggest that the emphasis here, is on innovation and creativity, market-orientation and people-driven rather than systems-driven management controls. IT will focus on enabling new things to be achieved or existing things to be done better. IT will need to support each users need for information, implying high overheads in development and operations. (i.e. value added, differentiated systems.)

By 'focus' Porter means targeting, and more specifically niche targeting. Porter explains that focusing on a particular niche though, is not enough. It has to be combined with a cost advantage or a unique customer value. Ward asserts that IT may be a competitive weapon in considering a niche/focus strategy. Here IT can assist in identifying and then establishing a strong hold on a particular niche.
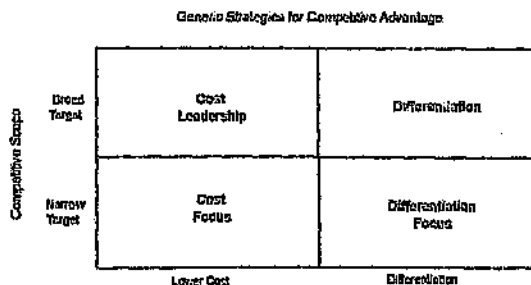
Generic Strategies for Competitive Advantage

Figure 2.2 - Porter's Generic Strategy.

Ten years on, Porter (1996) maintains strategic positions emerge from three definite sources.

- The first one he names as 'variety based positioning' being that it is based on the choice of product or service offerings rather than customer segments.
- The second basis for positioning he describes as 'needs based positioning' which is about targeting a segment of customers.
- The third position, being 'access based positioning' is about targeting customers who are accessible in different ways. E.g. the geographical location of the customer or the customer scale.

He further asserts that choosing a unique position is not enough to create a sustainable advantage over competitors. Many other factors need to be taken into account. Whilst IT can be viewed as a definite source of advantage it needs to be viewed in conjunction with other factors and resources. (Booth & Phillip, 1996.)

As all strategies rely on good information, managements, in their endeavour to reposition their organisations, have turned to technology to further enhance their strategies. Technology has been seen as a key enabler (Ventkatraman 1991) of strategy. Using technology to enable strategy has however initiated another set of challenges for organisations. These will be detailed in section 2.2.4.

2.2.3 Value Disciplines

The work of Treacy and Wiersema (1995) provides a framework for the research in terms of assessing the type of strategic direction organisations are adopting. Treacy and Wiersema's theory is that strategy thinking has moved from being industry or product driven to being customer driven. It is the customer who now rules. Customer choices are what is now driving organisations to rethink their strategies. Treacy and Wiersema advocate that a company can only succeed by excelling at providing a single type of value to their customers. They have named this a 'value discipline' and submit that organisations should build their entire strategy and operations around the chosen value discipline.

With market leadership being increasingly hard to win and to keep, with customers being more demanding and less loyal than ever, they suggest a new model of competitive strategy to assist managers in redefining their businesses. The have categorised them into three different categories: operational excellence, customer intimacy and product leadership. Their definition is as follows:

> "By operational excellence, we mean providing customers with reliable products or services at competitive prices, delivered with minimal difficulty or inconvenience. By product leadership, we mean providing products that continually redefine the state of the art. And by customer intimacy, we mean selling the customer a total solution, not just a product or a service."

In choosing a value discipline the operating model of the organisation will have to change to suit the value discipline, and together, this will define the nature of the

company. They further assert that these operating models are made up of operating processes, business structures, management systems and a company culture all of which together create a specific superior value. Different value disciplines demand differing operating processes. The following three sections elaborate on each discipline:

2.2.3.1 Operational Excellence

The focus of operationally excellent companies is on delivering quality, price and ease of purchase that is unsurpassed. These companies reject variety because it has cost implications and it is their intention to keep their prices consistently low. They also place emphasis on convenience.

Efficient operating procedures are the backbone of these companies. They work at shaping their customers' expectations. They strive for low overhead, with efficient re-engineered business processes.

To sustain operational excellence these companies look for one target, and this is growth. They look for a steady volume of business, they look for new ways to use their existing assets and finally they try and duplicate this formula in other markets.

2.2.3.2 Product Leadership

Product leaders offer their customers the best product. They consistently strive to provide their markets with leading edge products or a new use for an existing product or service. In so doing these organisations need to focus on creativity, commercialisation of their ideas, and speed. These organisations value the innovation process and avoid bureaucracy because it slows down the commercialisation process. Their strength lies in reacting to situations as they occur.

The features of a product leader operating model include a focus on the core process of invention, product development and market exploitation. The business structure needs to be loosely knit, ad-hoc and ever changing to adjust to entrepreneurial initiatives and their management systems should be re. '1s driven, that measure and reward new product success. It should have a culture that encourages individual imagination and accomplishment.

To be product leaders Treacy and Wiersema contend that companies have to show that they can create a steady stream of standout products. Product leaders create flexible organisational structures and robust processes. They provide efficient co-ordination while embracing innovation and discipline

2.2.3.3 Customer intimacy:

Companies delivering value via customer intimacy focus on providing a total solution for the customer. These companies' greatest asset is their customers loyalty. They cultivate relationships with their customers and concentrate on customer retention.

The operating model that supports such organisations allows them to deliver a much broader and deeper level of support. They tailor their mix of services or customise the products for their customers. These organisations focus on core processes that deliver solutions for their customers, have a business structure that delegates decision making

to employees who are closer to the customer, have management systems that are geared towards creating results for carefully selected and nurtured clients and have a culture that embraces specific rather than general solutions. These organisations strive for deep and lasting relationships with their clients.

Customer intimate companies personalise basic services and even customise products to meet unique customer needs. They take on the responsibility for achieving results with their customers. They do not sell products at the leading edge. Their business depends on a stream of products that represent evolutionary improvement, not revolutionary change. They steer clear of pure transactions. If customers do not require advice or expertise, customers wont find the customer intimate company's offering compelling.

Clients need to meet a certain criteria in customer intimate companies:
- attitude - does the client see an opportunity for joint gain?
- operation - where expertise meets with incompetence.
- financial - fit occurs where customers have large untapped potential.

In short, customer intimate companies continually deepen their client's dependence on them. Solutions are what these companies sell
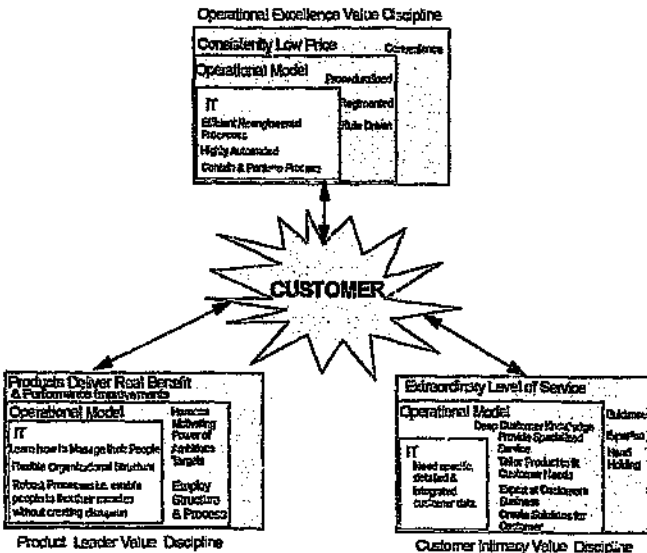
Figure 2.3 - A diagrammatic representation of 'Value Disciplines' as put forward by Treacy and Wiersema.

2.3 Organisational Transformation Models

The overwhelming volume of literature and research into the changing world of business and the implications for organisations bears testimony to the fact that companies are grappling with the constant and unpredictable changes in their markets. Lloyd (1994) states that IT is not a competitive weapon, it is an enabler of business

transformation and a re-definer of business scope. Organisations trying to change to align with their new business strategies have adopted various methods - from re-engineering and core competencies, to a focus on organisational capabilities. They are looking internally and externally in their attempt to re-define their strategies and make them operational. The following transformational efforts are being undertaken, amongst others:

2.3.1 Business Process Re-engineering

Whilst it has long been recognised that business process re-engineering (BPR) is not a substitute for strategy (Rigby, 1993), BPR is being leveraged as part of an organisation's strategy. Hammer and Champy (1995) define BPR as:

> *"the fundamental rethinking and radical redesign of*
> *business processes to achieve dramatic improvements*
> *in critical, contemporary measures of performance,*
> *such as cost, quality, service and speed."*

The fundamental rethinking and redesign of processes create similar kinds of changes in most organisations. Hammer submits that firstly, work units change from functional departments to process teams, where groups of people working together perform an entire process. The second change that BPR brings about is that job designs change - workers have to think of a far bigger picture, instead of just the task they used to perform. Thirdly, people's roles change, from being in a controlled environment, to being empowered. Within the boundaries of their job specifications, the workers should be deciding about the outcome of the process. The fourth change brought about by BPR is that if employees are to be empowered to make decisions, then that will have an impact of the skills level of the people. Hammer suggests that the focus should shift from training, to education of the workforce. Another change, the fifth one he cites, is that there should be a shift in performance measurements and compensation from activity to results. Related to this, the sixth change, is that advancement criteria changes from performance to ability. In the aftermath of reengineering, he states, the distinction between advancement and performance is firmly drawn. I.e. pay for performance and promote for ability. The seventh change relates to people changing from being protective about their functions, (work) to being productive. Managers change from being supervisors to coaches, organisational structures change from being hierarchical to flat, and lastly, executives change from being scorekeepers to leaders.

The changes that reengineering brings about requires leadership with real vision. Re-engineering thus cannot be thought of as the solution. It should be integral to an organisation's vision. Davenport and Short (1990) take a more conservative view of BPR. Whilst Hammer considers IT as the key enabler of BPR, Davenport and Short argue that BPR requires taking a broader view of both IT and business activity and the relationships between them. In their view, IT capabilities should support business processes and business processes should be seen in terms of the capabilities IT can provide. Thus their view, that BPR is the analysis and design of workflows, and processes in an organisation and between organisations.

King's (1994) viewpoint on the failure of BPR is that there is an over emphasis on the tactical aspects and therefore that the strategic dimensions get compromised. He notes that most failures of reengineering are attributable to the process being viewed and applied at a tactical rather than a strategic level.

2.3.2 Core Competencies

Another of the transformation practices suggest that, in order for organisations to deal with the ever changing business environment and increased global competition, is that they focus on core competencies of the organisation. Prahalad and Hammel (1990) contend that:

> "the real sources of advantage are to be found in management's ability to consolidate corporatewide technologies and production skills into competencies that empower individual businesses to adapt quickly to changing opportunities."

Prahalad further suggests that organisations are missing the strength of competitors by looking only at their end products. Of paramount importance is the collective learning of the organisation. Fundamental to the concept of core competence is communication, involvement and commitment to working across organisational boundaries. He uses three tests to identify core competencies in a company: Firstly, a core competence provides potential access to a wide variety of markets, secondly, a core competence should make a significant contribution to the perceived customer benefits or of the end product and thirdly, a core competence should be difficult for competitors to imitate

Prahalad and Hammel argue against outsourcing, suggesting that these organisations in an attempt to focus on core competencies have unwittingly surrendered them. Outsourcing contributes little to building the people.

If a firm's core capabilities are scarce, durable, defensible or hard to imitate they can form the basis for competitive advantage. (Schoemaker, 1992). He suggests that the following characteristics help define a core competence - if it evolved slowing through collective learning and information sharing, if its development could not be speeded up by increasing investments, if it could not be easily imitated or transferred to other firms, and finally, if in the eye of the customer, it confers competitive advantage. Parker (1996) also contends that core competencies and learning organisations cannot succeed where the IT function cannot deliver and disperse information and shared knowledge throughout the organisation. It follows then, that companies need to take cognisance of technology and make it a core competence if these organisations are going to succeed well into the next millennium.

Leading on from this, literature points to capabilities (also known as the resource based view of strategy) as being a key enabler of transformation in an organisation.

2.3.3 Competing on Capabilities - Resource Based View

The key to strategy and to competitive advantage used to be the positioning of the company as defined by Porter. However, in the more dynamic business world of today

strategy needs to be more dynamic - success depends on anticipating trends and a speedy response to customer needs. Stalk et al (1992) suggests that the essence of strategy is not the structure of a company's produ. and markets, but the dynamics of behaviour. The goal here then, is to identify and develop the hard-to-imitate organisational capabilities that distinguish a company from its competitors in the eyes of the customer.

Stalk et al (1992) identify four basic principles of capabilities based competition: the first being, that the building blocks of corporate strategy are business processes and not products and markets, the second being that competitive success depends on transforming a company's key processes into strategic capabilities that consistently provide superior value to the customer; thirdly, capabilities are created by making strategic investments into a support infrastructure that links together and transcends traditional strategic business units and functions, and lastly, the champion of capabilities-based strategy should be the CEO because capabilities cross functions.

Thus it can be said that capabilities are sets of business processes strategically understood. The primary objective of strategy should then be the business processes. The key to transforming business processes is to link them to real customer needs. When the process begins and ends with the customer, then it is seen as a capability. Stalk submits five dimensions where capabilities based organisations will outperform their competitors: the time it takes to respond (speed), where the product or service is unfailingly the same (consistency), where the company can anticipat delivery), how adaptive the company is (agility) and lastly, the stream of new ideas (i.. vativeness).

The starting point in becoming a capabilities oased organisation is for senior mangers to undergo a fundamental shift in perception so that they see their business in terms of strategic capabilities. From this they should focus on business processes and linking them to customer needs. Finally, they can then reshape the organisation - including roles and responsibilities to encourage new kinds of behaviour. This can be the formula to make them into a capabilities based competitor.

The four steps which a company can use to transform itself include shifting the strategic framework to achieve aggressive goals, organising around the chosen capability (i.e. making sure employees have the necessary skills and resources), making progress visible and bringing measurements and reward into alignment and lastly, not delegating the leadership of transformation.

Grant (1991) asserts firstly, that internal resources and capabilities provide basic direction for a firm's strategy, and secondly that resources and capabilities are the primary source of profit for the firm. His focus on resources includes financial resources, physical resources, human resources, technological resources, reputation and organisational resources. He states that

> *"the capabilities of a firm are what it can do as a result*
> *of teams working together.....A capability is, in essence,*
> *a routine or a number of interacting routines."*

Thus resources and capabilities are central to formulating strategies. In utilising IT to support a strategy it will become apparent that both competencies and capabilities within an organisation will form part of the plan to reshape the organisation. Thus it can be deduced that large scale implementation of software packages cannot be successful without due consideration to competencies and capabilities.

2.4 INFORMATION ARCHITECTURE

Many organisations have found that it is their information systems that have been inflexible and unable to meet their changing needs quickly, instead of it being the organisation's vision that was not properly communicated. Allen et al. (1993) suggest that in the past, information systems (IS) efforts have automated processes having frozen the organisation into patterns of behaviour and operations that have resisted change. Thus the challenge for the company is to structure IS to meet the changing requirements of the organisation. A succinct definition of an information architecture has been given by Brancheau and Wetherbe (1987) who define an information architecture as

> *"a high level map of the information requirements of an organisation. It shows how major information categories relate to business processes and how information categories must be interconnected to support the business. An information architecture provides the guide for applications development. It facilitates the integration and sharing of data among applications."*

Information architecture will be investigated as it is key to the success of software package implementations and the role these packages play in assisting with transforming the organisation.

By information architecture is meant not only the hardware but also the data, human resources, communications facilities, software and management responsibilities. According to King (1995) an information architecture is a strategic capabilities architecture because it is

> *"a flexible, adaptable and continuously improving infrastructure of capabilities that is intended to keep a firm competitive and allow it to achieve its multiple goals."*

Many organisations have incompatible technologies directly attributable to their efforts to stay at the forefront of technology and attempts at trying to meet business needs. This has compounded the problems of needing to integrate data and processes to be more efficient and flexible. This is supported by Segars and Grover (1996) who make the point that the effective utilisation of IT can only be achieved by carefully evaluating organisational needs and only then matching them to technology solutions.

Segars and Grover propose a framework which assists in conceptualising higher-level planning processes which are designed to assist in aligning IT with the business.
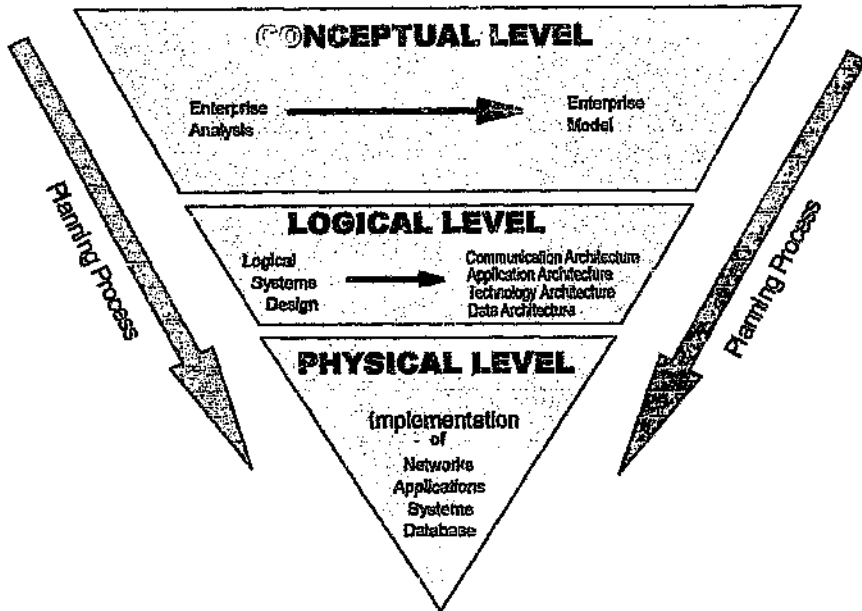
Figure 2.4 - Information Systems Architecture Framework.   Source: Segars and Grover 1996.

According to Segars and Grover Information Systems Architecture (ISA) development starts with a broad conceptual level analysis of the business and proceeds to a more specific level of logical systems analysis and then physical systems implementation. At each level there is a different planning process, from which emerges a 'different product.' Each step is gone through until a physical system emerges. All aspects of IT must be taken into consideration.   At the end of this there should be four sub-architectures, being data, communications, technology and applications.

2.4.1 Conceptual Level:

At this level the development aspects of an ISA should be seen from a strategic point of view. Top management's view should be taken into account at this level. The goal should be to transform the vision into a set of concrete strategies for the development of an information architecture.   Considerations should include the structure of the organisation, processes and policies.

Risks at this level include having no strategic direction (either not communicated or there is no plan), a lack of ongoing strategic assessments and a lack of skills and methodologies to undertake this analysis.

2.4.2 Logical Level:

There should be a more tactical perspective at this level. Middle management's point of view should be taken into account here. This level of architecture development should be concerned with matching information requirements with the functions, processes and tasks within the organisation. From here the ISA provides a blueprint for more specific conceptualisations of data flow, applications usage and processing needs across the enterprise. This can be divided into four clear process areas: a communications architecture for movement of information, an applications architecture for the distribution of software, a technology architecture for the distribution of hardware and a data architecture for the distribution of information.

Risks at this level are numerous: they include the amount of databases, business processes and information requirements which can be overwhelming; retaining the status quo instead of being more responsive to changes in the competitive environment; and the lack of skills and methodologies to undertake such an analysis, which could jeopardise the process.

2.4.3 Physical level:

This level of the architectural process is concerned with the implementation and development of databases, networks, hardware and software applications. The notion of an overall ISA guides the integration and implementation of other systems risks. These risks include political game playing, the temptation to avoid replacing 'tried and true' systems and a misunderstanding of the implementation plans.

Clearly information architectures are central to an organisation's strategy if IT is being leveraged to underpin their strategy. Without an information architecture then, organisations put their IT enabled strategies at risk.

2.5 SOFTWARE PACKAGES

The biggest advantage of purchasing software, is that it provides economies of scale. This is especially important in the South African context where there is a critical shortage of IT skills. This option offers a clear advantage to South African organisations in that the time scale to implement such software is less than the time it takes to develop such systems. The interest in packaged software, does however go beyond just an economies of scale issue; another important factor is that packages can assist the organisation in achieving integration of function and data. By implementing a package the organisation is forced to investigate its business processes, to best make a fit to the software.(Davenport 1990). The importance of processes to software packages is set out in section 2.4.1.

Software provides the mechanism through which managers can lower costs and compress time cycles. Software is also the core element in creating the functionalities that make products valuable to customers – it is often the strategic element in unlocking higher value-added opportunities and in restructuring entire companies and industries. (Quinn et al 1996) These integrated ERP packages cover a variety of functional modules, including general accounting, distribution, logistics, manufacturing

and human resources. Examples of such packages include SAP R3, Baan, Triton, Peoplesoft, Oracle and JD Edwards.

As such, software packages then provide organisations with solutions to their business problems. A software package needs to accommodate user and industry dynamics. Organisations are looking at software packages to provide the flexibility they require, to promote efficient work and data flow, and ease of use.

The key success of software implementations rests not with the mere deployment of these packages, but rather to leverage them to obtain the benefits sought to support the organisation's strategic direction. In these instances organisations seek to redesign their business to exploit software packages. To implement such large scale systems requires decisions about priorities within an organisation because of the interdependencies of the various functions from a business and systems point of view. (Rockart & Short, 1989) This forces a focus on the process behind the work being done or the product. Where IT is seen as the tool for changing business (Davenport, 1990) processes become the building blocks of the changed direction.

Organisations adopt two kinds of approaches to implementing such software. The first approach is to implement the software incrementally. (i.e. divide a large project into a number of smaller projects.) The second approach is known as the 'Big Bang' approach, which is an all-at-once approach.

Subramanian & Lacity (1997) point out that there are three types of incremental implementations. The first type of incremental implementation, protoyping, is where the system is developed in an artificial environment so that users can test and validate the new system. The second type, phasing, allows for large projects to be divided into a number of phases, with each phase being implemented at a different stage. The third type, piloting, is where the system is developed at one site. This site is used as the test site and when the system is complete, it gets rolled out to other sites.

Circumstances may not allow for the incremental approach, in which case, the 'Big Bang' approach is used. Literature points to the fact that a number of organisations prefer this method. Forrester's Cameron (cited by Radosevich, 1997) agrees, "if a company has a flat organisational structure that is not tightly controlled, it's very difficult to sustain commitment." Radosevich, describing an ERP implementation at Quantum (California) states that their reasons for using this approach was that they needed to integrate their business quickly and they did not want to write and test custom interfaces, (which is normally necessary with the incremental approach.).

2.5.1 Processes

Davenport and Short (1990) highlight a number of means by which IT can support a business objective: where IT assists in human labour and produces a more structured process, (automational), where IT augments the automation process and provides information for analysis, (informational), where IT changes the sequences of processes so that processes can be performed concurrently and not sequentially, (sequential); IT can assist with monitoring and tracking of a process, (tracking); it can facilitate in incorporating more data to be analysed and reduce time, (analytical); IT can overcome

geographical locations, (geographical); IT does away with highly segmented tasks, (integrative); IT can facilitate the distribution of knowledge more broadly and consistently, (intellectual); and lastly, IT can connect participants in the process and this he names 'disintermediating'.

Davenport further draws attention to the fact that business should be viewed not in terms of functions, divisions or products, but as key processes. He defines a process as

> *"a specific ordering of work activities across time and place, with a beginning, an end, and clearly defined inputs and outputs: a structure for action."*

A focus on processes allows companies to integrate functionally separated tasks into unified horizontal work processes. (Garvin, 1995; Quinn, 1996). This in turn facilitates new ways of working. P.Allaire CEO of Xerox (cited by Garvin) states that less developed information systems that supported command-and-control structures could not support today's changing business requirements - such as accessing information simultaneously from multiple locations. Software packages force a thinking about where processes intersect. Alignment across the business is critical if technology is to be leveraged.

Before a package can be implemented an investigation into existing processes is required. For example, what the process does, how well it performs, and knowing of the issues surrounding its performance. (Davenport 1990). Understanding the process and its output, can lead to an improved process. Hammer & Champy (1995) relate that the goal in understanding the process is not understanding the 'how', but the 'what' and the 'why', because to obtain a new process the concentration will be on what the new process will do. From here then, a re-engineering exercise can take place, and then it can be applied to the new software package. Thus, the software forces an understanding of what is critical to the performance of that process (i.e. what the real objective of the process is) and then the new process should be applied to the software.

For software packages and new business processes to have a positive impact on the organisation depends on the information management structure of the organisation. According to Davenport (1990) information and technology are rarely sufficient to bring about process changes and successful implementations of software; organisational structures and culture contribute largely to the success or failure thereof.

2.5.2 Organisational Values

Amongst the values that this review will consider are teamwork, employee empowerment and factors relating to human resources.

2.5.2.1 Teams

If IT fundamentally alters what knowledge is useful, where that knowledge is located, who has access to it and how it gets increased and applied (Clark, 1989; Drucker, 1988), then the changes that it brings to the organisation are connected to the people that drive these systems. If organisations then, shift their focus from individual tasks to processes, teams will be involved in performing these processes. (Wetlaufer 1994, Rockart and Short, 1989). According to Savage, (1996) reengineering of key processes, does not, in itself, assist an organisation to move to team-working. He further states that real integration is people dependent. Thus, integration is more dependent on the values of the organisation and the integrity of people than on the quality of the computer.

Teams facilitate a broader range of skills than any individual. Teams facilitate functional interfaces and parallel activities. Teams also benefit from improved quality of work life as there is a socialization added to the work done - workers do not feel alienated. Key to the success of the team are personality issues, performance evaluation and incentives, together with process activities.(Davenport and Short, 1990; Kiernan, 1997;).

2.5.2.2 Empowerment

The integrated nature of software packages and the focus on processes, allows for the empowerment of employees. As Allaire, (cited by Garvin, 1995) indicates, if employees control the processes, then they know how the organisation is working. This empowerment drives changes in the structure of the organisation. Benjamin et al. (1992) make the point that the locus of knowledge and hence power in the organisation changes where a large scale package is being sought as an enabler of change in the organisation.

Attaran (1996) suggests that this empowerment results in direction coming from the top management of the organisation and not from decision making. Companies will need to reorganize their infrastructures and responsibilities to support the role of IT within the organisation.

If empowerment is driven by new technologies then organisations must be prepared to support the increasing appetite for information. (Davenport et al., 1994). Together with new processes, new IT and new empowerment, emerges a requirement for new skills. This could be as a result of a broader set of work tasks - which might involve cross-training in business functions and also skills to use the new technologies.

Software packages introduce into an organisation the potential to attack as Ciborra (1994) describes, the 'competency gap' - by allowing new competencies to emerge and consolidate. He describes it as a process of radical learning which entails restructuring the perceptions and organisational backgrounds that give meaning to processes and skills at hand. Software packages, because of their 'tailorability' encourage employees to experiment with their systems. (This is particularly valuable if a stand alone test system is available to employees.) Ciborra suggests that from this, innovation can be achieved. Software applications open new horizons as to how things can be done.

2.5.2.3 Human Resources

To harness these applications, either new skills will have to be learned, or new skills will have to be bought in. By their very nature, cross-functional processes imply a variety of skills which in itself demands more effort from the employee. Therefore a broader view of employee training and development should be fostered within the organisation. (Ghoshal & Bartlett, 1995). The applicability of this will be of special interest to the South African situation which faces a particular challenge in terms of skills levels. (Meyer, 1996).

According to Strebel (1996) it is unrealistic for managers to expect employees to buy into changes that alter the status quo. He maintains that unless organisations redefine their employees' commitments to new goals, employees will remain skeptical of the change initiative and distrustful of management. Kotter (1995) agrees. He believes performance measurements and incentive schemes need to be put in place so that employees put the new vision ahead of their own self interest. This is of significance to large scale implementations as such implementations bring about large scale changes within an organisation.

2.5.3 Risks

The implementation of a new strategy in an organisation, together with a new information system to support it, is inherently a high risk strategy. Ward et al. (1990) maintain that new technologies and new software products should only be adopted where there are major functionality improvements which cannot be met by the organisation's existing environment; when significant longer term cost savings can be assured; and lastly when the system can deliver better long term options. Ward points out that the key risk is not achieving the expected advantage or business objective. Literature points to a number of successful and failed software implementations. (Radosevich and Dahle, 1996; Drummond, 1996;)

According to Fiedler et al. (1994) organisational risk is always present with organisational change - if the change is such that it precludes running old and new systems in parallel then there is increased risk with an 'all-or-nothing' approach. Associated with organisational risk is what Fiedler et al. define as process risk - i.e. the irreversibility of change process, resistance to change and task ambiguity. In addition they highlight structural risk which represents risks associated with crossing traditional functional boundaries and altering existing organisational structures - i.e. risks associated with structural change, increased structural complexity, and limited ownership of the process. This emphasises the need for top managements commitment to the project. Given that large scale software packages are being utilised to assist in the transformation of the organisation, risk evaluation and risk management should be high on the agenda of the overall strategy. Lauer (1996) draws attention to studies (citing Rothfeder, 1988 and Simmons et al., 1993) which state that a distinction needs to be drawn between such projects that fail managerially and not technologically. For example, where project managers are presented with an uncertain flow of resources and with conflicting objectives.

As BPR is fundamental to the implementation of ERP packages, there are risks attached to the business process redesign. Mumford (1996) contends that as society

has moved from the 'industrial age' into the 'risk age' managers are being asked to take new risks with which they are unfamiliar. She makes the point that today's risks (especially those risks stemming from new ideas like BPR) are that they are not known. Whilst managers are used to handling certain kinds of risk, these have usually been of a financial nature, with which they have been most familiar. Often organisation's enter into the risk of BPR to avoid the larger risk of an inability of competing in new markets.

Another risk which needs to be managed is the risk of timing. Charette (1996) highlights the time to implement and the resources required to implement, as high risk. Careful consideration needs to be given to these areas so as not to jeopardise the project and the organisation. E.g. A time frame of 6 months to implement where experience has shown that it has never been done in less than a year will put the project at risk.

High on the list of risks is the selection of software packages, where the selection methodology has not been rigorous enough - both with functional fit and with vendor selection. (Hecht, 1997; Dixon, 1989).

The change required within an organisation implementing such large scale packages, if not managed correctly, can lead to failed implementations. (Kotter, 1995; Attaran, 1996; Ghoshal & Bartlett, '995; Legare, 1995; Yetton et al., 1994; Sankar, 1991; Edwards & Pepper, 1994.). Management needs to be watchful of the response of employees, the new learning process, the political environment, the objectives and the structures of the organisation so that each can be incorporated into the new vision and implementation of software.

Just as there is a risk with overlaying the new software over old processes (Davenport, 1994), customising the software to make company specific changes, introduces another element of risk. Customisation wipes out cost savings and prevents companies from taking up new release of software as they are made available by the vendor. (Dean et al, 1994).

2.5.4 Critical Success Factors

Closely related to risks in implementing large scale software packages, are critical success factors (CSF's) which should receive constant attention from the management of the organisation undertaking such a project. Rockart's (1979) work on critical success factors provides a methodology to identify objectives and critical areas without detailed development plans. Rockart defines CSF's as being

> *"for any business, the limited number of areas in which results, if they are satisfactory, will ensure competitive performance for the organisation. They are the few key areas where 'things must go right' for the business to flourish."*

Critical success factors then, support the attainment of organisational goals. CSF's can pertain to a particular industry, company, business unit or manager. Ward et al. (1990)

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suggest that CSF's relating to information systems should only be identified once the stated objectives of the organisation are consolidated. Once CSF's have been identified, only then, should the IS or package be considered. This section will detail some of the CSF's which pertain to software implementation and their importance to the overall success of the project and the organisations strategy.

Undeniably, change management will top the list of critical success factors when utilising large scale packages as transformational agents. A project of this magnitude requires leaders in senior-level jobs. Sankar draws attention to five domains within an organisation where change takes place. The first area, is the behavioural domain, where the response of people within the organisation can have huge impacts. The second area, the technical domain, impacts because of the changed workflows and job functions as a result of the technology and applications. Thirdly, the process domain, where the balance of power within the organisation is impacted and fourthly, in management systems, where the political environment of the organisation can be challenged. The last area, the structural domain, is where software applications can contribute to flattened organisational structures and therefore will require attention. Change management, in itself being a broad subject, cannot be included in this research, except that it should be considered critical to the success of an ERP implementation.

Top management commitment is also considered to be critical to the success of ERP implementations, (Premkumar & King, 1992). Additional to this is a project sponsor or champion for the new system. (Beath, 1991). According to Beath

> *"champions are more than ordinary leaders; they are more like transformational leaders who inspire others to transcend self-interest for a higher collective purpose."*

Literature also refers to the following as critical to the implementation of ERP systems:

- User involvement
- Reengineering to fit the software
- Communication
- Realistic deadlines
- Re-skilling of people

Whilst this list is not comprehensive it is not the intention of this research to investigate implementation methodologies, merely to point out that there are a number of factors that inhibit the success of such projects.

2.6 Summary

The literature points to the significance of a number of strategies that organisations are employing in their bid to align their information technologies so that these organisations can either attain or sustain competitive advantage. It is clear that a complex web of issues contribute to the success of such projects. What is key is that information technology is the enabler of such strategies if the technology is correctly

deployed. Porter (1996) points out that the essence of strategy is in choosing to perform activities differently from what rivals do. Consequently, it is not the technology that matters, but how the technology is used.

In this chapter Porter's Five Forces Model, Porter's Generic Strategies and Treacy and Wiersema's Value Disciplines were presented. A number of organisational transformation models, together with literature relating to Information Systems Architecture and software package were also outlined. In the following chapter, the research method will be detailed. This will include the framework as put forward by Segars and Grover (1996), together with the organisational transformation models as summarised in this chapter.

CHAPTER 3

3.0 RESEARCH METHODOLOGY

The purpose of this chapter is to demonstrate the research method employed. The framework as proposed by Segars and Grover (1996), together with a number of organisational transformation models were utilized, in conjunction with the case study approach. This chapter also details the research sample.

3.1 INTRODUCTION

The central theme of this research is whether organisations are utilising software packages in their bid to transform their organisations to compete better in the changing world of business. To this end an analysis of the impact of information technology software architecture on business transformation strategy was undertaken. Integrated enterprise resource planning (ERP) software, which was traditionally designed to support labour-intensive back-office functions is now increasing in significance from the back office to the boardroom. (Hecht, 1997). Hecht attributes this shift to the globalisation of business and the evolution in technical architecture. To support his view he cites Cundiff as stating

> *"a significant shift in the business models from hierarchical, line-of-business-oriented activities to more process-driven models is motivating a re-examination of enterprise application software. Combining the influences of BPR with downsizing and acquisition, a new stage has been set that alters the role of ERP applications."*

In assessing how ERP packages are being used strategically to assist in the changed directions of organisations, the framework as put forward by Segars and Grover (1996), together with the organisational transformation models as set out in Chapter two, will be employed in conjunction with the case study approach..

3.2 THE RESEARCH METHOD

The research methodology used for the purpose of data collection is in the form of multiple case studies. Yin (1994) argues that a case study is a preferred method of research in examining contemporary events. Methods employed in collecting the data are by direct observation, open ended interviews, organisational documentation, and participant observation. Yin defines a case study as

> *"an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between the phenomenon and context are not clearly evident."*

Yin further maintains that case studies have a distinctive place in evaluation research, the most important of which for the purpose of this study, is to explain the causal links in real-life interventions that are too complex for a survey or for experimental strategies. In this instance the case study method will be used to explore those situations in which the interventions being evaluated have no clear, single set of outcomes.

The objective in using multiple case studies was to establish if organisations in employing the same software architecture, within different strategic specialities are achieving their anticipated benefits.

3.3 THE FRAMEWORK

The framework as put forward by Segars and Grover (1996) provides a foundation for the research primarily because it proposes an approach which is top-down and encompasses organisational IT requirements rather than focusing on requests of managers and end-users. Segars and Grover assert that:

> *"Conceptually, ISA (Information Systems Architecture) structures the strategic objectives of the enterprise, models the entire business in terms of its functions, processes or tasks, and relate them to the information required for successful performance. Ideally, ISA should meet the strategic and information needs of the organisation with minimal redundancy in data flow, processing and storage."*

As shown in Figure 3.1 the framework starts with the conceptual level, which comprises an analysis of the business. The framework then proceeds to the logical level, where the matching of information requirements with functions, processes and tasks take place. The last level, the physical level, involves the systems implementation.
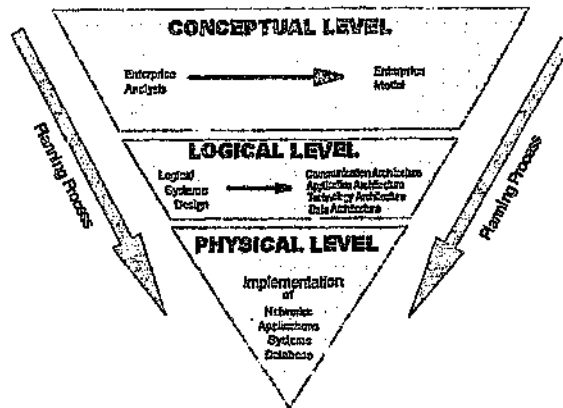
Figure 3.1 - Information Systems Architecture, as proposed by Segars and Grover, 1996.

3.3.1 The Conceptual Level

At this level the perspectives are those of top management. That is, the perspective is strategic. The objective of this level of analysis is to understand, communicate and represent the strategic direction of the organisation. At this level the vision of the organisation needs to be transformed into a concrete set of strategies vis-à-vis the new IS development. The issues at this level include uncovering how the business operates, where the business is going, and when it should get there.

Resulting from this analysis, should be a set of models which capture the strategic and tactical information about the business, the competitive approach and the organisational structure. These models should then build consensus regarding the requirements of the intended new IS. This should foster alignment between organisational strategy and the objectives of IS. This level of analysis helps establish the roles and responsibilities of each business and functional unit, and support the reengineering effort required within the organisation.

3.3.2 The Logical Level

At this level the perspectives of middle management are taken into account. This level of architecture development is concerned with matching information requirements with the functions, processes and tasks identified in the conceptual level. It is at this level that the effective restructuring of organisational processes takes place. Segars and Grover (1996) contend that a major planning product of this level of analysis is the Information Architecture. The Information Architecture then, includes personnel, organisational and technology profiles. (A number of profiles relating to this level, and not expanded on by Segars and Grover, will be dealt with in section 3.3.4.) Theses profiles show how information categories must be interconnected to facilitate support for decision makers. (Brancheau and Wetherbe, 1986.)

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The Information Architecture provides a blueprint for developing more specific conceptualisations of data usage, data flow, applications usage and processing needs across the organisation. Segars and Grover propose that four sub-architectures (being communications, applications, technology and data) provide greater detail concerning the use of information and information technologies within the organisation.

The Communications Architecture provides a conceptualisation of how information flows throughout the organisation (i.e. these communication links inter-connect organisations, people and machines.) The Applications Architecture documents existing and required applications necessary to support the processes within the organisation. The Technology Architecture illustrates how processing technologies are distributed in support of organisational processes. The Data Architecture is a blueprint of data created and used by the various process of the organisation. Figure 3.2 depicts the various sub-architectures within the logical systems design.

Structure (Processes)

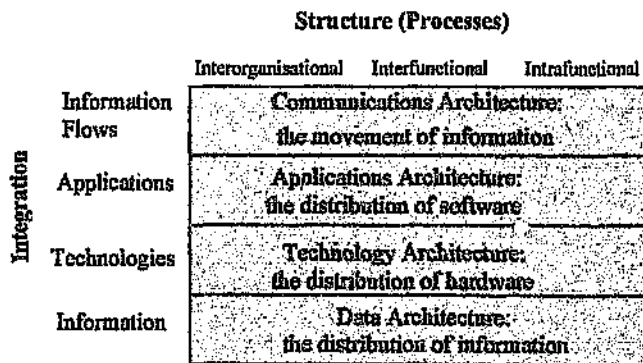|	Interorganisational	Interfunctional	Intrafunctional
Information Flows	Communications Architecture: the movement of information		
Applications	Applications Architecture: the distribution of software		
Technologies	Technology Architecture: the distribution of hardware		
Information	Data Architecture: the distribution of information		

Figure 3.2 - The logical systems design.

The logical level takes the broad requirements of the organisation and categorises them into more specific architectures. This facilitates the detailed design of particular systems and the setting of priorities for implementation.

3.3.3 The Physical Level
This level of the architectural process involves the actual implementation and development of applications, databases, networks and systems. The guide in the implementation is the overall ISA. The plans at this level are very detailed and take on the perspectives of operations or project management.

The benefits to the organisation using this framework leads to the identification and development of information resources integrated across the organisation. It facilitates a view of the organisation as is and how management would like it to be. It also facilitates the allocation of scarce resources to those projects which are most critical to supporting organisational needs. The development of the ISA provides the opportunity to rethink current organisational processes and forges links between organisational and IS strategies.

3.3.4 Extending the Framework

Expanding on the Segars and Grover (1996) Information Systems Architecture framework, more specifically on the logical level within the framework are the following important issues:

3.3.4.1 Processes/Business Process Reengineering

An analysis of the organisation at the logical level prompts an analysis of processes and functions within the organisation. Hammer (1990) considers IT as the key enabler of BPR which he views as radical. Davenport and Short (1990) submit that BPR requires taking a broader view of both IT and the business. BPR then is primarily a business tool - processes represent a new approach to analysing and co-ordinating functions within the organisation. Davenport's viewpoint is that business should not be viewed in terms of functions, divisions or products. This research will evaluate BPR as part of the framework and as being pertinent to software applications.

3.3.4.2 Core Competencies

A core competence is a unique combination of technologies, knowledge and skills that are possessed by the organisation. (Petts, 1997). This Resource-Based view suggests that it is the intangible assets which are invisible to external observers and which are difficult to analyse which provide the competitive advantage to the organisation. Core competence has a number of attributes (i.e. complexity, invisibility, inimitability, durability, appropriability, non-sustainability and superiority) which represent an organisations sustainable competitive advantage. (Petts, 1997; Schoemaker, 1992) Petts suggests that core competence is hidden from the customers perception. The customer demands the tangible benefits that arise from the core competence's existence. Thus, the competence becomes 'core' when it is linked to the customers needs. The ability to deploy a core competence into customer benefits is known as 'core capability'.

3.3.4.3 Core Capability

According to Petts (1997) core capability extends from the hidden strengths of the company as far as the perception of the customer. Petts presents a graphic idea (figure 3.3) as a means of depicting both core competence and core capability.
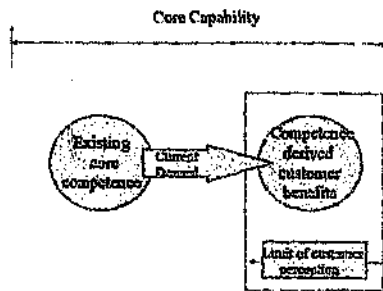

Figure 3.3 - The dimension of Core Capability - source Petts, 1997.

Petts portrays core competence as the hidden portion of core capability - the two concepts are inextricably linked, but are often confused with each other. Figure 3.3 shows the dependency between the two concepts. Core capability then, only exists when it is driven by a core competence.

Literature points to the fact that competitive advantage is now becoming the ability to satisfy the customer needs with product offerings that have been developed prior to customers asking for them. (Petts, 1997) Petts suggests that basic competences can develop into core competences if they reach the core capability chain at the right time. The key to core capabilities is to invest in a supply of new skills (e.g. individual skill, technology, marketing, knowledge and resource usage.) Skills development then, is the foundation for the building of a new core competence.

The building of a core capability then, also slots into the logical level of the ISA. Whilst the identification of a core competence is usually identified at the conceptual level of the ISA, capabilities building encompasses a middle management agenda.

3.4 THE RESEARCH SAMPLE

This research was limited to a sample of four organisations. They were selected to include medium sized organisations each in a different kind of industry. Each of the four organisations had redefined strategies and each were at a different stage in the implementation of their projects.

In the next chapter, the four organisations will be presented. Each organisation will be described in relation to their background, their perceived business problem, their planning phases and the benefits they expected to derive from the implementation of enterprise wide packaged software applications.

CHAPTER 4

4.1 Introduction

The four organisations evaluated for this study are each at different stages of the implementation of their information systems chosen to assist in supporting their new strategies. Mondi Cartonboard has just entered the cycle, where evaluation and resultant decisions have taken place and preparation for implementation has begun. Castrol are preparing to put their new information system into production by the end of 1997, having been operational on the JDE financials for 10 months. Trident has been operational on their system for six months, with financials in production for over a year. Johnson and Johnson, operational on the system for 5 years has had the benefits of two large software upgrades. At the beginning of each case study a diagram depicting the evolution of the JDE implementation is presented. This diagram serves to point out that implementations of this nature are iterative and depict where, in the cycle, each organisation is.
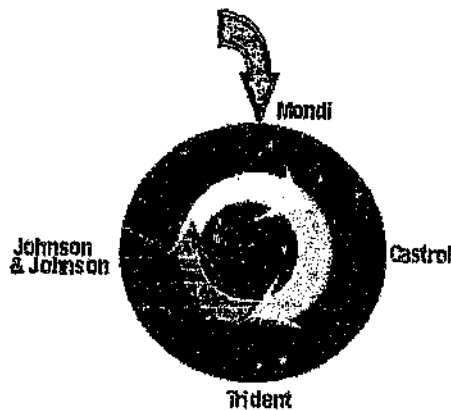
4.2 Mondi Cartonboard

Figure 4.1 - The evolution of the JDE implementation.

4.2.1 Background to the company:

Mondi, a 51% owned subsidiary of AMIC (Anglo American Industrial Corp. Ltd.), is a fully integrated forestry products business which comprises six operating divisions. These include Mondi Forests, Mondi Kraft, Mondi Paper, Mondi Cartonboard, Mondi Timber Products and Paperlink. Together their annual turnover is $7 Billion. Mondi is one of the biggest pulp and paper makers in South Africa and also has several mills in Europe. Mondi is one of four companies (together with Sappi, Nampak and Carlton Paper) which produces almost 98% of national paper and board production. The balance is provided by a number of smaller manufacturers.

Mondi Cartonboard, the focus of this case study, does a turnover of 500 million rands per annum, small in comparison to other divisions. Kraft and Paper, the largest, does a turnover of 2 billion rands and Forestry, a turnover of 1.3 billion rands. Mondi Cartonboard consists of two branches, a mill in Springs and the Umgeni Mills. Over the past five years the organisation has moved from a production push to a market pull strategy. As the business strategy has changed, so it has expected the systems to follow. The organisation was looking to a changed way of doing business as the organisation had not been profitable. Cartonboard's focus was local and it had long been contending with beating prices of dumped products.(That is where overseas organisations sell off products at a lower price than they sell in their own local market.) This has resulted in Mondi Cartonboard being constantly in reactive mode. To this end, Mondi underwent a process of evaluation to understand current business needs and together with a re-defined strategy, a process to redefine their information technology strategy with a view to supporting the new proposed business strategy.
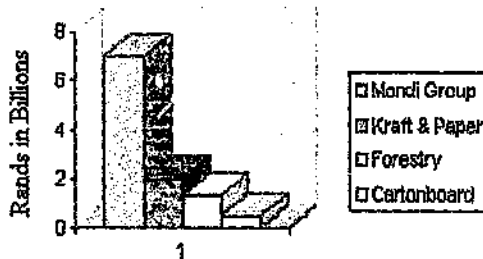

Figure 4.2 - Mondi Group Turnover.

4.2.2 The Problem

In the early 1990's Mondi Cartonboard lacked a clear strategic direction. The absence of a formal business plan was largely due to a re-engineering exercise which had left the

organisation with a top management structure which was new to the business. Thus the business plan that had been in place was outdated and the new managers were not familiar with the plan or had not bought into the plan

To support the business Mondi used an in-house developed system, which was modified to suit each division's specific requirement. MIMICS (Mondi Integrated Manufacturing and Inventory Control System) comprising of 2000 programs was developed in 1987 for Merebank and Richards Bay. In 1990 it was installed at Mondi Cartonboard and modified extensively to suite their requirements. Mimics was used for order entry, production planning/deckling, production recording/quality control, warehouse control, despatch, invoicing and sales analysis. Add-ons for product costing, raw materials usage and reel and pallet tracking (for recording information on the finishing floor) were scheduled for development or had been written to enhance system functionality.

For its financial reporting and controls, Mondi Cartonboard utilised the JD Edwards (JDE) software. All other Mondi divisions utilised JDE except for Mondi Recycling who used Accpacc and Merebank, who were in the process of implementing SAP R3. Whilst the Mondi Group had purchased most of the JDE modules , Mondi Cartonboard was only using the financial modules, and Mimics was being interfaced to the JDE system via the debtors module. As a result the division was not obtaining maximum benefits from the system. (Refer figure 4.3)
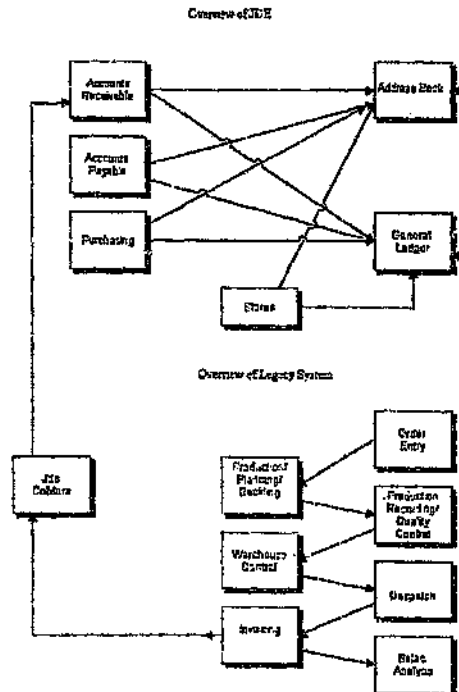

Figure 4.3 - Information Systems currently in use at Mondi Cartonboard.

Due to extensive modifications to the Mimics system, and pressure to develop changes speedily, the system lacked stability. This had led to an unstable database and integrity problems. Poor system knowledge and lack of user understanding had resulted in the perception that Mimics did not adequately support the business requirements. This, together with the fact that Mimics was originally developed from a production perspective, and that the business had started moving to being market driven, Mimics fell largely short in supporting marketing information requirements. Marketing information was downloaded from Mimics into a Lotus 123 spreadsheet, which contained information about production and logistics.

Each department within Mondi Cartonboard had its own system to analyse and report on data. No standard systems were used by common departments within the division. This severely impacted the organisation. No formal data architecture had been defined in the development of departmental systems at each site. As outlined in the literature review, Segars and Grover (1996) highlight that organisations have deployed incompatible technologies because of their need to stay at the forefront of technology and because of their attempts to meet ongoing business needs.

Information systems operated in isolation from the other business departments. In the business departments users were catering for their own IT needs and operating without the IT department's consultation or involvement. In the past management had perceived the IT department as not performing adequately and thus the IT department lacked credibility.

4.2.3 The Planning Phase
To this end, a team was established which comprised senior management of the organisation, including the IT function, and external consultants from Unisys. Their brief was to evaluate current business practices and formulate an IT strategy to support the business over the next three to five years. This assessment highlighted certain needs amongst which was the need for detailed documented business analysis to solve the problems of business systems not fully satisfying business needs.

4.2.3.1 Processes
A number of issues came to light during the investigation. The organisation was structured in such a fashion that it was more functional than cross functional. Islands of information existed, there was distrust of other's information, there were discrepancies in the information and there was repetitive capture of data. Simple processes had been overcomplicated. (Refer section 2.5.1.) There was a lack of training in both the business areas and systems areas of the organisation. The lack of reliable information was hindering progress. The flat structures that had been put in place due to a previous re-engineering effort was not supported by redesigned job specifications, systems or practices, hence the low levels of motivation and low morale. Added to this it was clear that resources were stretched. Processes were not optimised – they were designed around business inefficiencies. Some processes were not clearly defined.

4.2.3.2 Capabilities

An evaluation of IS knowledge and skills indicated that half of the IT department had been with the organisation for less than a year. All IT staff had been in their current positions for less than a year. This was attributed to the fact that job profiles change regularly and secondly that new IT positions had recently been created. There were only two people in the department who had extensive knowledge of current systems at Cartonboard. Of those two people, only one person had an in-depth knowledge of all critical systems but this knowledge was not formally documented. This was seen as a major risk.

Their approach was to investigate a number of alternatives. Retaining the present computer systems environment was ruled out as it did not comply with Cartonboard's strategic business objectives. Custom development or the rewriting of application systems was ruled out due to the scarcity of computer skills and previous experiences at Cartonboard. It was estimated the process of designing and constructing an information system required by the division would take in excess of three years. The business could not afford such a delay in the implementation of new systems. (Refer Section 2.3.3)

4.2.3.3 Software Applications

A package solution was also investigated, which was in line with the Mondi Group policy, even though it required the greatest short term investment. However, in the long run it was considered to be the most cost effective solution. Recent developments and trends had shown that the available range of package solutions was the best way to address systems integration and information requirements. Modern solutions have replaced the traditional interfaces approach with a fully integrated approach which includes a development platform, organisational re-engineering approaches and implementation methodologies. Whilst a number of packaged solutions was compared (including SAP R3), it was emphasised that Cartonboard had a substantial investment in hardware and applications experience relating to JDE. The implementation of JDE would allow for the retention of a substantial portion of the existing investment in hardware, software and the related skills at Cartonboard, and would allow for a controlled phased migration to new technologies already catered for in the JDE solution. (Figure 4.4 depicts the modules of JDE that Cartonboard intend implementing.)
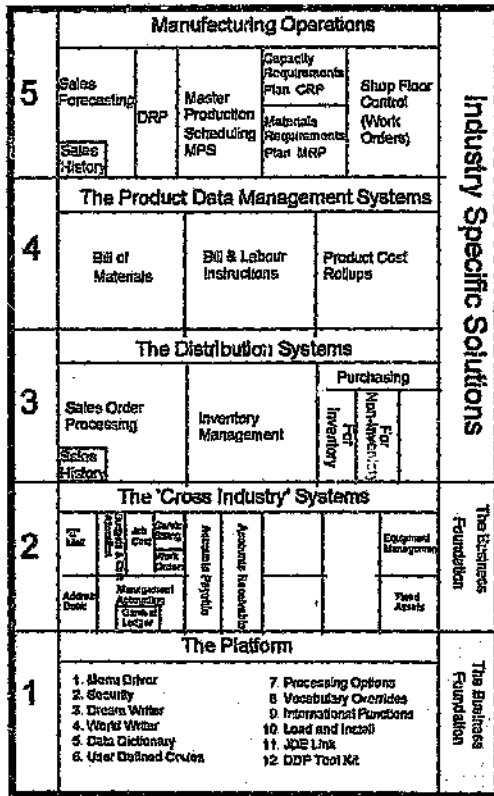
Figure 4.4 – Planned JDE Modules for Mondi Cartonboard.

4.2.3.4 Organisational Values

Given the substantial cost differential for similar functionality and the fact that a McFa
(1981) risk assessment for the system implementation of SAP and JDE had confirmed that
installation of a known quantity (JDE) would result in a lower risk project, the stee
committee voted unanimously to proceed with JDE. JDE provided the best business fit
Cartonboard at the most effective price due to the existing partial installation ther
McFarlan identifies three dimensions that contribute to the uncertainty of the success
projects of this nature. The first dimension is the size of the project. Large projects
riskier than small ones. The second dimension is the experience with the technology. Wl
the development team and users have experience with the technology and are knowledge
in the application area, risk is reduced. The third dimension, project structure, where ris
reduced to the extent the application fits existing structure for performing the tasks ar
organisation demonstrates commitment to change.

Mondi Cartonboard identified a number of critical success fa... which included top management commitment, user ownership of the processes and ... mation systems that would support these processes; professional project management, a committed partnership with JDE, available and committed process champions, realistic deadlines, and lastly, applicable re-engineering to the business to match the package. The methodology of identifying critical success factors, as advocated by Rockart (1979) and referred to in the literature review in section 2.5.4, assists organisations in maintaining a focus on objectives without being hindered by detailed plans.

4.2.4 Expected Benefi

Improved customer service was clearly an expected benefit as an enhanced system could reduce order delivery lead times which currently stood at 25 days. Issues pertinent to the customer, such as stock availability, order status, production and delivery schedules could be provided accurately and timeously. At the same time relevant information could be fed through to the marketing team in order for them to service the market.

There was the expectation that there would be improved reliability of customer service, in that accurate forecasting and capacity planning could assist the division in achieving due date performance and enable users to proactively manage deviations from the plan.

The organisation sought, through their improved systems, to minimise costs and improve margins. Product consistency could be improved by implementing improved materials handling and forecasting procedures. Logistics costs could be minimised by optimising working capital and reducing distribution costs. Cost could also be contained by managing the reduction of waste.

Tangible cost savings were based on the assumptions that an increase in machine optimisation could be obtained through product rationalisation and improved planning. This would be dependent on the new system supporting the shift from an order based to a product based strategy.(i.e. the changed strategy was to manufacture to forecast for 80% of the bus'ness. This represented a fundamental shift in the way they did business.) Cost savings would also be attributed due to improved planning and timing of engineering maintenance. Another cost saving could be obtained by a reduction in raw materials stocks resulting in a saving in interest cost.

Intangible benefits included the improved and speeded up decision making processes that would eventuate from an on-line real-time integrated system. Current batch processing bottle necks would be done away with. Management, personnel, suppliers and customers would feel the benefit of this system.

The investment in the latest technology and software applications would result in uplifting the skills base within the organisation. As such a system results in a large investment in training. The organisation viewed this as building up a new competency within the organisation. It was hoped that this investment would lead to enhanced motivation and upliftment of morale. The literature review (section 2.5.2.3) draws attention to the importance of training and re-skilling

if new competencies are to be developed and the new information system is to be harnessed to underpin its new strategy..
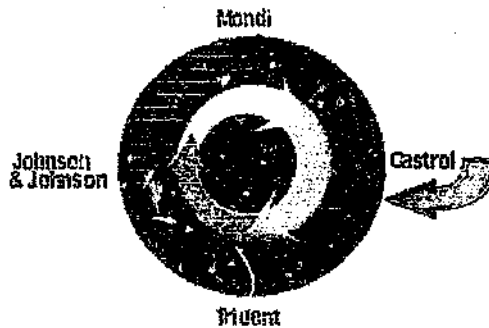
4.3 CASTROL SOUTH AFRICA

Figure 4.5 - Evolution of JDE implementation.

4.3.1 Background to the company:

Castrol South Africa (Castrol S.A.) is part of the global company Burmah Castrol with corporate head offices situated in the United Kingdom. Today Castrol (the principle company of the lubricants division of Burmah Castrol) is the world's leading international lubricants marketer. Their manufacturing, distribution, research and development facilities are strategically located throughout the world. Castrol is a global company that operates locally. As such, Castrol S.A. concentrates on its own market, enabling it to react quickly and effectively to the specific needs of its local customers, while using the knowledge and support of a world wide infrastructure. The African market, now open to South African organisations, is also a target for growth. Castrol South Africa's commitment to providing products and services which adhere to their brand values of 'high performance', 'premium quality' and 'technology led' was a driving factor in the restructuring and re-engineering exercise that took place in 1995.

The objective of the re-engineering exercise which resulted in a restructuring of the local organisation into six strategic business units, was to build on the organisation's heritage of product innovation and deliver a service that was totally responsive to the needs of its

customers. The restructuring led to a renewed scrutiny of the organisation's information technology with a view to supporting the new strategy. Figure 4.6 depicts Castrol's profile.
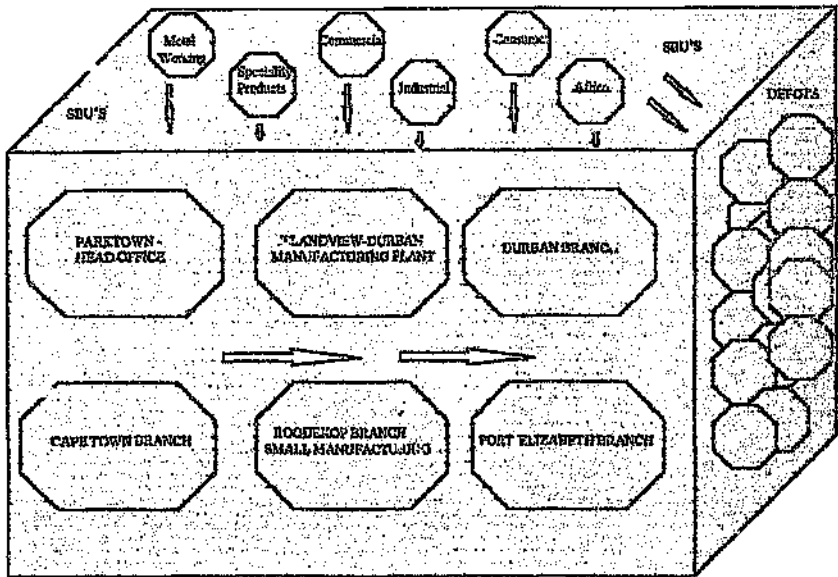

Figure 4.6- Diagrammatic Representation of Castrol S.A. Pty Ltd.

4.3.2 The Problem
The organisation's policy of continued information systems renewal for reasons of business survival manifested a new dilemma for the organisation. Castrol S.A.'s strategic plan which involved a focus on technological advancement, product development : and enhancement, improved manufacturing and increased customer service introduced to the business a higher level of complexity which the legacy systems were unable to deal with, without extensive maintenance to the programs.

For the organisation to maintain its business growth, it needed a stable system to support its current business environment and it needed an information system that could deal with the new structure and future growth. The legacy system was not capable of integration and there were a number of manual processes in place. Foremost of these was the manual reconciliation of the general ledger and subsidiary ledgers. The export process, which was an area targeted for growth had a number of manual processes imbedded in it. Added to this, the legacy system could not deal with the diversity of the international environment (specifically multiple currencies) which made the export process cumbersome. Data had to be re-keyed into a P.C. system for the processing of export documents. The competitive environment within which the organisation operated, meant that there was a continual revision of prices which

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necessitated increased manual intervention because the flow of data within the legacy system. Credit note processing was increasing as a result of incorrect processing.

To position the organisation for future growth, Castrol S.A. felt that they had reached the stage where, in particular their financial and manufacturing systems needed rejuvenating and improvement. Castrol S.A. had historically been highly computerised. In the late 1970's their computing had been outsourced so that they could concentrate on new development projects. In the early 1980's the organisation had installed a distributed interactive computing platform. By the 1990's Castrol S.A. had employed Computer Assisted Software Engineering (CASE) and Information Engineering to leverage systems ownership to the user community, away from the IT department. This had not been as successful as was hoped due to skills shortages experienced in South Africa and the shortcomings in available CASE tools.
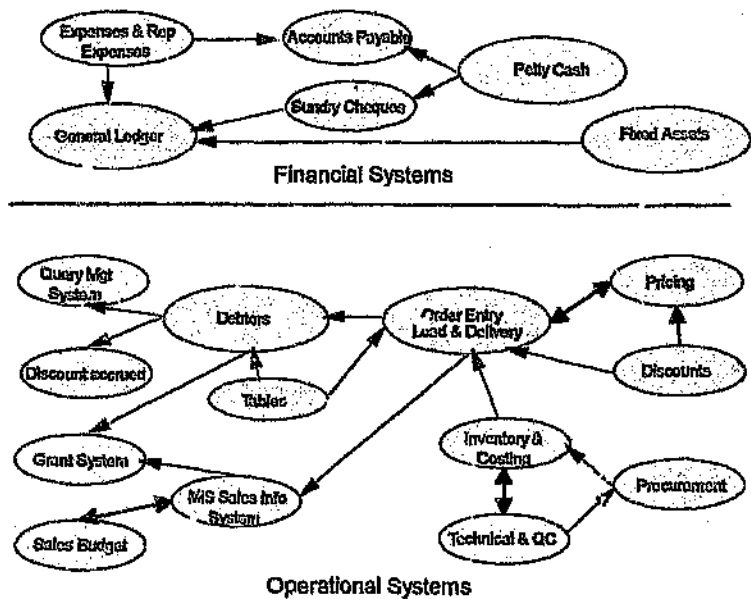

Figure 4.7 - Flowchart of legacy systems at Castrol SA (Pty) Ltd.

A decision to develop a system using a 4th GL tool resulted in several problems for the organisation. The developed system left the organisation reliant on too few key people and was overlaid over old processes. A lesson learned from this development was that there had been too much focus on the technology and not on the business. With this in mind, the organisation was counting on a new system where ownership of the system rested with the users and line management within the organisation, and not with the I.T. department.

As the demands of the business world become more complex, and the demand for increased systems sophistication and integration develops, maintenance of legacy systems becomes more

complicated and expensive. Within Castrol S.A. the maintenance and development backlog was increasing. Moreover, acquiring the correct level of skill was also becoming increasingly more difficult attributable directly to the skills shortage within the country.

A further strategy was to free up information systems human resources from the maintenance of existing systems to enable them to pursue implementation of value added systems. Development was required for processes which were unique to their business, and which required dedicated development resources.

Considering closer international business ties, intensifying competition and rapidly changing business needs including the projected cost of maintaining and developing unique systems, the organisation undertook an evaluation of integrated software solutions.

4.3.3 The Planning Phase

Since several of Castrol's other international companies had undergone a similar evaluation and since it was the corporate company's policy (adopted in 1994) to support the business with packaged software applications rather than uniquely developed systems, it was decided to investigate the finding of these other Castrol companies. Castrol companies in Europe, North America, Australia and Asia had selected JDE as the application to support their business. As such, some in-company experience existed regarding the software. Moreover, the corporate office had concluded a group licence for this software in 1995.

4.3.3.1 Capabilities/Competencies

A team of people comprising senior management, IT staff and key users however also investigated other application packages as well as JDE for suitability in the local market A large number of companies in the same industry had implemented JDE and discussions are had with other organisations in the country who had implemented JDE. Other applications (Baan/Triton, BPCS and SAP R3) were either too unknown in South Africa, didn't provide the functionality that JDE did, were poorly supported locally, were too expensive or the change was considered too dramatic with no competencies within the organisation, which was viewed as high risk. As the organisation had internal competencies relating to the hardware platform it was decided to stay with the current hardware platform.

4.3.3.2 Software Applications/Information Systems Architecture

A visit to Denver, Colorado, head office of JDE confirmed for the organisation that JDE's support and longer term plans (vis-à-vis client server technology and strategic direction) were in keeping with expectations of a suitable vendor. JDE was selected as the preferred software application because of its outstanding features and functionality and all-round strengths, their belief that the research and development by JDE, including their client/server solution would enable Castrol S.A. to acquire a software solution that would cater for their needs well into the 21st century.

Manufacturing Operations

| 5 | Sales Forecasting / Sales History | DRP | Master Production Scheduling MPS | Capacity Requirements Plan CRP / Materials Requirements Plan MRP | Shop Floor Control (Work Orders) |

The Product Data Management Systems

| 4 | Bill of Materials | Bill & Labour Instructions | Product Cost Rollups |

The Distribution Systems

| 3 | Sales Order Processing / Sales History | Inventory Management | Purchasing — For Inventory / For Non-Inventory |

The 'Cross Industry' Systems

| 2 | T. M/B / Budgets & Gr... / Job Cost / Work Orders / Address Book / Management Accounting / General Ledger | Accounts Payable | Accounts Receivable | | | Fixed Assets |

The Platform

| 1 | 1. Menu Driver
2. Security
3. Dream Writer
4. World Writer
5. Data Dictionary
6. User Defined Codes | 7. Processing Options
8. Vocabulary Overrides
9. International Functions
10. Load and install
11. JDE Link
12. DDP Tool Kit |

Industry Specific Solutions

The Business Foundation

The Business Foundation

Figure 4.8 - Planned JDE Modules for Castrol South Africa (Pty) Ltd.

Owing to the fact that integrated software by design needs more processing power, consideration was given to the hardware architecture. To take advantage of new features, including better client/server interfacing between mainstream and P.C. platforms, a new advanced series AS400 machine was selected.

4.3.3.3 Teams

An executive steering committee consisting of predominantly executive senior management of Castrol S.A. as well as a consulting manager from JDE was established. Project teams for each phase of the implementation was established. Each team consisted of a project leader, IS staff and key users and line management. JDE was to provide full user support throughout

the installation. It was decided to implement JDE using a phased approach and basing it on the JDE implementation methodology.

4.3.3.4 Risks
The team identified a number of risks involved in a project of this nature. Firstly the size of the project in itself was a risk, secondly, there was a lack of in-house skills pertaining to the software, and thirdly, vendor support was identified as a risk. In this instance it was highlighted that skilled staff were very mobile with regards to the software, and that JDE was subject to a high turnover of staff. Also their ability to properly transfer the necessary product knowledge and to support the full JDE product line over the project period was viewed as a potential risk.

4.3.3.5 Critical Success Factors
Key sensitivities were indicated, among them being that local management had committed to making process changes rather than customising the package; the change from unique systems to a fully integrated, enterprise wide packaged solution would not be easy and thus extensive re-skilling and training would have to be undertaken; other areas of concern were that ownership of the system should be held by Castrol S.A. and more specifically the functional users, and, that team members involved should be cross functional with the purpose that the company's objective is taken into account and not personal views.

4.3.4 Expected Benefits
Castrol S.A. clearly distinguishes between both the tangible and the intangible benefits. The basis for implementing the system was with the intention of staying in business and as such clear quantification of the benefits in terms of ROI was impossible.

Expected benefits were that they would have better information flowing through the organisation. The fact that the information was on-line real-time would assist the customer services departments within each SBU in being more proactive in their dealings with their customers. The information would facilitate a key organisational value of 'starting with the customer' (i.e. learning the customers business, giving a service not just a product, showing the customer you care and knowing the key people). The instability of the legacy systems and the difficulty with which they interfaced to other systems had previously hampered their dealing with customers. It was also expected that internal efficiency and effectiveness would reduce costs.

The new system was seen as strategic to the organisation and as such would provide a sound base for them to attach their unique mission critical systems to. It would also free up the information systems human resource from the continual maintenance of existing systems, thereby enabling them to pursue the implementation of added value systems.

It was envisioned that head count could be reduced because of the integrated nature of the system, thus doing away with the manual processes that currently existed.

The limiting factor in the rapidly changing environment and the re-engineering exercise which had changed the structure and direction of the organisation was the information system that supported it. The new system was perceived as having the flexibility to change as the business changed. Furthermore, the promised upgrades with the most up-to-date business practices and technology features (e.g. internet and client/server technology) would mean that in the long term the organisation could position itself for change without the information technology hampering it. The cost of the maintenance of the system should also be reduced. Less time would be spent on making programs work - thus more attention could be given to the deliverables of the total system. This would ensure that all business requirements could be met.

It was expected that a user driven implementation would improve the support of the business as there would be less focus on the actual technology and more focus on what the business required. The prototyping requirements of ERP systems would force user involvement.

Another benefit envisaged was that of building a new capability within the organisation. The training and re-skilling that was required to take full advantage of the new system meant that there would be an examination of current business processes, which would facilitate a new sharing of information within the organisation. Users would be required to share information about their roles within the organisation, which in turn could contribute to a thinking about better ways of doing things.

Castrol S.A. markets a differentiated product and has the biggest range of products compared to sister companies world wide. By having accurate costing and a flexible pricing structure together with an accurate gross profit analysis, managers would be able to make better deals because of better information.

The major benefits of this project stem primarily from the total replacement of an obsolete, inflexible and inefficient software system. JDE will allow the organisation to remain competitive and be significantly more proactive in addressing the rapidly changing business and technological requirements expected in the 21st century. The incremental functional benefits which include the flexibility, the full integration, enhanced automation, paperwork reduction and operational re-engineering all point to real benefits for the organisation.

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4.4 TRIDENT STEEL
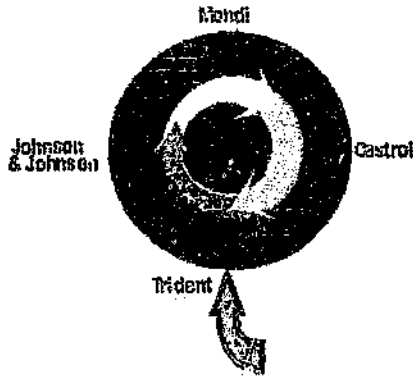
Figure 4.9 - Evolution of JDE implementation.

4.4.1 Background to the company:

The metal and engineering industry in South Africa represents a third of all manufacturing in South Africa, embraces more than 10,000 companies and employs approximately 340,000 people. Trident Steel (an Anglo Vaal Group Company) is a steel merchanting organisation within this industry. Trident comprises six divisions being the Merchanting Division, the Cutting Division, the Coil Processing Division, the Export Division, Sterling Tube and Namascor which specialises in steel products.

The Merchanting Division carries a wide range of steel in standard and stock sizes. The Cutting Division focuses on supplying cut-to-size steel so that customers can save on scrap, labour and time. The Coil Processing Division specialises in cut-to-length lines and slits cut steel to exact sizes ready for manufacture or assembly. They provide a wide range of coil widths, thicknesses and qualities to their customers. Primary customers to this division are South Africa's motor industry and white goods markets. Sterling Tube specialises in a wide range of structural round and square tubes. Namascor deals in specialised steel and the Export Division concentrates on newly opened markets.
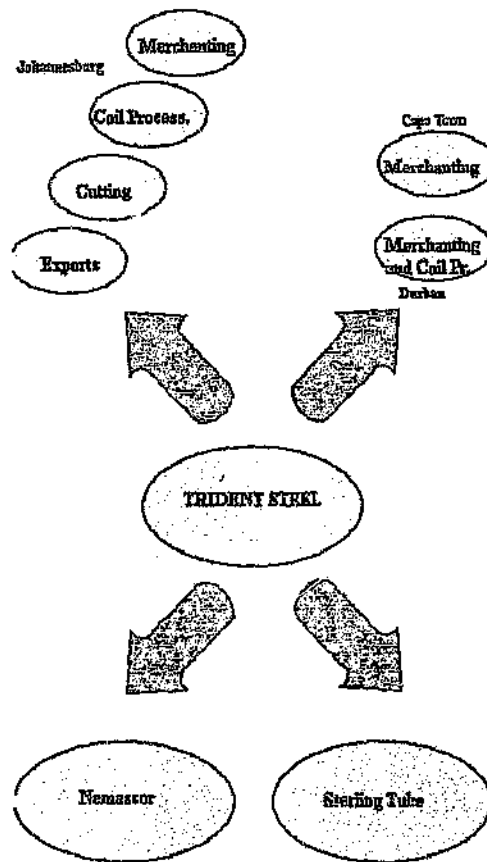
Figure 4.10 - Diagrammatic representation of the Trident Group of Companies.

Trident undertook an analysis of industry trends and this showed a long term decline in demand for structural products. Contrasting with this there was a growth in flat products. In addition, the price direction of steel was more uncertain and service was becoming more of a differentiator than price. In 1994 SEIFSA (The Steel and Engineering Industry Federation of South Africa) predicted a significant boost to the steel industry from the RDP (Reconstruction and Development Program) in South Africa. Potential high growth markets included housing and education, piping and cold rolled sheets for the automotive and white goods industries.

4.4.2 The Problem

Due to the recessionary years of the early 1990's in South Africa, Trident had effectively followed a strategy of forward integration, moving away from the core steel merchanting business to increased value added products. This was partly by design and partly through evolution. Since each division had a unique focus and was meeting a different need for each category of customer there existed an enormous amount of manual administrative work. A senior manager within the organisation comments that " for so long we have been customer focused, but the processes were wrong for the customer focus. This meant we neglected other areas of our business. The customer got his steel cut to his requirement, and on time, but we didn't optimise our loads and made many unnecessary delivery runs." Other system and process deficiencies included a lack of accurate costing and profitability analysis information, customer quotations were manually processed, certain divisions had a manual material requisitions process, order capturing was paper based, and the credit note process was cumbersome - whilst a number of processes were automated - there was no integration of systems.

The legacy systems were written for specific processes within each division, and were standalone. They did not lend themselves to natural bending or integration. The end result was that interfaces had to be developed and the ownership of the data rested with a few people within the organisation.
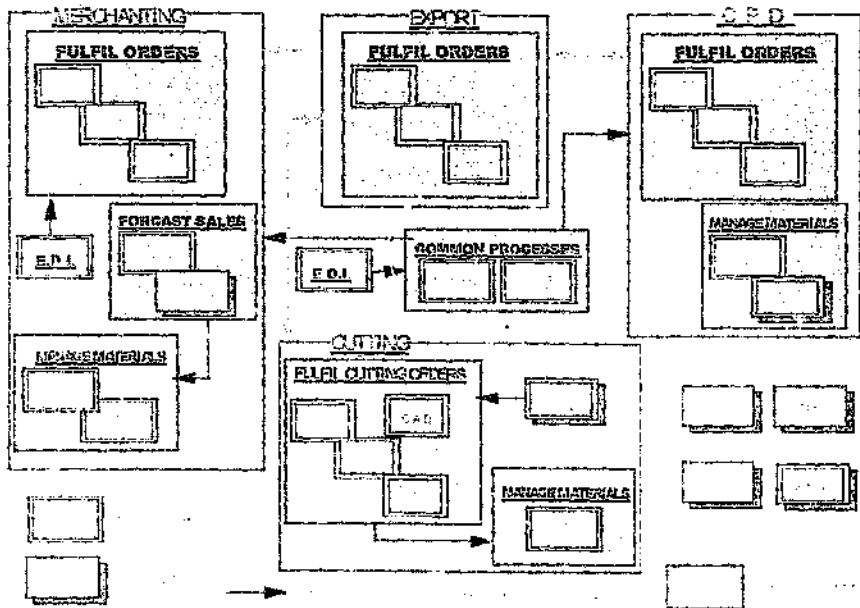

Figure 4.11 - Tridents legacy systems.

The business objective Trident was seeking to meet included maintaining and improving customer service, an increase in market share in selected sectors, achieving an appropriate return on investment (ROI) for expenditure on equipment, and an improvement in process efficiency (e.g. on scrapping of steel, stock levels, machine utilisation, fleet utilisation, labour efficiency and spares.) There was also a requirement to improve adherence to customer's quality standards.

Trident's mission "to be the premier provider of quality steel products and related services in the markets that we serve" had obvious implications for IT. An evaluation of their current information technologies within the organisation was undertaken in order to assess how IT could assist in the changes the organisation was seeking to make.

4.4.3 The Planning Phase

Andersen Consulting was retained to assist in developing a strategic information system plan which was the direct outcome of the changed and enhanced business strategy. The steering committee for this project was chaired by the managing director of Trident. The project sponsor was the sales director and the project team had a mix of IT personnel, line managers and external consultants. The committee gave consideration not only to industry analysis, but also to skills, resources, processes and management practices. The current application architecture was mapped out, which highlighted the major systems limitations. Various alternatives were investigated, among them being the development of in-house systems unique to Trident's business and selective package solutions. The brief for the team was to develop an IT solution that provided a competitive edge, enhanced customer service and complemented the company's entrepreneurial culture.

To do this the team had to meet the varying business requirements of all divisions within Trident and its existing subsidiaries. The requirement was to implement systems as soon as possible in those areas that provide significant business benefits and to do so with the minimum of disruption to the organisation. The solutions had to be based on proven, reliable and well supported technology that could accommodate changing business needs. The technology infrastructure needed to be flexible and integrated to allow for growth. Three alternatives were investigated.

4.4.3.1 Processes

With Trident's focus being on the customer - the strategy of the organisation was thus positioned to suite customer needs - not having the systems in place to support this strategy meant that other areas of the business got neglected. E.g. The customer got his delivery of steel, however, loads were not optimised and there were unnecessary delivery runs. In changing the systems and core processes to be more suited to a customer focus, benefits could be gained. With new processes in place logistics could be streamlined, which meant that the organisation could optimise their inventory, loads and deliveries to get the order to the customer on time and with efficiency, which would result in cost savings for the company. The adoption of a new IS together with Trident's re-engineered processes would force the

organisation to adapt to more modern business practices. Trident viewed the changing of old processes as fundamental to the new IS as it would contribute to more automation, tracking would be facilitated, and there would be more information sharing. This would result in a reduction in time and resources due to certain processes being performed concurrently. (Refer section 2.4.1)

4.4.3.2 Capabilities

The changes in the scope of Trident's strategic business requirements had not been adequately supported by their legacy systems over the years. The strengths within the IT division included a committed and responsive track record to providing user support; there was a flat organisational structure and most staff had cross-functional business and systems knowledge. However, the legacy systems structures (programs and data) were old, poorly constructed and difficult to enhance. The IT department, response to the changed business environment began a rewrite of all systems, but due to the effort required to maintain existing legacy systems, could only devote 20% of their time to development work. Added to this was the risk that too little attention would be given to processes and would thus result in the rewrite being overlaid over existing inefficient business processes.

4.4.3.3 Information Systems Architecture/Software Applications

The first alternative was to continue developing custom systems on the existing AS400 platform. Factors negating this plan included time and resources needed to implement such a plan. Ongoing operational costs could be relatively high with continued in-house maintenance and development. Notwithstanding this, custom systems as opposed to packaged systems were still viewed as being the best to meet Trident's requirements of maintaining competitive edge.

The second alternative was to select a package solution for the AS400 platform and custom develop select modules that were unique to Trident. Favourable factors to this approach were that the effort in systems development was reduced, external support was available for future releases and application support, and that proven business practices were encapsulated within packages, which did not have to be reinvented. Factors negating this plan included the perception that systems could be too complex or rigid for Trident's unique business processes and that too much depended on how the organisation implemented and utilised the system.

The third alternative was to select a package solution for a platform other than the AS400 and custom develop integrated solutions that were unique to Trident. The important considerations of this plan included resourcing, i.e. new IS skills would be required to support the new software and hardware platform, and this was seen as a major problem.

After due consideration the committee agreed that the second alternative would be the correct route to take for the organisation. Trident's unique system modules would be custom developed and integrated with the package. This route was seen to fulfil business requirements in the shortest time possible. It would be less disruptive to the organisation and solutions would be based on proven, reliable and well supported technology. It was also

viewed as being the most cost effective as it was seen as having the shortest payback period. JDE was selected as the preferred solution after investigating Business 400 MRS, Mapics XA, CA-PRMS, Software 2000 and Prodstar 2. Criteria used in selecting the package included functional fit, integration, hardware platform, implementation effort, cost, risk, flexibility to cater for changing needs, upgradeability, ongoing operational costs and ongoing systems support.
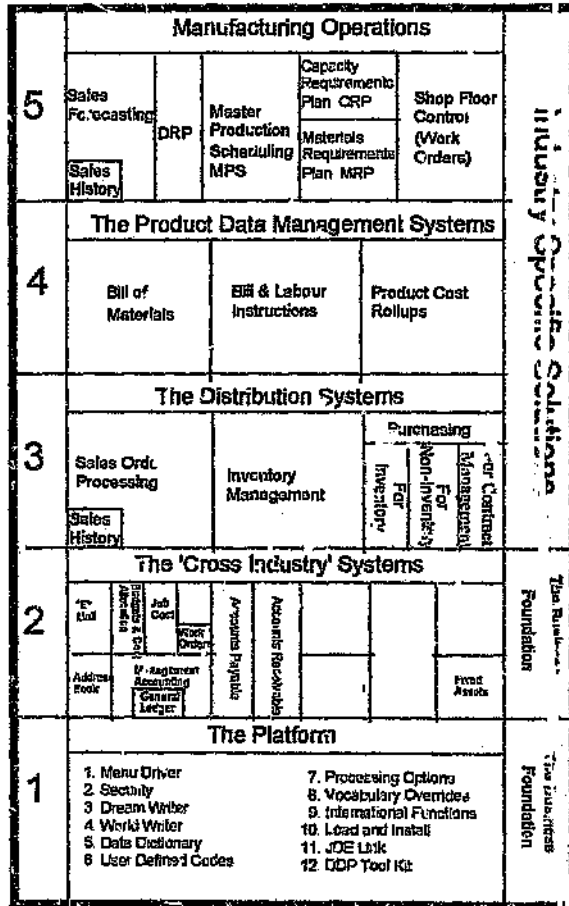

Figure 4.12 - Planned JDE Modules for Trident Steel

4.4.3.4 Organisational Values
A training schedule was developed which would include the upgrading of skills within the information technology department and employee re-skilling to suit the new cross-functional processes. For the new IS to be successful tremendous effort would need to be put into

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upgrading skills. As King (1995) and Johnston (1988) suggest, an infrastructure of skills, or internal capabilities provide competitive advantage. The skills level of personnel was not oriented towards integrated software, and in some cases, computer skills were non-existent. The training endeavour would need to be multifaceted: a focus on basic computer skills, on process changes and business knowledge was needed, and lastly, functional training on the computer system would be necessitated in some areas.

Another guiding principle linked to the training and re-skilling of people was that there would be information sharing which would contribute to synergy between people and departments within the organisation..

Critical success factors identified included a focus on processes which would enable the information system to support the business, user involvement and ownership of the processes and information system, top management commitment (which was considered of crucial importance so that management could communicate systems initiatives and the related impact to internal staff) and a flexible integrated software solution to support the business.

4.4.4 Expected Benefits

Trident's management recognised that there were benefits that were not clearly discernible. They were expecting increased revenue attributable to improved customer service which would be supported through IT by improved on-line pricing methods, through integrated sales fulfilment processes divisions and subsidiaries, and through shorter order processing lead times. Timeous credit information and real-time availability checking were also seen as enhancing customer service. The automated order tracking system would lend to proactive order management.

Another benefit, improved internal efficiency and effectiveness, could reduce costs. Integrated shop floor planning, job tracking and costing would be improved because of the information system. Management expected a reduction in administration effort through simplified inventory control procedures. Integrated despatch planning and logistics would reduce costs as well. Synchronising their fleet with despatch and production plans would facilitate efficiency and also reduce costs.

It was expected that management decision making would be enhanced through accessibility to formalised and integrated operational plans (e.g. sales forecasts, inventory replenishment plans, projected inventory levels and transportation plans.) There would be the availability of information to support total logistics cost analysis and planning. There would be visibility of product and process costs, also of customer and order profitability. Analysis of sales by product, industry, business unit and customer categories would be easier.

Organisational development through the development of business analysis skills was seen as another important intangible benefit. The skills profile of the personnel in the IT function of the organisation would undergo a gradual change: from focusing on development within a function to understanding the business and implementing integration within all the functions. The integrated system would require a broader knowledge of the business due to the impact

of information in other areas of the business. Added to this, all personnel in the organisation would need to undergo training on the system for functionality and understanding the flow of information through each function.

Tangible benefits included increasing Cutting sales revenue by alleviating the current paperwork bottlenecks through the automation and integration process. The new system was perceived to improve pricing accuracy and consistency, quotation turnaround times could be reduced and follow up of open quotations would be improved. Cutting scrap could be reduced by better information on theoretical and actual quantities scrapped, more optimal allocation of material to cutting jobs (as a result of better visibility of material requirements across customer orders), by improved visibility of off-cuts held in stock, and finally, by better control of materials issued against jobs.

A better return on scrap could be obtained by being able to differentiate between different categories of scrap on the system (e.g. light scrap, bin scrap, off cuts and claims.) and by improved visibility of off cuts and claims held in stock. CPD scrap could be reduced by measuring and monitoring the theoretical and actual quantities scrapped.

Transportation and fleet costs could be reduced by combining loads through integrated despatch planning, by prioritising despatch loads and optimising external transportation.
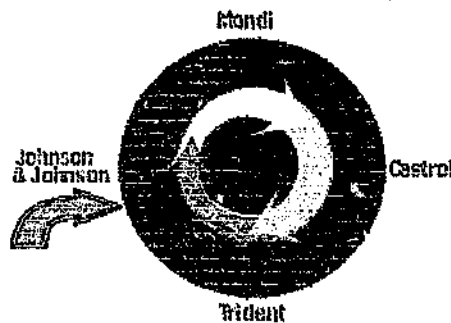
4.5 Johnson and Johnson Professional Products

Figure 4.13 - Evolution of JDE implementation.

4.5.1 Background to the Company:

Johnson and Johnson (J&J) a world-wide company, consists of more than one hundred and seventy companies, marketing health care products in more than 175 countries. The company engages in producing products that serve a broad segment of medical needs. These range from baby care, first aid and hospital products to prescription pharmaceuticals, diagnostics and products relating to dermatology and feminine hygiene. J&J with $21,6 billion in sales in 1996 is the world's largest and most comprehensive manufacturer of health care products serving the consumer, pharmaceutical and professional markets. Their innovati, health care products have resulted in consistent financial performance. The company has 64 consecutive years of sales increases, 35 consecutive years of dividend increases and 53 continuous years of dividend payments. Innovation is considered to be at the heart of J&J. Their aim is to spend $1.9 billion on research and development seeking advances in medical research and technology.

In South Africa, J&J has three subsidiaries, Jansens Pharmaceuticals whose focus is on animal health and pharmaceutical products, Johnson and Johnson Consumer, whose focus is on consumer products (skin care and baby products) and Johnson and Johnson Professional Products who are focused on the hospital and medical market. This case study will focus on Johnson and Johnson Professional Products. (J&J PP)

J&J PP employs approximately 350 people countrywide, 200 of which are concentrated on the manufacturing and distribution function of the organisation, and the remaining 150 personnel are employed in the marketing, financial and administrative function. Regional offices for the organisation are in Durban, Cape Town and Port Elizabeth. As such, J&J PP South Africa, is a marketing and distribution organisation.

J&J PP consists of seven business units, being Ethicon, Medical, Orthopaedic, Endo-surgery, Visiakon, Diagnostics and Interventional systems. Each division has its own sales forecast, profit and loss accounts and their own products. 40% of products are manufactured locally, however, the new products line and high technology products are all imported. As product leaders, their products are differentiated, for which a premium is charged. With the weak rand/dollar exchange rate and the changes that the South African medical environment is undergoing management is presented with a particular challenge in respect of maintaining their competitive edge.
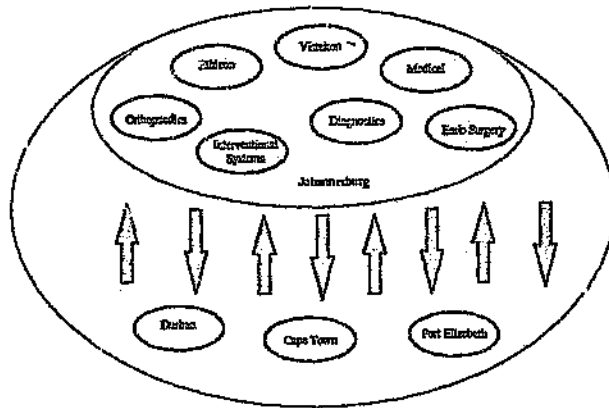
Figure 4.13 - Diagrammatic representation of the Johnson & Johnson Professional Products.

4.5.2 The Problem:

To maintain their market share in South Africa and with their focus being on customer care, the organisation deemed it necessary to home in on operational efficiency to further streamline their business. This must be seen against the backdrop of the South African health care environment which is faced with tremendous pressure - private medical aid schemes which were financed partly by organisations and partly by employees and excluded, in most cases a large group of South Africa's workforce, underwent changes which required organisations to include all personnel in equal company benefits. Managed healthcare systems have come to the fore as medical aid schemes are proving too expensive for organisations. (For example, Anglo American has established their own company - Southern Life Care, to manage all their own employees via a managed care system.) Whilst there is much debate surrounding health care in South Africa, management of JNJ PP believe that private health care will expand, albeit with cost pressures on prices.

The World Health Organisation having awarded South Africa First World status (albeit that South Africa is a developing country) has meant that South Africa is not entitled to drug aid from the World Health Organisation. Labour costs in South Africa are high in return for low productivity and the high cost of capital. Trade restrictions of the apartheid years led manufacturers to produce medicines here in quantities that are small in world terms and are more expensive to produce. The government is seeking to provide cheaper healthcare which in turn is putting pricing pressure on medical companies. Within the public sector cheaper medical assistance is provided in government hospitals - but with the shortage of doctors and surgeons in these hospitals whom J&J PP target and with the focus in government hospitals of using the cheapest products, J&J PP is now faced with charging smaller premiums to stay competitive. In the past the organisation was able to charge a premium of between 20 and 40% for the research and development and the technology that was invested to bring the product to market, but with the changing health care environment these margins are being squeezed.

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To be prepared for the changes that were taking place in South Africa in the early 1990's J&J PP required from their IT systems a solution that would support the rapid changes that the organisation was expecting. The company had in-house written developed systems which had initially been developed for a midrange system (IBM System 34),but had been migrated to an IBM System 38, and later to an ...i AS400. The software was batch driven, and the bulk of the programs had merely been converted to run on later technology. The software had been written for hardware where capabilities had been very restrictive. The systems comprised of financial applications, stock control, distribution, sales and purchase order entry. There was no integration between the systems, and before any capturing of data took place, was placed on a paper system. This contributed to a double load of work. Two such paper processes existed, one in the receiving area and the other being the sales order entry function.
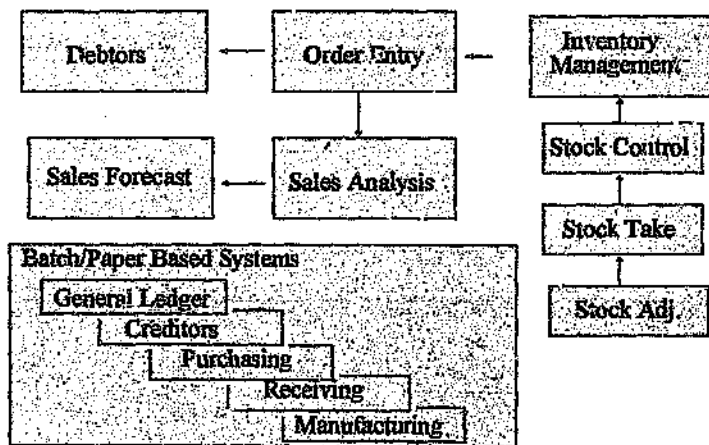
Figure 4.14 - Flowchart of legacy systems at Johnson & Johnson Professional Products.

The rapid change of pace in the business world meant that for every change to the business, software changes had to be made to keep pace. For every new acquisition the parent company made and decided to market in South Africa, programming changes needed to be made. Added to this the organisation felt it was time for a closed loop MRPII system which demanded a fully integrated system.

4.5.3 The Plan:
An evaluation of the business and its IT was undertaken to establish a plan. A cross-functional team of high level managers within the organisation was established which consisted of the financial controller within the organisation, the IT manager, a business analyst from within IT, 2 product managers, 2 marketing managers and the materials manager. Independent external consultants were contracted to assist in the business systems evaluation, so at to avoid politicising the evaluation.

From the systems requirement specification came the brief - integrated software was needed to assist with operational efficiency. To develop in-house systems with the kind of functionality that packages could offer was not cost effective To develop a system with the overhead of maintenanc э work on then current systems, was considered too high, as 40% of the IT department's time was taken up with maintenance work.

Added to this was the perception that pre-packaged software had come of age. More business techniques were available, built into the packaged software. Within the time frame given, in-house systems could not compete with the breadth of functionality available and thus packaged solutions were considered to be superior.

As J&J world wide were knowledgeable on the AS400 platform and at that time the AS400 was the most state of the art midrange technology, it was decided to remain on the AS400 platform and investigate systems from that point of reference. The skills base within the organisation also received consideration, and as all of its skill was invested in the AS400, it seemed most cost efficient and prudent to stick with a known element. JDE was selected over other packages such as BPCS, Assignment 400, Mapics, Solutions 2000 and MacPac. Evaluation of the packages took place on a points system, considering functionality, ease of use, vendor support and cost. Figure 4.15 depicts the modules implemented by Johnson and Johnson. The manufacturing operations (figure 4.15) are targeted for implementation in 1998.
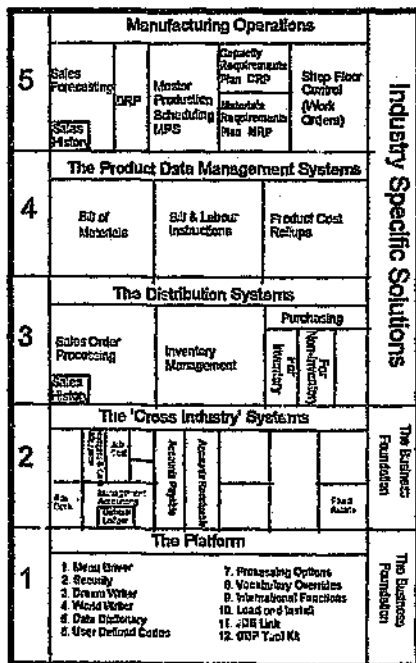

Figure 4.15 - JDE modules installed at Johnson & Johnson Professional Products.

4.5.4 Expected Benefits:

Owing to the on-line integrated functionality of the system is was expected that headcount would be reduced. This headcount reduction was expected in both the functional areas of the business as well as in the IT department. From the perspective of the IT department, the profile of the skill was expected to change, as it was envisaged that there would be less maintenance work and more building of business knowledge.

The organisation also expected to achieve more reliable systems with less intervention as the nature of the system had changed - from being batch driven to being an interactive on-line system.

It was perceived that there would be more functionality for users and that these users would be less reliant on the IT department to get information from the system.

As it was an integrated package and processes were re-engineered in preparation for the new information technology, benefits were expected from operational efficiencies.

Financial figures were reported to its corporate head office in America thirteen days after month-end close offs. It was expected that figures would be ready much sooner after close off when the new system was in place. The aim was close-off plus five days.

The upgrade path that the system offered promised increasing functionality with each new release of software. In-house systems had locked the organisation into a method of processing and delivered very little in the way of extra functionality.

Stock holding was running at 180 days - whereas by comparison, in Europe, J&J companies' stock holding was running at 60 days. It was envisaged that the stock holding days could be reduced once the integrated system was installed.

4.5.5 Benefits obtained:

On the question of benefits obtained from the system, John Calvert, operations director of the organisation says "the first time you implement a package of this nature you don't get benefits, mostly you get unexpected disasters! Being part of a big multinational company like J&J with its decentralised management structure (the package) has assisted the organisation in being able to take on new products and franchises without major system changes. To maintain our world class standards has meant we have been able to respond to the business changes rapidly."

Whilst it was acknowledged that benefits were slow to occur, another benefit was in the information flow through the organisation. Users, albeit haltingly, took ownership of the system and became less reliant on IT staff. However, as the system introduced more complexity to the business as seen by users (in that systems weren't written for their specific business function, but were introduced as part of a process) a higher level of skill was required, and in some cases, there was actually an increase in staff levels, and in some areas of

the business remuneration far exceeded that of other similar departments owing to the skills levels required. In this respect remarked Koot du Plessis, financial director of the organisation, ' the system didn't deliver the cost savings we were expecting."

The IT department reduced its headcount. The role of the IT department also changed. Whilst development work was reduced, the skills profile of IT personnel also changed - they required more skills after the implementation. Together with their technical and programming skills, they needed to have cross-functional business knowledge and enhanced people skills. The personnel in the IT department were working more closely with the user departments and were perceived to be part of the business. Ultimately the organisation sees the demise of the IT department as it was once known. They envisage perhaps one or two operations staff, with the rest of the people in the department being deployed into departments where the work gets done. Says John Calvert again, "the days of the IT department as it was known are numbered - it is too expensive to maintain different systems and to maintain huge departments of development workers, economies of scale will dictate. Packages are cheaper in the long run, provided they are implemented correctly."

4.5.6 Lessons Learned:
J&J PP affirm that large scale package implementations must be viewed not as just another project within the company, but as THE project an organisation undertakes. John Calvert maintains that organisations fail because they view the implementation of ERP packages as just another project and make IT responsible for it.

After an unsuccessful upgrade of the software they also believe that a project team must have the right mix of skills - i.e. people drawn from within the organisation and not too many external consultants. In their experience, if the project team doesn't gel then the project is faced with potential problems. Management saw as an immeasurable advantage the fact that they had one person on the team who was drawn from within the organisation who had cross-functional knowledge of the business and who also had a broad knowledge of the package. A recent upgrade of software has gone so successfully after a change in the focus of the project team and also with different players.

The organisation also maintains that to re-engineer and implement software at the same time puts the organisation at risk. The organisation should make a decision - either to re-engineer well in advance or to re-engineer after the system has gone live. States John Calvert, "you can't do both - there is just too much change. We had to make a decision and accept that we were not doing this right. It is also often a difficult route to take - not to re-engineer". Time pressures, skills profiles and an organisation's culture normally dictates, as does the process that needs to be put on hold until after the system is in place.

Management are of the opinion that a project of this nature can not be an IT project. Midway through the project staff changes necessitated the shifting of the project from a user driven project to an IT driven project. At this stage problems were experienced with the project. Whilst there was a lot of politics involved, a decision was made to move the project away

from IT again. They got more benefit when they moved the project away from IT. They were amazed at how much commitment they got from the user base within the organisation when they knew they were responsible for the system.

Experience with a package of this nature has taught them that extensive learning within the organisation only happened once they had a major problem with the package. No matter how much training had been given, nobody believed how central the system was to the business. Only after immense effort to resolved problems was there a grasp of how important the system was to their effort and a renewed interest to make it work.

4.6 Conclusion

This chapter has presented case studies of four organisations based on evidence gathered from interviews, organisational documentation and observation. In each case the background to the company was presented, their problems were documented and their planning phase was set out. Competencies, capabilities, information systems architectures and organisational values were highlighted in order to establish how organisations were utilising packaged software applications in order to achieve strategic and transformational benefits for their organisations. In the following chapter these will be analysed to ascertain if organisations are achieving transformational benefits from the utilisation of large scale packages.

CHAPTER 5

5.1 ANALYSIS

The main aim of this research was to discover how organisations were utilising large scale software packages in order to achieve strategic and transformational benefits for their organisations. Each of the organisations presented in chapter four were responding to their changing business environments by re-evaluating and changing their business strategies and then paving the way for their information systems to support their new strategies. It is a given that most South African organisations were insular and were forced to concentrate on local markets because of the sanctions embargo of the 1980's. With the cessation of the sanctions embargo in the early 1990's, South African organisations were launched into a globally competitive environment.

At the outset of the interviews with each organisation, the 'Value Disciplines' model (Treacy and Wiersema, 1995) was presented so that the organisation had a framework relating to their redirected strategies. Johnson and Johnson Professional Products and Castrol S.A. were clearly 'Product Leader' organisations; Mondi Cartonboard's new strategy was aimed at the 'Operational Excellence' value discipline and Trident Steel was aiming at the 'Customer Intimacy' value discipline. Of interest is the fact that each of the four case studies affirmed that customer service was a high priority for their organisations. As Treacy and Wiersema suggest, customer choices are clearly driving organisations to rethink their strategies.

An analysis of the four case studies highlighted a number of interrelating issues which will be reviewed in the following sections.

5.2 BUSINESS PROCESS REENGINEERING

From the research it was found that although each organisation had different strategies which led to their reengineering efforts, the manner in which these efforts took place also differed. What was clear was that information technology was the key to the reengineering efforts - it assisted the organisations in refocusing their business, change the structure of the organisation, and facilitated improvements in levels of performance.

At Mondi, the change in business from a production push to a market pull, together with a refocus on who their customer was, required that the organisation reengineer their business. The previous reengineering exercise which had left the organisation with flat structures, (without having had job specifications, practices or systems redesigned), had resulted in low morale and low levels of motivation within the human resources domain of the organisation. The literature review highlights King's (1994) viewpoint that reengineering fails because it is applied at a tactical rather than a strategic level. Mondi's

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new endeavour was based on lessons learned and was not focused on downsizing, but rather on acquiring a different category of customer, which required that their operating model change. (i.e. manufacture to forecast and not to order).

The reengineering exercise which took place at Castrol in 1995 and which resulted   ie restructuring of the organisation into six strategic business units (SBU), was und... without a supporting information system. Each of these SBU's had their own customers and their own products. The inhibiting factor in this reengineering exercise was the legacy system in place at Castrol - extensive and expensive changes were required to the system, which resulted in cumbersome and 'patched' changes to processes and systems. Whilst it was found that the reengineering exercise did indeed refocus attention on the customer, the maintenance to the systems to assist in this focus were not responsive to prerequisite needs. The organisation found that, as Davenport and Short point out, IT is the key enabler of BPR. Personnel affected by the reengineering found that their jobs became more complex, that they had no control over the process, and that to maintain a customer focus was being increasingly hampered by their information systems.

Trident's new mission 'to be the premier provider of quality steel, products and related services in the markets that they served' set in motion an evaluation of how the business and its supporting structures were performing. The strategy, to move away from core steel merchanting, to increased value added products, required an organisation that was responsive and intuitive to customer needs. It was found that the information systems in place could not respond to these needs.

Unlike Mondi and Castrol, Trident did not first reengineer their business and then seek an IT solution. Trident first evaluated a number of IT solutions and then sought to reengineer according to the capabilities the technology could offer. Subramanian and Lacity (1997) refer to a similar approach in a case study they undertook. However, whereas their study concluded that this hindered BPR, other studies have demonstrated the success of such an approach. (Appleton, 1997).

As a 'Product Leader' company JNJ PP was continually adding new products and franchises to their portfolio. As stated in section 4.5.2, for every new acquisition the parent company made and marketed in South Africa, programming changes to the information system were required. Since the software package has been 'live' for five years, greater insight into the impact of their reengineering efforts can be derived. John Calvert, operations director of the organisation is of the opinion that to reengineer and implement large scale packages at the same time, puts the organisation at risk. JNJ PP's experience was that there was too much change at one time. It was found that projects to upgrade the software to gain benefits from increased functionality, were done so without any reengineering efforts. Once the users were comfortable with the software, only then did reengineering take place. This was found to delay benefits, however JNJ PP felt that time pressures, skills profiles and organisational culture dictated this methodology.

5.3 PROCESSES

This section will show that implementing large scale software packages forces a re-evaluation of processes within the organisation. It also highlights the danger that benefits can be reduced where an organisation chooses to leave old processes in place where a better solution could have been applied. Of interest is the fact that three of the four organisations presented in chapter four did not follow Hammer and Champy's (1995) advise to obliterate what they had, rather, they opted for the more moderate approach of process improvements. Mondi, whilst not having a 'clean slate' from which to begin, sought a radical change for their business.

In order for Mondi to shift their business strategy from 'make to order' to 'make to forecast', their processes needed changing. It was found that their processes were overcomplicated due to information systems inhibitors. The problems experienced at Mondi and referred to in section 4.2.3.1, further underlines Davenport and Short's (1990) point that functionally separated tasks cannot support today's changing business requirements. All the areas where IT could have been supporting the business were incorrectly deployed within the organisation. Whilst there was automation, clearly the informational aspects of their processes were mistrusted. The tracking, analytical, integrative aspects (Davenport and Short, 1990) of their processes fell short of business requirements. Only once their processes were mapped and reengineered did Mondi investigate specific software packages.

The approach that Castrol followed relating to their processes, differed from Mondi, that a prior reengineering exercise at Castrol had streamlined all major processes, so that it was envisaged that only smaller processes would need tailoring. It was found that Castrol underestimated the need to change their processes when, during the prototyping phase of their project, a number of problems with processes became evident. Castrol's commitment to installing the software without any system modifications also forced a number of unintended process changes on the organisation. Moreover, there was reluctance to map processes as it was felt that all the steps were clearly evident. This led to project delays. Davenport (1994) and Heygate (1990) point out that organisational structure and culture contributes largely to the success of a reengineering effort, of which processes are central. Furthermore, Gutierez (1993) contends that where an imbalance between the software product and the process exists, adequate technical and procedural solutions together with organisational support is required. Castrol has since begun a fresh evaluation of all business processes.

At Trident the legacy systems were written for specific processes within each division - consequently, there was no integration of data which led to extra workloads, inefficiencies and duplication of data. IT (and more specifically the software) was seen as a key enabler of their redefined processes. The various legacy systems and manual processes that had existed, had been instrumental in the organisation maintaining a customer focus at great expense to itself. Davenport and Short (1990) draw attention to the fact that business should not be viewed in terms of functions, divisions or products, but as key processes.

Trident retained their divisions but functions within these divisions became processes; each division had visibility of all processes and information on the new system.

The JNJ PP case study presented in chapter four outlined that the reengineering exercise was managed by the IT department, and as such was an IT driven proj ct. It was found that this impacted the project from the outset. B .cause personnel within the IT department never had the authority or the credibility to enforce process changes, there was resistance to the changes put in place. This in turn inhibited the benefi· pertaining to informatior sharing, process changes and contributed to a power struggle relating to information sharing within the organisation. This underscores Davenport's (1994) viewpoint that successful process changes can only be carried out if the organisation's culture is changed as well.

5.4 COMPETENCIES

Notwithstanding the fact that all four organisations felt that their information systems were an inhibitor to the changes they were seeking to make, they still viewed their information systems as a core competence.

At Mondi it was recognised that any competencies that existed within the organisation were diminished in value as a consequence of the business being more functional than cross-functional. The competencies within the IT function were not leveraged to support the business in a co-ordinated manner. Parker (1996) contends that core competencies and learning organisations cannot succeed when the IT department cannot deliver and disperse information and shared knowledge, throughout the enterprise.

The evaluation of processes at Mondi which revealed that islands of information existed pointed to the inefficiencies within the organisation. Without an IT competency within Mondi it was evident that no knowledgeable decision making could take place, and that knowledge transfer would not happen. It was also evident to the organisation that a new information system alone could not provide the benefits they were seeking - a holistic approach was taken at Mondi, to build on procedures, people and products to build a new competence within the organisation.

Whilst Castrol's core competence was surely its product that it sold, the information pertaining to the movement of that product (inbound and outbound) fell short of business requirements. The legacy system encouraged managers of the six SBU's to make decisions based upon improving their divisions performance at the price of other SBU's. Parker (1996) confirms that old systems enforce old cultures in her study of Analog. Analog introduced a new information system which was designed to enforce co-operation between divisions based upon improving company performance, instead of divisional performance. The new information system that Castrol was preparing to put in place would give all SBU's visibility of stock movement and commitment, and would enhance customer service.

Within the IT department at Castrol, the only competency that existed was related to hardware and software programming. Business skills rested with one member of the department, consequently, resources were stretched. Moreover, the system in place was written using a 4th GL tool and that competence rested with the same person. Accordingly, Castrol determined that a new competence was required within the organisation - an IT competence that had the necessary analytical and business knowledge skills. It was felt that the introduction of a software package would initiate the building of such a competence within the organisation.

Trident viewed competencies as an important contributor to the success of the new IT - just how vital IT as a core competence was, only manifested itself well into the project. Comments the sales director of the organisation; "we didn't realise just how reliant we're we were on a computer (until we were well into the project) - it affects everybody's' lives." His statement relates to their belief that more people studied the processes in the company to a greater depth than ever before. This contributed to knowledge and information sharing which was fundamental to the building of this new competency.

JNJ PP, driven by the need to have a system in place to deal with the entry of new franchises to the South African market, and later on, to deal with the changed health-care environment, centred their approach on the products and the marketing drives within the organisation. The need for a new IS was seen as crucial, however, the business objective got obscured. Whilst the IT was clearly identified and incorporated into the companies overall strategic plan, their mistake was to allow the project to be driven by the IT department.

5.5 CAPABILITIES

It was found that the issue of capabilities was of importance to all four organisations presented in chapter four. However, two of the organisations viewed capability building as an organisation-wide and process driven function, whilst the other two organisations focused entirely on the IT function.

At Mondi capability building was assessed at an organisation-wide level, with special attention given to the IT function. A change in strategy such as that which Mondi was undertaking required focus being given to physical, organisational and human resources.(Refer section 2.5.2) It was found that Mondi gave these equal attention. Given the complexity and scale of the change that Mondi was about to undertake, the organisation gave due consideration to its IT structure as well. Mondi saw in the IT the means through which their strategy could be accomplished. Marks (1996) affirms that organisational change is brought about by people and not technology it was found that Mondi recognised the importance of the role that people played in making the IT a success. Training and re-skilling both in business and the software application was

scheduled for all employees. It was found that the organisation was putting in place mechanisms for organisational learning.

At Castrol the subject of capabilities centred largely around the IT department - being the physical and human resources that were needed in place to assist in the strategic direction of the organisation. Only as the understanding of the system grew, did the focus on capabilities escalate. The organisation chose to remain with their existing hardware architecture, as it was recognised that to remove this capability would put the organisation at risk. (Considering the overall project.) Likewise, the selection of the software package pointed to the organisation wanting to retain some of its IT capability in terms of software programming. To assist in the training of business knowledge for the IT personnel, each person was allocated to a team that was mapping current business processes . It is too early in the project life cycle to determine if this method of skills enhancement has been effective. Castrol views its IT as strategic to the organisation having learned from experience (refer section 4.3.2) just how imbedded IT is in the organisation.

Trident's view on capabilities extended to all personnel within the organisation. Senior management of the organisation were confident that the new IT put in place would support its business needs, but they were concerned about the skills levels of all employees. To this end, extensive training and re-skilling took place. It was their view that the skills level was not oriented to processes and integrated software. Most departments were functional, and in some cases, staff had never used a computer. Training (and learning) took place in three areas: in the business arena, application training and functional training.

It was found that within Trident, the learning culture which was initiated contributed to a broader knowledge of the business, and staff were keen to share their views. The learning culture put in place at Trident fostered a sharing of beliefs and goals as suggested by Parker. (1996) Parker states that organisations need to create a new culture that makes people feel safe in learning. i.e. they must have a motive, a sense of direction and the opportunity to try new things without fear of punishment. Comments the sales director of the organisation, "the skills we have in place now are dramatically different to those that were in place a year ago."

The consideration JNJ PP gave to capabilities was centred solely on the IT function within the organisation. It was on this basis that the project team decided to stay with the current hardware and seek out a package that would run on that hardware. Training focused purely on the functionality of the system and training was also left to the IT department to roll out. Because of the problems that the organisation experienced with this approach, new projects relating to upgrades and training, had teams drawn from the user base to install them. According to Appleton (1997) managers neglect to assess not only the skills development needed by employees but also the organisational changes required of them. It was found that JNJ PP learned that training was an important factor when implementing large scale packages.

5.6 INFORMATION SYSTEMS ARCHITECTURE

The point made by Segars and Grover (1996) and referred to in section 2.3 is that the effective utilisation of IT can only be achieved by carefully evaluating organisational needs and only then matching them to the technology solution This was demonstrated by the four case studies presented in chapter four and elaborated on in previous sections of this chapter. This section will focus on the framework proposed by Segars and Grover and in particular, the 'physical level' of the framework. The other two levels, being the 'Conceptual level' and the 'Logical level' were indirectly dealt with in previous sections of this chapter.
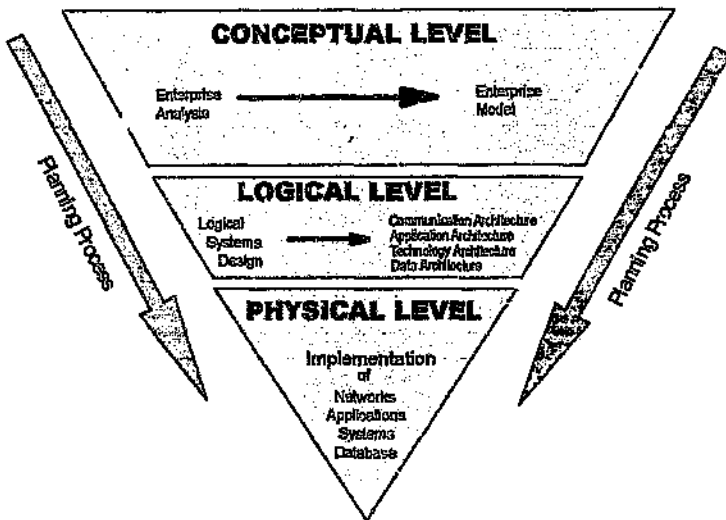

Figure 5.1 - Information Systems Architecture as proposed by Segars & Grover (1996).

At Mondi the deployment of incompatible technologies and stand-alone departmental systems had had an effect on efficiencies within the organisation. Nolan's Stage Model (1979) was useful in pinpointing the direction of the change. It was ascertained that Mondi was at stage 3. (Where high levels of controls were required, and where information systems planning was given increased visibility.) The hardware and software in place at Mondi was an inhibiting factor for the business. The problem at Mondi underscores the Segars and Grover viewpoint that an information systems architecture is crucial to the success of an IT enabled strategy. It was found that Mondi's decision to stay with the current platform of hardware and implement a software package to integrate all data was based on decisions made at the conceptual and logical level of the Segars and Grover framework. Mondi's intention was to make use of the 'co-existence' features of JDE (refer section 1.3) whereby certain areas of the organisation could use 'green screens' (specifically where skills levels would be hampered by the use of client/server technology); in other areas of the organisation client/server technology could be deployed, using a

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single database and server. This decision was made at the physical level of the Segars and Grover framework. Moreover, as Mondi conformed to the 'Operationally Excellent Value Discipline', they were striving for low overhead, with processes that were highly automated. (Treacy and Wiersema, 1995).

As Castrol had historically been highly computerised, the importance of IT was imbedded in the organisation - however, ownership of information rested with the IT department. The unsuccessful deployment of an IT system in 1990 had strengthened the viewpoint within the organisation that data should rest with users and not with IT. With reference to Nolan's Stage Model, Castrol was at stage 4 - where emphasis was on integration, user control of information systems costs and the use of databases.

The Segars and Grover ISA framework was also relevant to the Castrol case study. At the conceptual level considerations included the structure of the organisation (i.e. the six SBU's) and the processes. However, policies weren't changed. At the logical level middle management (represented or. the project teams and involved with requirements analysis) provided a blueprint for applications usage. At the physical level consideration was given to hardware, the networks and the software applications. The implementation of JDE was undertaken in a phased approach. (Refer section 2.4).

It was found that at Trident the awareness of the systems inefficiencies pertaining to the organisations customer focus was high. The change initiative that the organisation launched, placed it in the Treacy and Wiersema value discipline of 'customer intimacy.'

The Segars and Grover framework is pertinent to the Trident case study as well. At the conceptual level, top management set out explicit strategies for their ISA. At the logical level, requirements were analysed and designed and at the physical level, the implementation of JDE was taking place. Using Nolan's Stage Model, Trident could be placed at stage 3 moving to stage 4, as the focus of the new IS was on integration so as best to suit customer needs.

Like Castrol, Mondi and Trident, JNJ PP also remained with the known quantity in terms of its hardware and capabilities within the organisation. JNJ PP and Castrol (both multinational companies) observed what sister companies were doing overseas, and were influenced by their experiences. In both instances however, the local projects progressed at a faster pace than those overseas, so the in-company assistance they were hoping to secure was negated.

5.7 SOFTWARE PACKAGES

Literature supports the view that a software application implementation takes less time than it takes to develop such a system. (Refer section 2.5). Moreover, software packages also necessitate an investigation of all business processes. One of the most often cited downsides to uniquely written systems is that they are overlaid over old processes. (This is

not to say that organisations don't do the same thing with software packages - for example, JNJ PP prefer to install their software as is, and allow their users time to get used to the new software, and only then does reengineering and process redesign take place.)

At Mondi attention was focused on systems integration - the interfaces from the different systems and the fact that there were individual departmental systems had inhibited changes to the business. The decision to implement JDE would provide the organisation with ready developed programs, a reengineering framework and an implementation methodology. This view is supported by Payne, director of information services at Saffiland, Ontario (cited by Appleton, 1997) who, after implementing an ERP solution at their organisation, suggests that orga   .ons should adopt a preference for changing processes to make them compatible with the system. (i.e. customisation of the software should only take place when absolutely essential.)

Like Mondi, Castrol has chosen to implement JDE without any changes to the software. Consequently, processes will have to be tailored in such a fashion that they suit the software. Castrol has chosen to implement the system without using all the functionality that is available within the software. Jeff Wood (cited by Appleton, 1997), plant manager at Par Industries states:

> *"there is a tendency sometimes to become enamoured with all the bells and whistles that go with fully integrated ERP systems, and that can cause problems down the road..........(the software) can cause a huge disruption if misapplied."*

Castrol has also chosen a phased approach to their implementation of JDE. Within this phased approach, Castrol are also prototyping the system in a separate environment so that testing and validation can take place prior to installation into a production environment.

Along with the focus on processes, integration, time and resources, Trident also sought application support and proven business practices built into the software. It was found that senior management were circumspect regarding the software because they could not confirm that a software package could support what they believed to be their unique business processes. Comments the sales director of the organisation:

> *"we are a strong company in our current culture. We are nervous that implementing a software package would result in it (the software package) being susceptible to changing the culture of the company."*

Like Castrol, JNJ PP was a multinational company with corporate headquarters overseas. It was found that the implementations at these organisations were largely influenced by

implementations overseas.(i.e. that they were not alone in their endeavour to implement JDE, that there was inter-company expertise and skills.) JNJ PP also used the incremental implementation approach. Subramanian and Lacity (1997) define incremental approaches as the practice of dividing large IT projects into multiple, smaller projects; within this incremental approach there are three different types of implementations, prototyping, phasing and piloting. JNJ PP, having employed the incremental approach, prototyped the system in a test environment known within the JDE implementation methodology as a 'conference room pilot'.

5.8 ORGANISATIONAL VALUES

The following organisational values were analysed:

5.8.1 Teams
Process redesign prepares the way for functional departments to dissipate and for process teams to replace them. In the section on BPR and processes it became clear that teams facilitated functional interfaces and parallel activities. The literature review highlighted how teams and not individuals facilitate the work of processes. According to Parker (1996) many organisations shy away from creating truly cross-functional teams because ingrained corporate hierarchies actively resist. All four case studies presented in chapter four undertook business process reengineering with a view to establishing process teams.

At Mondi user ownership was seen as crucial to the success of the project - i.e. project members were removed from their day to day functions, new employment contracts were signed, they were assigned new managers and were fully committed to the project. An incentive scheme was put in place to ensure continued commitment to the project. There was an intention to move away from functional units and this began with the project team. It is too early in the project to assess how successful the move to team working has been at Mondi. It was found that this focus on teamwork at Mondi coincided with the 'operational excellence' value discipline of Treacy and Wiersema, which indicates that such organisations prize the team and not the individual.

At Castrol, as a consequence of a previous reengineering exercise (1995) the organisation was largely structured into teams. The team focus however, centred only on a number of areas. Their customer service centres were team structured, likewise their warehousing and procurement functions.

The team established to implement the software at Castrol was also cross-functional. However, because of the size of the organisation, skills could not be fully committed to the project; moreover, the incentive scheme put in place was not clearly defined, so did not act as a motivating factor. The problems experienced at Castrol related to work overload which contributed to project members feeling demoralised.

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At Trident, the project team established to oversee the reengineering and implementation was drawn from executive managers, senior managers, line managers, key users, IT staff and external consultants. Like Castrol, team members could not be fully committed to the project. This also impacted on the project, as workloads became burdensome. Parker (1996) contends that teams need senior management participation and influence within the organisation to be successful. At Trident the project was successful attributable mainly to the team mix - where problems were experienced, there was enough influence to get a decision without delay.

At JNJ PP the initial project team was driven by IT. (This problem was set out in section 4.5.6.1). Problems included not having enough influence within the organisation and user scepticism due to the team not being fully representative of the organisation. The responsibility for the information system remained with the IT department for 5 years. During this time there were ongoing credibility problems. At the beginning of 1997 the responsibility for the system was moved from IT back to the user base; A new team was established which consisted of senior and line managers from within the organisation. Appleton (1997) highlights the importance of team-building and communication skills. JNJ PP learned this through experience. Appleton maintains that implementations require people to create new work relationships, share information that was once closely guarded and make business decisions they never were required to make. Comments John Calvert, operations director of JNJ PP

"we were surprised how well the upgrade had gone - because we did all the right things, for the first time."

5.8.2 Empowerment

According to Benjamin (1992) the locus of knowledge and hence power in the organisation changes where a large scale package is being used as an enabler of change in the organisation. Consequently, organisations will need to reorganise their infrastructures and responsibilities to support the role of IT within the organisation.

The four organisations presented in chapter four all viewed empowerment as a natural outcome of focusing on processes instead of functions - indeed, all four organisations were hoping to achieve this empowerment which in turn would contribute to a new organisational structure.

5.8.3 Human Resources

A natural consequence of process/team driven, empowered employees implies a variety of skills which is demanded from employees. Grunwald, CEO of Deloitte & Touche Consulting Group /ICS s (cited by Appleton, 1997) submits that organisations focus too much on the benefits of ERP implementations - and not on the educational content of the employees to prepare them for the change in systems, thus they cannot take full advantage

of the process. It is widely accepted that to harness such systems, employee training and development should be comprehensive. (Goshal and Bartlett, 1994; Parker, 1996; Kotter, 1995).

It was found that Mondi, Castrol and Trident gave high priority to training and re-skilling of employees. Trident still has one consultant dedicated to training and hand-holding. JNJ PP, from past experience, believe that learning from experience contributes more to the knowledge enhancement of employees. (Refer section 4.5.6.4).

5.8.4 Risks

Risk associated with IT projects encompasses a variety of issues - i.e. lack of leadership, lack of vision, communication and the corporate environment. Harris and Katz (1991) contend that investments in IT represent a major source of business risk, and thus must be managed effectively through the link with the organisations strategy, the structure of the organisation, the measurement and control system and the characteristics of the technology.

It was found that all four organisations presented in chapter four took a 'known' route relating to their information systems, as opposed to the point of view expressed by Hammer and Champy (1990) in their article 'Don't Automate, Obliterate'. In each case risk assessments highlighted that by staying with one or other competency/capability, the project would be at a lower risk.

At Mondi a risk assessment revealed that risk would be reduced where the development team and users had experience with the technology and were knowledgeable in the application arena. At Castrol, a number of risks were identified: firstly, the size of the project was in itself a risk, secondly, there was a lack of in-house applications knowledge and thirdly, vendor support was identified as a risk. To deal with these risks, it was found that the project was being implemented using a phased approach. This approach was taken so as to reduce risk and allow competency to build in stages. Training was scheduled to acquire application knowledge, and the organisation retained the services of a JDE business partner so as to avoid staff turnover problems at JDE. Trident perceived competencies as high risk. As such, it was found that extensive training took place to build application and business knowledge. IT staff were involved in the project from the outset.

5.8.5 Critical Success Factors

It was found that there was a similarity in the critical success factors identified by the organisations presented in chapter four. These included top management commitment, user ownership of the system, and aligning processes to fit the software package instead of customising the software. JNJ PP came to recognise that user ownership of the system was crucial, only after an unsuccessful attempt by their IT staff to maintain support of the system. Comments John Calvert again,

"we were amazed at how much commitment we got from the user base within the organisation when they knew they were responsible for the system."

5.9 BENEFITS

Given that large scale software implementations take time to penetrate into an organisation's culture, that people take time to develop confidence in the system, that benefits (and dis-benefits) impact dynamically on the organisation, its people, processes and customers, to accurately measure these benefits requires that the system be in place for a period of time. JNJ PP is the only organisation that has had the time frame to measure the impact of the software on the organisation. (Refer sections 4.5.5 and 4.5.6).

At Castrol, Trident and Mondi visible benefits thus far have related to building skills, redefining processes and information sharing. Consequently, benefits thus far have all been internal. JNJ PP have found benefit in being able to take on new products and franchises without changes to their systems, thus satisfying their customers choices.

Table 1 depicts the benefits the four organisations were seeking to gain from their new information systems.

Expected Benefits	Mondi	Castrol	Trident	JNJ
Improved Customer Service	X	X	X	X
Online/integrated information	X	X	X	X
Better information	X	X	X	X
Minimise costs, improve margins	X	X	X	
Increase in machine optimisation	X		X	
Cost savings	X			
Build new skills base/competency	X	X	X	X
Reduce headcount		X		X
Free up resou. ces		X		
Best busines; prac*:-?		X	X	
Improve the sup··:: of the business	X	X	X	X
Increased Re en .e			X	

Table 1

In this chapter, the four organisations presented in chapter four have been analysed according to a number of interrelating issues. These included business process reengineering, processes, competencies, capabilities, information systems architecture, software packages, organisational values, risks, critical success factors and benefits.

CHAPTER 6

6.0 SUMMARY AND CONCLUSION

This chapter will summarise the main findings of this research, suggest further areas for research, and provide management guidelines relating to ERP application implementations.

6.1 SUMMARY

The objective of this research was to determine if the implementation of large scale software packages was being utilised to transform organisations as opposed to only providing a back-office support system. The research showed that the implementation of ERP applications does have impacts for the organisation and on that ground organisations are exploiting these applications to accelerate their change initiatives. The impacts identified stem from the enabling capabilities of information technology.

In the introduction of this research it was suggested that the changing world of business demanded more from its people. The quest for more information also demanded more from information technology, hence IT was expected to deliver more. Business demanded systems that could follow its direction and not inhibit its changes, as was clearly the case in past decades.

As anticipated, large scale package implementations are viewed as integral to an organisations strategy (where packages have been selected); however, in some instances, top management still believe that such projects can be delegated downwards and dealt with at a lower level within the organisation.

The framework of an Information Systems Architecture as put forward by Segars and Grover (1996) proved to be useful in that it provides organisations with an approach that takes in all domains of the organisation and its information needs. Segars and Grover intended the framework to be an architectural approach to IS planning. The fact that an organisational perspective is taken if the Segars and Grover framework is used, means that most structures within the organisation are incorporated.

It was found that where senior management had communicated the strategic direction of the organisation, that where an analysis of the organisation existed in terms of its competitive approach and its organisational structure, there was an understanding of the objectives the organisation was desiring to achieve. This also assisted IT in terms of *its* objectives. Where senior management had failed to communicate these objectives, the project developed unintended setbacks. Consequently, the researcher submits that the

analysis undertaken at the Conceptual Level of the framework is crucial to the success of large scale software implementations.

At the Logical Level where the perspectives of middle management are taken into account, the researcher found that the success of an implementation of software applications was largely based on the contribution made by middle management - if the processing needs were not adequately conveyed, the implementation was slowed down due to a revisiting of certain requirements. The various sub-architectures, if planned up-front, facilitated the setting of priorities for the implementation further down the line.

Whilst Segars and Grover include personnel, organisational and technology profiles at this level (i.e. the Logical Level), they do not detail these profiles. The researcher proposes that BPR, core competencies, core capabilities and organisational values, be incorporated at this level.

The research sample showed that the business process reengineering projects that organisations were engaging in were not of the dramatic nature as put forward by Hammer & Champy (1995), but could rather be classified as process improvements. The research found that, even though these exercises could not be considered 'radical' or 'dramatic', they did however, challenge internal company rules, were customer oriented and contributed to cross-functional working within the organisation, and indeed, better ways of doing things.

The attention given to processes within these organisations, as a consequence of implementing a new information system had impacts on other domains within the organisation. It contributed to knowledge-sharing within the organisation, which in turn, contributed to a broader knowledge of the business.

The building of this new core competence within the organisation gave management the confidence to leverage IT to support the business. The also forced and focused attention on capabilities within the organisation - their IT and their employees together, constituted a new competency in the organisation.

The research also found that the implementation of the software was a greater enabler of change than was originally anticipated. The impact on the structure of the organisation was of such a nature that a number of business policies needed revisiting. In some cases new mechanisms were required within the organisation to manage these objectives. The issues related to personalities within teams (getting the team mix and the team accountabilities right), performance evaluation (incentive schemes) and making available educational programmes to further enhance capabilities and the need to acquire knowledge.

Employee empowerment as a consequence of team-working and having the correct information to do their jobs, required a different kind of management style. The hierarchical structure of the organisation was at odds with the new way of working. The

research found that a new kind of leadership needed developing - the old command-and-control style of management was out of keeping with the new 'informated' organisation.

The Physical Level of the framework details the actual implementation of the given information technologies. Segars and Grover contend that the guide in the implementation (of software applications) is the overall Information Systems Architecture. The researcher found that where adequate attention was given to analysis at the Conceptual and Logical Levels of the framework, the implementation went according to plan with the desired benefits.

6.2 LIMITATIONS OF THE RESEARCH

The limitations of the research are as follows:

The selection of companies may not be fully representative or random. In working with companies, data gathering may have been affected by company politics. The wide range of information technology change initiatives might introduce other limitations. Only organisations using the same software architecture were used. My own position as a consultant within these organisations may have lent to some bias.

6.3 AREAS FOR FURTHER RESEARCH

Some global companies are implementing ERP applications world-wide. Two approaches are taken. In some instances these companies are using one platform, and one environment and dictating conventions. The other approach allows for companies to tailor the package to their specific needs. Further research would enhance knowledge as to which approach is deemed more successful.

This research was based on the implementation of ERP applications as a tool of transformation strategy. Further research is required to determine the long term benefits of such a strategy, as the research sample highlighted mostly internal benefits.

It would be informative to conduct a similar research using similar organisations who have employed different methodologies and different software applications to achieve transformation benefits.

This research has purposefully avoided a focus on purely implementation issues, it would be useful to research similar projects and focus entirely on implementation and project management issues.

Some organisations hold that to reengineer and implement ERP systems simultaneously puts the organisation at risk. Research into the approach of implementing software without first reengineering could highlight the benefits of such an approach.

6.4 MANAGEMENT GUIDELINES

Key findings which may provide guidelines for management are as follows:

Communication from senior executives as to the urgency and importance of the implementation of large scale software applications in such a way that employees can relate to the proposed project can contribute to greater understanding within the organisation. If employees grasp that they are embarking on something of great importance to the organisation and to themselves greater effort is invested in the project. Inadequate executive support is frequently a contributor to failed implementations. Involvement on the steering committee does not constitute the kind of executive support that the project team is seeking.

Closely linked to top management commitment, is the performance measurement systems that the organisation has in place. Given that large scale software implementations require immense effort from employees who are on the project team, incentive schemes, if clearly defined (i.e. there is recognition of specific accomplishments) facilitates teamworking.

The profile of the project leader for large scale software implementations is such that this person needs to have support from both senior management and employees. Strong leadership skills are required of this person. Aside from project management skills, this person will need to be people oriented, inspiring, charismatic and have a fair amount of clout within the organisation.

Ownership of the system has to rest with the user base within the organisation. Software applications are shaped by the input given from employees within the organisation. If the input does not have the business itself in mind, then the system will be perceived has being slow to deliver business benefits. IT departments cannot implement such applications in isolation. This does not mean that such implementations can take place without the input of IT personnel. The management of IT personnel also requires careful consideration as in this area a change of direction is required from IT, from programming to business analysis skills. Some IT personnel are hesitant to make the change from programming to business support.

This leads on to the project team mix. If such applications are tailored by users within the organisation, then project team members need to be representative of the whole organisation. Line management needs to be represented so that their requirements are adequately met and there is buy in of the system.

Often the reason for implementing software applications is to scale down the commitment to developing and maintaining custom code. Where software applications are customised, more effort is required to keep up to date with vendor supplied updates to the software. Added to this is the risk that the customised code will not work with later releases of the software.

There needs to be realistic expectations about the project. Time constraints and resource constraints need to be taken into account. Where organisations cannot commit employees fully to such a project careful management of the employees time need to take place.

Processes need to be reengineered before selecting a software application. Whilst software applications might require that some processes need revisiting because of software constraints, largely, processes will be redefined to suit the business and not the business suiting the information technology.

The success and acceptance of the software application will depend on the people using the applications. Considering that there are fundamental changes in the way people do their work when software applications are implemented, employees need to be prepared for this changed way of doing things. (i.e. training and re-skilling requirements of employees cannot be underestimated.)

6.5 CONCLUSION

Organisational change is brought about by people and not technology. Technology is merely the tool which can increase people's capacity to make decisions and thereby contribute to the change within the organisation. Software packages assist organisations in their change efforts because they force organisations to re-examine their business, their processes, their capabilities and ultimately their structures. Software packages thus have the potential (and are being used) to directly support the creation and implementation of organisational strategic and transformational plans.

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