Implementation of enterprise resource planning model based solutions in medium-sized South African companies

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ABSTRACT

Implementation of enterprise resource planning model based solutions in medium-sized South African companies.

The medium-to-large manufacturing organisation in Sub Saharan-Africa has been particularly slow in adopting information technology as a competitive business tool. Most medium sized companies have been successful with the bare minimal information infrastructure necessary to support its day to day operations.

There is a need today for a real time information system to support fast and effective decision making. This has become a determining factor in ensuring continued success in a rapidly changing and competitive business environment. The cost and choice of software, implementation partners and the necessary people skills to sustain such a system are areas of great concern, as the "horror stories" of costly, lengthy and often painful implementations permeate the business community.

This research is designed to identify reasons of model based implementation failures/successes in medium sized companies, and to formulate a generic implementation model that will provide a reasonable measure of confidence to companies undertaking enterprise resource planning system implementations.

A questionnaire was designed to establish the approach followed in model based implementations undertaken locally. The questionnaires were e-mailed to companies that have undertaken BaaN implementations during the period January 1999 to April 2000. A high return rate of 75% was achieved.

The responses generally indicated that implementations failed due to poor alignment of information technology with the strategic objectives of the organisation. Without this important aspect present at the highest level of the organisation, commitment to the project by management and employees was not always forthcoming.

The role of model based solutions was however to facilitate a faster implementation period, and this was found to be particularly useful in companies where business processes were not formalised. While the software had the flexibility required, most companies did not have skilled personnel to derive maximum benefit from the system.

Recommendations are to integrate information technology at the executive level of the business. This will ensure that the appropriate

performance measures are in place to facilitate its execution. A holistic implementation approach is to be adopted, which will ensure the integration of all business processes.

The training and education of employees, identified as a major shortcoming, is essential in enabling the company to use the system as a competitive business tool.

The study concludes that the research provides a useful baseline against which future implementations of model based enterprise resource planning systems can be measured in medium-sized South African companies, and this will provide a competitive advantage.

Key words

ERP
Enterprise resource planning
Model based solutions
Implementation in medium-sized companies
Industry solutions

OPSOMING

DIE IMPLEMENTERING VAN 'N MODEL-GEBASEERDE BESIGHEIDBESTUURSTELSEL ("ERP"-stelsel) IN MEDIUM GROOTTE ONDERNEMINGS IN SUID-AFRIKA

In die verlede was medium tot groot vervaardigingsorganisasies in Sub-Sahara Afrika traag om inligtingstegnologie as 'n kompeterende voordeel te benut. Die meeste medium-grootte organisasies se sukses is toeskryfbaar aan die optimale benutting van 'n minimale infrastruktuur om daaglikse bedrywighede te ondersteun.

As gevolg van vinnige verandering in die besigheidsomgewing het voortgesette sukses afhanklik geword van die optimale benutting van 'n intydse inligtingstelsel vir die ondersteuning van effektiewe besluitneming. Die koste en keuse van sagteware, implementeringsvennote en noodsaaklike kernvaardighede om so 'n stelsel in stand te hou, is areas van groot kommer vir voornemende implementeerders as gevolg van rillerstories in die sakegemeenskap van duur en uitgerekte implementerings.

Hierdie navorsing is eerstens gerig op die identifisering van suksesse en mislukkings van modelgebaseerde implementerings in medium-grootte ondernemings. Verder formuleer die navorsing 'n generiese implementeringsmodel wat kan dien as redelike maatstaf van vertroue vir maatskappye wat sagteware wil implementeer.

'n Vraelys is ontwerp om vas te stel watter benaderings tans gevolg word tydens model-gebaseerde implementerings. Die vraelys is met behulp van e-pos gestuur aan maatskappye wat implementerings onderneem het gedurende die periode Januarie 1999 tot April 2000. Terugvoer van 75% van die teikengroep is ontvang en word in die navorsing gebruik.

Uit die reaksie blyk dit duidelik dat implementerings hoofsaaklik misluk het as gevolg van swak integrasie van inligtingstegnologie met die strategiese doelwitte van die onderneming. Dit het tot gevolg dat die topbestuur nie die nodige ondersteuning aan die projek verleen nie, wat weer aanleiding gee daartoe dat werknemers nie ten volle toegewy is aan die projek nie.

Daar is verder gevind dat model-gebaseerde sagteware 'n rol gespeel het om 'n vinniger implementering te fasiliteer en dat die modelle besonder behulpsaam was vir die ondernemings sonder formele besigheidsprosesse. Alhoewel die sagteware in die algemeen oor die

vereiste buigsaamheid beskik, het die meeste ondernemings nie die nodige personeelvaardighede om die maksimum voordeel van hierdie stelsels te kan geniet nie.

Daar word aanbeveel dat inligtingstegnologie geintegreer moet word op die uitvoerende vlak van die onderneming. Dit sal verseker dat toepaslike maatstawwe in plek gestel word om die vordering van die projek en die uitvoering daarvan te fasiliteer. Indien 'n holistiese implementeringsbenadering gevolg word, sal dit die integrering van al die besigheidsprosesse verseker. Die opleiding en opvoeding van werknemers wat, as 'n wesenlike tekortkoming geidentifiseer is in sulke implementerings, is noodsaaklik om die maatskappy in staat te stel om die stelsel as 'n kompeterende voordeel te kan benut en optimiseer.

Die studie lei tot die slotsom dat die navorsing 'n nuttige basis verskaf waarteen toekomstige implementerings van model-gebaseerde besigheidbestuurstelsels in medium-grootte ondernemings in Suid-Afrika gemeet kan word.

Sleutelwoorde

Model-gebaseerde besigheidbestuurstelsel
ERP-stelsel
Sagteware implementerings
Besigheidsprosesse
Generiese implementeeringsmodel

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4.4 Summary

CHAPTER 1 NATURE AND SCOPE OF THE STUDY

1.1 INTRODUCTION

The past decade has witnessed an explosion in information technology, which has affected our lives in ways that we thought not possible. As technological development in this field continues to break new ground, the human resources required to maintain and exploit these advances struggle to keep abreast of the changes, even in technologically advanced countries.

South Africa has become one of many "emerging" countries that are, at times rated a third world economy, and yet in certain sectors of the economy rate amongst the technologically advanced. Local large multinational companies have been employing the latest available software for a number of years, often because of the requirements of parent companies. The small to medium company however, has tended to avoid massive investments in such technology, opting to utilise the most affordable spreadsheets, word processors and customised software to obtain similar results, according to Worst (1997:60).

Over the last decade, the information requirements of these companies outstripped the capabilities available, leading most companies up the technology ladder, in search for an integrated solution. For managers who have struggled, at great expense and frustration, with incompatible information systems and inconsistent operating practices, the promise of an off-the-shelf solution to the problem of business integration became enticing.

Sales of enterprise resource planning systems, the software package that integrates the information flowing throughout the company, have increased dramatically in recent years. The turnover of Germany's SAP, the largest vendor, has soared from $500 million in 1992 to $3,3 billion in 1997. The Meta Group Inc. (Feb. 1999), a leading information technology advisory services firm, forecasts that by 2001, 10 000 new enterprise resource planning systems will have been implemented. This is supported by a recent survey (Schwartz, 2000:62) which indicates that the spending on enterprise resource planning software will continue unabated, as the internet lends its weight to the industry. This is despite the fact that all the major players have been experiencing a reduced demand for their products in recent months.

Enterprise resource planning systems in South Africa have followed the trend internationally, where implementations of such complex systems have resulted in success stories, and some horror stories about failed or out of control projects. Some software developers have recognised the need to address lengthy and failed implementations, by introducing reference models.

Reference models are templates of business processes. The templates are grouped together to form a model for a particular industry. These models enable the rapid installation of enterprise resource planning systems within a short period, providing that there is a high degree of fit between the model and the company.

According to a communication with Van Vuuren (2000), it is apparent that the issues arising from reference model based implementations are no different from implementations undertaken previously. The implementation of enterprise resource planning systems continues to be problematic. The objective of this study is therefore to analyse the few BaaN model based implementations undertaken locally, to as to determine their effectiveness in the current business environment.

1.2 PROBLEM STATEMENT

Enterprise planning systems are commercial software packages that seamlessly integrate all of the information flowing through a company – financial, accounting, engineering, manufacturing, and customer information. These systems first exploded on the South African market at the beginning of the previous decade.

At this time the attention of business leaders was focussed on globalisation and internal restructuring, following the release of Nelson Mandela and the un-banning of the African National Congress. The 'new' buzzwords, downsizing, streamlining and business process engineering, together with the vaunted benefits of enterprise resource planning systems, spurred companies into embarking on the grandest of system architecture schemes.

Companies also began replacing their financial systems in anticipation of the much discussed ''millennium bug'', and at the same time were intent on consolidating manufacturing and accounting needs with a single enterprise resource planning package. Software vendors were quick to respond to the demand, providing solutions that sometimes did not fulfil customer expectations (Planting 1999:80.). Often these grandiose projects fell flat, ending in recrimination and finger pointing, and in some cases ending in enterprise resource planning vendors or

their consultants having to explain implementation failures in court (Planting, 1999: 79).

Enterprise resource planning vendors began developing ''reference models'', which were intended to redress some of the implementation shortcomings. These ''models'' are standardised implementations for specific industries, such as the Automotive and Defence, Food and Beverage, Chemical, and Retail industries, amongst others. The use of these models facilitate smoother implementations with predictable results by reducing the technical consulting required, using ''best practices'' in a particular industry. The solution is pre-loaded at the vendor and is delivered to the customer with a predefined technical configuration and with operational procedures. According to Roberto (1998:29), this makes this approach ''more proactive, flexible and understandable'', as opposed to ''standard'' implementations.

In a country such as South Africa, business enterprises and non-profit organisations alike, face challenges such as low computer literacy, insufficiently educated or trained supervisory and management staff (Stumpf and Vermaak, 1996:4-10), and extremely tight information technology budgets. The latter, being the result of management's inability to adequately understand the role of information technology in a rapidly changing business environment (O'Brein,1996:13).

Model based solutions therefore provide the opportunity to use a proven solution at a fixed price, implemented in a given timeframe. However, the success of this methodology is based on the following assumptions:

- The company and the implementation partner have a clear understanding of the business processes of the enterprise and the functionality offered by the system; and

- There is an extremely good ''fit'' between the company's business processes and the reference model selected.

Herein lies the problem. According to Planting (1999:80), few software vendors with strong enterprise level software can carry that strength through to the operational level. Customers are sold systems that are supposed to provide a solution to all their business problems, and become disillusioned when their expectations are not met. What is interpreted as ''standard '' functionality or ''best practice'' to the vendor's sales team, appears to be totally unsatisfactory to the customer at operational level. This is usually only apparent when the implementation is underway, and the company experiences the practical aspects of the concepts previously discussed.

1.3 PURPOSE OF THE STUDY

In the relatively small number of BaaN implementations that have been undertaken locally, it is apparent that the issues arising from reference model based implementations are no different from implementations undertaken previously. Model based solutions certainly facilitate a smoother implementation from a technical perspective, but the strategic and people issues remain the same. The fact that medium sized South African companies are faced with obstacles such as, the dwindling supply of systems specialists, shortage of management skills, poor computer literacy, and a general resistance to the change of established business practices, warrants a more holistic approach.

The objective of this study is therefore to:

1) Identify the common causes of implementation failure, and

2) Prepare the framework for a generic implementation model. The model will incorporate common aspects from successful and failed implementations, starting with the specification, selection and finally the implementation of the system.

1.4 FRAMEWORK OF REFERENCE

Enterprise resource planning systems have been implemented in South African industrial companies over the past few years, some successfully and some with great difficulty. This study will focus on medium sized companies, which have installed BaaN model based enterprise resource planning systems.

1.5 RESEARCH METHODOLOGY

The information gathered on enterprise resource planning systems implementation during an informal pilot study undertaken prior to this dissertation will be used as a framework for further investigation. A literature study will be undertaken of the issues surrounding the management of strategy, the role of information technology, the evaluation, selection, and implementation of enterprise resource planning systems.

The study will consist of:

- Strategic management in South African companies;
- Enterprise resource planning systems;
- A brief overview of the types of model based solutions available locally;
- The selection process used; and
- Implementation of enterprise resource planning systems.

Based on the above, a questionnaire will then be prepared and distributed to companies that have undertaken the implementation of a BaaN model based enterprise resource planning system. In addition, the findings presented at seminars, conferences, and user group meetings. These experiences, together with the opinions of experts and companies will be consolidated to present an overall view of local implementations.

1.6 LIMITATIONS OF THE DISSERTATION

The investigation into enterprise resource planning systems will be limited to South African medium sized companies, where enterprise resource planning systems have been implemented, or are in the process of implementation. As the subject is evolutionary in nature, most of the published information is less than two years old, published only in industry specific magazines and by research organisations. The opinions and experiences of the implementation personnel and management consultants will therefore form an essential part of the investigation.

The dissertation will focus on the implementation product offerings of the two major players in the model-based enterprise resource planning software field for two reasons. Firstly, because of the large number of software vendors in the international and local market, and secondly the huge amount of resources required to continuously upgrade the software will force many smaller vendors to satisfy niche markets rather than upgrade continuously to satisfy the broad requirements of industry.

According to the Executive White Paper (Aberdeen Group, 1998) the five major international vendors of enterprise resource planning systems

are SAP, BaaN, J.D. Edwards, Oracle, and Peoplesoft. Reference model based solutions are only available from BaaN, and to a lesser degree (as at the end of 1999) SAP.

Implementation issues, rather than software functionality will be discussed. Of the eight BaaN model based implementations that have been undertaken, four will be discussed in some detail. The BaaN product was selected due to quantity and quality of information available, as well as the fact that the author was directly involved in some of the implementations.

1.7 DEFINITIONS

Enterprise resource planning (ERP) systems - Commercial software packages that seamlessly integrate all of the information flowing through a company – financial, accounting, engineering, manufacturing, and customer information.

Software solution – A set of programs co-ordinated to provide all the information for a specific requirement.

Model-based solutions - The enterprise resource planning vendor's view of the best practices for a host of business processes in a particular industry.

Information system – An organised combination of people, hardware, software, communications networks, and data resources that collects, transforms, and distributes information in an organisation.

1.8 Layout of the study

Chapter 1

This chapter describes the background to the research. Included are the research problem, and the objectives to be achieved. The research methodology is explained, and limitations defined.

Chapter 2

The chapter contains a discussion of related literature on strategic management of information technology in South African medium sized companies, the model based enterprise resource planning solutions available locally, and implementation methods used.

Chapter 3

Four model-based implementations are discussed in some detail, as well as the findings of a survey done.

Chapter 4

A review of the results against the stated objectives, culminating in a generic implementation model. A final conclusion to the stated problem is included.

CHAPTER 2 INFORMATION TECHNOLOGY IN BUSINESS

2.1 STRATEGIC MANAGEMENT

2.1.1 Introduction

The traditional process in developing strategy required that a long-term purpose or reason be identified as to why the organisation exists. Then short-term and medium term objectives should then be defined that will move the organisation towards its stated purpose. A strategy can now be developed to achieve the objectives.

In theory this approach may sound simple, but in practice it is difficult to arrive at a strategy without clear objectives. According to AMR Research (2000), the selection and deployment of enterprise application systems are among the most strategic decisions a company will ever make.

Formulating a winning strategy is however ''messier than most textbooks suggest'' according to Campbell and Alexander (1997:45). They assert that the solution to this impasse is to understand the fundamental building block of good strategy: insight into how to create more value than competitors can. These insights are directed at practical issues and point to new ways of doing things.

The crafting of a winning strategy usually creates a mistaken belief that the competitors will be overtaken. ''In reality, that is less than half the battle'' (Charan & Colvin, 1999:31). The authors cite the bad execution of strategy to be a major cause of chief executive's being fired. It was simply a case of being indecisive, not getting things done and not delivering on commitments that led to their downfall.

The major reasons quoted by Charan and Colvin (1999:32) for chief executive officers not executing the strategy was the ''failure to put the right people in the right jobs'' and '' failure to deal with people problems''. Effective people management is therefore fundamental in the execution of the business strategy.

In the technological age that we find ourselves in today, information technology forms an important part of business strategy. Daly (2000) argues that technology has become a critical component of the business strategy, not just support for it. Information technology policy and strategic decision making can no longer be delegated to technical professionals. Information technology has to be escalated to the strategic management level, if companies are to realise the

significance of a function usually relegated to the domain of the accountants. While its importance is recognised, some information technology departments in industry still report to the financial division, as was the case a few decades ago. This has much to do with the fact that computers were first used for ''number crunching'' by the accounting department, and has since remained much under their control ever since.

Installing state of the art computer hardware and software without due consideration for the implication on the strategic objectives of the company is only accelerating the speed at which entropy results. The challenge for companies today, therefore, lies in the co-ordination and integration of information technology within the organisation to support its strategic objectives (Daly, 2000).

2.1.2 Strategic management – Definition

Strategic management, according to Thompson and Strickland (1998: 3) consists of five interrelated managerial tasks. The forming of a strategic vision of what the future business makeup will be and where it is headed, setting objectives, crafting a strategy to achieve desired outcomes, implementing and executing the chosen strategy and evaluating performance.

According to Hahn (1991:27), strategic management is based on the fundamental ideas of strategy and management, and includes the development and communication of corporate goals, the strategic plans, corporate philosophy and culture.

Weeks (1996:28) states that strategic management is a ''process whereby the organisation is optimally positioned in its competitive environment''. In the information age of today, ineffective positioning of the organisation could make it less competitive, and eventually spell the end of the road for the company.

Information technology can provide the information a business needs for efficient operations, effective management, and competitive advantage, thus playing a vital role in the success of a company (O'Brien 1996:7).

Information systems perform three vital roles in any type of company (O'Brien, 1996:15):

- **Support of managerial decision making** – Information systems help managers to make better decisions through the storage of vast amounts of data, which is accessible instantly.

- **Support of strategic advantage** – Key business decisions are typically made after an analysis provided by computer based systems, such as the type of new investments required or product lines to be added or discontinued.

- **Support of business operations** – Technology is often used to provide strategic products and services, which gives the company a competitive edge over its competitors.

Keen (1991:1) concurs that information technology is reshaping the basics of business. Customer service, operations, product and marketing strategies, and distribution are dependent on this technology, which has become an everyday part of business life.

Cash, *et al.* (1995:101) emphasises the fact that managers today require all the help they can get, as their companies are "buffeted on all sides by strong frequently shifting winds of change". The company's strategic objectives and business processes are undergoing significant and volatile changes, thus placing a tremendous amount of pressure on the managers and employees. The perceived complexity of information systems challenges the ability of managers, who if not adequately equipped, loose sight of the basic management principles, rendering them ineffective and the company less competitive. In addition, if the senior management is not supportive of information technology, the chances of lower level staff adopting new technology to become more efficient and effective is greatly reduced.

With reference to the expert opinions, common elements can be identified. Strategic management can be viewed as all those management activities directed at formulating and implementing a strategy, to ensure the survival and growth of the company in order to realise the stated mission and objectives.

2.1.3 Management of strategy in South African companies

2.1.3.1 Management skills

Empirical research undertaken (Smith, 1997:193), indicates the type of organisational culture and the extent of strategy formulation in South Africa. The study showed that a task culture was the most dominant type of organisational culture implemented by the surveyed companies, and that a person culture is the least dominant type of culture. This view is supported by a study conducted by Chicago based International Survey Research (ISR) and quoted in the Business

Times, which concluded that the South African employee felt "left behind by rigid, tight managers" (Robertson, 1997:23). Management considered people less important than operating efficiency.

South Africa has a dire shortage of skilled managers as indicated by the above mentioned authors. The shortage has led to the appointment of individuals, who are appointed based on technical, rather than administrative ability. Leadership qualities are often a secondary consideration in appointing managing directors and chief executive officers. It is therefore not surprising that poor people management has been one of the major reasons why chief executive officers have been dismissed (Charan & Colvin, 1999: 31-37).

Management skills in South African companies are amongst the lowest in developing countries. The 1995 World Competitiveness Report (South Africa Foundation: 1996) ranks the management component of South Africa's competitiveness as 48th out of a total of 48 developing economies. The ranking for 1997 and 1998 indicates that this position has not improved much.

2.1.3.2 Information technology strategy

The information technology function plays an understated role in the operational control of an organisation. Usually attached to the finance function, it has become the "custodian" of the company's hardware and software investments, often viewed as necessary for financial control. Information technology departments are tasked to ensure that operational capabilities are maintained, rather than contributing to effective solutions to company requirements. A recent survey, (Hoffmann, 1999:29) conducted with 16 000 information technology professionals at 6 000 companies in 28 countries revealed the following rather disturbing statistics:

- Eighty-five percent of information technology departments in the United States were failing to meet their organisation's strategic business needs; and

- Only a fraction of companies are seeing visible returns on their e-commerce investments.

While there are no specific statistics in South Africa, it would be accurate to draw a parallel with South African companies. The last decade has witnessed an unprecedented increase in information technology investment by local companies. These investments, it would appear from this study, (Hoffmann, 1999:29), are not necessarily

directed to addressing the organisation's strategic needs. To succeed, the study recommends that information technology departments must focus on the bottom line, by collaborating with the various business units of a company to achieve strategic objectives.

However, measuring the success of information technology implementation purely with financial objectives is insufficient. Due to the number of variables that can influence such investments, the impact of "customer relationships, intellectual capital growth, organisational learning, and process improvement", must be factored in to achieve a fair assessment.

2.1.4 Summary

The execution of the company strategy is the responsibility of the managing director/chief executive officer. Execution is achieved by ensuring the appointment of "the right people in the right jobs". Charan and Colvin (1999:35), further stress the importance of "people first, strategy second". Although information technology strategy is vital to the organisation, it is the effective management of the people resources that enables execution.

Research into strategy management in South Africa revealed that on average, companies tended to formulate strategies correctly (Smith, 1997:93). However their execution will be much more effective if the following points were addressed:

- The annual revision of mission statements to reflect the changing business environment;
- Mission statements should be communicated to all parties in the company;
- The involvement of all levels of management in the formulation of strategies; and
- The operation of a permanent strategic planning function.

The overall impact of information technology on the success of the business in the modern era, necessitate its integration into the overall business strategy. Recent developments in the business use of the internet will render companies less competitive in the future, unless this technology is harnessed to serve the strategic objectives of the company (Minahan, 1998).

2.2 ENTERPRISE RESOURCE PLANNING SYSTEMS

2.2.1 Introduction

Enterprise resource planning is an industry term for the broad set of activities supported by multi-module application software that enables a company to manage important functions of the business. The modules offered vary between software vendors, although a core set is common to all. The software packages seamlessly integrate all the financial and accounting information, human resources information, supply chain information (engineering, manufacturing, inventory) and customer information. According to Davenport (1998:122), it is estimated that businesses around the world spent about $10 billion in 1998 on enterprise resource planning systems.

2.2.2 Evolution of enterprise resource planning systems

Manufacturing systems in the 1960's concentrated on inventory control, when most software packages were designed to handle inventory based on simplistic concepts. In the 1970's, the emphasis shifted to material requirements planning (MRP), which translated the master schedule built for end items, into time-phased net requirements for the sub-assemblies, components and purchases of raw material. The concept of manufacturing resource planning (MRPII) was expanded during the 1980's, to incorporate the shop floor and distribution activities. In the 1990's the manufacturing resource planning (MRPII) concept was further extended to cover areas such as engineering, project management, finance, human resources, service and maintenance. The objective being to provide a seamless integration of modules, which were previously run as ''island solutions'', that enables visibility and consistency throughout the enterprise. The inclusion of all the activities within the enterprise led to the term enterprise resource planning (ERP) being coined (Buhrmann *et al.*, 1999:14).

2.2.3 Enterprise Resource Planning (ERP) – The solution

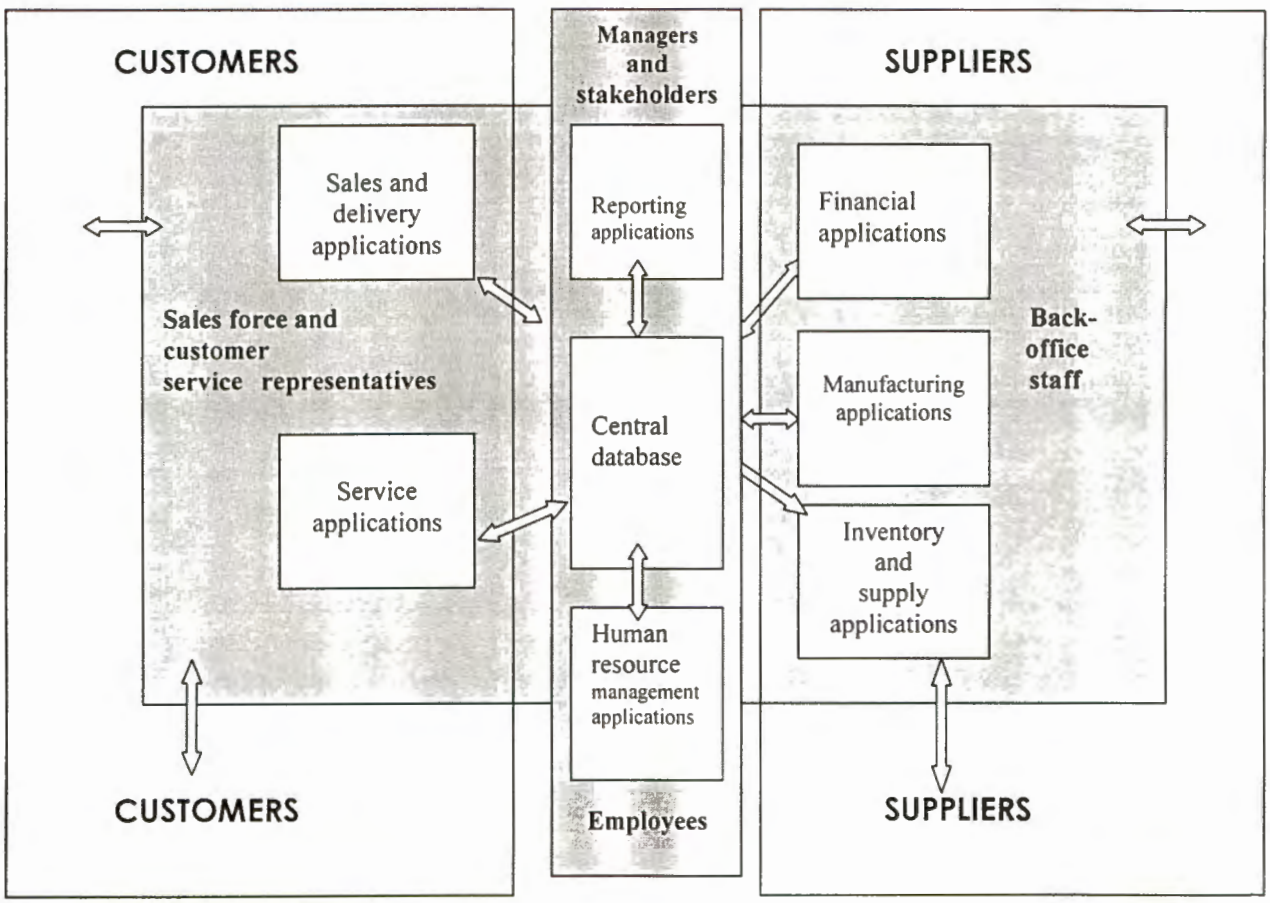
In order to understand the attraction of enterprise resource planning systems, it is essential to understand the problem they are designed to solve namely the fragmentation of information. Every company

collects, generates and stores vast quantities of data. Davenport (1998:123) states that in most companies, the data is not stored in a single repository. Information is spread across many separate computer systems; each designed for the individual function, business unit, region, factory or office. Each of these so-called legacy systems may provide invaluable support for a particular business activity, but in combination, they represent one of the heaviest drags on business productivity and performance now in existence.

Maintaining many different computer systems leads to enormous direct costs, such as storing and rationalising redundant data, re-keying and reformatting data from one system for use in another, updating and de-bugging obsolete software code, and for developing programming communication links between systems to automate the transfer of data. The indirect costs, which are more important that the direct costs and difficult to calculate, arise when, for example, a company's sales and ordering systems cannot communicate with its production scheduling systems, with the result that its manufacturing productivity and customer responsiveness suffer. Decisions are made on instinct rather than fact if the sales and marketing systems are incompatible with the financial systems (Davenport, 1998:123).

An enterprise resource planning system has at its core a single comprehensive database. The database collects data from and feeds data into modular applications supporting virtually all of a company's business activities – across functions, across business units and across the world. Using a single database dramatically streamlines the flow of information throughout a business, as depicted in Figure 2.1.

Figure 2.1 ANATOMY OF AN ENTERPRISE SYSTEM



Source : Davenport (1998:124).

The effects of an enterprise resource planning system are explained in the following example. A Paris based sales representative for a South African computer manufacturer prepares a quote for a customer using an enterprise resource planning system. The sales person enters some basic information about the customer requirements into his laptop computer, and the system automatically produces a formal contract, in French, specifying the product's configuration, price, and delivery date. When the customer accepts the quote, the sales representative enters the acceptance by using one keystroke, and the system, after verifying the customer's credit limit, records the order. The system schedules the shipment; identifies the best routing; and then working backward from the delivery date, reserves the necessary materials from inventory; orders needed parts from the suppliers; and schedules assembly in the company's factory in Taiwan. The sales and production forecasts are immediately updated, and a material-requirements-

planning list and bill of materials are created. The sales representative's account is credited with the correct commission, in French Francs, and his travel account is credited with the expense of the sales call. The actual product cost and profitability is calculated in South African Rands, and the divisional and company balance sheets, the accounts payable and accounts receivable ledgers, the cost centre accounts and company cash levels are all automatically updated.

The system performs nearly every information transaction resulting from the sale. An enterprise planning system streamlines a company's data flows and provides management with direct access to a wealth of real time operating information (Davenport, 1998:23.) For many companies, these benefits have translated into dramatic gains in productivity and speed.

2.2.4 Enterprise resource planning systems available

Software development in the manufacturing sector has, over the years, been custom written for companies as requirements were identified. This led to individual solutions being developed, and eventually interface programs written to exchange data for integration purposes. In addition, these solutions were industry specific, often automating the manual process in existence at the time. This resulted in industries, and even companies within a given industry, each having a different approach to managing the same business process.

The resulting problems associated with integration, and the need for greater visibility and consistency of data, eventually led to integrated solutions being available. The systems launched at the time were basically material resource planning (MRPII) systems with basic finance functionality added on, which provided a simplistic view of the business processes used by companies. This resulted in companies having to customise the software in order to manage the essential business processes not included.

As demand for the products grew, software developers gathered customer and academic feedback, and incorporated these changes/modifications, to a point where these systems now reflect their view of "best practices" of industry (BaaN Company, 1999). The Research Institute of America identified five software vendors that collectively account for 67% of all 1997 ERP revenue.

They are as follows:

Table 2.1 Market share by vendor

Vendor	Revenue –1997 (millions)	Market Share 1997
SAP (Germany)	$ 3360	32 %
Oracle (America)	$ 1500	13 %
PeopleSoft (America)	$ 815	9 %
JD Edwards (America)	$ 703	7 %
BaaN (Netherlands)	$ 684	7 %

Source: Laughlin (1999:139).

SAP

SAP AG is ranked the leader in this industry, based on revenue. The above table illustrates the extent to which it leads the competition. It is particularly strong in the following industries: electronics and high technology, automotive assembly, chemicals and petro-chemicals, food and beverage, and retail.

SAP has a range of products, R/2 (main frame computer, but is being phased out) and R/3 (client-server technology), and more recently mySAP.com. The latter being an open, collaborative internet solution. These products, together with the other vendors share many features and provide similar functionality. It is not intended to distinguish the functionality offered, as all products manage certain functions to a greater or lesser degree.

Functionality of enterprise resource planning systems:

- An integrated suite of software modules, which cover the requirement of most companies, from order in-take to financial statements;

- Real-time database updates for integrated applications. This means that when a business transaction such as the receipt of inventory occurs, the entry into the system will immediately be effected in the inventory reports and the financial ledger;

- Support for organisations with multiple companies in different locations;

- Support any number of currencies within the organisation. If an item is posted to the system in foreign currency, it is also entered into the system in the company's local currency;

- Support for multiple languages. The users select their native language when logging in, and users can specify a report to be printed in a foreign language; and

- Suitability to a wide range of industries and organisations. The software can be tuned to practically any company's requirements through configuration and customisation.

SAP's mySAP.com application is operated on a number of platforms, including Windows NT, and uses the client-server model. The latest version (4.6) includes a comprehensive internet-enabled package. By using this version a sales representative can initiate the workflow for a sales order by filling out an electronic form on a notebook computer, and have it translated into input from anywhere in the world. (SAP, 2000).

Oracle

Based on revenue, the Oracle application is the second-ranked software vendor, operating within the same market as SAP, and with similar functionality. Although it's manufacturing and financial applications are adequate, its main focus has been its database. Buhrmann *et al.* (1999:16) reports that Oracle is perceived by the market place as greater flexibility due to its powerful database, but it has not having achieved the same level of complex functionality as the other vendors.

The latest version, Oracle 9*i* contains functionality that integrates marketing, sales, manufacturing, service, and the supply chain with financial operations, project management, human resources and business intelligence systems. The combination unifies business processes to benefit from emerging internet business practices (Oracle, 2000).

PeopleSoft

Peoplesoft only joined the enterprise resource planning race since 1987, but has managed exceptional growth. Initially making its mark with human resource software, it is building its core human resources management expertise into a complete enterprise resource planning package, according to Buhrmann *et al.* (1999:16). PeopleSoft does not have the same functionality of the market leaders in certain areas. To compensate, it has chosen a strategy that targets industry specific groups.

The latest version, Peoplesoft 8 is delivered completely in html. This means that organisations can create collaborative networks that can be accessed anytime, anywhere by their customers, employees, and suppliers. The application also delivers extensive wireless capabilities for mobile ecommerce.

The application has functionality that spans the entire business cycle, from customer relationship management, supply chain management (incorporating the entire enterprise resource planning features), human resources management, and financial management. In addition, functionality has been added to cater for educational and governmental organisations, making version 8 more accessible to a wider customer base (Peoplesoft, 2000).

JD Edwards

This company distributes an enterprise resource planning product called OneWorld, which is developed for the open systems market, like all other major enterprise resource planning vendors, according to Buhrmann *et al* (1999:16). This enables the software to operate in a multi-platform environment. Applications range from finance, distribution and a growing number in manufacturing. Being one of the oldest software vendors, it has shown particularly strong growth in recent years.

Recognising that businesses cannot survive by themselves, J D Edwards has built on the traditional strengths of OneWorld, to provide the means to collaborate with other businesses. The OneWorld Xe application, which is delivered in three interfaces, Windows, Java and HTML, facilitates the automation of the processes that flow between businesses. The easier sharing of resources and information with customers, suppliers and manufacturers creates value for the entire chain.

In addition to the existing functionality in finance, distribution and manufacturing, JD Edwards have developed customer relationship management and performance management functionality that completes the total solution provided (J D Edwards, 2000).

BaaN

BaaN is a 20-year old Dutch company that transformed itself in the last four years from an obscure European midrange material requirements planning (MRP) vendor to a strong global player (Baan Company, 1999). It has successfully developed enterprise resource planning solutions that take advantage of areas where its competitors are weak, allowing it to acquire many blue chip companies, such as Boeing Corporation, Nortel Networks, Daimler Chrysler and the Odense Steel Shipyard in Denmark.

The Odense Steel Shipyard is the most complex BaaN installation in the world. The world's largest ships are built using the project management and control capabilities of BaaN. The System tracks 400 000 large and small parts, of which the ship's engine is only one part. The integrated design, production, inventory, construction and finance functionality ensures the timely delivery of ships to major shipping companies.

Dynamic enterprise modelling is the next generation of BaaN's innovative business modelling environment, the backbone of BaaN solutions. The industry-leading graphic models, such as business control models, define relationships between entities across the value chain, linking core business strategies to the configuration, navigation and execution of business processes throughout the entire system.

The dynamic enterprise modelling architecture serves as a buffer between a business and the changes made to its underlying information technology. The actual components used to execute the strategies can be changed as new components are released, allowing the enterprise to leverage the ongoing innovation while minimizing the impact on its business. These models can be implemented generically, or easily and quickly tailored to meet the unique needs of a given situation. Dynamic enterprise modelling is a key, unique element of the BaaN offering and delivers the requirements for speed, flexibility and simplicity that the market requires (BaaN Company, 2000 ϕ).

The development of these automatic system configuration tools, such as dynamic enterprise modeling (DEM), decreases the dependence on implementation specialists, as the bulk of implementation expenses are

spent on software experts who configure the system personally. These tools have the prospect of cutting implementation times in half, if not more. Dynamic enterprise modeling (DEM) enables non-technology users to define business processes, and the software takes over and configures the system based on the company's business processes.

The latest version of BaaN, BaaN ERP, provides the enterprise with a portfolio of integrated services and component-based applications that span an organisation's entire value chain including e-business and web commerce, customer relationship management, enterprise resource planning, supply chain management, and corporate knowledge management (BaaN Company, 2000 ϕ).

2.2.5 Advantages of enterprise resource planning systems

The benefits of using an enterprise resource planning system is that because it integrates all applications, less time is spent updating information, as information is entered once, and updated immediately. Information is available immediately, which improves the time and resources required for decision making. Some of the benefits that can be achieved by successfully implementing an ERP system are, according to Buhrmann *et al* (1999:16):

- Greater accuracy of information, with detailed content and good presentation;
- Provides an opportunity to benchmark the company's business processes against "best practices", and requires a major re-think of the manner in which some activities are being executed. It is also an opportunity to install new ways of achieving results, by managing processes, rather than business functions;
- Providing access for entering and retrieving information, reducing the use of paper documents;
- Enables quick responses to changes in business operations and market conditions;
- Improves information access and management throughout the company;
- Improves timeliness of information by permitting daily posting instead of monthly posting;
- Improved cost control; and

- Better monitoring and quicker resolution of queries.

2.2.6 Disadvantages of enterprise resource planning systems

The major disadvantage of enterprise resource planning systems is most probably the time it takes to educate and train personnel in the operation of such a complex, but resourceful system. Lack of generic education and systems knowledge is critical to an implementation according to a communication by Van Vuuren (2000). Next to the duration and people issues, choosing a system that does not have a high degree of fit between the company's business processes and the software can have serious consequences for the company. Forcing an implementation through without education and training can easily result in the competitive advantage being lost, not even counting the huge financial losses than can be incurred in abandoning the implementation.

During the implementation phase, if the re-engineering process is not managed carefully by management, it can cause major organisational turmoil. New systems that are integrated and structured, usually challenge established political fiefdoms. Ineffective and inefficient processes are therefore highlighted, often resulting in the re-organisation of roles and responsibilities. A change management process is part of the implementation process. Companies that are not willing to re-assess established procedures will be well advised to steer clear of enterprise resource planning systems, until such time that it is ready to do so. Examples abound in industry of failed, lengthy and painful implementations, such as the Dell Computer company, which has a competitive edge in being able to rapidly deliver a customer configured (on the internet) computer virtually anywhere in the world.

Dell has abandoned a SAP implementation in favour of products from Glovia and i2, because it found SAP would not fit its new decentralised model, according to Davenport (1998:121). The company was planning to install R/3 throughout its world-wide manufacturing operations. It will now install Glovia's software for controlling inventory, warehousing and material and i2's supply chain-planning system. Dell was using version 2.2 of R/3 and had struggled with the implementation for 2 years.

Implementation of enterprise resource planning systems also have a disadvantage in that with all the help functionality built into the system, it still requires users who have had some form of education, particularly in the disciplines of accounting and planning to name few areas.

Although some processes such as receiving materials are fairly straight forward, the more complex processes require skilled personnel, which are not usually available in developing countries where labour is unskilled. Implementation of sophisticated systems in these countries will therefore continue to be a problem until the skills level is uplifted (Van Vuuren, 2000).

2.3 REFERENCE MODEL BASED SOLUTIONS

2.3.1. Introduction

One of the essentials of the highly evolved social organisation of the human species is our ability to communicate using symbols according to Ward and Mellor, (1996:15). Our spoken and written languages constitute an elaborate model of the realities surrounding us, a model that enables us to exchange complex information about people, places, and things. The converse is also true: any model is a language whose symbols allow us to exchange information without contact with the things modelled.

An enterprise model is a computational representation of the structure, activities, processes, information, resources, people, behaviour, goals and constraints of an enterprise. It can be both descriptive and definitional; spanning what it is and what it should be. The role of an enterprise model is therefore, to achieve model driven enterprise operation.

Enterprise resource planning systems are considered to be the backbone of business infrastructures as they balance production, distribution, financial and other business functions to optimise results. The ability to quickly adjust this infrastructure in rapidly changing business conditions is therefore of vital importance, if the enterprise is going to continue to grow. The average medium sized business however, cannot afford the time and money to extract the best solution from a large enterprise resource planning system. Software vendors have blended years of software solution experience together with in-depth knowledge provided by many small and medium sized companies, to create industry-oriented reference models (BaaN Company, 1999).

The reference models are business models, which represent the generally accepted way to manage, control and execute activities specific to certain business processes. Merging business and software application expertise, the graphical representation of business

processes are very practical and easy to follow, eliminating some of the complexity of these huge systems. By modeling the company's core activities, such as, selling, designing, manufacturing and delivery, it enables the selection of the necessary functionality from the extensive enterprise resource planning package, to provide an industry specific solution (BaaN Company, 1999).

2.3.2 Reference model solutions available

Only two of the top five software vendors have reference models for their enterprise resource planning systems, namely SAP and BaaN. Their products cover a wide variety of industries, with new reference models being developed as implementations extend to all areas of commerce.

SAP supplies a reference model that provides a starting point for a business blueprint. Process models are then selected from a repository that reflects the business processes of the company. This gives a clear picture of integration among the various business processes, resulting in a solution that is specific to the company.

BaaN supplies reference models specific to types of companies in a particular industry. The models are more specific, but as with SAP, these models can then be adjusted to the particular company without the need for specialised computer skills (BaaN Company, 1999).

2.3.2.1 SAP

Accelerated SAP (ASAP) is SAP's rapid implementation methodology specifically designed to standardise the implementation process, so that essential system functionality is rapidly achieved, (SAP, 1999). By installing essential functionality such as inventory and finance, it lays the foundation for further implementation. Together with the reference model, it supports every phase of the implementation project, by combining more than 25 years of implementation experience in developing and implementing standard business software. Utilising the ASAP and reference model combination requires no special data processing skill, thus enabling medium sized companies to have access to software, which otherwise would only be available to large companies with huge information technology staff and budgets.

The main elements of ASAP are:

- The roadmap – a methodology and project plan with detailed descriptions about what, why and how certain activities are performed;

- Tools – specific tools to support project management, questionnaires to help define business process requirements, and checklists to simplify the implementation. All documents are available on Microsoft software for easy use;

- R/3 service and training – consulting, education and support activities; and

- Knowledge management – Pre-defined documentation templates for business procedures, role-oriented training and user authorisations.

SAP industry solutions are available for the following industries (SAP:1999):

SAP aerospace & defense;

SAP automotive;

SAP banking;

SAP chemicals;

SAP consumer products and retail;

SAP engineering and construction;

SAP healthcare and insurance;

SAP higher education & research;
SAP media;

SAP mill products;

SAP oil and gas;

SAP pharmaceuticals;

SAP public sector;

SAP service provider; and

SAP telecommunications;

2.3.2.2 BaaN

The Gartner Group stated that, "With smaller budgets and fewer resources small and medium companies have different enterprise requirements planning requirements than larger enterprises. In the ''mid'' market, the top priorities are low cost, service and support, and a quick implementation" (BaaN Company:1999). In an effort to satisfy these requirements, BaaN have developed model-based industry solutions that provide the means for cost-effective implementation for medium sized companies.

Enterprise requirements planning implementations often exceed their budgets, extend their duration, and never effectively use the software, (BaaN Company, 1999). Elements such as communication, project management, training, software enhancements, and custom programming are often problem areas in an enterprise requirements planning implementation. Baan has proactively addressed these elements in the medium sized company market with the introduction of industry solutions.

The industry solution targets the needs of the specific industry, and offers a tool kit targeted towards these elements. An Industry solution (reference model) is a complete ready-to-use set of products developed by BaaN for the medium sized company. BaaN develops enterprise reference models in accordance with dynamic enterprise model (DEM®) principles. This tool developed by BaaN facilitates graphical representation of business processes in an orderly business model.

To illustrate an industry solution, the machine building industry reference model will be explained in some detail. This reference model is applicable to most manufacturing companies that have undertaken implementations where products are designed, manufactured and sold.

The BaaN industry solution for the machine building industry.

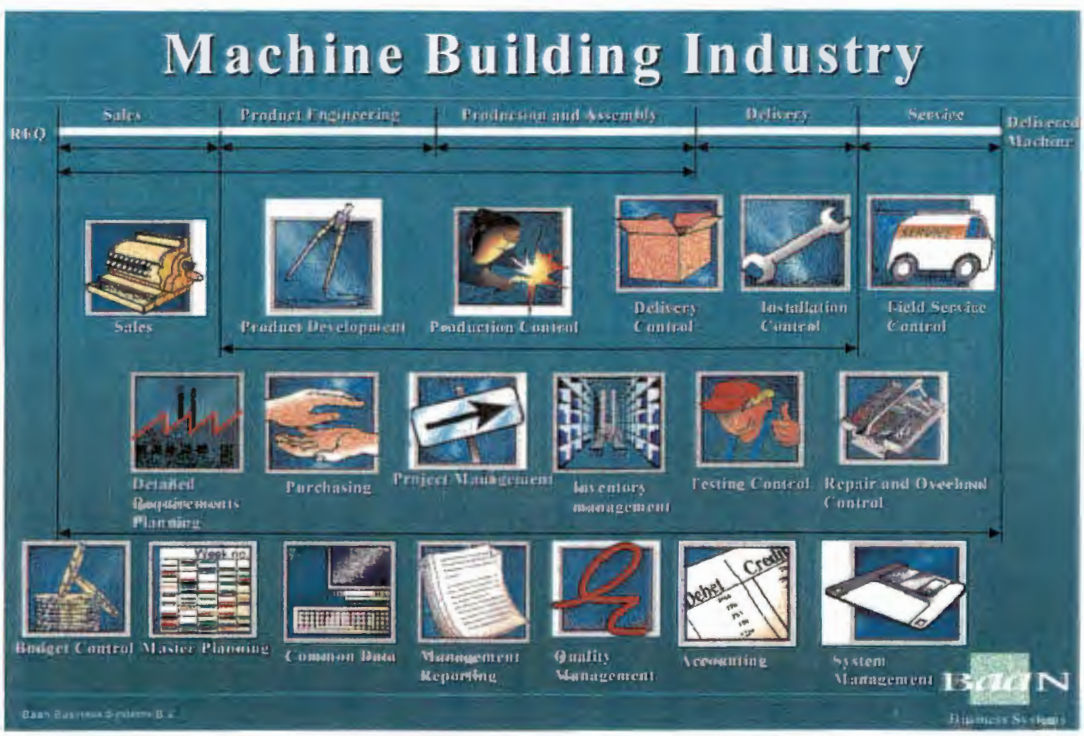
BaaN's industry solution for the machine building industry is a total solution providing most of the required business processes for this industry. Years of experience in the machine building industry and the input of knowledge by many machine-building customers enabled

BaaN business systems to develop an industry-oriented solution. The BaaN industry solution does not so much focus on the software package, but rather on business processes, all of which have been modeled in the industry solution for the company's core activities, being selling, developing, manufacturing, delivering and maintaining machines (BaaN Company : 1999 b).

This model facilitates the management, control and execution of business processes as indicated in Figures 2.3, 2.4 and 2.5, which are screen layouts of the software. These figures demonstrate the ease at which a user is able to select a business process, such as the sales function, and create a sales quotation

The industry solution consists of nineteen functions supporting the main business process from a request for quotation (RFQ), into the sales order process, through product engineering, into production and assembly and finally delivery to the customer. The service and maintenance of the machines is also catered for.

Figure 2.2: High-level overview with supporting functions



Source : BaaN Company (1999d).

BaaN's definition of the machine building industry model

The machine building industry operates in a combined assemble-to-order (ATO), make-to-order (MTO) and engineer-to-order (ETO) environment. Companies in this industry operate in a business-to-business market. They design, develop, manufacture, install and service products that are custom built to their customers' specifications (BaaN Company : 1999[d]).

Characteristics and requirements

The following is characteristics and requirements are typical of the machine building industry:

- Customised end products are based on existing product concepts;
- Document control with respect to maintenance of product concepts is essential;
- Time-to-market (of the end product) varies from several weeks to approximately four months;
- Order acceptance processes require workload analysis of the relevant order fulfilment departments (especially engineering);
- End product development is project-driven;
- Cost control during engineering and progress control are major project management functions;
- Flexibility in adapting products to specific customer wishes;
- Production starts before the end product is fully developed (concurrent engineering);
- Trend towards modular products (subassemblies) and standardisation of parts;
- Desire to re-use existing designs;
- Trend towards outsourcing components;
- Dealing with consequences ensuing from engineering change orders during product development and production;

- Planning functions centred on materials and capacities;
- Short customer order lead times (time-to-market);
- Ad hoc make/buy decisions at tactical and operational levels; and
- Integrated design and logistics environments.

Source : BaaN Company : 1999 [b]).

The above represents the rapidly changing environment in which medium sized enterprises are expected to function. The need for accurate and timely information requires an integrated solution to enable the sharing of information across functional boundaries within the organisation.

Supporting business functions

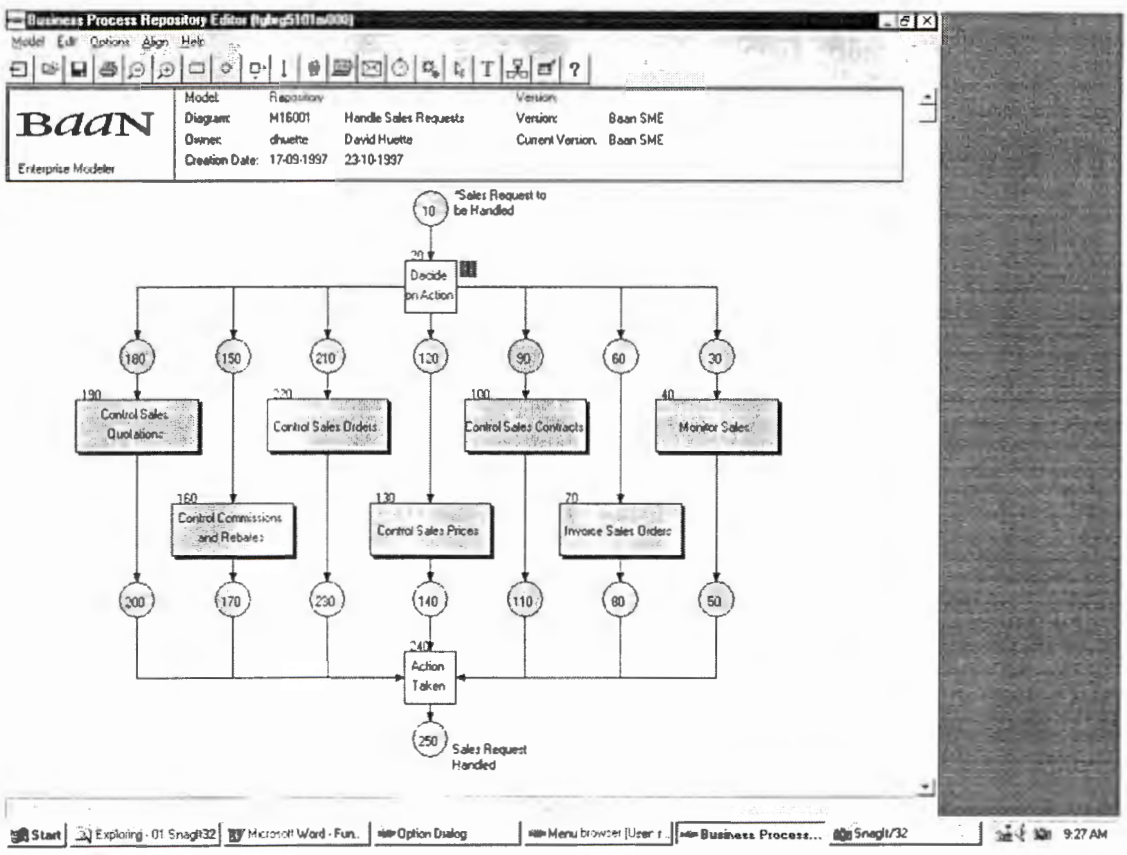
The Industry solution for the machine building industry is supported by the following functions:

- Budget control;
- Common data;
- Detailed requirements planning;
- Field service control;
- Installation control;
- Inventory management;
- Management reporting;
- Master planning;
- Product development;
- Production control;
- Project management;
- Purchasing;
- Quality management;
- Repair and overhaul control;
- Testing control;
- Accounting;
- Delivery control;
- Sales; and
- System management.

Source : BaaN Company (1999 [d]).

The industry solution covers the requirements of the entire cycle from the tender stage (budget control) and sales order intake process, through to product development, manufacturing, testing, and finally delivery and financial control. This would satisfy the initial information requirements of most medium sized businesses. Performance measurement and business analytics are not sufficient addressed, necessitating an optimization phase after the installation of the basic functionality.

Figure 2.3 : Sales order process

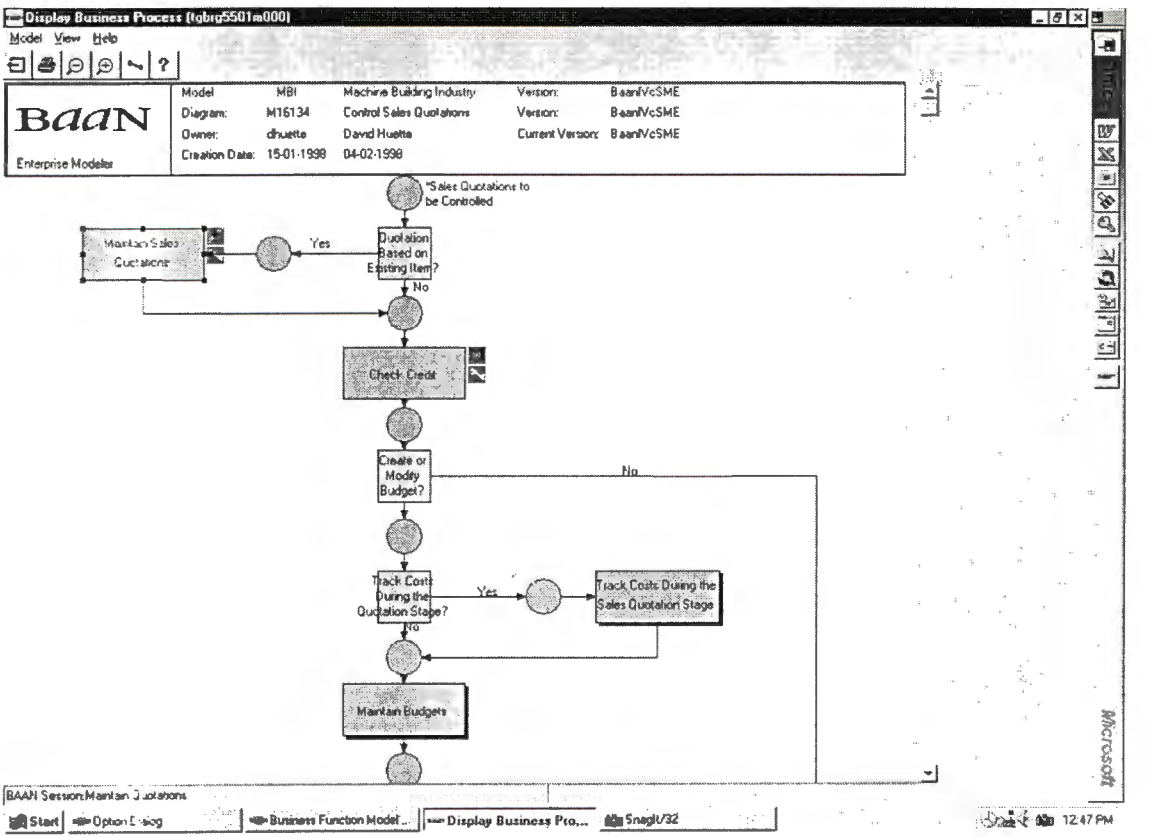


Source : BaaN Company (1999 [9]).

Figure 2.3 refers to the highest level of the sales process. The entire process is managed from this level, from the preparation of a sales quotation, to creating a sales order or contract, monitoring its progress through the organisation, and finally producing an invoice for the customer.

Selection of a sub-process, such as control sales quotations is enabled with a computer mouse.

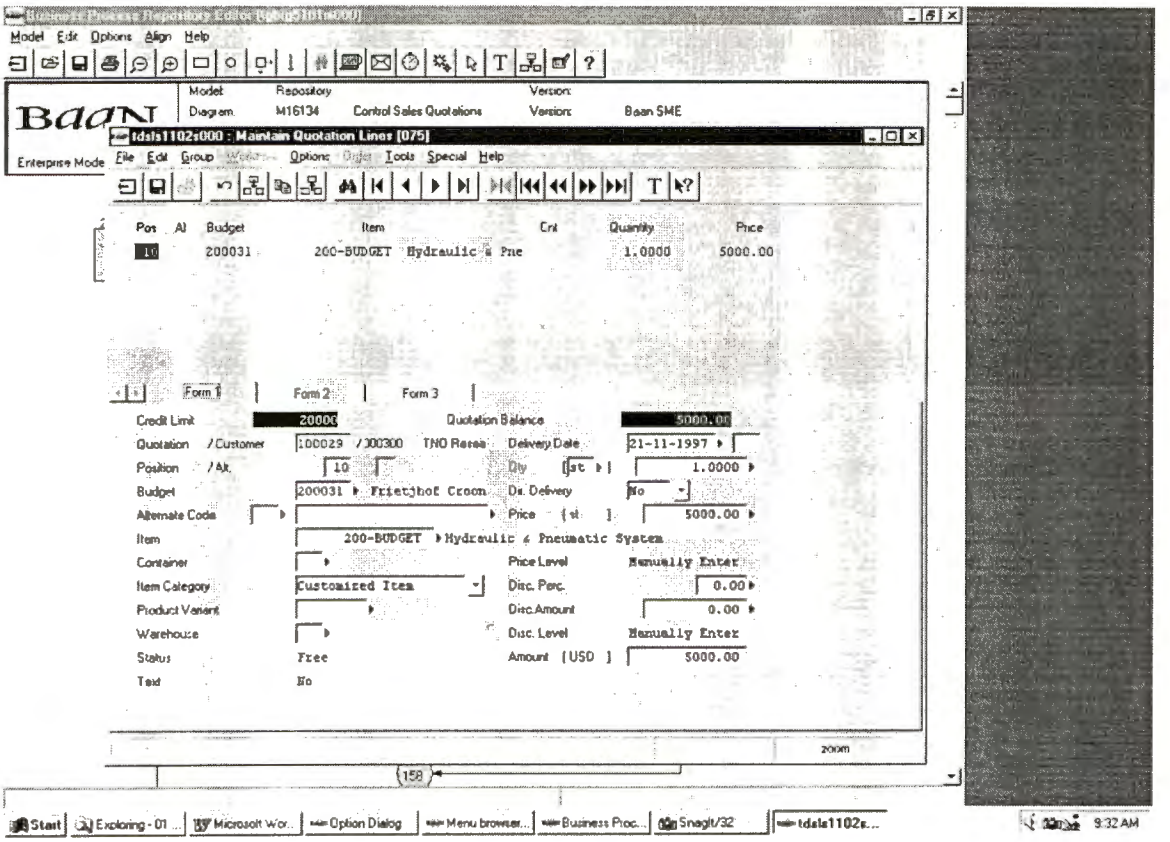
Figure 2.4 Control sales quotations



Source : BaaN Company (1999 b).

Selecting the sales quotation sub-process prompts action from the user. By reading through, the user is assisted in executing a pre-defined business process, which can be tailored according to company specific requirements if required. When the required process is selected, the maintenance screen becomes available to insert data.

Figure 2.5 **Maintain quotation lines**



Source : BaaN Company (1999 ©).

This screen is used for the maintenance of data. Details of a quotation line, such as the item code, category, quantity and price are entered against a budget code, which will be used to calculate a cost and selling price.

2.2.3 Types of reference models (industry solutions) available

SAP provides a reference model, which is essentially a framework. Using the repository of business processes, a final model is configured with the requirements of the customer.

The BaaN company supplies complete reference models for a particular industry. The reference models (industry solutions) currently available are:

Aerospace and defence;

Automotive;
Consumer packaged goods;
Electronics;
Engineering and construction;
Forest products;
Heavy equipment;
Primary metals;
Semiconductor;
Specialty chemicals; and
Wholesale.

Source : Baan Company(1999[c]).

2.4 Selection process

2.4.1 Introduction

In the not too distant past, when developing information systems, companies would first decide how they wanted to do business, and then choose a software package that would support their propriety processes. They would, according to Davenport (1998:125), rewrite large portions of the software code to ensure a tight fit. With enterprise resource planning systems, however, the sequence is reversed. The business often must be modified to fit the system. Selecting the correct enterprise resource system is therefore a strategic decision, which has far reaching consequences for the company.

2.4.2 Reasons for selecting an ERP system

An enterprise resource planning system is after all a generic solution. Its design reflects a series of assumptions about the manner in which companies operate in general. Software vendors, in consultation with leading companies in their industries attempt to define ''best practices''. In most cases, the system will enable a company to operate more efficiently than it did before. In some cases, the system's assumptions will run counter to a company's interests.

The selection of an enterprise system has never been more confusing for medium sized South African companies. Worst (1997:64) states that most organisations acknowledge that a competitive advantage can be gained or maintained by using information technology. The

commitment to further development and expansion is reflected in their strategic plans.

What is not clarified, is the understanding of the implications of purchasing a sophisticated enterprise resource planning system. According to Pim and Schmidt (1999), "Executives think they can buy software like they buy a suit – add cuffs, take in the seat a little...". Decision-makers still believe that their businesses are unique, and that systems must be modified to suit their requirements, instead of modifying the company around a proven model.

The selection of the appropriate software for the company essentially depends on what the strategic requirements of the company are. The main findings of a survey conducted by the Marker Data Group indicated that 57 % percent of management executives felt that enterprise resource planning systems enables them to standardise business processes.

In a survey supporting the above, Deloitte Consulting found that the top reasons for selecting and implementing an enterprise resource planning system in sixty-two of the Fortune 500 companies in manufacturing and consumer industries were:

- Required a solution to the Year 2000 problem 42%
- Had incompatible systems 37%
- Had data quality problems 26%

Source : Anon (1999:89[Q]).

The reasons for selecting an enterprise resource planning system, discounting the Year 2000 problem, appears to be focussed on the establishment of a system that enables the enterprise to use one standardised set information for effective decision making.

2.4.3 Reference model solutions

Ten years ago, the biggest risk in software packages was the absence of software functionality in the market place. The increased demand for enterprise resource planning systems, have seen tremendous development being undertaken by the suppliers, that practically eliminates differences between rival systems. Most companies can find

a solution that satisfies their requirements. The biggest risk, however, is the purchase of too much functionality, according to Pim and Schmidt (1999). Companies make the mistake of buying excess functionality, with the intent that they will grow into the software they are currently not using. As a result of this logic, excess costs do not stop at the application purchase, but continue through implementation services, as well as through ongoing support.

Model based solutions eliminates the complexity of having too much, by supplying industry specific requirements, which can be re-configured as the business requirements change. Model based solutions also offer the purchaser the opportunity to overcome problems associated with out of control implementations, which were consistently late, over-budget and short of promised functionality. Reference models are templates of business processes that are considered "best practices" in that particular industry.

Many of the problems these implementations face probably could have been avoided with a user-involved analysis effort prior to the purchase of the software package. Using a reference model, it would cut down the time required to perform such an analysis. If the model is easy enough to configure, it will be possible to perform an analysis on the entire scope of the project. This focused effort will drive out definitions of the key entities, and will uncover the need for complexity in critical areas. These definitions will assist in prioritisation. Software package implementations will always have risk. The only way to reduce risk is to conduct an effective analysis during the selection phase, mapping out requirements for all users of information.

2.5 IMPLEMENTATION

2.5.1 Introduction

The potential benefits of enterprise resource planning systems are huge, but so are the risks. It is not uncommon for a company to walk away from an enterprise resource planning project poorer and nothing to show for it. A recent study conducted by Market Data Group as reported by Connoly (1999:74), reveals that 65% of executives believe enterprise resource planning systems have at least a moderate chance of hurting their businesses because of the potential for implementation problems. This view is shared by Davenport (1998:122), who reports that there are a growing number of horror stories about failed or out of control projects. Large corporations, such as Dell computer, Mobil and

Dow Corning, have abandoned projects, resulting in huge financial losses, and a disrupted organisation.

2.5.2 A winning game plan for enterprise resource planning implementations

Much of the blame for such disasters lies with the enormous challenges of rolling out enterprise systems – these systems are profoundly complex pieces of software, and installing them requires large investments of money, time, and expertise. The biggest problems are business problems. According to Davenport (1998:122), '' An enterprise system imposes its own logic on a company's strategy, organisation and culture. If a company rushes out to install an enterprise system without having a clear understanding of the business implications, the dream of integration can quickly turn into a nightmare. The logic of the system may conflict with the logic of the business, and either the implementation will fail, wasting large sums of money and cause a great deal of disruption, or the system will weaken important sources of competitive advantage, hobbling the company''.

Committing the company to using an enterprise resource planning system is a major decision. This will affect most of the company's business functions and directly involve a significant number of people. To succeed, according to Laughlin (1999:32), a ''winning game plan'' for implementing enterprise resource planning applications must contain the following:

Motivating business justification

Proving the business benefits of implementing an enterprise resources planning package is perhaps the easiest part. The difficult part is understanding the risk and opportunity cost of the investment. The benefits include both hard savings (expense) and soft savings (efficiency, effectiveness and revenue growth). The hard savings typically include reductions in procurement cost, inventory, transportation, increased manufacturing throughput and productivity improvements. The soft savings typically include general and administration expense reduction, revenue growth, margin enhancement, sales and other productivity improvements. Headcount reductions also result when implementing such a system (Van Vuuren, 2000).

The financial costs for implementing an enterprise resource planning system for South African medium sized companies can easily reach R 1 million. More important than this cost, are the opportunity costs, which can be quite high. This effort requires a significant investment of capital, human resources and management focus. Implementing such a system is as significant as building a new plant, or launching a new product. Laughlin (1999:34) asserts that if management cannot devote attention to the project, it would be advisable not to proceed.

Internal business support

Before going ahead with an enterprise resource planning implementation, it is important to ensure the **commitment**, and not only the **involvement** of the senior executive team, according to Langdoc (1998 : 88). The entire team must agree on the need for an enterprise resource planning application, commit to achieving the benefits, and undertake to provide the required management attention. Management attention includes the sharing of business direction, facilitating compromise and dealing with resistance to change. This however been difficult to achieve in practice, as the senior team is invariably made up of personalities that will, because of their respective educational backgrounds, not fully appreciate the nature of information systems.

The right internal owner

Laughlin (1999:32) states that implementing an enterprise resource planning system can be a serious source of conflict within the organisation, especially when existing procedures must be documented if not existing, or changed to fit the application's functionality. It is therefore important that a senior executive be appointed to lead the process. This executive must have both the credibility and willingness to lead this effort. The individual should preferably be recognised for prior contributions to company success, have strong management capabilities and have an ability to get things done. He or she should be able to lead the process by leveraging an understanding of the business direction. Conflict resolution is a major function undertaken by such an individual, often at peer level.

The right degree of change

The implementation of an enterprise resource planning systems solution causes changes to the organisation, which if not managed correctly can create turmoil. Most implementations are used to drive change, and success stories stem from when a clear vision of what the organisation should look like is communicated to the entire organisation. Management must demonstrate empathy with those involved in the change process. Performance measures should be aligned to incentives, and every opportunity must be taken to reinforce change by weaving it into other initiatives, according to Laughlin (1999:32).

The right internal resources

To ensure success of the implementation, the company should be prepared to commit the best and brightest persons to the enterprise resource planning implementation team. The implementation process can be as important as its successful conclusion. Therefore, team members must recognise that a key part of their role is to prepare the company to accept the enterprise resource planning and the change that it drives. They must have the tenacity to challenge the status quo, and the internal fortitude and confidence in their convictions to overcome not only subtle and passive resistance, but also direct and aggressive attacks. Individuals must also possess the intellectual rigor to resolve problems by identifying issues, gathering data and conducting analysis. A facts based approach will enable the team to achieve compromises necessary to implement the enterprise resource planning solution (Van Vuuren, 2000).

The right external resources

Few companies that implement enterprise resource planning software have ever done anything like it before. The changing of both business and information systems takes enormous resources, often more resources than the company can spare. Most companies select an external partner, who has the experience to guide the implementation. Laughlin (1999:36) advocates the selection of an implementation partner, who has a holistic approach (i.e. business, application, technical and most importantly, people perspective), and not just a focus on only implementing the application. Enterprise resource

planning implementations do not fail because the applications do not work, but because the enterprise rejects them.

In finally selecting a partner, it is important to check references on prior implementations, and interviewing the executives that had experience of consulting enterprise resource planning implementations in general. It is important to select a partner that demonstrates an ability to react and adjust to unexpected challenges that usually arise during an implementation project. Selecting the right partner also does not guarantee success. Interviewing the key people to be assigned on the project has become a norm, to ensure that a highly competent team is selected. It is important to note that although it is in the company's interest to ensure continuity of the leadership of the project, the partner must have some flexibility during the life of the project.

Finally, given the level of investment of an enterprise resource planning system, it is considered reasonable to have a risk and reward arrangement with the external partner. The risks of an enterprise resource planning initiative should be shared by all the participants, as these projects are highly complex technically, they often require individual team members - in particular, employees of the implementation partners - to make decisions.

2.6 CONCLUSION

Davenport (1998:130) states that almost every company that installs an enterprise resource planning system struggles with its cost and complexity. User acceptance, particularly in South Africa, given its historical past, places an additional constraint on an already complex problem. The companies who have the biggest problems are those who install an enterprise resource planning system without thinking through its full business implications.

The reasons for companies upgrading to enterprise resource planning systems have concentrated on eliminating the year 2000 problem. This is has changed, now that the requirement to consolidate information for effective decision making has been satisfied. Companies are now focussing on how to use the system for competitive advantage, moving from just saving costs to making money.

The choice of system, therefore, if correctly aligned with a company's strategy, can be a determining factor in the long-term survival and growth of the company. The system selected should be user friendly enough to allow re-configuration as the business requirements change.

The company should not be held "captive" to the software, locking it in to a fixed mode of operation.

Industry solutions (reference models) are effective in that they are industry specific solutions, which can be adapted as required. In less developed countries where there is distinct lack of specialised skills, the opportunity to rapidly re-configure with minimal expertise and costs, represents an opportunity for medium sized companies to reduce the complexity of information systems and concentrate on optimising the business. In this way, the advantage once only enjoyed by the large corporation, can now be utilised as effectively by the medium sized company.

CHAPTER 3: EMPIRICAL RESEARCH

3.1 Methodology

The research was conducted using two separate methods to obtain a more holistic approach. The quantitative approach using questionnaires was selected to elicit data from those companies who have implemented the BaaN model-based implementations.

3.1.1 Survey sample

A general questionnaire (annexure A) was sent to companies that have completed Baan model based implementations in the period January 1999 to May 2000. The objective was to determine pre-implementation activities, the selection process used to select an enterprise resource planning system, and how the project progressed in general.

An assumed low response rate caused by "survey fatigue" was anticipated, due to the number of enterprise resource surveys underway from the various software developers and research organisations. Care was taken to design the questionnaires in a non-threatening manner, as most of the respondents were responsible for the implementations in one way or the other.

A response rate of 75% of the installed solutions thus represents a significant portion of the total population of model based implementations.

3.1.2 Questionnaire structure

The questionnaire was designed to operationalise concepts identified in the research objectives and literature study:

Causes of implementation failure with specific reference to:

- The management of strategy;
- Applicability of model-based solutions;
- The implementation;
- User education; and
- Implementation costs and duration.

3.1.3 Case study approach

The case study approach provided the opportunity to participate and observe actual implementations. This method yielded a deeper insight

into the practical implications of implementing model-based solutions in medium sized South African companies, and was useful, together with the survey findings, in the development of a generic implementation model for future implementations.

As model-based implementations are still relatively new to Southern Africa, the sample is relatively small at this stage. A total of eight model-based implementations were completed since the official launch of this approach. While there many more in progress, data emanating from them in the future will no doubt contribute towards a better understanding of their use.

3.2 Questionnaire analysis and findings

All data collected was entered in a spreadsheet application for ease of data sorting and score computation. Due the small number of questionnaires issued, there were no incomplete responses that had to be deleted.

Before presenting the survey findings regarding attitudes, it is appropriate to accept that "most relationships are weak than to over interpret results" (De Vaus, 1996:33). Interpretation of survey results is therefore restricted to areas of significance. Results should also be interpreted with an awareness that some dissatisfaction may exist, as there will always be 10% to 20% who are not really satisfied (Shaw *et al*, 1996:33).

Survey questions operationalising the identified concepts are shown under the relevant concept heading:

3.2.1 The management of strategy

Response frequency distribution

B 1. Frequency of review of information technology requirements?

6 months	0%
12 months	16.7%
24 months +	16.7%
Not a distinct part of company strategy	67.0%

N = 8

C 5.1 Company procedures reviewed?

Yes	50%
No	50%

N = 8

C 5.2 Job descriptions reviewed?

Yes	33%
No	67%

N = 8

C 5.3 Change management activities undertaken?

Yes	16.7%
No	83.3%

N = 8

C 5.5 Business process re-engineering exercise undertaken?

Yes	16.7%
No	83.3%

N = 8

B 2. Primary reason for deciding on the implementation of an enterprise resource planning system?

Year 2000 compliant replacement of legacy system	66.6%
Need to integrate the various systems	16.7%
Requirements of the parent company	16.7%

N = 8

Overall scoring indicate that most companies undertaking enterprise resource implementations do not consider information technology requirements to be a part of the overall company strategy. This is supported by the fact that the preparation for such an implementation failed to consider factors such as change management and a review

of business processes. The impact on people appears to have had little or no consideration prior to commencing with the implementation.

The major reason for companies embarking on such implementations was to have systems that were year 2000 compliant (67%). In one case (16,7%), the motivating factor was a decision by the parent company.

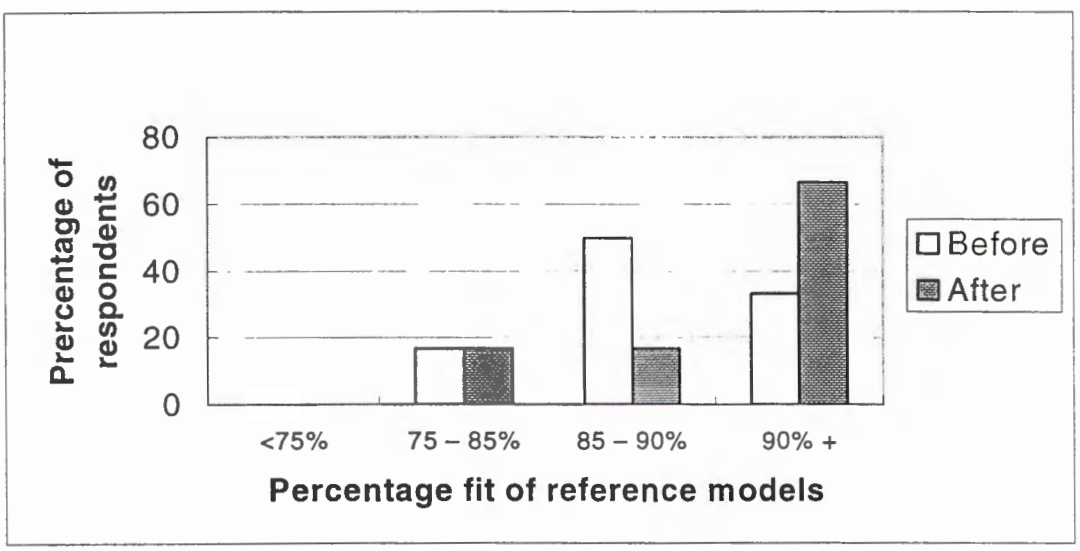
Business process re-engineering and change management activities were not considered by approximately 83% of the respondents.

3.2.2 Applicability of model-based solutions

B 5.0 Percentage estimate fit of the model based enterprise resource planning solution **prior** to implementation?

D 4.0 Percentage estimate fit of the model based enterprise resource planning solution **after** the implementation?

Figure 3.1: Applicability of the reference model



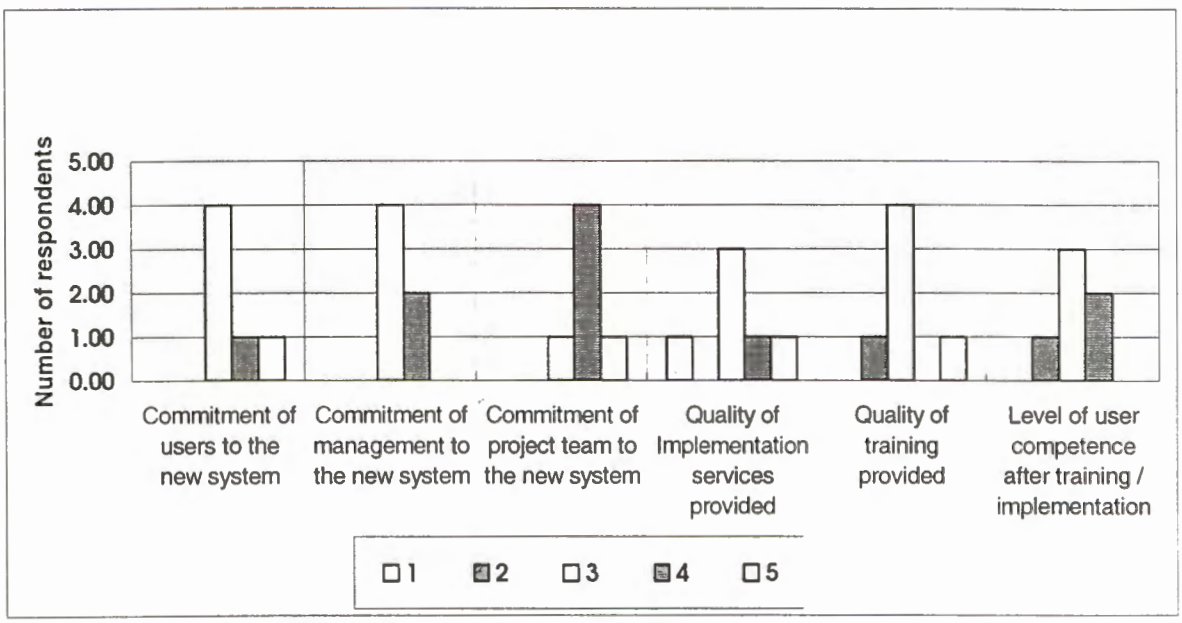
N = 8

The implementation of the model based enterprise resource planning solution, with its pre-defined business processes, was perceived to have a better fit after the implementation. A high number (67%) estimated that the reference models had matched their new business processes

in excess of 90%, demonstrating the effectiveness of the model-based approach.

3.2.3 Implementation factors

Figure 3.2: Implementation factors – response frequency distribution



N = 8

Legend:

1 – very poor
2 - poor
3 – not good, but also not poor
4 - good
5 – very good

	Mean	Median	Standard deviation
Commitment of users to the new system	2.00	1.00	1.73
Commitment of management to the new system	3.00	3.00	1.41
Commitment of project team to the new system	2.00	1.00	1.73
Quality of implementation services provided	1.50	1.00	1.00
Quality of training provided	2.00	1.00	1.73
Level of user competence after training / implementation	2.00	2.00	1.00

Overall, the scoring from the implementation factors indicate that implementations have not been very successful. In particular, the

commitment by management was rated as being indifferent by two thirds of the respondents.

The low score obtained for user commitment and level of system competence can be ascribed to the quality of training provided, and the fact that the commitment by management is rather low for such a strategic investment.

Most project teams (67%) however, appeared to be committed to the project, but this had little impact on the end users. Only 33% of this group were fully committed to use the system. This is a further indication of a lack of management training. The indifferent commitment by management is transmitted to the lower levels, because the implementation is not viewed as important as other activities in the company.

3.2.4 User education

C 5.4 Specific education undertaken?

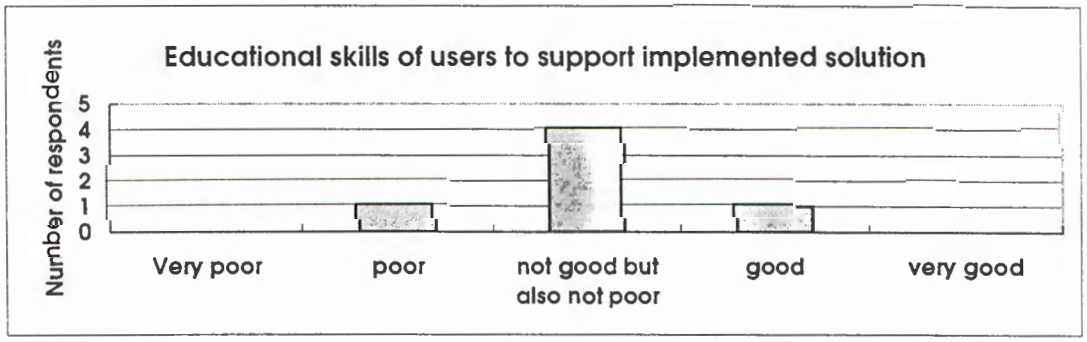
Table 3. 1 Response frequency distribution

Yes	16.7%
No	83.3%

N = 8

D1. Education skills of system users

Figure 3.3: Response frequency distribution



N = 8

No specific education was undertaken by 83% of the respondents in the preparation to implement the new software. In view of the fact that most companies implemented solutions to overcome the year 2000 problem, the education and training were not strategic considerations.

The low scoring obtained in supporting an implemented solution by system users (figure 3.3) is therefore attributable to the lack of skills required to support such a system.

3.2.5 Implementation costs and duration

Table 3.2: Response frequency distribution

D 2.0 Project completion - duration

Within quoted duration	16.7%
Within extended duration as agreed	16.7%
Exceeded	66.6%

N = 8

Table 3.3: Response frequency distribution

D 6.0 Project budget

Project completed within budget	50%
Exceeded by 20 - 30%	16.7%
Exceeded by 30 – 50%	33.3%
Exceeded by 50% +	0%

N = 8

Table 3. 4 Response frequency distribution

D 5.0 Customisation/modifications and/or interfaces built to other systems, because original intended solution was inadequate?

Yes	50%
No	50%

N = 8

The above table indicates that implementations of enterprise resource planning systems generally exceed the quoted duration (83%). This is consistent with the previously mentioned reasons why implementations are drawn out.

In terms of the financial implications, only 50% managed to complete the project within the anticipated expenditure. There is a positive correlation between the 50% of the respondents who chose to customise the system and the 50% who exceeded their budgets.

3.3 Case studies

To obtain a deeper insight into the practical aspects of a model based implementations, two of the eight BaaN model based implementations will be discussed in detail. Sasol Fibres and StonCor Africa were selected, as the opportunity to participate directly, yielded sufficient information that would represent an overall view of model based implementations. These implementations were both complex and lengthy, which required unique solutions for the type of manufacturing processes employed.

3.3.1 Implementation at Sasol Fibres

3.3.1.1 Introduction

Sasol Fibres is a continuous process manufacturing plant that produces acrylic fibre from a range of chemicals. The plant was purchased from Courthaulds in France, dismantled, transported in components, and re-erected in Prospecton, Durban. Annual production is approximately 30 000 tons, the majority of which is exported. Since the plant was established in 1992, it has been using a combination of applications, some of which were written specifically for the plant, and others were off-the-shelf applications for specific purposes, such as finance and maintenance.

The applications used were not integrated, resulting in information being re-entered as it travelled from one business function to another. In some cases, information that was needed by more than one function, but for different purposes, were maintained separately, either in manual or computerised systems. The business functions served were sales and distribution, inventory, purchasing, production, maintenance and finance.

3.3.1.2 Software selection

During 1997, Sasol Fibres began to investigate an alternative solution to its information needs, as a result of the impending year 2000 problem. As the possibility of re-writing the existing Cobol based programmes was found to be a very expensive option, it was decided to investigate an off-the-shelf solution. Since enterprise resource planning solutions were readily available, and adequately supported on the South African market, this option was preferred.

Being part of the Sasol group of companies, the logical choice was to approach SAP, which had traditionally supplied all of the Sasol companies with enterprise resource planning solutions. After a detailed on-site investigation was conducted, a formal quotation was submitted to management. The solution consisted of the full SAP R/3 system, implemented over a twelve-month period. The proposal was rejected after careful consideration of the functionality provided, the duration proposed and the costs involved. It was felt that a more cost effective and industry specific approach was needed to address the company's information needs.

A second vendor, BaaN SA, was contacted for a demonstration and subsequent quotation for the supply and implementation of the system. The solution offered by BaaN was a product that was due to be released during the following year, known as BaaN-on-board (B-o-B), which was an enterprise resource planning system aimed specifically at medium sized companies. Due to the urgency for a quotation, only three days were spent on site evaluating the suitability of this new approach. The proposal consisted of a model-based implementation for the machine building industry (MBI), which had system parameters and business processes pre-defined. The pre-installed solution consisted of the application, database and operating system, thus enabling an immediate project start. An implementation period of three months was quoted using the model-based approach.

The machine building industry (MBI) model was proposed primarily for the product configuration capabilities available. The possibility to configure, code and cost a complex customer specific requirement at the order intake stage was an essential requirement. Sasol Fibres produces acrylic fibre used in a range of industrial and domestic purposes, including the manufacture of clothing, carpets, and fabrics for industrial use. Fibre is configured from eleven ingredients and processes for specific end uses. Each of these ingredients and processes can contain up to thirty different chemicals and operations.

In addition, the customer can specify a colour from the three thousand shades available. Each shade could contain up to eight raw materials.

The solution proposed by BaaN was approximately thirty percent of the SAP quote, and could be implemented within three months from acceptance. In addition, the first phase also included unspecified ''interfaces'' to existing process control systems, as part of the implementation costs. This proposal was found to be suitable, particularly the use of a reference model approach to the implementation, which offered a reduced implementation period. This translated into lower costs and less complexity, both of which were important considerations. A formal contract was then signed at the end of 1998, for the implementation to commence in January 1999.

3.3.1.3 Project preparation

Prior to the formal acceptance of the BaaN solution, a BaaN specific risk analysis exercise was conducted with the aid of a tool, at the end of 1998. The objective of the exercise is to identify factors that may pose a risk during the implementation phase. To use this simple tool, the BaaN project director and Sasol Fibres management answered all questions, indicating their scores with a "0" or a "1" in the last column. The Microsoft Excel program has hidden columns, which contain factors that are multiplied to finally determine an overall risk value.

Sasol Fibres achieved an overall risk value of 25,7%. In terms of the BaaN assessment criteria the implementation was deemed to be acceptable. The analysis is presented in table 3.5:

Table 3.5 BaaN project risk analysis for Sasol Fibres – December 1998

1.0	Project size		0/1
1.01	Total necessary people (capacity)	5-12 weeks	0
		12-20 weeks	0
		20-40 weeks	1
		More than 40 weeks	0
1.02	Total time to complete project	0-12 months	1
		13-18 months	0
		More than 19 months	0
1.03	Is there a "dead-line" for the realisation?	No Yes	0 1
1.04	Is the foreseen schedule too tight (i.e. are there many project members with little time?	No Yes	1 0
1.05	Is the foreseen schedule too long, with the risk of too many changes in personnel, which might result in the failing of the project?	No Yes	1 0
1.06	What is the co-ordination status of the subprojects? (Are they co-ordinated, well phased?)	Satisfactory Not enough subprojects Too many subprojects	1 0 0
1.07	Who takes part from the own organisation?	Mostly own personnel Limited number Few	1 0 0
1.08	Number of departments involved or influencing the project?	1 department 2 departments 3 + departments	0 1 0
1.09	Number of organisation-units that are co-responsible for the result of the project?	1 unit 2 or more units	1 0
1.10	Number of future users of products delivered by the project?	1-20 users 21-50 users More than 50 users	0 1 0
1.11	Number of organisation-units that are involved in offering the products to be delivered?	1 unit 2-3 units More than 3 units	0 1 0

1.0	Project size (continued)		0/1
1.12	Number of applications of the product to be delivered, for example, finance/purchasing/sales /planning/product development /production?	1-2 applications 3-5 applications 6-9 applications More than 9 applications	0 1 0 0
1.13	Are there departments responsible for systems of which this system is dependent on?	Yes Partly No	1 0 0
1.14	How many project members work part-time in the project?	0-20% 21-40% 41-60% 61-100%	0 0 0 1
1.15	Total number of project members full-time (80%) available at the most crucial moments?	1-5 persons 6-10 persons 11-15 persons More than 15 persons	1 0 0 0
	TOTAL RISKVALUE – Project size :		**51 of 167**

Explanation

The above indicates that the organisation has the capacity to undertake the project, in terms of human resources and time necessary to complete the project. The low score indicates that the company did have the capacity required to successfully complete the project.

2.0	Information technology experience		0/1
2.01	Are many changes planned in existing procedures?	Few Average Many Completely new	0 1 0 0
2.02	Is it necessary to implement changes in the procedures of users?	None Minimal Average Many	0 0 1 0
2.03	Do the project members have the possibilities, the experience, and the time to oversee certain distinguishable areas, such as organisation, administration and procedures	Yes, with sufficient time Yes, with limited time No	1 0 0
2.04	Will there be many inquiries from different authorities during the project?	Few Some Many	1 0 0
2.05	How much training is necessary for the users?	Few Average Many	0 0 1
2.06	Are there currently projects underway on which this project depends?	No Yes, but there is sufficient time and the project risks are low Yes, and there is insufficient time and/or the other projects risks are high.	1 0 0
2.07	How reliable are the project plans?	Very good Good Acceptable Bad	1 0 0 0
2.08	How complicated is the management of the project?	Simple Difficult Complicated Very complicated	1 0 0 0
2.0	Information technology experience		0/1

	(continued)		
2.09	What is the user's attitude towards the project? (generally speaking)	Positive Interested Doubtful Negative	0 1 0 0
	TOTAL RISK VALUE - Information technology experience:		**38 of 123**

Explanation

This section of questions seeks to determine the information technology experience, level of training that will be required, and the attitude of system users to changes that will result from the implementation of the project. The extremely low score indicated that sufficient information technology experience was available.

3.0	Technique		0/1
3.01	Technique	Elsewhere proven technology? No proven technology	1 0
3.02	Are special or new technologies necessary?	No Limited Many	1 0 0
3.03	Is the technology new for the (future) suppliers?	No Limited Partly Completely	1 0 0 0
3.04	Are new suppliers to be selected?	No Yes, 1-3 Yes, more than 3	1 0 0
3.05	Experiences with the suppliers?	Good Not known Bad	1 0 0
3.06	How good do the suppliers provide the support?	Good Average Unknown	1 0 0
3.07	Does the project result in new work methods for the project members?	No Yes, partly new Yes, completely new	0 1 0
3.08	What experience is gained with the new work methods?	Elsewhere in the company Elsewhere None	0 1 0
3.09	Do legal or other demands apply?	No Yes, already stable Yes, not yet stable	1 0 0
3.10	Do we need a conversion from the old to the new situation?	No Yes, low effort Yes, average effort Yes, large effort	0 0 1 0
	TOTAL RISK VALUE - Technique:		**23 of 151**

Explanation

This objective of this section is to determine the risks associated with the techniques to be used in implementing the proposed solution, and the level of experience of the proposed implementation partner. A very low score indicated that the required technique and experience was available.

4.0	Project organisation		0/1
4.01	How broad is the knowledge of the project management on the level of the project contents?	Broad Relatively broad Small No knowledge	0 1 0 0
4.02	How broad is the experience of the project management in relation to comparable projects?	Broad Relatively broad Small No knowledge	0 1 0 0
4.03	Are users involved in the project?	Yes, full-time Yes, part-time No	0 1 0
4.04	How broad is the knowledge of the users in the project concerning deliverables?	Knowledge and experience Understand the concepts No experience Minimal or no knowledge	0 1 0
4.05	How big is the chance that the specifications will be changed?	None Small Average Big	0 1 0 0
4.06	How broad is the experience of the project members in relation to comparable projects?	Majority has extensive experience Some members have no experience Many members have no experience	0 1 0
4.07	Is the responsible hierarchical management really involved in the project?	Yes Doubtful No	1 0 0
4.08	Are relationships with third parties taken into account?	Yes Partly No	1 0 0
	TOTAL RISK VALUE - Project Organisation		**33 of 108**

Explanation

The project management capabilities are assessed, to determine the project risk in terms of the necessary elements, such the scope, the involvement of users, project experience of the users, and the relationships with third parties. The low score indicates that the project has the necessary support infrastructure to succeed.

5.0	Operational conditions		0/1
5.01	Are priorities clearly set?	Yes No	1 0
5.02	How big is the chance that the priority given to the project will be set lower?	Nil Small Average Big	0 1 0 0
5.03	Is a project management method used that is accepted within the company?	Yes Partly No	1 0 0
5.04	Is the test and acceptance method as used in the project accepted in the company?	Yes Partly No	0 1 0
5.05	Will involved persons be asked for their opinion as milestones are reached according to the project management?	Yes Partly No	0 1 0
5.06	Is there a chance that the project will be carried out with low motivated people ?	Yes Doubtful No	0 1 0
5.07	Is there a chance that the project will lead to many changes in personnel?	No Yes	1 0
5.08	How far is the starting points and conditions commendable, for example, can project management demand conditions?	Completely Partly Not	0 1 0
	TOTAL RISK VALUE – Operational conditions:		**24 of 108**

Explanation

The operational conditions of the project are reviewed to ascertain whether the project will be affected by factors such the level of priority being assigned, staff motivation and involvement of key resources. The project management method and level authority is also assessed to determine the possible impact on the project. In this case, the low score indicates that the project conditions were ideal

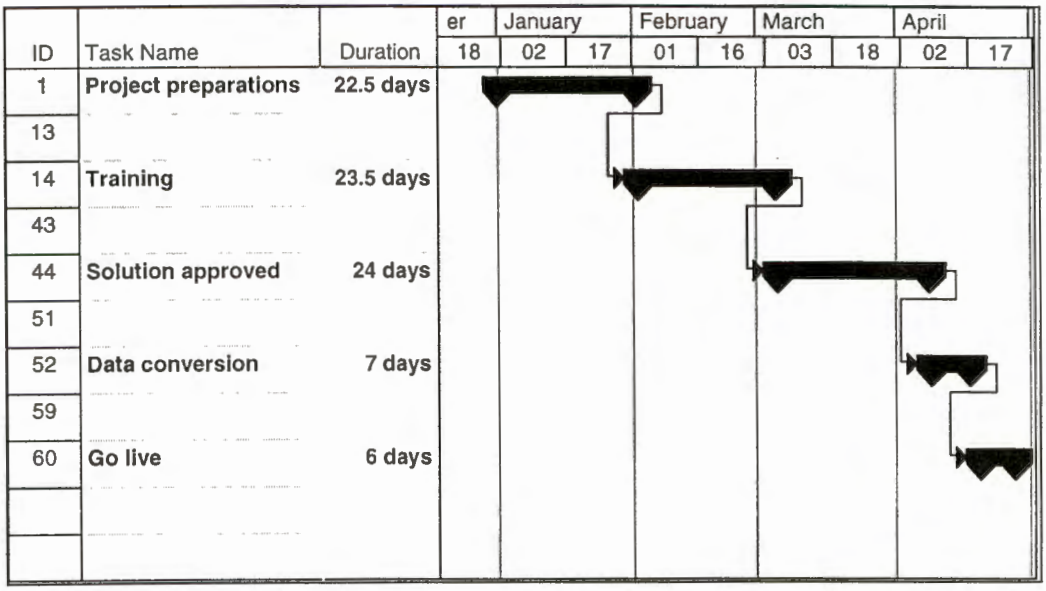
Summary values

Risk value – all groups	169			
Maximum risk value	657			
Reference	Group	Risk Value	Max. risk value	Risk
	Project size	51	167	30.5%
	Information technology experience	38	123	30.9%
0 - 25% = risk low	Technique	23	151	15.2%
26 – 50% = risk average	Project organisation	33	108	30.6%
51 – 100% = risk high	Operational conditions	24	108	22.2%
	Total	**169**	**657**	**25.7%**

The objective of the risk analysis was to indicate potential threats to the implementation. The areas covered, had indicated that adequate manpower resources were available for the duration of the project, and that there was sufficient time in which to complete the project. The analysis also indicated that operational conditions in the company were conducive to an implementation. Management was assessed to be fully involved with the project (4.07).

In view of the low risk anticipated, the model-based approach was deemed to be adequate for this implementation. A project plan for Sasol Fibres was then established, based on a template implementation provided in the machine building industry solution. This plan indicated the activities and duration of each individual activity. The plan is presented in figure 3.4, and indicates the summarised activities of the project plan.

Figure 3.4: Project plan



The project plan was prepared using Microsoft Project software. Only the highest level is indicated. Each activity consists of sub-activities, for example, project preparations consists of installing the software, conducting interviews, establishing system parameters and preparing training material and facilities (activity numbers 2 to 12).

The project commenced in Johannesburg with the selection of consultants. A total of three consultants were selected based on their experience in manufacturing, distribution and finance. After a brief overview of the project plan, the consultants were dispatched to Sasol Fibres in Durban, to commence with project preparation. A Johannesburg-based project director was also assigned to manage the project for BaaN. This consisted of monthly attendance at steering committee meetings, allocation of resources and feedback to BaaN management.

Steering committee

A steering committee (figure 3.5) was then established to oversee the implementation. The committee comprised of the managing director, who was the project sponsor, the finance manager, the production manager, and the sales/marketing manager. The information technology manager was appointed to the position of internal project manager, and was also included in the steering committee. The BaaN

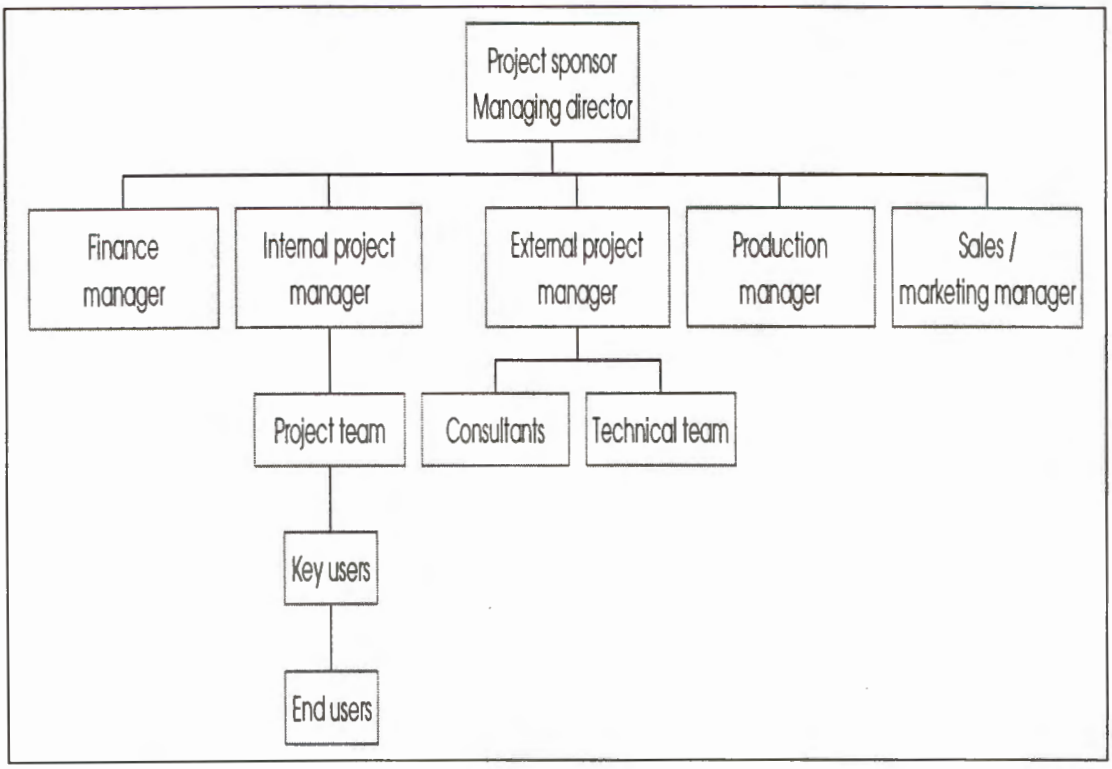
appointed project manager represented BaaN interests at steering committee meetings. A notable exclusion from the executive team, was the human resources manager. Management was of the opinion that this was a technical implementation, and therefore did not require any input from the human resources function.

The responsibilities of the Sasol Fibres steering committee in terms of the BaaN professional services agreement signed by the management were as follows:

- The steering committee has the prime responsibility for the project and the achievements of the project objectives in the Sasol Fibres organisation;
- Ensure that the correct environment in which the project objectives can be achieved;
- Resolve contentious business issues;
- Assign appropriate resources;
- Drive and manage culture changes;
- Approval of any additional spending and variation orders; and
- Promote commitment and buy-in by employees using the new system.

The above responsibilities placed the management of the implementation at the highest level in the organisation. Success or failure of the project depended on the action or inaction of this committee. The project organisational structure within the company is indicated in Figure 3.5.

Figure 3.5: Sasol Fibres steering committee



Source: BaaN Company (1999[e]).

Project team

A project team was also established comprising of future system users from each business function. The project team was co-ordinated by the information technology manager.

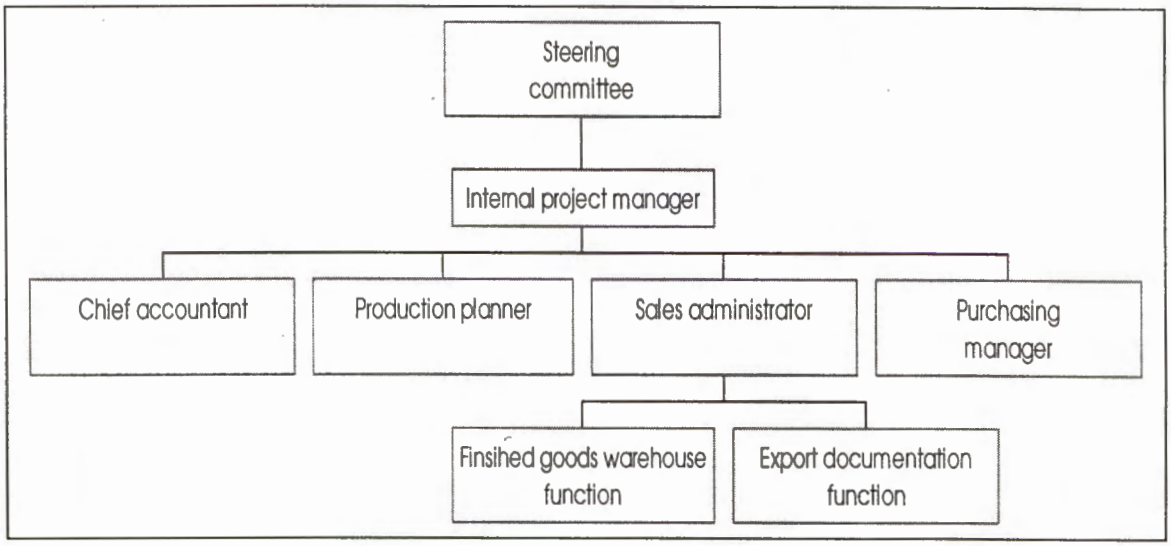
The responsibilities of the project team was to:

- Identify key business requirements;
- Provide in-depth knowledge of the business;
- Investigate and confirm reporting requirements;
- Monitor progress of the project in own area of responsibility; and
- Ensure that all areas of the project are integrated.

The senior management of the particular function selected the project team members. Selection was based on availability of resources. Sasol Fibres is a typical medium sized company, employing only the minimum required staff. As a result, no selection criteria could be used in the

selection of the project team. All available manpower was assigned to the project team, irrespective of their educational background or work experience.

Figure 3.6: Project team structure



Source: BaaN Company (1999e).

3.3.1.4 Applicability of the BaaN machine building industry (MBI) reference model to Sasol Fibres

The project began with an initial meeting in which the BaaN-on-board methodology was presented to the steering committee and project team. The objective was to familiarise all participants with the machine building industry reference model, the scope of the project, and the project plan.

The machine building industry (MBI) reference model is designed for medium sized companies that operate in a hybrid environment of assemble-to-order (ATO), make-to-order (MTO) and engineer-to-order (ETO) production typologies. Companies in this industry operate in a business to business market. These companies develop and manufacture a product customised to the specifications of the customers.

The following characteristics of the reference model were particular to Sasol Fibres:

- The customised end product is based on a known product concept;

- Document control is important, especially export requirements;
- The time to market of the end product can vary from several days to several weeks;
- The order acceptance process requires analysis of current department workloads;
- The development of the end product had a project driven approach;
- Cost control during product configuration and project control (actual versus estimated) are important;
- Flexibility to adapt the product to specific customer specifications;
- Product modularity (sub assemblies) processed to manufacture end products;
- Planning functions focussing on materials and capacities;
- Ad hoc make/buy decisions at tactical and operational level; and
- Integration of the development and production environment.

3.3.1.5 Business functions selected to be implemented

The above requirements determined which of the business functions were to be utilised in the development of the final solution. The industry solution in this particular case provided a high degree of suitability to the business processes of the company. The business functions selected were:

- **Sales** - The objective of the sales function is to negotiate, enter and control requests from customers. The result of the request can be a quotation, a sales contract or a sales order. In Sasol Fibres case, the complete customer request is configured within the sales order intake process.
- **Project management** – This business function controls all activities for a project or customer order. A complete sales order from the customer is managed as an individual project. This also enables reporting of all costs per customer order.

- **Product development** - The objective of this business function is to develop a product according to customer specifications. This business function also includes the maintenance of the standard bills of materials, which are used in the configuration process.

- **Detailed requirements planning** - This business function determines what items must be purchased or produced to meet the sales order accepted.

- **Purchasing** - The objective of this business function is the selection of suppliers for products and services, purchasing the products and services, and ensuring that the delivery of these items is on time.

- **Inventory management** - The objective of this business function is to manage the flow of goods. The flow of goods consists of receiving, storing, and issuing goods. This function also manages the replenishment of stock parts, the reliability of stock balances, and the analysis of inventory.

- **Production control** - The objective of this business function is the release and control of shop floor orders and operations for stock parts, sub-assemblies and the end product. In Sasol Fibres case, an interface needed to be developed to link this function with the existing process control software.

- **Delivery control** - The objective of this business function is to deliver the product to the customer. This function covers activities such as the co-ordination of delivery, associated paper work crating/packaging, and disassembly.

- **Repair and overhaul control -** The objective of this function is to prepare and execute the repair and overhaul of the plant.

- **Accounting** - The objective of this function is to manage all accounting activities, such as cash management, accounts payable, accounts receivable, and general ledger activities.

- **Management reporting** - The objective of this function is to allow senior management to review information on the progress and costs of projects, utilisation of work centres and finance data.

- **Common data** - This function manages dynamic data by area, facilitates periodic processing, and is used to set up basic master data.

- **Quality control** - The objective of this function is to analyse quality, calibrate test instruments, and define the quality plan.

- **System management** – The objective of this business function is to execute the following:

    - Batch job management;
    - Check, repair, and delete BaaN software;
    - Data set management;
    - Device management;
    - Physical data management;
    - Software management;
    - User management; and
    - User request management.

In addition to the above functionality, additional modifications were to be developed to interface with the existing process control and dispatch control systems, which were developed specifically for the plant. These modifications were not specified at the beginning, due to a lack of time and resources, but were included in the contract at a fixed price.

The following functionality was also agreed to be outside the scope of the project:

- Business planning;
- Product marketing;
- Human resource management; and
- Process manufacturing control of the base product (polymer).

3.3.1.5 The implementation – a summary

3.3.1.5.1 Training

The project commenced in January 1999, with eight weeks of continuous training for the project team, who were tasked to undertake the training of users in their respective departments. Most participants were included in all training, for example production planning personnel were included in financial integration and finance personnel in production.

Due to the relatively small size of the administrative staff, daily training was scheduled to complete earlier, to enable the project team to carry out normal duties. Often the execution of normal duties would

extend into late nights and weekends. In certain instances, training had to be re-rescheduled to accommodate month end peaks in workload and the sudden removal of project team members for ''urgent'' work as required by management.

The training courses were based on generic courses for each particular business function. The project team were tasked to provide company specific requirements, in order to set up system parameters. This proved to be a problem, as very little or no company procedures existed. The project team's ability to contribute meaningfully to the implementation was severely compromised due to their disparate educational backgrounds and levels of experience.

Clarification of roles to be performed also proved difficult, as no job descriptions or work procedures were ever formally documented. Responsibilities were broadly defined, and activities to be executed were scheduled and re-scheduled by the manager as required. This created confusion during the training, as some employees executed more than one role and some roles were not performed at all. The matter was referred to management to resolve, as it meant that the employees ended up being trained in more modules than anticipated, to cater for the roles not performed at all.

The training of individuals across the various functions provided a forum to discuss and understand the integration of functions. It became evident as the training progressed, that some record keeping was being duplicated, and that some information rigorously prepared was in fact not required at all.

The lack of specialised manufacturing education was identified during the training phase. A recommendation was made to embark on the South African Production and Inventory Control Society's basic education course, which covers all the basics of modern manufacturing control techniques. Management eventually accepted this, and training commenced five months later.

The reference model with detailed graphical representation of activities to be performed provided the necessary bridge between the theoretical training and practical application. The reference model approach proved invaluable, as project team members were able to use the pre-defined key business processes in formalising company specific procedures into operational manuals. These manuals assisted the subsequent training of end users by project team members.

3.3.1.5.2 The business solution

The mapping of the company specific business processes to the pre-defined process of the reference model followed the training phase. Although this task was completed relatively quickly, the execution proved to be a problem. As no standard bills of material were loaded on any system, these had to be compiled from an assortment of sources. Where no information was available, this was estimated, and added to finalise the task. Prior to implementing the BaaN system, costing was done globally across the entire product range. The total tonnage produced in a month was divided by total costs incurred. Moving to a dynamic system required that detailed costs be established for base data. This exercise took weeks to complete, as no agreements could be reached internally. A workable solution was eventually completed. However, it was recognised that the lack of education would prevent the proper use of the system. Users were trained how to follow routine procedures. The concepts would become familiar once the internal education program commenced.

3.3.1.5.3 Management involvement

The participation of the management team was confined to attendance at monthly steering committee meetings, and the occasional visit to some training sessions. Feedback to management by project team members was on an ad-hoc basis, as no formal departmental meetings were held to discuss the status of the project. It was quite clear that management viewed the implementation of systems to be the domain of the finance function, and that as users they only used the system. The finance department, to which the information technology function reports, traditionally undertook all data capturing, printing of reports and maintenance of existing data. Ownership of the business process in the new system was therefore not deemed to be the responsibility of the different departments. Consequently, the commitment was not forthcoming by the managers.

3.3.1.5.4 Customisations

The project was delayed on two occasions, the first due to the manpower availability problems and secondly, the lack of BaaN consulting support necessary to perform the customisations. The

manpower issue was a direct result of the factors mentioned above. The lack of skills for the customisation requirements is attributed to two reasons. Firstly, the growing demand for South African information technology skills overseas is rapidly depleting the available pool of experienced consultants. This made it difficult to implement a system with the same consultants who started the project. Secondly, the customisations required were of a very complex nature. The drafting of the specification alone took almost two weeks, due to the fact that a Johannesburg based third party supplier of process and instrument control software was also involved.

The customisations were eventually completed, by adding two additional technical consultants to the project. In addition to these resources, development work on the more complex issues were shared with a pharmaceutical company based in East London, who had similar requirements. Although the acquiring of additional resources more than doubled the costs of customisation, all the interface programs were completed and operational.

3.3.1.5.5 System testing

Adequate testing of the customisations however, was not possible, due to the non-availability of the project team. Month end procedures, and an unexpected upturn in business created a bottleneck for the already time pressured project team, who were executing daily functions in addition to the project work. Appeals to management for assistance yielded very little direct support. This lead to further decline in motivation within the project team, resulting in an abrupt end to working beyond normal working hours.

After a brief meeting between the steering committee and the project team, arranged by BaaN, to discuss the project status, a final date was set for the switch over to the new system. Additional temporary resources were made available to the project team, to relieve some of the pressure. Although testing began in earnest, this effort received a serious set back, when the master scheduler resigned a few days before the switch over date to take up a similar position at another company.

This experienced individual was responsible for establishing most of the company requirements in the system. The testing was therefore confined to isolated business functions, leaving out the integration of the total system, which was one of the benefits anticipated by the company. A suitable replacement for the master scheduler has not

been possible, due to a shortage of skilled planning personnel in the manufacturing sector of industry.

3.3.1.5.6 External problems

The external implementation team also suffered a similar fate in terms of manpower. A consultant allocated to the project resigned to take up a better offer with another supplier of enterprise resource planning systems. The project director also resigned to take up a much more lucrative position in England. From the two remaining consultants, only one was allocated on a full time basis. This resulted in the remaining consultant having to manage and implement the remaining activities of the project.

The infrequent availability of the project team due to the fulfilling of normal duties resulted in more BaaN support being required than was budgeted for. In addition, training had to be repeated in areas where the project team due to their lack of knowledge in systems knowledge was not familiar with the functionality of the system. Time was also spent in assisting with further investigations, where the management changed some of the decisions taken previously. This lead to exceeding of the fixed price for the implementation in excess of thirty percent. The additional training had to be billed as an extra requirement over and above the fixed price contract in place.

3.3.1.5.7 Project conclusion

Due to time constraints on the implementation, no further scheduled meetings were held. A decision was taken to eliminate functionality that was not considered essential, in order to go live with the basic system, before attempting to add the 'bells and whistles'. Instead a tacit agreement was reached with the management on the cost overrun.

During the transition between systems, various activities as planned did not occur, due to manpower and motivational problems. This was discussed directly with management, but to no avail. This situation continued until the next steering committee meeting, where the outstanding issues were raised and documented, and an option tabled by BaaN to stop the implementation, due to the unfavourable conditions being experienced. The stoppage would also enable consolidation of the implemented areas, and give management the

opportunity to rectify issues surrounding manpower allocation, and time to discuss policies and procedures internally.

The steering committee rejected the motion, and indicated that they were dissatisfied with the cost overrun on customisations and the lack of commitment by the project team. A decision was taken to complete the remaining portion of the project, which consisted of the planning functionality not implemented due to the master scheduler position not being filled. The planning manager, who was not directly involved with the project up to that stage, was tasked by management to learn the master scheduler's duties ''as soon as possible''. Basic training was therefore repeated to enable production to continue. The sophisticated planning features were held over until a replacement for the master scheduler was found.

The first phase of the implementation was finally completed almost three months later than planned. The functionality of the legacy systems was adequately replaced by the new system. All the customisations were operational, although scheduling functions had been implemented, sophisticated planning functionality could not be utilised, until a master scheduler had been recruited. The primary objective of implementing a year 2000 solution was achieved.

3.3.1.6 Issues arising from the implementation

The delays in implementing the solution at Sasol Fibres can be ascribed to many factors. It was apparent that the over optimistic view of the organisations capabilities led to a costly and protracted implementation, as these factors were contained in the project risk analysis document completed prior to the commencement of the project. The following issues represents the significant obstacles that prevented the project being completed on time and within budget:

- The prime motivating factor for selecting an enterprise resource planning system was based on achieving a solution to the year 2000 problem. Achieving competitive advantage was not a strategic consideration.

- Communication between the various levels of management was lacking. No formal process existed between management and employees at a departmental level to discuss work related issues. Consequently only exceptions were brought to management attention.

- The extent of the project team's involvement during the implementation was under estimated. Project team members were expected to perform normal duties outside the project.

- The implementation date was moved twice and the budget was overspent by approximately 30%.

- No detailed investigation of internal requirements was undertaken prior to selecting a new system, as it was anticipated that the functionality provided by the legacy system would be replicated in the new system.

- Company procedures were never documented, which required that a company specific solution had to be designed from input by the project team, which was made up of individuals from varying educational backgrounds and levels of experience. The result was that the decisions taken by the project team were, in some cases rejected by the senior management of the particular function. This meant that new solutions had to be investigated, which slowed the pace of the implementation.

- No formal job descriptions or work procedures were in existence. This caused confusion during the implementation of an integrated company wide solution. Although an attempt was made to introduce job descriptions, they were never completed, due to disagreements on individual responsibilities. The importance of clarifying duties did not appear to be important, as the expediting of this task was ignored.

- Inadequate preparation for the implementation especially issues surrounding human resources. Management reporting at the executive level did not recognise the importance of resolving people related issues.

- Inadequate measurement of the risk analysis, which lead to an over enthusiastic assessment of risk and subsequent project plan.

- Lack of continuity on the project by the consultants assigned to implement the system. The lack of sufficient specialised BaaN skills in South Africa at the time of this project is attributable directly to the huge requirement internationally to overcome the year 2000 problem.

- Inadequate assessment by BaaN of the level of customisation required for an effective solution. The complexity of the interface to other systems was underestimated.

- Inadequate project management. Even customer satisfaction has its limitations, and where necessary this needs to be appropriately enforced. This was especially relevant during the non-availability of the project team during training and final testing.

- In addition to normal duties, the information technology manager was appointed as the internal project manager. Since the database management functions were the responsibility of this individual, the transfer of static data to the new system was viewed as an information technology function. The result was that more time was spent on information exchange than on internal project management.

- Insufficient management commitment to the implementation project. No performance criteria were established for the project, hence no measurement of progress at executive level. The implementation of the project was viewed as a replacement to the old systems, and therefore did not warrant special attention. Consequently no specific project feedback was required at the executive level.

- The impact of people management on the implementation was grossly underestimated by the steering committee.

- The use of the model-based approach clearly facilitated a structured approach to business processes. Project team members were able to use the pre-defined key business processes in formalising company specific procedures into operational manuals.

- Management and users were unaccustomed to the higher level of discipline required in the use and maintenance of an integrated enterprise resource planning system.

3.3.2 Implementation at StonCor Africa

3.3.2.1 Introduction

StonCor Africa is the South African subsidiary of StonCor International based in the United States of America, which manufactures a range of industrial and decorative paints, thinners and bonding applications. The company has two manufacturing plants, one at the Midrand head office, and the other at Pinetown in Kwa Zulu Natal. The Pinetown division being a recent acquisition by the parent company in America. Sales offices and branches of both divisions were distributed

throughout Southern Africa, and products are exported to most African countries, as well as the islands off Africa.

3.3.2.2 Systems used

Information systems used at StonCor Africa prior to the implementation consisted of an off-the-shelf financial package, and a manufacturing control package developed by an independent software programmer. The manufacturing package was developed specifically for chemical and related industries that required software that would consider specific gravity when establishing a formula. The package was customised over a period of four years, to a point where the application was specific to StonCor Africa. The changes represented the company's way of managing the business.

At the commencement of the implementation the Pinetown facility had just completed a conversion process of its manufacturing system to a stand-alone version of StonCor Africa's manufacturing system. The responsibility for the maintenance of the application was left to individual departments within the division, such as purchasing, inventory and the technical function.

The applications were not integrated, and served specific purposes in either manufacturing or finance. Actual production costs per individual batch were thus never measured as a result. Figures were produced in separate systems and amalgamated manually to produce financial statements. Performance measurement and reporting was therefore not possible for individual functions. In addition, the two manufacturing plants operated separate versions of the same software, each customising the application even further to be plant specific. As a result, management reporting required for decision making was prepared by using word processors and spreadsheets.

3.3.2.3 New solution

The approach to the end of the millennium (July 1999) presented a dilemma to the organisation. While the manufacturing application could be upgraded to be year 2000 compliant, the financial package had to be abandoned, as the developer was no longer supporting the outdated version used. Quotations where sought from various suppliers of financial solutions, but no final decision was being reached.

3.3.2.4 Final decision

In the midst of the local investigation into an alternative financial application, the parent company decided to adopt the Baan enterprise resource planning solution for implementation at all its plants. The fine chemicals reference model was selected from a range of solutions proposed by the leading vendors of enterprise resource planning systems. The BaaN-on-board solution was regarded as having the best fit to StonCor operations and would facilitate global reporting. The solution consisted of a template implementation for the fine chemicals model, which had system parameters and business processes pre-defined. The solution was pre-installed together with the application, database and operating system. This approach enabled a faster implementation, which was of a major concern to the StonCor Group's global information technology strategy.

The parent company decided that the countries that required a year 2000 compliant solution would be the pilot sites for the BaaN implementation. It was therefore decided to implement the solution at the StonCor Middle East operation in Dubai, and at StonCor Africa in South Africa, before rolling out in Europe.

The choice to implement the BaaN solution solved the financial application dilemma for the South African operation. The manufacturing application, however, presented a problem, as the legacy system in use had been customised to be company specific. The impending year-end, together with a directive from the parent company forced the South African operation to start evaluating the BaaN solution. After a series of meetings both in South Africa and America, a contract was signed in South Africa for the purchase, installation and implementation of the BaaN solution in South Africa and the Middle East, by BaaN South Africa.

3.3.2.2 Project preparation

The project began August with visits to StonCor International and StonCor Middle East. The objective was to ensure that the solution was uniformly implemented. Various discussions were held with the group information technology division responsible for the global implementation.

Implementation activities began in South Africa, where the systems were configured. In view of the limited time available, and the decision by the parent company to use the BaaN solution, a risk analysis was not conducted. Instead, all efforts were directed at demonstrating the

process manufacturing capabilities in detail, as the financial modules were found to be more than adequate. Being a medium sized company, business processes were not documented at all, nor were job descriptions ever prepared, as it was felt that with limited resources, this was not possible. Consequently preparation for the implementation of a new system was confined to selecting a project team, under the leadership of the chief executive officer, and testing the functionality of the manufacturing process. No project objectives were formulated, other than implementing a year 2000 compliant solution as directed by the parent company.

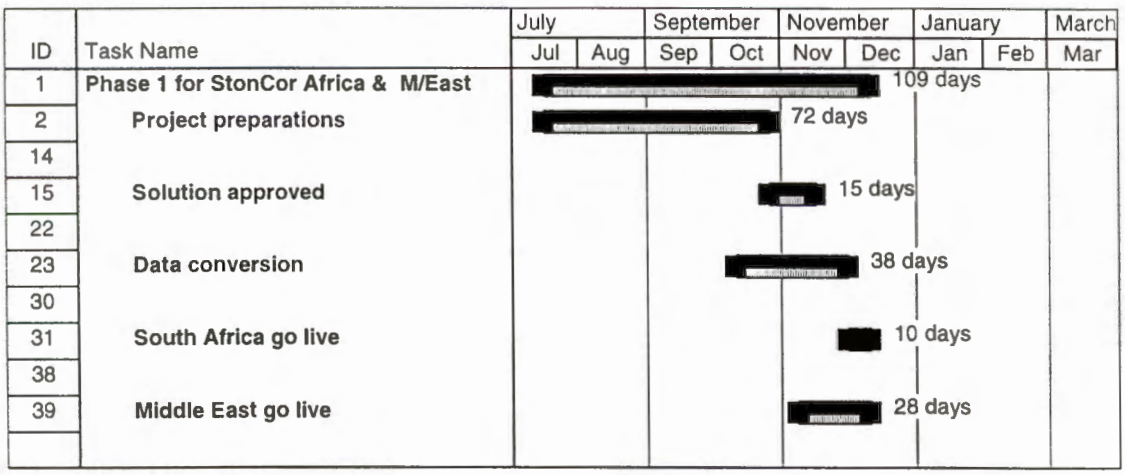
The testing of the manufacturing functionality revealed that the production documentation was not adequate and would have to be modified in accordance with the current system. The same applied to the formula management input screens, which were not "user friendly".

Due to the uncertainty as a result of these concerns, visits were undertaken to America and Dubai, by the StonCor Africa internal project manager and the BaaN project manager. The objective was to assess the requirements of other companies in the organisation, before customising the system. After a series of meetings, the decision was taken by StonCor Africa to customise the system, so that the legacy system functionality could be replicated.

3.3.2.2.1 Project plan

Based on the template contained in the fine chemicals reference model, a project plan was established. Figure 3.7 indicates the combined implementation.

Figure 3.7: StonCor Africa project plan



Source: BaaN Company. (1999).

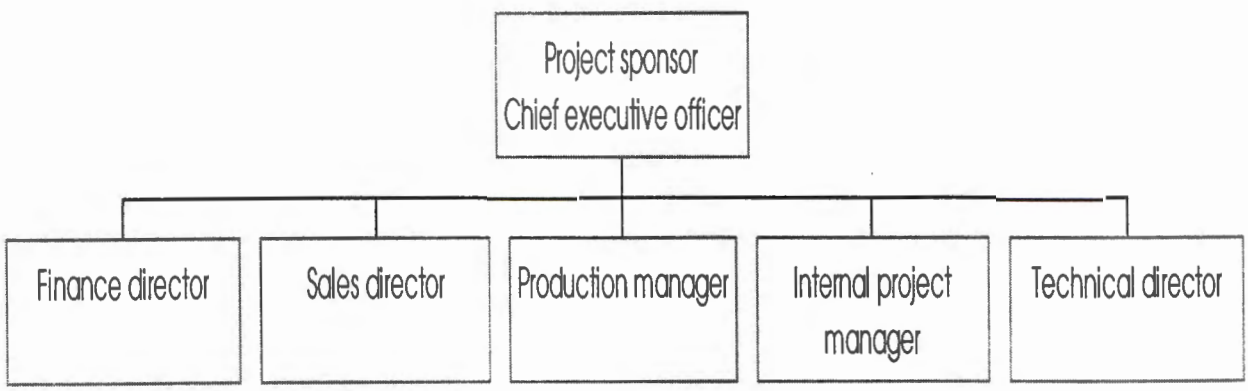
The project plan indicates consolidated activities, which indicated that the implementation would be completed before the end of December 1999.

3.3.2.2.2 Steering committee

A steering committee was established to take responsibility for the project and for the achievements of project objectives within the organisation. The committee consisted of the chief executive officer as the project sponsor, the financial director, technical director, sales director, and production manager. The information technology manager was assigned the role of internal project manager, and appointed to the steering committee.

The above responsibility placed the management of the implementation at the highest level in the organisation. Success or failure of the project depended on the action or inaction of this committee. The project organisational structure, represented by the steering committee is indicated in Figure 3.8:

Figure 3.8: Steering committee



Source: BaaN Company. (1999).

3.3.2.2.3 Project Team

No formal project team was established. A representative from each function was to "make time available" to assist in the implementation, under the co-ordination of the internal project manager. This also had

to be done in addition to normal duties, as no additional resources were to be engaged. The internal project manager would transfer company specific information from the legacy system. Business functions would therefore only be involved during the training stage.

3.3.2.3 Applicability of the BaaN fine chemicals reference model to StonCor Africa.

StonCor Africa has a primary bulk process and a secondary conversion and packing process. The primary process, batch manufacturing, is based on forecasts whilst the conversion and packing process will be done on receipt of the customer order. The following business characteristics of the fine chemicals reference model were particular to StonCor Africa:

Product and process definition

- Development of formulations, and the recording of their release to production.
- Functionality to establish the routing, specifying of the quality requirements and executing the testing of a product.
- Examining the financial consequences of the tests.

Purchasing

- Raw materials are purchased through negotiated contracts.
- Delivered quantities will vary from the quantity ordered.
- High degree of variability on quality of raw materials leads to variability in quality and quantity (yield) of finished products.
- Suppliers are paid on the quantity and quality of materials as determined by the manufacturer at the point of goods receipt.

Production Process

- The production process is semi-continuous or batch.
- Production to bulk stock is produced on a make to stock basis.
- Bulk stock materials are blended and/or packed to order.

- Actual production output varies from the planned quantity.
- To assure the quality of the produced end items, ingredients may be added during the processing.
- Reworking is common and takes place via a variety of routes.
- Effluent and waste management is a major factor.
- The materials being processed require special handling.
- StonCor Africa has relatively short lead times.

Production Planning

- Planning is done by process line.
- Planning is done against finite capacity.

Quality

- High material variability and process yield variability requires analytical and on-line quality control support work at various stages throughout the production process.
- Analysis is required on the raw material after receipt before it can be given an exact material classification.
- Tracking and tracing is very important in this business. Quality requirements require delivered goods to be traceable back through the production process.

Inventory management

- Storage capacity is product specific.
- Intermediate and finished products have limited shelf lives.
- Products change whilst in storage such as drying out, gaining moisture or degrading.

- Different products can be blended whilst in storage to create a different product.

- Lot control is obligatory.

Customers

- Products are supplied to customers in a variety of containers.

- Sales are often roughly negotiated supply contracts with customers placing call-off orders, as they require deliveries.

3.3.2.4 The implementation – a summary

3.3.2.4.1 Customisation

The project commenced with specification of changes required to documents, reports and input screens. The internal project manager undertook this task. The legacy system used served as the basis for the all the changes required. It was soon evident that StonCor Africa assumed that the new system would provide the same functionality, input screens, documents and reports as the legacy system. This was based on a belief that the same functionality as the legacy system would be available. StonCor Africa's interpretation of "functionality" was that all reports, field descriptions and screen layouts will be exactly the same.

A tacit agreement was reached between the chief executive officer and the initial BaaN project manager to modify the formula management functionality. A subsequent agreement was also reached on the creation of monthly reports as per the legacy system. This agreement was formalised into a schedule and attached to the professional services agreement, as part of the original contract.

The customisations required changes to source code, in order to provide the functionality and documentation required. No formal document could be prepared detailing the changes required, due to a lack of specialised internal skills to undertake such an activity. The internal project manager constantly referred to the legacy system and the technical director, while the BaaN technical consultant effected the necessary program changes. The customisations were eventually

completed at the end of November, but required constant amendments to ensure that it replicated the legacy system.

3.3.2.4.2 Training

Training could not commence until such time that the customisation was completed. This was necessary, as the item master, that is the basis of most input screens, was modified substantially to cater for company specific requirements.

Due the short implementation period, user manuals were prepared on company specific information. The training manuals contained pictures of screen layouts of each business process from the fine chemicals reference model, and field-by-field input instructions. In addition, full training was provided in accessing the help features built into the system.

The training sessions were structured around the flow of business at StonCor Africa. Training commenced with the customer services and warehouse functions, where training was completed within a week, enabling the users to begin utilising the system. The success of the training is as a result of the commitment by the managers and personnel involved in executing the sales and warehousing processes.

The purchasing and technical training was however not so successful. The training sessions were repeatedly extended to cope with user concerns raised about the complexity and the fact that the BaaN screen layouts were different to the legacy system. The resistance to change stemmed from a lack of familiarity with computer systems in general. The lack of modern manufacturing systems knowledge made it difficult to understand terms that was never encountered before.

The legacy system was modified to accommodate every requirement from each user, most of whom had learnt just enough to perform basic functions required in their roles. The reference model approach was based on pre-defined processes and screen layouts. This presented a problem to these users, who had become familiar to the legacy system over the past four years, and were unwilling to change. Due to insufficient progress during the training sessions, the matter was communicated to senior management. The solution proposed by management required that the internal manager spend more time assisting the users. This process was to extend over a period of five months, before any meaningful progress could be measured.

The production related training was delayed on a number of occasions, due the moving of the Pinetown plant. Due to this situation, temporary staff was engaged to execute production activities on behalf of the production manager. Training was provided to three individuals, all of whom resigned to take up permanent positions elsewhere. The additional training costs incurred convinced the management to accept a BaaN recommendation, made at the start of the project to engage a full time production planner.

3.3.2.4.3 Data conversion

The electronic transfer of data from the legacy systems to the new system was the responsibility of the internal project manager/information technology manager. However, before this data could be transferred, data had to be merged into one file. Data had been maintained in two separate systems that contained a few numbering conventions. An unsuccessful attempt was previously made to use a common numbering system for raw materials. As there was no integration of the two systems, the process was not verified. Furthermore, no procedures were put in place to ensure that each division that maintained data conformed to the agreed convention.

Transferring the merged data into the BaaN system therefore resulted in many errors. Firstly, the data, which was verified to be correct, was in fact incomplete and contained logical errors. The legacy system was amended over the years to be specific to the company, irrespective of modern manufacturing techniques. This was due to a lack of manufacturing and adequate system maintenance skills in the organisation. Being a medium sized company the information technology department consisted of a manager and a part-time system administrator, who supported in excess of thirty (30) system users. This left little or no time to develop the necessary skills or train users in the use of personal computers. Consequently this factor delayed the project substantially.

The correction of errors resulted in additional BaaN technical resources assigned to assist in the correction process, in order to meet the implementation target date. Technical resources to correct company specific data however, were not available, due to a management decision to transfer the manufacturing plant from Pinetown to Midrand in the midst of the implementation. Some of the Pinetown based technical personnel were retrenched as a result of the move, leaving the quality of this division's data in a state of disarray. Due to a lack of adequate planning and resources, the task of correcting the data was left in an indeterminate state.

The situation was brought to the attention of senior management in meetings and project updates, but management could arrive at no solution. Management resolved to leave the matter to be addressed by the already over burdened internal project manager.

3.3.2.4.4 Data input

The conclusion of the training and data conversion was followed by real time activities at the beginning of December. The first transactions to be processed consisted of all inventory, raw materials, intermediate, and finished products. This was followed by sales of the products brought into the system.

The first few sales transactions that were processed revealed that the inventory levels were incorrect, and in some cases no information could be found on certain products. It was then established that the legacy system in use had facilities to amend, delete and create data as required. Products could be sold that were never manufactured or in stock in the warehouse. The use of "island" solutions had facilitated an environment where information could exist without any references to other functions.

The above findings were communicated to management, who once again undertook to address the matter. On this occasion, several employees and managers were severely reprimanded, and ordered to correct the inventory levels. Although a process was immediately undertaken to correct the situation, resignations of sales and warehousing personnel prevented the task from being completed during the implementation.

3.3.2.4.5 Management involvement

The StonCor Africa's management team's involvement in the project was limited to ensuring that the functionality available in the legacy system was replicated. New added functionality was not explored for competitive advantage, as this was not a primary concern. Attention was focussed on the format rather than the content of information. The result being that the benefits envisaged by the implementation of an enterprise resource planning system were limited to replacing the legacy system.

3.3.2.4.6 Project conclusion

The project achieved a switch over to the new system as per project plan. However the effective use of the system was not possible, as the quality of data electronically transferred and manually entered was incorrect and inconsistent.

The non-availability of permanent staff during the December/January period resulted in the engaging of temporary staff. This more than doubled the training costs, as the permanent staff had to be re-trained. Management had approved the leave of most employees without considering the impact of the implementation. To complicate matters, the financial manager resigned just before the switch-over date. This left the financial function without adequate supervision, resulting in a month-end bottleneck as data quality deteriorated.

The first phase of the implementation was finally completed almost six weeks later than planned. Training and support of users in the execution of daily functions became necessary, as the slow process of building competence continues. The functionality of the legacy systems was adequately replaced by the new system, together with new features that ensured data integrity. The primary objective of implementing a year 2000 solution was achieved, but under great duress.

3.3.2.5 Issues arising from the implementation

The implementation objectives were not fulfilled, as a basic understanding of the deliverables was not clearly understood by StonCor. In addition, the organisation was ill prepared for a cross functional implementation. A detailed risk analysis prior to the commencement of the project would have indicated that preparedness of the organisation for a major change was lacking. The following factors represent the significant obstacles that prevented a smooth implementation:

- The prime motivating factors for selecting an enterprise resource planning system was, achieving a solution to the year 2000 problem and satisfying a directive issued by the parent company.

- Proper assessment of internal requirements was not undertaken prior to implementation. StonCor incorrectly assumed that the functionality inherent in its legacy system would be catered for in the new system.

- Company specific procedures were not documented.

- Formal job descriptions were non-existent.

- No detailed investigation of internal requirements was undertaken prior to selecting a new system, as it was anticipated that the functionality provided by the legacy system would be replicated in the new system.

- No risk analysis was undertaken, due to the decision taken by the parent company to use the system. A risk analysis would have indicated the organisation was not ready for such a drastic change without adequate change management initiatives.

- Unspecified customisations led to an over enthusiastic project plan.

- The decision to customise the system spawned a range of problems, ranging from lengthening field sizes and descriptions to altering the system logic to accommodate company specific requirements. These changes would have to be repeated when upgrading to a newer version of the software.

- Inadequate management of human resources. The project was plagued with resignations at regular intervals.

  The internal project manager was tasked to test the new system, merge information from two systems, transfer the data into the new system and manage the project. Management viewed this as the only option available, as no other individuals had any skills to render any form of useful assistance.

  A system administrator engaged to assist the internal project manager resigned within a month, to take up another position elsewhere.

  The resignation of the existing warehouse manager due to dissatisfaction with management, led to the appointment of a new warehouse manager. This manager also resigned within a month, citing unhappy working conditions.

  At the commencement of the implementation, the financial manager resigned. His resignation followed a spate of resignations from previous financial managers. The senior accountant was then promoted to financial manager, only to resign towards the end of the implementation.

Without going into an analysis of each resignation, it was evident that a problem existed in the recruitment and retention of employees at StonCor Africa.

- Insufficient management commitment to the implementation project. No performance criteria was established for the project, hence no measurement of progress at executive level. The implementation of the project was viewed as a replacement to the old systems, and therefore did not warrant special attention. Consequently no specific feedback was required at the executive level.

3.4 Summary

The two implementations cannot be considered successful, as in both cases, although the solutions that were developed eventually fulfilled the requirements, both the implementations exceeded budgeted costs and the time frames set.

The implementation issues that arose indicated that the reasons attributed to the situation were common. Both implementations were undertaken to overcome the year 2000 problem. The companies had therefore not prepared adequately, nor were there documented business procedures in place, slowing down implementations that were subject to fixed deadlines. The lack of job descriptions further complicated the role of employees, as they struggled to adapt to a cross functional system, that focussed on processes, rather than functional responsibilities.

The poor risk analysis in the case of Sasol Fibres, and the omission of a risk analysis prior to StonCor implementation contributed to a situation where the project scope and deadlines became impossible to achieve.

The adoption of a model based implementation in both cases did however facilitate a structured approach to defining business processes, and provided an effective tool to rapidly adapt the solution to changing business conditions.

The lack of basic management control highlighted the state of management capabilities in both companies. This also created a situation where the lack of education and training at lower levels contributed to an "average" functioning of the companies. The implementation of an integrated system therefore complicated the projects, resulting in the above situations.

Chapter 4: INTERPRETATION, RECOMMENDATIONS AND CONCLUSIONS

4.1. Interpretation

4.1.1 Reasons for implementation failure

The study revealed that in cases where the implementation was not successful, this was due to the following reasons:

4.1.1.1 Strategic alignment

The companies in the two case studies, as well the respondents in the case study have implemented reference model based industry solutions because of the year 2000 problem. In an attempt to replace legacy systems, enterprise resource planning systems were selected to replace existing systems with the same functionality.

The reasons for choosing such systems clearly indicate that information systems are still seen as necessary ''evils''. Their use is not incorporated into the overall strategy of the company as an opportunity for competitive advantage. This is evident, taking into account the commitment of management, through the lack of performance measurements to ensure that a competitive advantage is attained. If the year 2000 problem did not exist, these companies would have retained their existing systems. The lack of management commitment is therefore ascribed to the poor alignment of information technology with the strategic objectives of the business.

4.1.1.2 Internal communication

Communication tended to be very informal, and in some cases non-existent, as there appeared to be a distinct lack of interaction between the levels of management. Some of the issues arising from the implementation could have been addressed much earlier, if only clear communication paths existed.

Preparation for an implementation of an enterprise resource planning system requires that the organisation have the basics in place, such as a communicated (to employees) business strategy, company specific procedures and job descriptions. If not documented, it is important that employees have the knowledge of the company's business processes, key performance areas and key business objectives. Embarking on a complex implementation only complicates matters, resulting in a

difficult and drawn out implementation, as decisions are repeatedly changed due to a lack of consensus.

The selection of personnel to steering committee's and project teams cannot be decided on availability alone. For a quality solution to be designed, it is imperative that the company seconds its best resources. Utilising the best contributors will ensure a more focussed solution that will position the business for growth, as opposed to retaining the status quo.

While it is acknowledged that medium sized companies have limited financial resources, it is therefore critical that the resources allocated to the implementation are provided with temporary assistance. Being responsible for normal duties and the implementation cannot be sustained productively.

In implementations where customisations are absolutely necessary, it is vital that these be identified prior to the project plan being established, and adequately documented. Unspecified customisations with a fixed duration at the start of a project only serve to expose the project to risk.

Effective project management is the vital link in the implementation chain. Implementing change associated with a new system requires that the company change from a current state, to a new improved state. This usually involves major changes, depending how rigid the company is.

A project plan is a guideline for the implementation, which must be re-negotiated if circumstances warrant it. The sales personnel usually sell software and implementation services together. At the time they may not have all the details regarding the specifics. A project should be stopped as soon as it becomes apparent that the information on which the sale was concluded has changed drastically, for example, the availability of project team members for training and testing. The stoppage enables both parties to review the conditions under which the original agreement was reached. A decision to continue or abandon the implementation is therefore clearly understood by all.

Management commitment is of paramount importance to an implementation. Implementing information systems is no different to any other project in the company, and should accordingly receive the same level of priority. In successful implementations discussed in this study, it evident that the input of the management had a significant effect in achieving a positive end result.

Aside from being committed to a project, management has to display leadership qualities. The ''knowledge worker'' of today cannot be

''managed'' as in the past. Unfortunately in South Africa, most managers attained their positions without the necessary training and education. As indicated in the study (paragraph 2. 1.3.1), the South African management style is still task oriented. Extensive training will follow the purchase of new expensive equipment for the operator, but little or no training for a newly appointed manager.

Most of the issues that have arisen in failed implementations are people issues. Ineffective management eventually leads to dissatisfaction, poor productivity, resignations and eventually in unchecked loss of customers. Modern information systems may need less people to achieve the same level of productivity, but the few people that are required, have to be well equipped to undertake the challenging task of using information systems for a competitive advantage. As more companies implement information systems that provide similar levels of functionality, the only differentiating factor will be the people operating those systems.

4.1.2 The applicability of model based solutions in medium sized South African companies

The role of enterprise resource planning model based solutions in medium sized companies is ideally suited to South African companies. On its own it does not guarantee a successful implementation. The study revealed that in implementations where factors such as the lack of effective people management, poor executive commitment and unclear communication exist, these can negate the advantages offered by a model based solution.

The use of the model based approach is particularly useful to medium sized companies, who require a quick and cost-effective solution. In most cases these companies had no formalised procedures in place, and implementing model based industry solutions enabled the companies to formalise procedures and operating practices.

In most implementations, there was a high degree of fit between the software and the company's business processes. This enabled the companies to rapidly install systems that would otherwise be out of reach, as the costs of a full implementation would not be feasible. Operating procedures between companies in the same industry cannot be so unique that each function requires massive customisation. Generic solutions therefore enable companies to install systems cost-effectively, so that they can concentrate on the core reason why the business exists.

4.2 Recommendations

4.2.1 A framework for implementation

The implementation of enterprise resource planning model based solutions for medium sized South African companies are essential in achieving a solution to integrated information requirements. Although the issues facing reference model based solutions are no different to a ''normal'' implementation, a proper approach can yield the benefits that these systems promise. The following framework is particularly useful in the South African context.

4.2.1.1 Management commitment

Before embarking on an enterprise resource planning implementation, the need to change systems must exist. This should be supported by the organisational hierarchy, both in word and deed. Lack of executive support has crushed many implementations. Management must be aware of what an implementation entails. It is not merely a case of substituting information systems. It affects the very core of the organisation, with many established practices being questioned. Management must take cognisance of the change process that the company will be exposed to.

4.2.1.2 Solution selection

In selecting a system, it is important that the solution be able to provide functionality that matches the company's business processes as close as possible. This reduces the amount of consulting required, and enables a faster and more cost-effective implementation. Implementation costs outrank software costs by up to 200%.

The use of model based solutions provide an opportunity to use the "best practices" of companies in a similar environment. This approach is particularly useful to companies where no formalised procedures exist.

The vendor should also be an established player in the enterprise resource planning solutions arena. As technical differences between applications are gradually being eradicated, as newer releases come to the market.

The solution finally selected should also be modular, so as to facilitate a phased implementation as required. It is far easier to manage phases that are executable, than attempting to implement everything in one ''big bang'' approach.

4.2.1.3 Implementation partner

The partner selected must have a proven track record of similar installations and implementations. In addition to technical skills relating to the software solution, the implementation partner should also be able to align business practices with the software solution. Due to the nature of skills required to fulfil such a function, it is often difficult to assess capabilities of the personnel involved. It is therefore important that the consultants to be assigned are interviewed, so as to determine the skill level to be deployed in implementing the solution.

4.2.1.4 Education and training

No implementation should be undertaken without an assessment of the skills available. Enterprise resource planning solutions require skilled personnel to operate the system. As all vendors attempt to provide similar functionality, the differentiating factor will be the people that use the system. This is possible by continuous training and education of employees.

4.2.1.5 Return on investment

The return on investment must be justified. Most companies fail to make this important justification, spending huge amounts without measuring the benefits.

4.2.1.6 Risk analysis and project plan

A risk analysis, as indicated in Table 3.1 should be conducted, to determine factors that are likely to be detrimental to the implementation. Factors such as, human resources, knowledge of current business processes and the educational levels of key users should be assessed at the outset.

A realistic project plan can only result after the risk analysis. This should be rigidly enforced during the implementation, with changes only approved by the senior management. This also allows for the re-evaluation of the original objectives as each phase is concluded.

4.2.1.7 Customisations

Customisations should be kept to a bare minimum. Where absolutely necessary, these should be documented in detail, before the implementation begins. Additional features identified during the implementation should be investigated, and where absolutely necessary this should be approved by management after a rigorous process. Feature "creep" can paralyse an implementation.

4.2.1.8 Project management

Project management (both internal and external) should have the necessary authority and responsibility to manage the project. Poor project management has been identified as a major contributor to failed implementations.

4.2.1.9 Solution testing

The final solution to be implemented should be tested and demonstrated to management for approval. This aligns all participants with the solution, so that all training is focussed on delivering the solution.

4.2.2 Manufacturing planning education

From the few model-based implementations undertaken locally, knowledge of manufacturing education is found to be lacking in most companies. In particular, planning concepts seem to be almost unheard of. The reason could be ascribed to the fact that most planning personnel did not intend to become planners. They gradually gravitated to the function as a result of circumstances.

The use of enterprise resource planning systems is severely compromised if these features are not utilised. A recommendation is

therefore made that this area be investigated further. Without the effective use of the planning features, enterprise resource planning systems could be in danger of becoming expensive word processors.

4.3 Conclusions

The study indicated three major highlights:

4.3.1 Failure to align information technology with the strategic objectives of the company.

Most implementations were the result of addressing the year 2000 problem. It appears that medium sized South African companies have still not recognised that information technology can be used as a competitive advantage. The continually changing and increasingly competitive business environment forces companies to find innovative ways to retain and grow their customer base.

The lack of alignment of information technology with the strategic objectives of the organisation will have a greater impact in the future, as the internet becomes the transaction medium by which businesses communicate with each other. While it is the internet that that the customer interfaces with, it is enterprise resource planning systems that will provide back-end support to convert the customer requirements into actual deliverables

4.3.2 People management

Although model based implementations assist in fast implementations of proven industry specific business processes, trained individuals are required to extract the benefit for the organisation. This cannot be achieved if the right personnel are not selected, trained and managed correctly.

The availability of skilled human resources, both in the manufacturing and information technology fields is hampering the progress of implementations. Companies are reluctant to embark on education courses, either because of the costs associated or from a fear that staff will be poached. These fears are not unfounded, as indicated in the study, but this creates a vicious circle, in which there is no winner.

4.3.3 Management skills

Finally, this study revealed the fact that the management skills in medium sized companies need to be upgraded, if they are to remain competitive. Performance management is a widely understood concept that is rarely implemented successfully.

The anticipated benefits will remain elusive, until such time that medium sized companies realise the human potential that is required to fully utilise the system, at the management and the employee level.

Enterprise resource planning systems can be of great benefit to management, if implemented and used correctly. It provides the means to measure and control the business objectives that ensure competitiveness.

This fact also holds the threat that if the company is not willing to change its business practices in line with the changing business environment, it must be aware of the pitfalls of purchasing, implementing and using enterprise resource planning systems.

4.4 Summary

The main objective of this study was to identify common causes of implementation failure of BaaN model based implementations. From the conclusions drawn above, it is evident that these implementations would have had a far greater possibility of success if basic management practices were followed. The tools available in enterprise systems will be of little use if a company does not spend time in reviewing its business strategy (Minahan, 1998).

The study also raises an awareness of the lack of skills, both at the management and operational levels in medium sized companies. While the cost of education and training is perceived to be a constraint, the cost of not addressing this important shortcoming should change these perceptions. The rapid advances in enabling businesses to trade in digital market places of the future will render these organisations ineffective, as the successful use of the internet is dependant on good quality enterprise resource planning systems being able to process the information generated electronically on the internet.

The complementary objective of developing a generic framework for a model based implementation will go some way towards assisting

medium sized organisations in the implementation of information systems. While it is apparent that the rapid advances in technology will pose new challenges to management in the future, the generic framework as proposed should continue to provide a yardstick against which future implementations can be measured.

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This study fulfils part of the requirements for a Master of Business Administration (MBA) degree at the Potchefstroom University for Christian Higher Education. This research is conducted under the co-ordination of Dr. Louis Fourie. Queries relating to the questionnaire, the study or topic may be directed to the undersigned.

Thank you for the time and effort taken to complete this questionnaire.

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"Annexure A"

Questionnaire

A. General information

Please place an ' X ' where applicable. This questionnaire can be sent by fax, or preferably, by email.

1.

Name of Participant : Position :	
Name of Company :	e-mail address:
Phone No. :	

Would you be interested in receiving a summary of the findings?
(This will be forwarded by email)

Yes ☐
No ☐

2. Number of employees in the company?

0-50	50 - 100	100 – 150	150 – 200	200 +

3. Nature of business?

Manufacturing – process	☐
Manufacture – discrete	☐
Distribution	☐
Engineering	☐
Other	☐

B. System selection

1. Review frequency of information technology requirements?

6 months	☐
12 months	☐
24 months +	☐
Not a distinct part of company strategy	☐

2.0 Reasons for deciding on the implementation of an enterprise resource planning system?

Year 2000 compliant replacement of legacy system	
Need to integrate the various systems	
Requirements of parent company	

3.0 Request for quotation (RFQ) issued

Yes	
No	

3.1 If yes to 3.0 please indicate persons involved in specifying details in RFQ

Executive team	
External consultants / executive team	
Finance department	
Information technology department	

3.2 Duration of RFQ preparation and approval process

0 - 4 weeks	4 – 8 weeks	8 – 12 weeks	12 weeks +

4.0 Number of ERP vendors approached?

One	
Two	
Three	
Four	
Five +	

5.0 Percentage estimate fit of the model based enterprise resource planning solution **prior** to the implementation?

Less than 75 %	
75 – 85%	
85 – 90%	
90% +	

6.0 Customisation/Modifications identified as part of project scope?

Yes	
No	

6.1 Detailed specification of Customisation/modifications available?

Yes ☐
No ☐
To be have been specified during the implementation ☐

7.0 Reason for selecting the enterprise resource planning solution?

Only option available ☐
Quality of solution (best fit) ☐
Vendor reputation ☐
Price ☐
Implementation support ☐

C. Pre-implementation activities

5.1 Company procedures reviewed?

Yes ☐
No ☐

5.2 Job descriptions reviewed?

Yes ☐
No ☐

5.3 Change management activities undertaken?

Yes ☐
No ☐

5.4 Specific education undertaken?

Yes ☐
No ☐

5.5 Business process re-engineering exercise undertaken?

Yes ☐
No ☐

D. Implementation

1.0 Please rank the following factors,

1 – very poor
2 - poor
3 – not good, but also not poor
4 - good
5 – very good

Factors	1	2	3	4	5
Commitment of users to the new system					
Commitment of management to the new system					
Commitment of project team to the new system					
Quality of Implementation services provided					
Quality of training provided					
Educational skills of users to support implemented solution					
Level of user competence after training / implementation					

2.0 Project completion - duration

Within quoted duration	☐
Within extended duration as agreed	☐
Exceeded	☐

3.0 Project scope – post implementation

No variation	☐
Variation – additional functionality required	☐
Variation – original solution proposed insufficient	☐
	☐

4.0 Percentage fit of the model based enterprise resource planning solution **after** the implementation?

Less than 75 %	☐
75 – 85%	☐
85 – 90%	☐
90% +	☐

5.0 Customisation/modifications and/or interfaces built to other systems, because original intended solution was inadequate?

Yes	☐
No	☐

6.0 Project budget

Project completed within budget	☐
Exceeded by 20 - 30%	☐
Exceeded by 30 – 50%	☐
Exceeded by 50% +	☐

7.0 Extent to which business process were changed during the implementation

No change at all	☐
Minor changes	☐
Changes forced by system with no benefits	☐
Major changes resulting in savings (time and money	☐

E. General

Reference model based ERP systems; i.e. 'best practice' industry solutions for specific industries are being implemented throughout the world. Two vendors, SAP and BaaN, are currently the only major ERP developers, who have products in this segment. The objective is not to compare product functionality, but rather to focus on the implementation factors surrounding these 'best practice' generic solutions. It is anticipated that this study contributes to the tertiary knowledge base on this growing topic.

Please add any comments that will enable the student/practitioner of ERP systems implementation to gain a further insight into the 'real' world.

Comments :

Thank you for the time and effort taken to complete this questionnaire.

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