THE NEED FOR A MANUFACTURING RESOURCE PLANNING SYSTEM WITHIN A MANUFACTURING COMPANY: A CASE STUDY.

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Abstract

The title of this study is: 'The need for a Manufacturing Resource Planning System within a manufacturing company: A case study.

The findings revealed that the current lack of an effective MRP system is hampering the profitability of Euro-Plastifoam. The research has shown that communication, inventory control and the management of material resources is a matter of concern and that material resource planning plays an interlinking role in assuring that production activities are performed effectively. The current ineffective communication and lack of up to date information makes it difficult for management to plan ahead. It is believed that there exists a need for a more effective MRP system.

The need for an effective and up-to-date MRP system is evident. It will improve the flow of communication; the effective use of resources; increase productivity and enhance financial control. The implementation of such a system will only be successful if management can harness the buy-in from all employees.

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CHAPTER 1: ORIENTATION

1.1 Introduction

Competitive pressures are forcing manufacturing companies to continuously seek new ways to manage their production capabilities more effectively in order to meet the demands of the market. Chase, Jacobs and Aquilano (2004:55) rightfully noted that designing new products and getting them to the market quickly is the challenge facing manufacturers in all diverse industries. Part of management's drive in an organisation is to ensure future sustainability. This involves the introduction and ongoing investment into advanced information systems that can assist management across core production functions. This includes inventory control, order management, production scheduling and financial management and the cross-linking thereof. One such system that supports these activities is manufacturing resource planning or MRP.

1.2 Problem statement

Euro-Plastifoam (EPF) is located in Rosslyn, Pretoria with a workforce of approximately 140 workers. It focuses on the manufacturing and supplying of moulded polyurethane as well as plastic injection components to various industries. New product design at EPF is the transformation of market ideas and concepts into products that satisfies customer needs.

As part of the employed Total Quality Management system, new product and process design system called Advanced Product Quality Planning (APQP) is followed. This facilitates the design and implementation process, ensures that the new products are successfully developed and implemented within critical time frames and budget constraints.

The above processes encapsulate the view of Chase *et al.* (2004:57), which stated that new product development entails a complex set of activities that cut across most functions in a business.

Due to integrated processes at EPF, cross functional teamwork and continuous communication of accurate information is crucial to achieve required results in limit timeframes. It is believed that the implementation of a MRP system can greatly enhance the provision of critical information and support activities along the planning, development and production line of EPF.

1.3 Research objectives

The primary research objective is to establish the need for a Manufacturing Resource Planning (MRP) system within Euro-Plastifoam.

More specifically the study had the following objectives, namely:

- To determine the current state of operations management within Euro-Plastifoam including communication and sharing of information, coordination of work efforts, the use of resources, and collaboration of work force including management
- Identify challenges faced and information gaps in the operations management system across the information value chain
- To determine the key success factors for the implementation of a MRP system within Euro-Plastifoam.

1.4 Research methodology

A case-study approach was followed, with Euro-Plastifoam as the case study organisation. Quantitative data was collected through a self-completion, semi-structured questionnaire that was developed and distributed amongst the 27 top, middle and line managers within the

organisation. All 27 questionnaires were completed. Chapter 3 elaborates on the methodology.

1.5 Importance of the study

It is believed that Euro-Plastifoam faces various challenges and information needs, similar to other medium sized manufacturing organisations in the industry. By using EPF as case study organisation to document the information challenges, it can greatly help practitioners in the field to plan and act effectively in similar scenarios.

1.6 Definitions

OEM: Original Equipment Manufacturer. OEM's are manufacturers who resell another company's product under their own name and branding. It refers specifically to the act of a company re-branding a product to its own name and offering its own warranty, support and licensing of the product.

APQP: Advanced Product Quality Planning is a quality framework used for developing new products. It is a structured process for defining key characteristics important for compliance with regulatory requirements and achieving customer satisfaction.

1.7 Outline of the research report

The report is divided into four chapters. Chapter 1 served as an orientation to the problem statement, research question and research objectives. Chapter 2 provides a literature study. In chapter 3 the research methodology that was followed are discussed. Chapter 4 presents the results and provides a discussion of the main findings. The findings are also linked to the literature and from these, conclusions are made and recommendations are presented.

CHAPTER 2: LITERATURE STUDY

2.1 Introduction

For any size organisation, change will be a constant in this world. Technological advances, including non-technical ones, are developed quicker than ever before, thereby affecting all aspects of a typical company. It is believed that in these fast-changing times, decision makers are utilising a wide range of information and planning systems to improve their decisions and increase production. Resource planning systems are capable of leveraging a company's assets to optimise their value and provide a good return on investment. These systems and the effective utilisation thereof give decision makers the ability to keep their fingers on the pulse of their organisations. Computer-assisted manufacturing, flexible manufacturing systems, and demand flow technology provide manufacturers with the means to respond quickly and efficiently to changing market conditions (Chase *et al.,* 2004:583).

This chapter focuses on the available literature and the application thereof. It also explores the value of operations management and its role in an organisation. The need for information and planning systems will also be evaluated.

2.2 Operations and operations management

2.2.1 The operations of an organisation

Summers (1998:1) note that the "operations" of an organisation are all of the activities directly related to accomplishing the main purpose of the organisation, whether it be producing some product or providing some service. In either case the operations system will provide the conversion of certain inputs, such as materials and labour, into certain outputs, either products or services. Thus, the operations function can

be distinguished from the other functional areas of an organisation, such as marketing, finance, personnel, and accounting, which are less directly related to the organisation's day-to-day pursuit of its main business. Summers (1998:1) also points out that all main functional areas of an organisation are intricately entwined; all interact with and provide support for the others, and the boundaries are not always clear between them.

Manufacturing organisations deal with many different changes in, or coming from, their environment. Ruffini, Boer and Riemsdijk (2000:861) provide various examples to illustrate this point namely:

- the development of new methods for and approaches to product design;
- ever-tougher market demands in terms of quality and speed; and,
- the development of new technologies such as factory automation, new manufacturing and assembly techniques, information and communication technology, computer aided design and manufacturing such as CAD/CAM and enterprise resources planning (ERP) systems.

These mentioned aspects fall to a large extent under the umbrella of operations management. Operations management plays an important role in successful product and service creation, and can be characterised as the function responsible for:

- making and implementing decisions about the design of a company's operational, operations management and maintenance processes, the technologies which incorporates people and resources needed to perform these processes, and the organisational arrangements, notably structure and culture, dividing and coordinating the processes;
- ensuring that these decisions align properly and that they are examined in the light of their contribution to the manufacturing

tasks. In other words providing the capacities and capabilities that are needed for the company to qualify for, and to win orders in;

- managing this, what ought to be an ongoing process of planning and design, implementing, monitoring, learning, (re-)planning and (re-)designing. (Ruffini *et al.*, 2000:863)

The characteristics tie in with the fundamental functions of management (Cronje, Du Toit, Marais and Motlala, 2003:127). These activities include planning, organising, leading and control. Management bear the responsibility for ensuring that the organisation operates to meet its objectives, taking into account the various participants, regulatory authorities and laws. Management activities include setting objectives, controlling work, reviewing results, applying corrective action and providing an environment that stimulates and motivates. These activities form the backbone of the management tasks in an organisation.

Operations management focuses on carefully managing the processes to produce and distribute products and services. Related activities include managing purchases, inventory control, productivity, quality control, storage, logistics and evaluations. A great deal of focus is on efficiency and effectiveness of processes. Therefore, operations management often includes substantial measurement and analysis of internal processes. The main challenge of operations management is thus to use both technical and behavioural skills to manage the organisation's operations, to achieve the goals of productivity, quality, and dependability (Summers, 1998:2). Ultimately, the nature of how operations management is carried out in an organisation depends on the nature of products or services in the organisation. According to Ganeshan and Harrison (2005:7) the two major cornerstones of operations management are quality and productivity.

Operations management is also supported by different other management functions (Ganeshan & Harrison, 2005:8). These functions include:

- *Supply chain management*: A supply chain is a network of facilities and distribution options that performs the functions of procurement of materials, transformation of these materials into intermediate and finished products, and the distribution of these finished products to customers. Supply chains exist in both service and manufacturing organisations, although the complexity of the chain may vary greatly from industry to industry and company to company. Traditionally the marketing, distribution, planning, manufacturing, and purchasing functions along the supply chain operated independently. These functions often have their own objectives which can be conflicting. Marketing's objective of high customer service and maximum sales conflict with manufacturing and distribution goals. This happens when the manufacturing operations are designed to maximise throughput and lower costs with little consideration for the impact on inventory levels and distribution capabilities. Purchasing contracts are often negotiated with very little information beyond historical buying patterns. The result of these factors is that there is not a single, integrated plan for the organisation - there were as many plans as organisations (Ganeshan & Harrison, 2005:9). There is a need for a mechanism through which these different functions can be integrated. Supply chain management is a strategy through which such integration can be achieved. Supply chain management is typically viewed to lie between fully vertically integrated organisations, where the entire material flow is owned by a single organisation and those where each channel member operates independently. Therefore coordination between the various players in the chain is a key factor in its effective management. Cooper and Ellram (1993:13) compared supply chain management to a well-balanced and well-practiced relay team. Such a team is more competitive when each player knows how to be positioned for the

hand-off. The relationships are the strongest between players who directly pass the baton, but the entire team needs to make a coordinated effort to win the race (Ganeshan & Harrison, 2005:11).

- *Product and service management*: Product or service management includes a wide range of management activities, ranging from the time that there's a new idea for a product to eventually providing ongoing support to customers who have purchased the new product. It also includes product evaluation, development, production and distribution (McNamara, 2002:17)
- *Quality management*: Quality management is crucial to effective operations management, particularly continuous improvement. More recent advancements in quality, such as benchmarking and Total Quality Management, have resulted in advancements to operations management as well (McNamara, 2002:17).
- *Inventory and facilities managemen*t: Costs can be substantial to store and move inventory. Innovative methods, such as Just-in-Time inventory control, can save costs and move products and services to customers more quickly. Effective operations management depends a great deal on effective management of facilities, such as buildings, computer systems, signage and lighting. (McNamara, 2002:18).

2.2.2 Key Success Factors of Operations Management

Singh (2006: 2) noted that industries have characteristics or strategic elements that affect their ability to prosper in the marketplace for example attributes, resources, competencies, or capabilities. Those that most affect an organisation's competitive abilities are called key success factors (KSF's). These KSF's are actually what the organisation must be competent at doing or concentrating on achieving in order to be competitively and financially successful; they could be called prerequisites for success (Lewis, 2003:741). In order to determine their own KSFs, an organisation must determine a basis for

customer choice. This in effect means that an organisation must establish how customers differentiate between competitors offering the same or similar products or services and how the organisation will distinguish itself from these competitors? Once this is determined, the organisation has to decide what resources and competitive capabilities are required to compete successfully, and to achieve a sustainable competitive advantage (Lewis, 2003:742).

KSF's can be related to technology, operations, distribution, marketing, or to certain skills or organisational capability. The organisation may derive advantages from superior ability to transform material or information (technology or operations), to quickly master new technologies and bring processes online (technology or organisational capability), or to quickly design and introduce new products, service a broad range of products, customize products or services on demand, or provide short lead times (skills) (Hill, 2000:14).

The set of KSF's that are delegated totally or substantially to the operations function has been termed the manufacturing mission. It represents what top management expects from operations in terms of its strategic contribution. All decisions made relative to system design, planning, control and supervision must aim at accomplishing the manufacturing mission. The manufacturing mission is the principal driver of the operations function and gives it its reason for existence. All world-class manufacturers have an explicit, formal manufacturing mission (Neilsen-Englyst, 2003:679).

From the manufacturing mission the operation's function derives its distinctive competencies or competitive priorities. Distinctive competence refers to the characteristic of a given product/service or its producing organisation that causes the buyer to purchase it rather than the similar product/service of a competitor (Thompson, Strickland & Gamble, 2007:101). It is generally accepted that the distinctive

competencies are cost/price, quality, flexibility, and service/time (Singh, 2006:4).

- Cost/price: An organisation competing on a price/cost basis is able to provide consumers with an in-demand product at a price that is competitively lower than that offered by organisations producing the same or similar good/service. In order to compete on a price basis, the organisation must be able to produce the product at a lesser cost or be willing to accept a smaller profit margin. Organisations with this competency are generally in a position to mass produce the product or service, thereby giving the organisation economies of scale that drive the production cost per unit down considerably.
- Quality: Refers to the eight dimensions of quality namely performance, conformance, features, durability, reliability, serviceability, aesthetics and perceived quality. Organisations competing on this basis offer products or services that are superior to the competition on one or more of the eight dimensions. Obviously, it would be undesirable if not impossible for organisations to compete on all eight dimensions of quality at once. This would be prohibitively expensive, and there are some limitations imposed by trade-offs that must be made due to the nature of the product.
- Service: Superior service can be characterised by the term customer service or it could mean rapid delivery, on-time delivery, or convenient location.
- Flexibility: Organisations that can easily accept engineering changes (changes in the product) offer a strategic advantage to their customers.
- Trade-offs: Organisations usually focus on one distinctive competency (rarely more than two). For some competencies there are tradeoffs involved for which the organisation needs to keep a balance.

2.3 Information systems/Information technology

2.3.1 The role of information systems (IS) and information technology (IT)

Garg, Joubert and Pellissier, (2005:36) defines information systems (IS) as a system, whether automated or manual, that comprises people, machines, and/or methods organised to collect, process, transmit, and disseminate data that represent user information including any telecommunications and/or computer related equipment or interconnected system or subsystems of equipment that is used in the acquisition, storage, manipulation, management, movement, control, display, switching, interchange, transmission, or reception of voice and/or data, and includes software, firmware, and hardware.

The potential of IS in supporting organisational and production activities and gaining competitive advantage has been widely recognised. (Garg *et al.,* 2005:37). Advances on the information technology (IT) front over the last decade have made it possible to exploit the potential that the relationship between IS and IT brings. IT applications help organisations to gain competitive advantage, reduce competitive disadvantage, or meet other strategic enterprise objectives. Applications such as these are referred to as the strategic management of information technology and continue to be key issues in exploiting IT/IS capabilities to achieve higher organisational performance (Garg *et al.,* 2005:38).

Effective planning and deployment of information and technology resources are active functions of successful organisations. A flexible and speedy planning function enables an organisation to rapidly respond to changes in a dynamic market. Planning for and managing organisational information and associated constructs for example, acquisition, access, content, quality, integrity and security become

more pervasive within an effective, adaptive organisation (Garg *et al.*, 2005:41). This is supported by Khosrowpour and Liebowitz (1997:141), noting that a new set of challenges has arisen as organisations integrates IT into all functions and activities of the modern organisation.

The role of IS in the organisation is also shifting to support organisational processes rather than individual functions. Services are as important as products. Organisations are changing more and more rapidly. This poses a challenge to existing information systems, which are often inappropriately structured to meet these needs. It also poses a challenge to the people who design, work with, and use these systems, since they may hold outdated assumptions (Petros & Giannoula, 2007:105).

The organisational environment is characterised by great uncertainty and variability. In this ever changing environment, IS has proved to be an important strategic ingredient for the creation of competitive advantage. This role of IS has been widely accepted during the past few years. In the new era of production, strategic priorities rather than a cost contained focus have proved to be important for competition, namely: quality, dependability, flexibility, customer service, after sale service, and supply chain management. IS proved to be vital for successful competition as it can facilitate the attainment of these strategic targets (Petros & Giannoula, 2007:108). Technical developments continue to enable great change in organisations. Securing the benefits, however, requires more than technology; it requires a coherent approach to organisational and strategic issues. IS enables organisations to redesign business processes, strengthen their customer relationship management, and develop a new business model (Lee, 2004:219).

Business process redesign is one area where organisational strategy and IT have played a crucial role. Some organisations have reported significant productivity gains by integrating IT into their core business processes. Recently, business process redesign has been further facilitated with ERP systems and e-commerce applications (Das Neves, Fenn & Sulcas, 2004:42).

2.3.2 Enterprise Resource Planning Systems (ERP)

Das Neves, *et al.* (2004:45) define ERP as an information technology software system, integrating business processes to increase accessibility of information flows inside an organisation. ERP systems strive to integrate the key business processes of an entire organisation into a single software system that allows information to flow seamlessly throughout the organisation. These systems may also encompass transactions with customers and suppliers. Each department in an organisation typically has its own computer system, each optimised for the particular way that department does its work. ERP software combines all systems together into a single, integrated software program that runs off a single database so that various departments can share information and communicate effectively with each other.

The key advantages of ERP systems are:

- ERP software provides integration of systems and therefore business processes across all functions
- Integrated financial data avoiding many different versions of the truth from, for example, finance vs. sales business units
- The ERP software holds a single-set of consistent customer records leading to better customer service through timely responsiveness
- Easy company-wide information sharing, particularly in companies with multiple business units
- ERP makes possible an integrated supply chain

These advantages can only be exploited if the correct choices are made. Tanner (2002) argues that correct ERP selection is vital to minimise financial risk and uncertainties about the software and its compatibility within the organisations' business structure. Das Neves, *et al.* (2004:47) is of the opinion that inadequate research by organisations in choosing an ERP system is due to certain problems, namely:

- *Inadequate financial research:* ERP implementation often results in intangible benefits that are difficult to evaluate using financial tools such as Return on Investment (ROI) (Scott, 1997:4). This implies that an ERP system with higher upfront costs or less obvious future benefits may be rejected for an inferior product (Slater, 1999b:6).
- *Functionality constraints*: Every ERP selection process eventually gets down to the search for individual features and functions, which, if not identified, could transform an otherwise great fit into a complete mismatch (Slater 1999a:6). Some organisations accept that no off-the-shelf product will exactly fit their purpose and rely on customising capability to complete the replacement of the legacy system (Davenport, 1998:125).
- *Time constraints*: Time has become a major factor in tempting organisations to cut corners. Some organisations rush their IT strategies to maintain or gain competitive advantage without performing sufficient preparatory work (Fang Yih, 2001).
- *Skill constraints*: Management in many organisations can mistakenly assume that the necessary skills to choose an ERP system already exist within their organisation (Donovan, 2000). This fallacy can lead to the eventual overuse of outside consultants who may not be totally objective in the choice of ERP systems.
- *Complacency:* ERP has been around for a long while and there have been many case studies on the implementation of ERP systems (Das Neves *et al.*, 2004:44). This may lead some organisations to believe that most if not all the lessons of past mistakes have been learnt. However, mergers and acquisitions

have introduced many new market players in the last few years. The latest push has been towards integrating ERP with the Internet. This has lead to a plethora of new versions and niche modules (Fox, 2000). These changes strongly suggest that any organisation wishing to purchase or upgrade their ERP system should still perform basic selection research to avoid dissatisfaction.

- *Scalability:* The selection procedure should be dependant on the scale of the intended ERP installation. The complexity of the impact of an ERP purchase to an organisation ranges from the upgrade of a single module to that of an entire ERP system within a BPR (Business Process Re-engineering) initiative.
- *Vendor influence*: Collins, (2002) recommends attending meaningful demonstrations at live sites from more than one vendor. Organisations must not believe everything vendors tell them. The role of vendors has changed in recent years, moving closer to that of consultants.

ERP represents the latest in the evolution and expansion of production planning and control techniques of manufacturing enterprises. MRP II systems began evolving into ERP systems as early as 1988. The term enterprise resource planning describes systems that are designed to plan and schedule all the organisation's internal resources. However, during the period 1988 to 1994 the terms MRP II and ERP were being used interchangeably.

ERP software modules may include material planning and inventory. A typical ERP system integrates all of the company's functions by allowing the modules to share and transfer information freely (Muscatello, Small and Chen, 2003:855). In addition, all information is centralised in a single relational database accessible by all modules, eliminating the need for multiple entries of the same data. Smaller organisations often adopt a piecemeal approach, starting with a few modules or a few components of each module (Ferman, 1999:48).

Companies implementing ERP have four rationales for doing so namely; technology, business process, competitive and strategic rationales. Technology rationales are technology problems companies faced with their old computer system, hence motivating them to implement ERP. Business process rationales aim at improving companies' performance. Competitive rational is the need for companies to stay competitive in business. Strategic rationales are strategies which companies wish to implement through ERP, where existing software does not support. ERP facilitates value creation by the following ways: integrating the activities of an organisation; using "best practices"; inherent within the software; enabling organisational standardisation; eliminating information asymmetries; proving on-line and real-time information; allowing simultaneous access to the same data for planning and control; and facilitating intra and inter-organisation communication and collaboration (Muscatello *et al.*, 2003:859). They also remarked that the first step to implementing ERP is to justify the necessity based on costs and benefits to the organisation. How might ERP strengthen the organisations' competitive advantages?

Muscatello *et al.* (2003:860) also noted that despite the advantages, ERP implementation carries with it some risks. The highest probability of successful implementation of ERP software occurs when there is only minimal need to change business processes and ERP software. Some risks associated with ERP implementation are the lack of adequate technology infrastructure; failure of technology to meet specifications; application complexity; customisation and integration complications; user-unfriendly applications; and misunderstanding user requirements. The structural changes affecting the materials supply and the trend towards shorter product development time have altered the conditions for materials supply system (MSS) supporting ERP systems (Johansson, 2007:388).

The acquisition of ERP software is not without its challenges as it is a high expenditure activity and if a poor choice is made, it can adversely affect the organisation as a whole, even jeopardising its very existence. This highlights the need for performing adequate levels of research into making the correct choice of software and preparing the organisation for its introduction (Das Neves *et al.*, 2004:49).

2.3.3 Manufacturing Resource Planning Systems (MRP)

The APICS dictionary (1998) define MRP as a set of techniques that uses bill of material data, inventory data, and the master production schedule to calculate requirements for materials. It makes recommendations to release replenishment orders for material. Further, because it is time phased, it makes recommendations to reschedule open orders when due dates and need dates are not in phase. Time phased MRP begins with the items listed on the master production schedule (MPS) and determines the quantity of all components and materials required to fabricate those items and the date the components and materials are required. Time phased MRP is accomplished by exploding the bill of material, adjusting for inventory quantities on hand or on order, and offsetting the net requirements by the appropriate lead times.

Kenworthy (1998:129) referred to MRP as a method for the effective planning of all resources of a manufacturing company. It addresses operational planning in units, financial planning in monetary value, and has a simulation capability to answer "what if" questions. It is made up of a variety of functions, each linked together: business planning, sales and operations planning, master production scheduling, material requirements planning, capacity requirements planning, and the execution support system for capacity and material.

In many industries, large structural changes affecting the materials supply have taken place over the last few decades, for example, a greater number of product variants, modularisation and outsourcing trends, and global suppliers have become ever more involved in product development (Von Corswant & Frederiksson, 2002). In addition, technology development and competition are very intense in many industries, and companies have much to gain from reaching the market with new technology and products ahead of their competitors. Therefore, companies try to shorten the product development and production time (Smith & Reinertsen, 1998:69). The use of integrated information and management systems for example MRP enable organisations to manage material flow, the supply chain and the production process more intensely.

Koh, Demirbag, Bayraktar, Tatoglu and Zaim (2007:108) note that the use of management systems like MRP and related strategies are crucially important to the success of a manufacturing organisation. This is because the cost and quality of goods and services sold are directly related to the cost and quality of goods and services purchased and manufactured. Integration of internal processes of the organisation with the suppliers and customers forms the essence of the whole idea behind these management tools.

2.4 Considerations for implementation of a resource planning system

According to Guerreiro and Serrano, (2006) organisations invest in new technology with the expectation to improve their economic performance and increase net worth. Similarly Osey-Bryson and Ko (2004:2) state that for most of the past half-century, organisations have been increasing their investments in IS, primarily because of the belief that it has a significant impact on organisational performance. Al-Mudimigh, Zairi and Al-Mashari (2001:225) postulated that the right system can improve information sharing, decision-making, coordination, product

quality, responsiveness and distribution. Lee (2004:232) is of the opinion that because of increasing competition and limited capital budgets, organisations need to carefully assess the structure and choice of potential information systems to ensure that their resources are spent judiciously. The capital investment going into implementing of a resource planning system and the continuous cost expenses for the maintaining of the system should be carefully considered.

Townsend (2003:36) noted that the significance of what has been taken on in the consideration and implementation of an MRP is seldom realised. The selection process should be lengthy and detailed, as many factors have to be considered. Among the generally important criteria left out of the selection process are the Total Cost of Ownership (TCO) over five years or longer and the Return on Investment (ROI) calculation. ROI using discounted cash flow techniques arriving at Net Present Value or Internal Rate of Return values is required. Townsend (2003:36) also postulated that the hardware and software capital costs alone are not comparison enough. Essentially ROI depends on internal factors such as how the organisation uses the software. The software is merely a tool, an enabler, and cannot add value or ROI by itself. The more the organisation is driven (a management process) to use the software to its limits, the better the ROI. If the resource planning system is not used, no positive ROI may be achieved. It may therefore be argued that users must take ownership of the system and drive processes to optimise ROI. While resource planning systems are expected to provide a ROI there are IT projects that cannot as they are support services, such as networks, disaster recovery teams and so on where their return can only be measured when they are absent.

2.5 Summary

This chapter explored operation management and the relationship of IS and IT within an organisation. The potential of IS is to support organisational activities and helping them to gain competitive advantage. This has been widely recognised and advances in IT over the last decade, have made it possible to exploit the potential of IS/IT. The use of IS and IT now help organisations to gain competitive advantage, reduce competitive disadvantage, or meet other strategic enterprise objectives. The introduction of resource planning systems has opened a new horizon for organisations. ERP systems represent the latest in the evolution and expansion of production planning and control techniques of manufacturing enterprises and aids in business and manufacturing management. These systems proof to be useful but require capital and human investment to maximise the effect thereof.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

The sections that follow describe the research approach followed, sampling, methods employed for data gathering, data handling and data analysis, reliability and validity and limitations of the research.

3.2 Research approach

This study followed a case-study approach. Euro-Plastifoam, a supplier to original equipment manufacturers (OEM's) within the automotive industry, served as case study organisation.

The benefits of a case-study approach were argued by various researchers. Bourque and Clark (1992) postulated that a case study approach provides a single unit of analysis from which first-hand insight is gained into a particular phenomenon. Similarly Hussey and Hussey (1997:57) state that studying real-life situations can be an advantage as it provides a medium for gaining insight into the complexity of particular and unique phenomena experienced by a case-study organisation, allowing the researcher to recognise issues to be considered and developing directions for change – a process that can be referred to as 'unfolding'. Furthermore Garbers (1996:288) is of the opinion that case-studies provide options for in-depth descriptions and explanations of specific phenomenon within the context of reality, environment and meaning.

In choosing a case-study approach, the researcher were able to gain an understanding of the most important aspects relating to operations management and the need for an effective manufacturing resource planning system, and linking research findings to existing literature with the aim of furthering knowledge development.

3.3 Sample and data gathering

The sample frame for the study was considered to be top, middle and line management of Euro-Plastifoam. Top management included all Directors, while middle management included all General Managers. Line management were presented by all supervisors.

A self-completion semi-structured questionnaire (see Annexure A) was used as data gathering instrument and distributed amongst management during May 2007 for completion. A total of 27 questionnaires were distributed, and all 27 respondents completed questionnaires by the deadline.

3.4 Data handling and analysis

The use of a semi-structured questionnaire produced quantitative data. The inclusion of open-ended questions did not limit responses but provided a frame of reference for respondents to provide feedback. Content analysis was henceforth used as data reduction technique. Responses from open-questions were coded based on the emerging of common theme. This allowed for the quantifying of responses.

Coded data from both the structured and open-ended questions were captured into SPSS for Windows, a statistical software package.

Data analysis involved the producing of frequency and descriptive tables. This provided a structured summary of responses. Where applicable, graphs were also produced to provide a graphical representation of the distribution of responses. The analysis of data was done with the assistance of a statistician. Refer to Tables 4.1 to 4.4.

3.5 Reliability and validity

Hussey and Hussey (1997:65) noted that a case-study is an extensive examination of a single instance of a phenomenon of interest and is an example of a phenomenological methodology. Phenomenological studies tend to produce data from a small sample, which is regarded as highly valid in the context of the phenomenon researched, yet less reliable as no two case-studies will produce similar results. Yet, Hussey and Hussey (1997:58) contended that it is possible to generalise from a very few cases, or even a single case, if your analysis has captured the interactions and characteristics of the phenomena you are studying.

Although much progress has been made in the design of questionnaires, it stays an art and is no clear-cut science. The researcher took cognisance of aspects such as avoiding of leading and ambiguous questions, flow, scales used and length of the questionnaire in an attempt to increase validity. The development of the questionnaire also went through a process of iteration and looping and was piloted with one of the general managers. This allowed for revision of unclear questions and flow of the questionnaire. Churchill (1979:192)

3.6 Limitations

The research aimed to determine the need for a MRP system at Euro-Plastifoam. The scope of this study was limited to Euro-Plastifoam and only included data from this organisation.

3.7 Summary

This chapter motivated the research methodology that was chosen to conduct the research. In chapter 4 the results obtained from the

analysis of the data and supporting graphs and tables will be presented.

CHAPTER 4: RESULTS, DISCUSSION CONCLUSIONS AND RECOMMENDATIONS

4.1 Introduction

Chapter 4 represents the results from the study. A discussion of findings is also provided.

4.2 Results and discussion regarding the research objectives

The research outcomes of the four research objectives are reflected under the relevant sub-headings below.

4.2.1 State of operations management within the case study organisation

To gain an understanding of the state of operations management within the case study organisation, respondents were asked to rate nine activities within the case study organisation. The nine activities were:

Communication between departments
Sharing of information
Coordination of work efforts
Use of resources
Collaboration of work force
Material resources planning
Inventory control
Financial management
Overall management of production activities

A 5-point rating scale was used where 1 = not effective; 3 = effective to some extent; 5 = very effective.

Table 4.1 shows the distribution of ratings per activity.

Table 4.1: Rating of activities

	Not effective	Effective to some extent	Very effective
Communication between departments	29.6%	44.4%	25.9%
Sharing of information	22.2%	66.7%	11.1%
Coordination of work efforts	18.5%	63.0%	18.5%
Use of resources	18.5%	63.0%	18.5%
Collaboration of work force	18.5%	70.4%	11.1%
Material resources planning	29.6%	59.3%	11.1%
Inventory control	25.9%	63.0%	11.1%
Financial management	3.7%	70.4%	25.9%
Overall management of production activities	14.8%	74.1%	11.1%

Three out of every four respondents (74%) rated the overall management of production activities as 'effective to some extent'. Other activities received similar ratings with the majority of respondents feeling that activities are effective, but also only to a certain extent.

An examination of those activities that received relative high ratings of 'not effective', reveal that communication and material resources are potential weak production management areas. Inventory control was also rated less effective compared to the other activities.

Table 4.2 shows the Pearson correlation coefficients calculated between the effectiveness of material resource planning and other supporting production activities.

Table 4.2: Correlation between material resources planning and other activities

	Material resources planning
Overall management of production activities	0.694
Collaboration of work force	0.633
Inventory control	0.540
Use of resources	0.498
Communication between departments	0.474
Coordination of work efforts	0.399
Sharing of information	0.262
Financial management	0.136

The results show that material resource planning has a positive correlation with overall management of production activities as well as with activities such as collaboration of work force and inventory control.

It can be deduced that material resource planning plays an interlinking role in assuring that production activities are performed effectively. An improvement in material resource planning will also influence other activities positively.

The distribution of ratings can also be presented graphically.

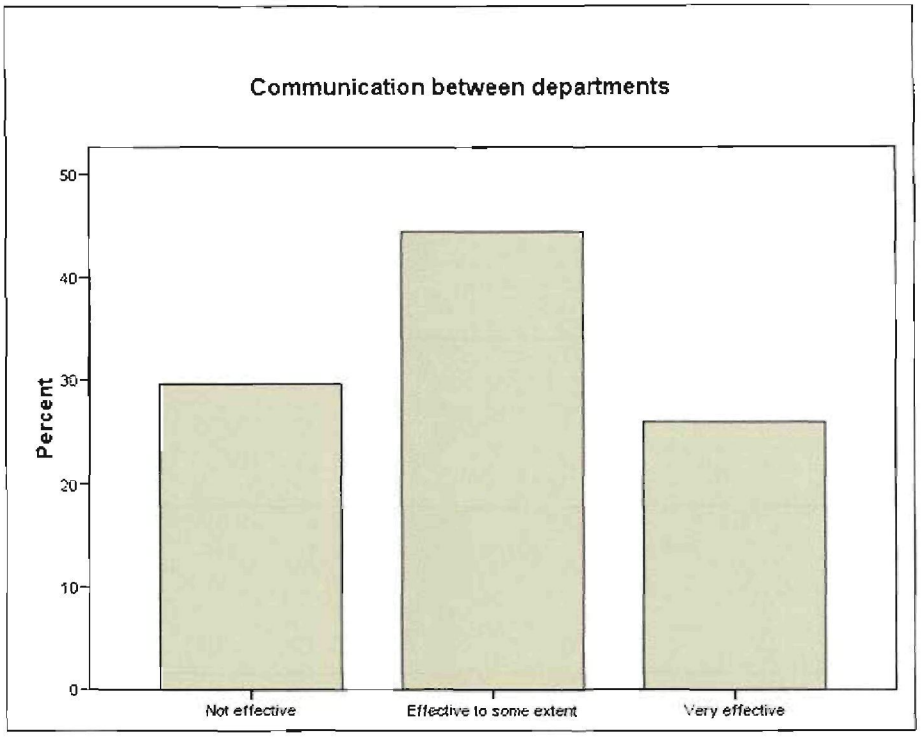

Figure 4.1: Perceived effectiveness of communication between departments

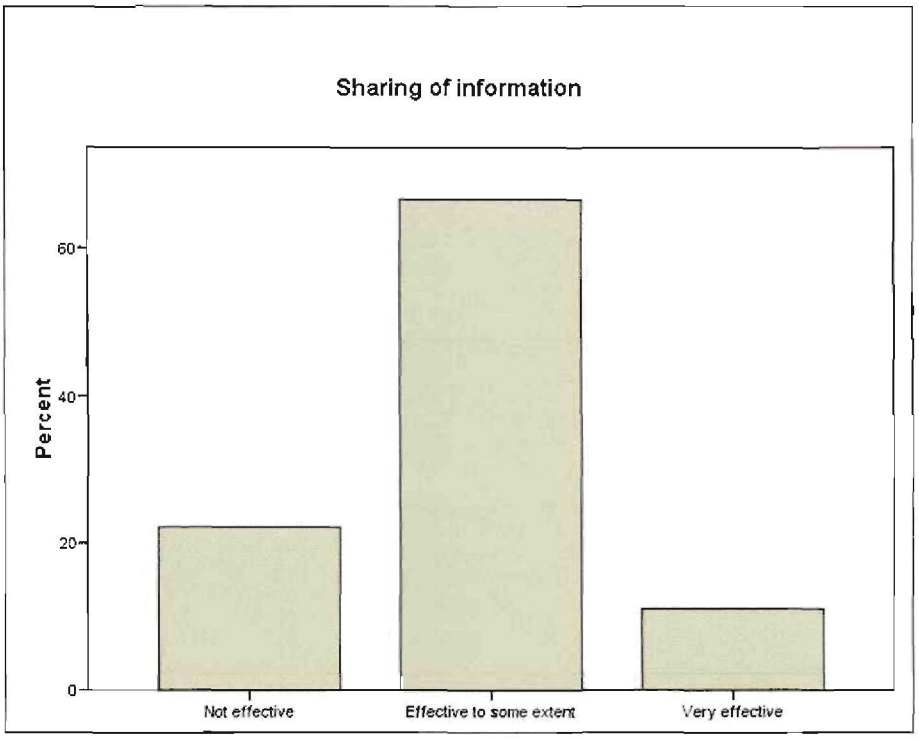

Figure 4.2: Perceived effectiveness of information sharing

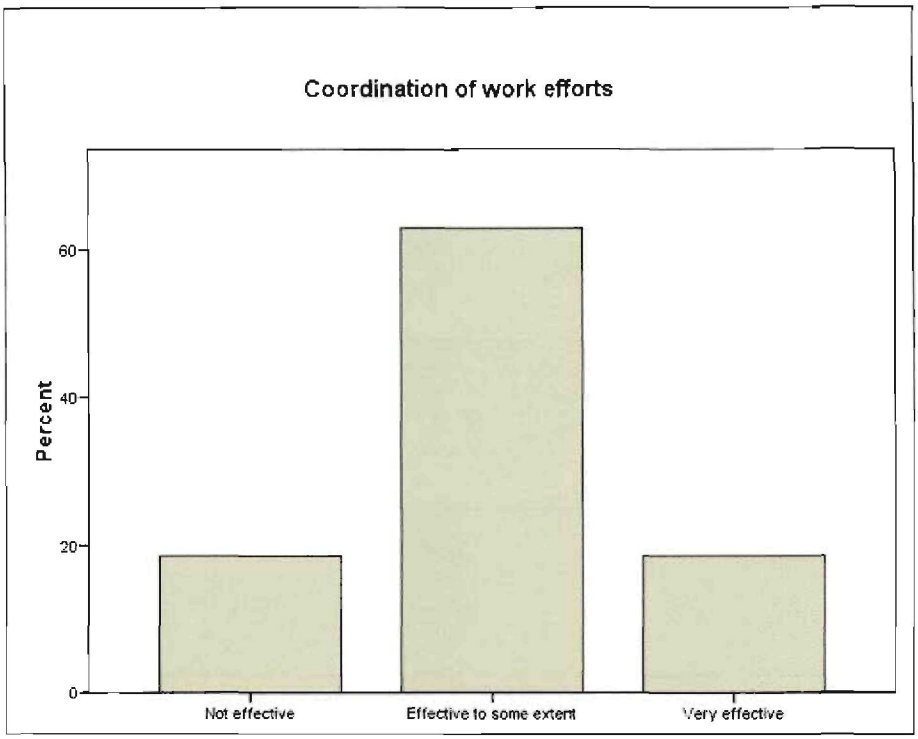

Figure 4.3: Perceived effectiveness of work effort coordination

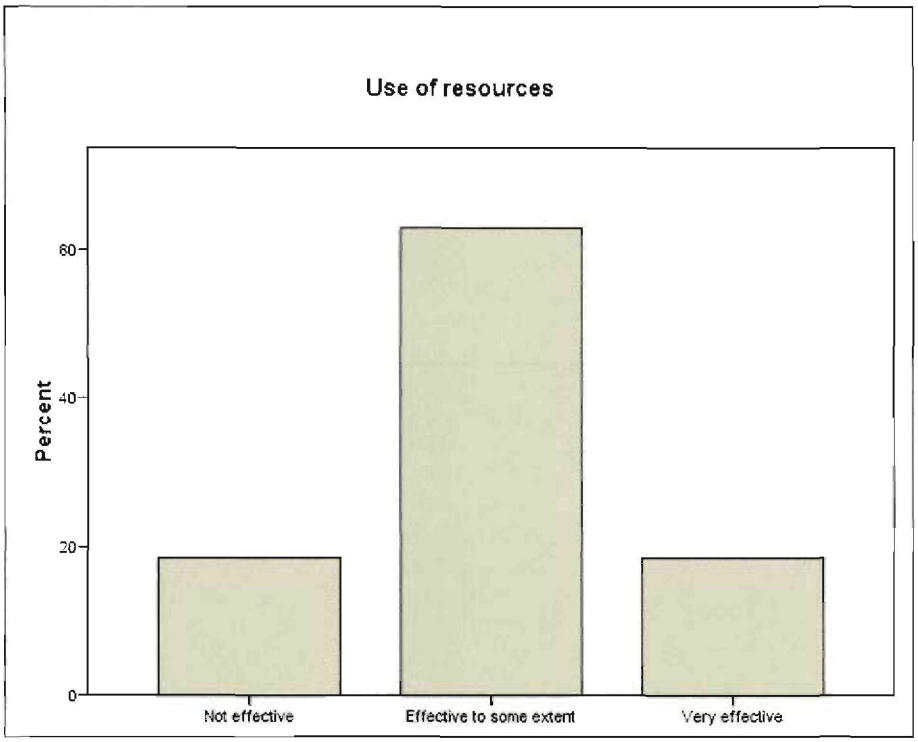

Figure 4.4: Perceived effectiveness of resource utilisation

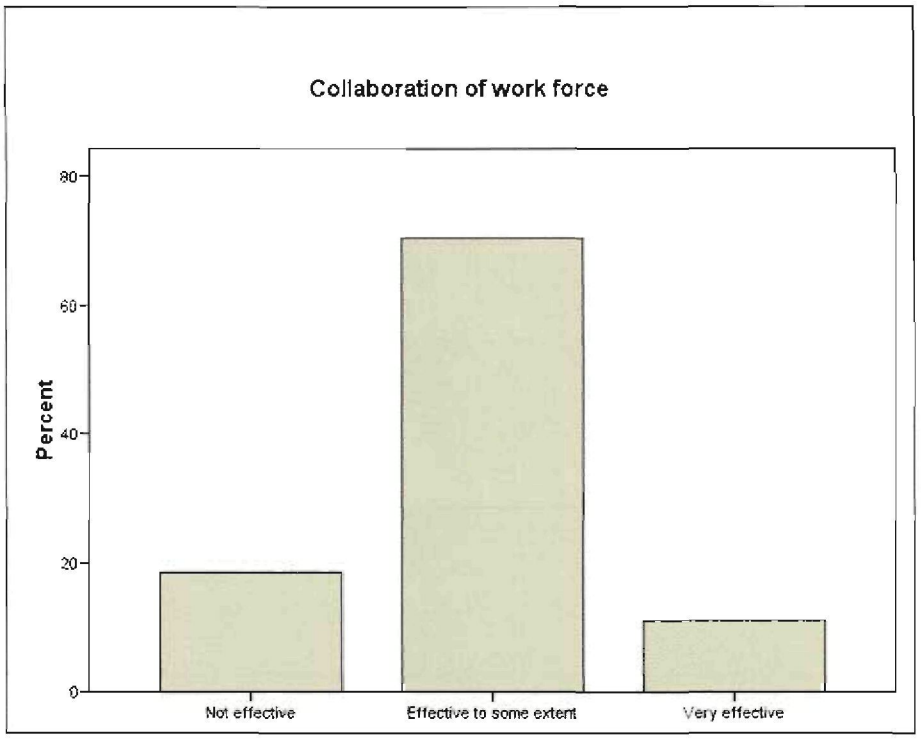

Figure 4.5: Perceived effectiveness of work force collaboration

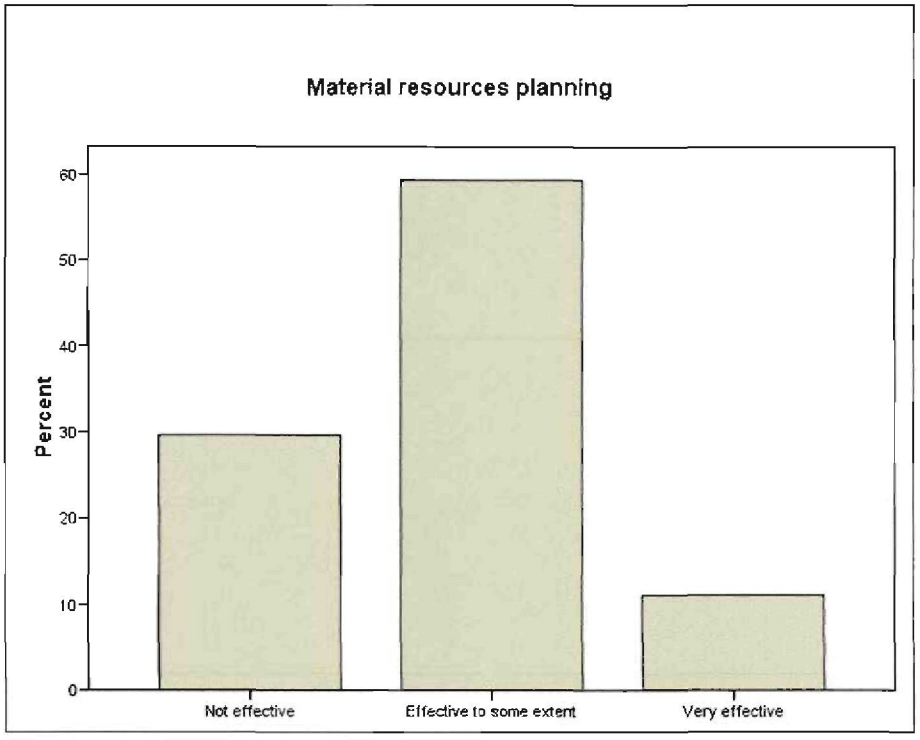

Figure 4.6: Perceived effectiveness of material resources planning

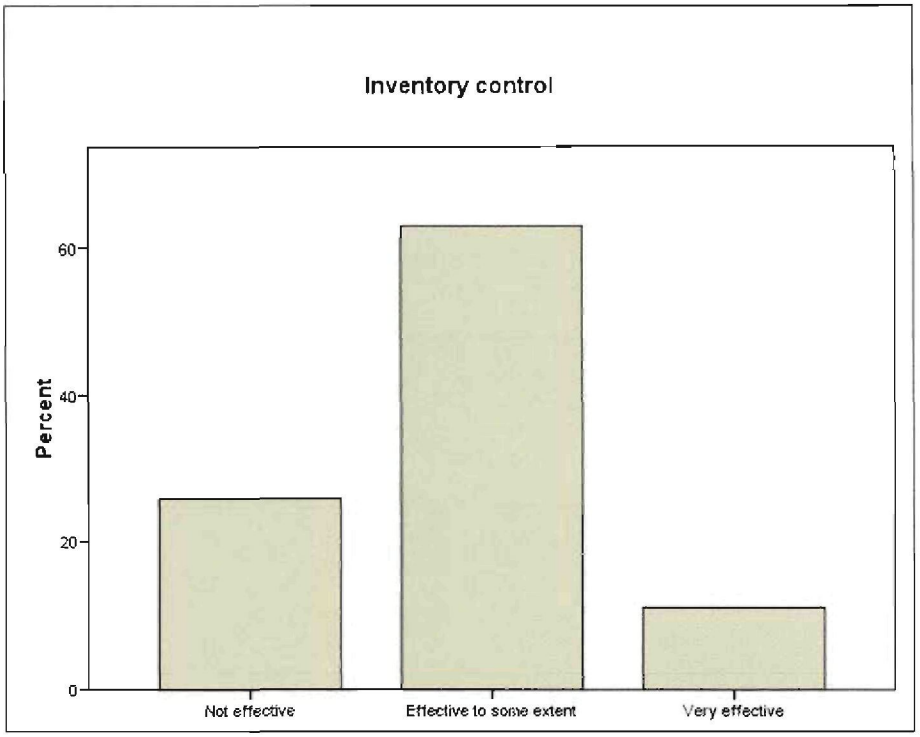

Figure 4.7: Perceived effectiveness of inventory control

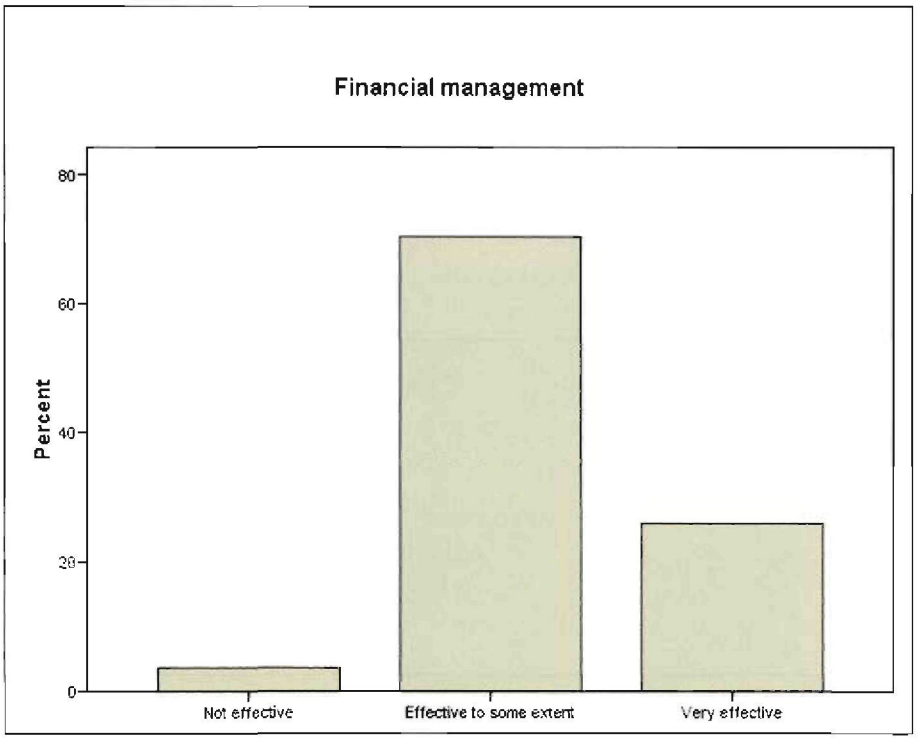

Figure 4.8: Perceived effectiveness of financial management

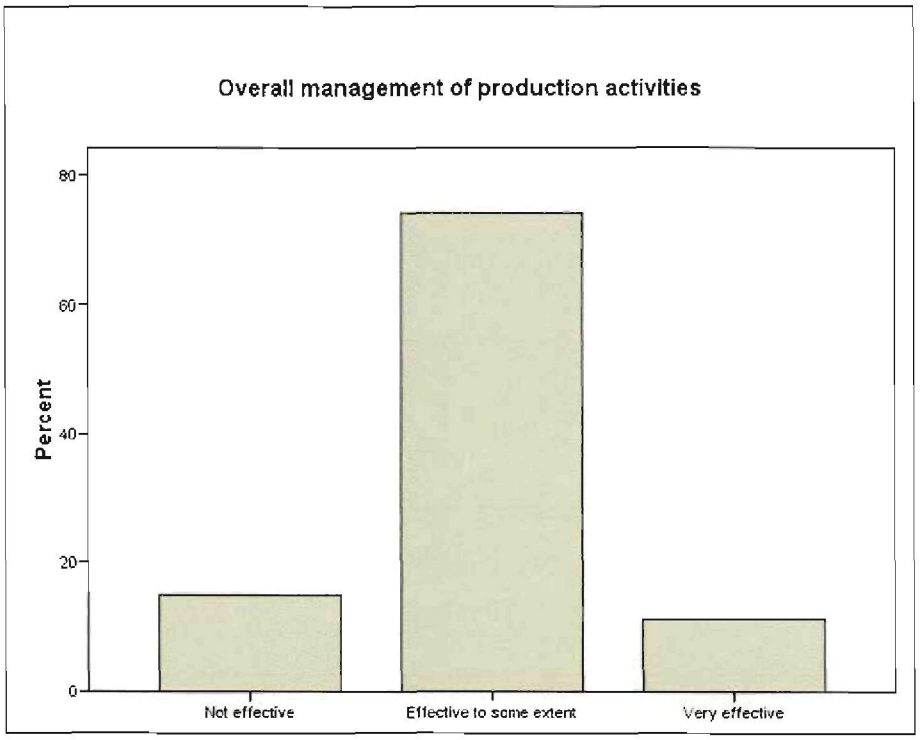

Figure 4.9: Perceived effectiveness of overall production management

4.2.2 Challenges faced and information gaps in the operations management system across the information value chain

The following comments were made regarding challenges faced and information gaps:

- Breakdown of communication - no system that can provide up to date information - need to phone all the time
- Can't get hold of buyer and production staff
- Buyer don't order on time
- Customers need to wait plus minus 3 days for an answer
- Some confusion with regards to price increases
- Find it difficult to plan ahead due to lack of proper information and feedback
- Last minute changes should be avoided
- Lack of sharing information between departments
- Must keep by lead times and targets promised to customers
- No system in place
- Data (historic) not available to base decisions on

It is evident that a MRP system might alleviate communication and scheduling of orders.

4.2.3 The need amongst management for a more effective MRP system

All respondents were in agreement that there exists a need for a more effective MRP system within the case study organisation.

Reasons mentioned included:

- With the new system there is no need to make numerous calls to check stock
- Communication will improve
- Can sort out queries by myself
- Will know future plans for production and buying of stock items
- More staff and workers will know what to do next (job planning)
- Will aim to execute work tasks more productively
- Can sort out problems with manufacturing before hand
- Improve decision-making
- Better control over cost and stock
- Limit possible losses and wastage
- Will ensure the smooth flow of the planning system
- All departments will have access to information regarding each other

4.2.4 Key success factors for the implementation of a MRP system within the case study organisation

Respondents were asked to rate nine activities within the case study organisation. The nine activities were:

Support from management
Technical competency of users
Communication
Cost of development & implementation
Time taken to implement system
Involvement from staff
Buy-in from staff
The use of a consultant to drive and manage the implementation process

A 5-point rating scale was used where 1 = not at all; 3 = to some extent; 5 = to a large extent.

Table 4.3 shows the distribution of ratings across key success factors.

Table 4.3: Evaluation of Key Success Factors

	Not at all	To some extent	To a large extent
Support from management	3.7%	3.7%	92.6%
Technical competency of users	3.7%	18.5%	77.8%
Communication	3.7%	22.2%	74.1%
Cost of development & implementation	11.1%	48.1%	40.7%
Time taken to implement system	3.7%	85.2%	11.1%
Involvement from staff	3.7%	0.0%	96.3%
Buy-in from staff	3.7%	11.1%	85.2%
The use of a consultant to drive and manage the implementation process	22.2%	48.1%	29.6%

Aspects such as involvement from staff, support from management, and buy-in from staff were rated as very high. This is in contrast to aspects such as use of a consultant and cost of development and implementation, which were not seen as critical KSF's.

Table 4.4 shows the correlation between the various KSF's.

Table 4.4: Correlation between Key Success Factors

	Support from management	Technical competency of users	Communication	Cost of development & implementation	Time taken to implement system	Involvement from staff	Buy-in from staff	The use of a consultant to drive and manage the implementation process
Support from management	1.000							
Technical competency of users	0.211	1.000						
Communication	0.521	0.260	1.000					
Cost of development & implementation	0.256	0.008	0.570	1.000				
Time taken to implement system	0.052	0.099	0.294	0.210	1.000			
Involvement from staff	0.891	0.282	0.629	0.387	0.038	1.000		
Buy-in from staff	0.647	0.107	0.664	0.295	0.077	0.750	1.000	
The use of a consultant to drive and manage the implementation process	0.152	0.152	0.252	0.505	0.254	0.294	0.258	1.000

Communication plays an important role in ensuring support from management and buy-in from staff. It is also notable that the cost of development and implementation has a significant association with the use of a consultant.

The distribution of ratings can also be represented graphically.

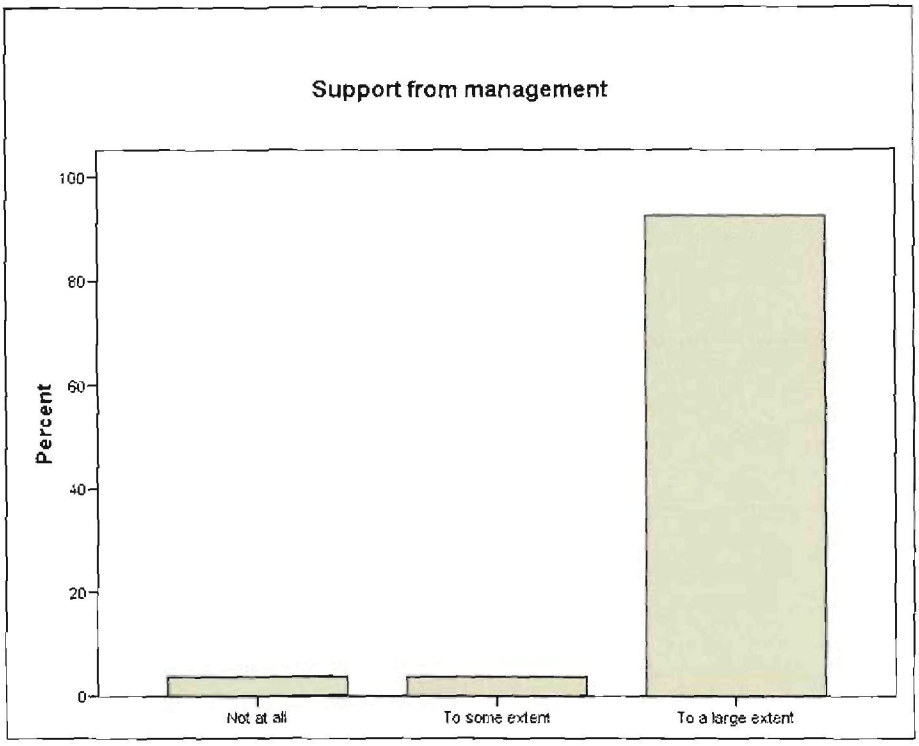

Figure 4.10: Management support as key success factor

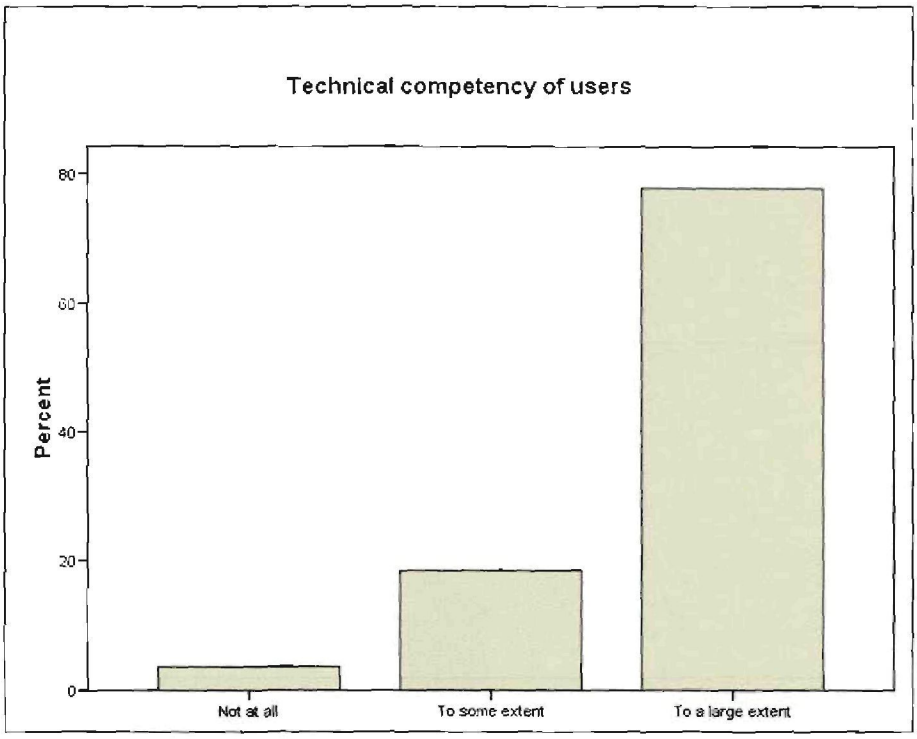

Figure 4.11: Technical competency of users as key success factor

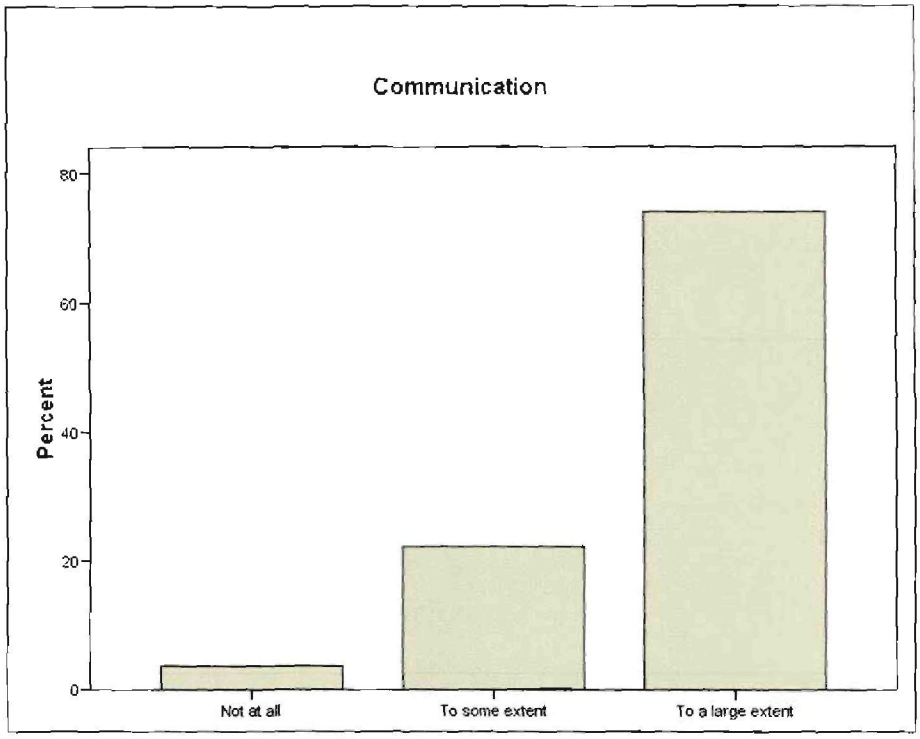

Figure 4.12: Communication as key success factor

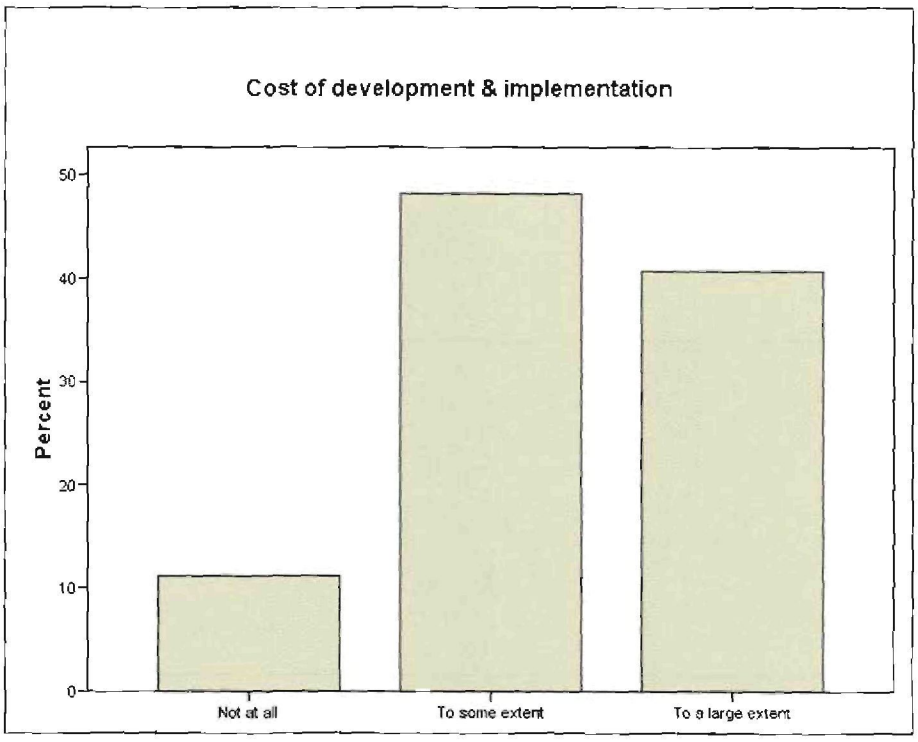

Figure 4.13: Cost of development and implementation as key success factor

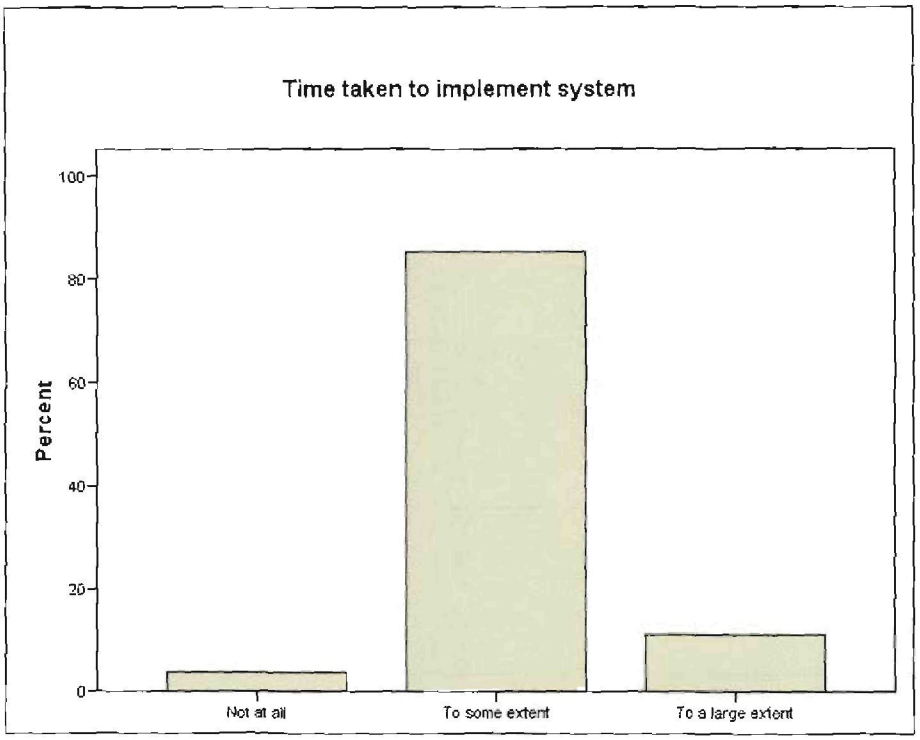

Figure 4.14: Time taken to implement system as key success factor

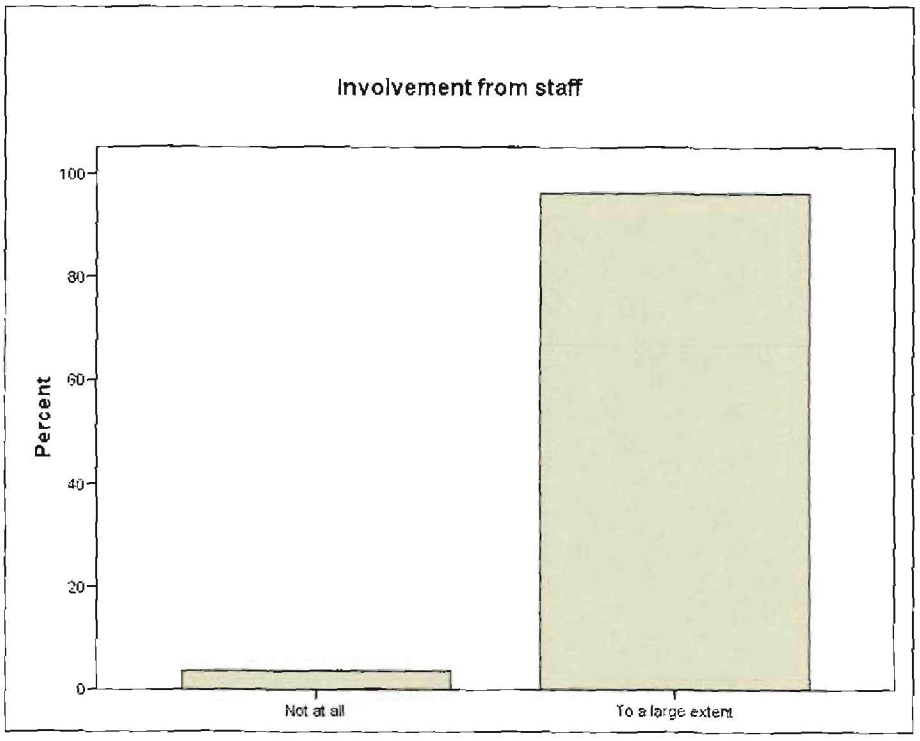

Figure 4.15: Involvement from staff as key success factor

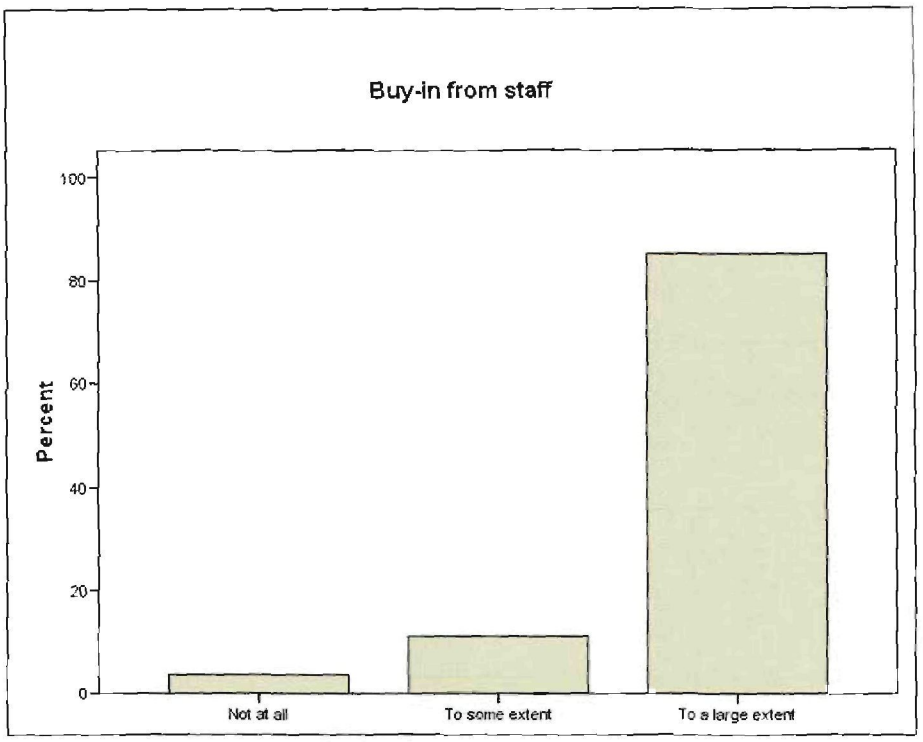

Figure 4.16: Buy-in from staff as key success factor

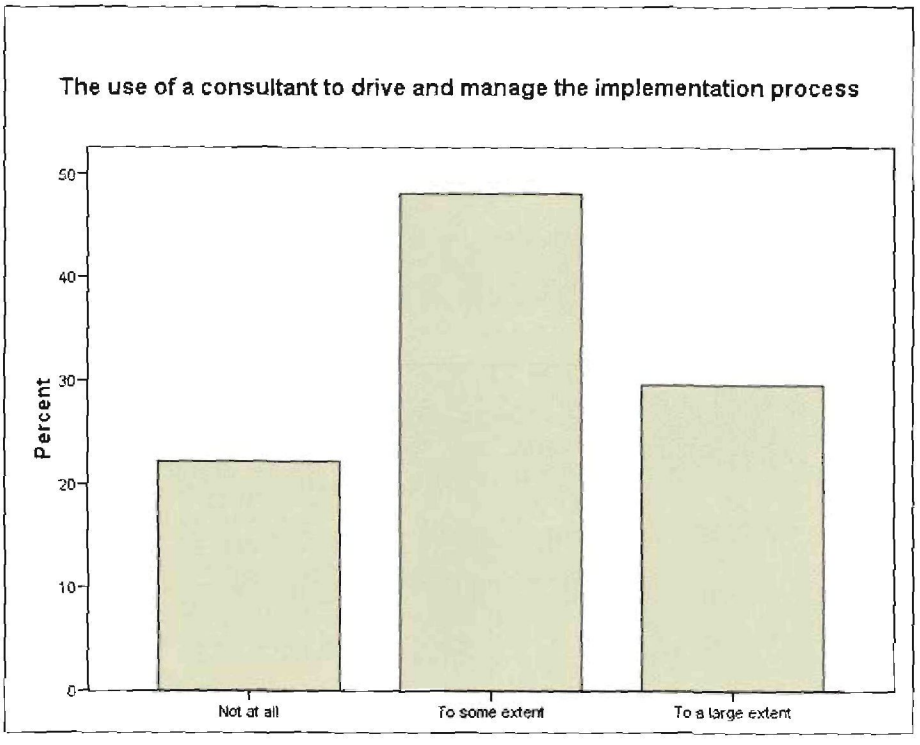

Figure 4.17: The use of a consultant as key success factor

Figure 4.18 show the result from the question asked if it is more preferred to implement the system as a whole as quickly as possible or rather in phases over a period of time. The majority of respondents were of the opinion that a rapid implementation would be more beneficial.

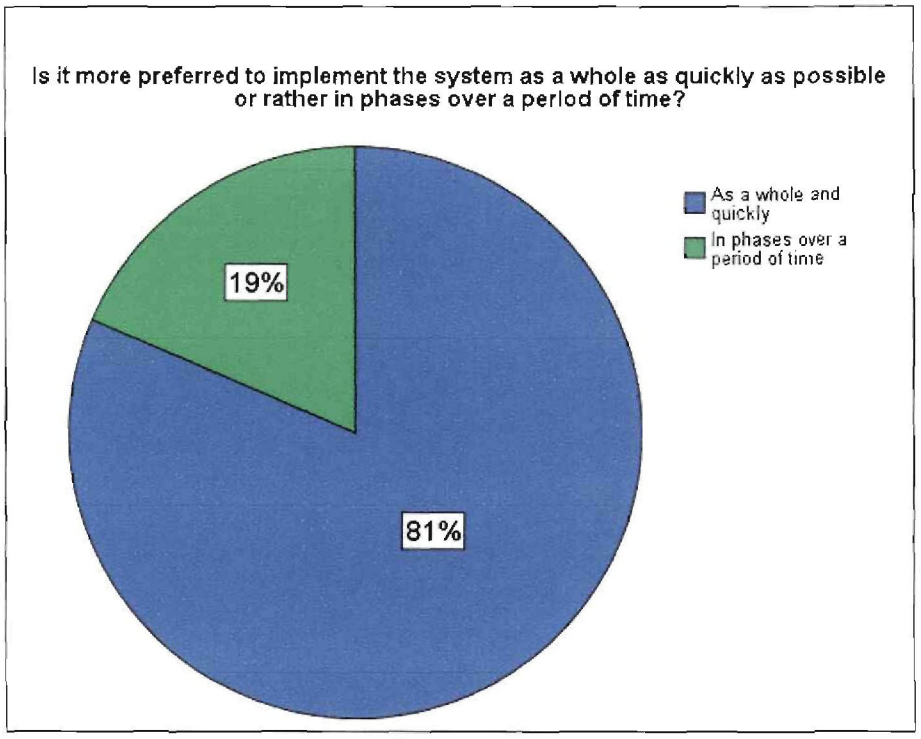

Figure 4.18: Preferred approach for implementation of MRP system

4.3 Conclusions

From the research results it is seen that management support, as well as the competency of the users are important success factors for system implementation. Communication seems to be lacking within the organisation, and it is believed that a MRP system will improve inter-departmental communication, collaboration and information sharing. Through the respondents' rating "effective to some extent", it can be noted that managers realises that a MRP system will not solve all its problems, but will most certainly assist in improving the flow of the important activities within the organisation, and therefore making it more efficient.

The current lack of an effective MRP system is hampering the profitability of Euro-Plastifoam. The research has shown that inventory control and the management of material resources is a matter of concern and that material resource planning plays an interlinking role in assuring that production activities are performed effectively. The current ineffective communication and lack of up to date information makes it difficult for management to plan ahead. Management were also in agreement that there exists a need for a more effective MRP system, and their preferred approach for implementation is to implement such a system as soon as possible.

4.4 Recommendations

The need for an effective and up-to-date MRP system is evident. It will improve the flow of communication; the effective use of resources; increase productivity and enhance financial control. Cognisance must however be taken that a MRP system will not solve all the current problems it is facing, and that all inputs from various departments are very important. With wrong inputs, required outputs cannot be expected with such a system.

It is furthermore recommended that a MRP system is implemented as soon as possible, and not phased over a period of time. This will cut out ineffective work activities and assist in the long-term sustainability of the organisation.

The implementation of such a system will only be successful if management can harness the buy-in from all employees.

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Annexure A: Questionnaire

DETERMINING THE NEED FOR A MANUFACTURING RESOURCE PLANNING SYSTEM WITHIN A MANUFACTURING COMPANY: A CASE STUDY OF EURO-PLASTIFOAM

1. Please tell me, what are the main problems/challenges that your business currently experience with regard to production and materials resource planning?

.....

.....

2. Please evaluate the following activities in your organisation using a 5-point rating scale where 1 = not effective; 3 = effective to some extent; 5 = very effective.

ACTIVITY	1	2	3	4	5
Communication between departments					
Sharing of information					
Coordination of work efforts					
Use of resources					
Collaboration of work force					
Material resources planning					
Inventory control					
Financial management					
Overall management of production activities					

3. Do you think there is a need for an integrated MRP system within the organisation?

Yes	1
No	2

4. Please motivate?

.....

.....

5. What would you say are the risks involved in implementing such a system in your company?

.....

.....

6. *Is this a project that you would support?*

Yes	1
No	2

7. Please motivate?

.....

.....

8. From the following pre-defined list, what factors do you think will be critical in the successful implementation of a MRP system in your company? Please use a scale of 1 to 5 where 1 = not at all; 3 = to some extent; 5 = to a large extent.

CRITICAL FACTORS FOR SUCCESSFUL IMPLEMENTATION	1	2	3	4	5
Support from management					
Technical competency of users					
Communication					
Cost of development and implementation					
Time taken to implement system					
Involvement from staff					
Buy-in from staff					
The use of a consultant to drive and manage the implementation process					

9. Please indicate if it is it more preferred to implement the system as a whole as quickly as possible or rather in phases over a period of time?

As a whole and quickly	1
In phases, over a period	2

10. Please motivate?

.....

.....

.....