

**UNIVERSITY OF KWAZULU-NATAL**

**Perceived Production Planning and Control Problems at Cataler South Africa**

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## DECLARATION

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- (iii) This dissertation/thesis does not contain other persons' data, pictures, graphs or other information, unless specifically acknowledged as being sourced from other persons.
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## **ABSTRACT**

The business environment is dramatically changing. Companies today face the challenge of increasing competition, expanding markets, and rising customer expectations. This increases the pressure on companies to lower costs in the entire supply chain, shorten throughput times, reduce inventories, expand product choice, provide more reliable delivery dates, better customer service, improve quality, and efficiently coordinate global demand, supply and production. Process improvement and the need for it move fast in today's competitive markets. Methodologies used in business for advancement and remaining competitive are enterprise resource planning and lean.

This study was concerned with the perceived production planning control problems at Cataler South Africa. Cataler South Africa manufactures catalytic converters for the Toyota market. The objectives of the study were to evaluate the inventory system, procurement of raw materials, to determine the impact of the need to place urgent orders of raw material, to establish an effective production planning schedule and to ensure timeous delivery of products to customer.

The study employed an exploratory research using qualitative methods to analyse the responses of 15 participants at senior level.

Several initiatives were identified which would enable the organisation to pursue an effective production planning system. Strategic recommendations were made for the production control department.

In terms of implementation, it was recommended that Cataler South Africa commence with inventory policy objectives, supplier and customer delivery monitoring and visualisation, training and communication at all levels to redesign the production control processes and to change the way the department conducts its daily duties.

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# CHAPTER ONE

## INTRODUCTION TO THE RESEARCH

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### 1.1 Introduction

This research addresses the challenges faced on a day to day basis with the perceived production planning and control problems experienced at Cataler South Africa and offer some solution approaches. Within the constraints imposed, being that the operation has to be run on a continual basis to satisfy the customer requirements.

The research conducted focusses on the production control department at Cataler South Africa with the aim of identifying challenges that could be rectified and does not focus on the manufacturing process and how the process can be improved.

The chapter follows with a delineation of the purpose of the study and the research problem. Leading from the research problem, the objectives will be derived and the primary research questions will be posed. The limitations of the study will then be listed.

### 1.2 Background

Cataler South Africa is a subsidiary of Toyota South Africa that manufactures automotive catalytic converters for the export market and the local market. The automotive catalytic converters are placed into the Toyota Motor Corporation global supply chain with most of the production going to Toyota facilities in Europe and South America. At Cataler South Africa, the focus is on the production of traditional catalytic

converters where the latest metal spinning technologies are used. The head office of Cataler which is situated in Japan, was established in 1967 (Cataler South Africa brochure, 2012:2)

In December 2001 Toyota South Africa announced its entry into the volume component export business with the commissioning of a joint venture catalytic converter manufacturing facility. This joint venture brought together Toyota South Africa as a local investor, Toyota Motor Corporation with its global automotive manufacturing power and Cataler as a technology leader in exhaust catalyst development and manufacture (Cataler South Africa brochure, 2012:4). The Cataler South Africa facility in Prospecton opened its doors with a manufacturing capacity of 1 million catalytic converters a year in 2001.

Parts are manufactured in the plant as per the customer order and then delivered to the Toyota Export Warehouse where it is shipped as per the final customer order. Cataler South Africa has only one customer that it supplies and that is Toyota.

Conformance of the product to specification is vital to Cataler South Africa who follows the Toyota Production System (TPS) approach to manufacturing.

### **1.3 Motivation for the Study**

The primary reason for this research was to conduct an analysis of the production control department at Cataler South Africa. The production control department at Cataler South Africa have had challenges with a change in management and no clear guidelines, which resulted in production planning and control problems. This research aimed to highlight gaps that the production control department may have and more importantly, how the department should position itself to create harmony and synchronisation with the production and quality departments thereby ensuring sustainable business growth and customer satisfaction. The key stakeholders who will benefit from this study will be the production control clerk, production control assistant, production supervision and the quality inspectors. The benefits for the

business as an entity will result in customer delivery satisfaction, employee motivation and financial benefits.

#### **1.4 Focus of the Study**

The primary focus of this study is to analyse and explore the perceived production planning and control problems. This study will apply this focus in the form of an interview of the production control department, production and quality employees. The communication between these departments is poor and attention is required in order to create a system for good performance and customer satisfaction.

#### **1.5 Research Methodology**

A qualitative study was undertaken in this research because there was a need to determine the reasons why there were production planning and control problems at Cataler South Africa. A quantitative study would have confirmed what was already known, namely the extent of the problem, whereas a qualitative study managed to elicit the reasons for the problem.

#### **1.6 Problem Statement**

The business environment is dramatically changing. Companies today face the challenge of increasing competition, expanding markets, and rising customer expectations. This increases the pressure on companies to lower costs in the entire supply chain, shorten throughput times, reduce inventories, expand product choice, provide more reliable delivery dates, better customer service, improve quality, and efficiently coordinate global demand, supply and production.

Supply chain management is recognised for the minimisation of non-value added activities with costs and enhances the bottom line performance of the business. Establishing the links within the business and the supply chain results in business

success and customer satisfaction.

An “Enterprise Resource Planning” (ERP) process allows the business to link the customers, suppliers and manufacturing process together in unity where all objectives and status is clearly indicated and known to all within the supply chain of the business. The process allows for the maximum efficiency and accuracy of inventory at any given time if properly maintained.

The problem experienced at Cataler South Africa are the production planning, no supplier monitoring, no inventory monitoring which then results in poor delivery to the customer ; high overtime in the inspection department due to inconsistent production scheduling. Management change has taken place and the employees in the department have no clear production control policy and no clear responsibility and authority descriptions of daily functions. The communication between the production control department and the quality and production department is poor, which results in frustration and employee motivation decreased.

## **1.7 Research Questions**

- i) How is the inventory system measured and monitored?
- ii) How are raw materials procured?
- iii) What causes the impact of the need to place urgent orders for raw materials?
- iv) What effect does poor production planning have on the manufacturing plant?
- v) What problems are caused when stock is not delivered to the customer on time?

## **1.8 Objectives**

- i) To evaluate the inventory system
- ii) To evaluate the procurement of raw materials

- iii) To determine the impact of the need to place urgent orders for raw materials
- iv) To establish an effective production planning schedule
- v) To ensure timeous delivery of products to customer

## **1.9 Limitations of the study**

Due to the small population and sample size, the fact that the perceived production planning and control problems had been identified by key individuals at Cataler South Africa, it was decided in consultation with these individuals to undertake a qualitative study. The qualitative study was restricted in terms of the quality and the quantity of data that it would yield. In spite of this, management were of the view that a qualitative study would identify the reasons why the perceived production planning and control problems were evident.

The following limitations and assumptions are applicable to this research:

- i) The research only applies to Cataler South Africa and to the operations within the country
- ii) Respondents were senior employees at Cataler South Africa. This small scale study of Cataler South Africa, was not statistically sound due to the small number of respondents
- iii) A qualitative approach was used hence the research lacks a quantitative element

## **1.10 Summary**

An empirical study was conducted through personal interviews with 15 employees at Cataler South Africa in order to ascertain how to improve the perceived production planning and control problems. Special emphasis was laid on trying to gain a valuable insight and understanding into the frustrations experienced between the production control, production and quality departments and implemented key

improvements, thereby enabling the production control department to become efficient and successful.

The outline of the research consists of:

- Chapter 2: Review of Literature
- Chapter 3: Research Methodology
- Chapter 4: Presentation of Results
- Chapter 5: Discussion
- Chapter 6: Conclusions and Recommendations

The next chapter deals with the literature review. The purpose of the literature review will be to introduce the available literature on the production control. This will indicate the current state of literature available on the subject and will provide guidelines to the requirements necessary for an effective improvement system for production control.

## **CHAPTER TWO**

### **REVIEW OF LITERATURE**

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#### **2.1 Introduction**

According to Klopper (2006), the general objective of a literature survey is to demonstrate the ability to do a critical comparative analysis of the major references that relate to a research project. This general objective can be restated as three more specific objectives:

- i) “To identify an appropriate theoretical framework to constrain how to interpret the results of empirical research.
- ii) To determine to what extent the research problems that have been formulated, and the critical questions that have been resolved by prior research so that they can remove them from the set of problems that one is investigating” (Klopper, 2006).

This section of the literature review covers issues pertinent to the objectives which consider the procurement of inventory and the production process in order that final product can be delivered to the customer on time.

#### **2.2 The Literature Review**

##### **2.2.1 Supply Chain Management**

Supply chain management (SCM) is “a key strategic factor for increasing organisational effectiveness and for better realisation of organisational goals such as enhanced competitiveness, better customer care and increased profitability”

(Gunasekaran et al. 2001, p.71). The major goals of SCM are to minimise non-value-added activities and associated investment cost and operating cost, increase customer responsiveness and flexibility in the supply chain, and enhance bottom-line performance and cost competitiveness (Steward 1995).

Many companies are trying to find tools for performance improvement in response to turbulent business markets and for efficiently controlling their business activities. The objectives of performance measurement are to improve the efficiency and effectiveness of a supply chain (Beamon 1999; Gunasekaran et al. 2001). In addition, Keeber (2000) also stated that the purpose of performance measurement is to reduce operating costs and customer service in logistics activities, improve firm's revenue growth, and enhance shareholder value.

### 2.2.1.1 Conceptual Model

The study of buyer-supplier relationships and purchasing process has been the focus in relationship marketing and purchasing including business-to-business marketing literature. The figure below shows the important elements of supply chain integration.

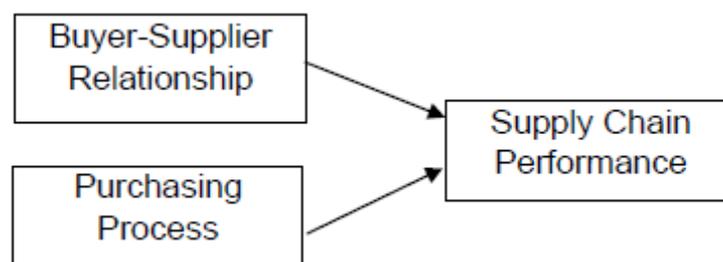


Figure 2.1: Conceptual Model Source: Maloni and Benton 2000

Establishing and managing effective relationships at every link in the supply chain is becoming the prerequisite of business success. High volatility in the motor industry reflects rapid fluctuations in customer demand and unpredictable market trends. In addition, environmental diversity reveals uncertainty in the global business environment. Facing market volatility and diversity, business are encouraged to develop flexible relationships with partners to deal with unexpected market demands

and reduce the dependence on the vendor (Ganesan 1994). Maloni and Benton (2000) found that strong buyer-supplier relationships have significant positive effect on manufacturer performance, supplier performance, and performance of the entire supply chain. Purchasing is key to a business competitive advantage, and that increased profitability, market share and technological innovation can be achieved through an appropriate purchasing strategy. A company's purchasing practices can impact the effectiveness of its SCM strategy and its financial and market performance (Tan et al. 1998). In current purchasing practice, orders from suppliers are placed with the international suppliers many months ahead. The lengthy pipeline increases inventory carrying cost and inefficiency in the supply chain.

### **2.2.2 Production Planning and Control**

Planning and control is concerned with “managing the ongoing activities of the operation so as to satisfy customer demand” (Pycraft et al., 1997:342). This requires that the resources of the operation are available in the appropriate quantity at the appropriate time and at the appropriate level of quality.

Pycraft et al., (1997) note that constraints within which the planning and control activity have to take place will apply to most types of operations. Generally these are as follows

- *Cost constraints* – products and services must be produced within an identified cost.
- *Capacity constraints* – products and services must be produced within the designed capacity limits of the operation.
- *Timing constraints* – products and services must be produced within the time when they still have value for the customer.
- *Quality constraints* – products and services must conform to the designed tolerance limits of the product and service.

Production planning and control, an important managerial function determines the quantity of outputs to be produced, the expected levels of inventory and work force or

any other resources required for the planning period. It is important for the manufacturing business to have a sound production plan in order to be productive.

### **2.2.2.1 The difference between planning and control**

Production planning and scheduling are long-standing research problems which are critical to the efficiency of manufacturing systems (Pinedo, 2002). Planning determines which activities to perform, while scheduling allocates the resources over time to these activities, so that production tasks can be accomplished timely and cost-effectively (Smith, 2003). Despite the tremendous effort made on production planning and scheduling, their application to real-world problems remains very limited (Jacobs and Weston, 2007)

According to Pycraft et al., (1997), planning and control is not clear. A plan is a formalization of what is intended to happen at some time in the future, therefore it is a statement of intention that it will happen. When operations make plans, things do not always happen as expected. Customers may change their mind about what they want and when they want it. Suppliers may not always deliver on time, machines might not be functional and, or there may be high levels of absenteeism. Any of these reasons may contribute to the plan not being carried out. There are many different variables, any one of which could cause a plan to become unworkable. Control is the process of coping with changes in these variables. This may mean plans need to be redrawn or that intervention will need to be made in the operation to bring it back on track.

Production control is seen as a system for controlling a number of things in most manufacturing organisations and to reduce the potential of customer dissatisfaction that may arise. At Cataler, the interaction of the production control department with engineering, production, finance and quality department is very important. The exchange of information among the departments is important for daily operational functions in order to ensure that the parts are manufactured to the customer on time.

According to Tooley (1981), if production control is to function correctly, it must be able to decide:

- i) Where the products are made
- ii) How many products are made
- iii) When the products are made
- iv) How the products are made

*Where the products are made:* To make this decision it necessary to know:

- the best method of manufacture to satisfy possibly conflicting conditions of delivery, plant availability, direct labour and cost
- if suitable facilities exist in the company
- if such facilities are already committed
- if the work is to be subcontracted, which is the best source; or, if the item can be either manufactured inside or outside the company, which will give the best results and provide the goods at the least cost and within the required timescale.

*How many products are made:* The question how many of a particular product are to be made or purchased can be answered in two ways. The first answer is the result of variable parameters available and regularly revised as part of the stock control routine. The second is motivated by a sales forecast or by customer demand.

*When the products are made:* The evaluation of when raw materials and parts should be requested for delivery represents one of the challenging production control activities. While the planned co-ordination of such an exercise presents problems of some level, it is insignificant when compared with the necessary calculations to arrive at the best sequence of loading each operation to obtain optimum performance.

*How the products are made:* Somewhere within the manufacturing plant facility must be someone who can decide upon the best method, plant and equipment, and tooling necessary for that method, with an appreciation of what is the most efficient layout of the works to provide optimum performance of both plant and the labour that operates. In the larger organisation these responsibilities are allocated to the production

engineer who necessarily is motivated in his decisions and calculations by the quantities of each item and how frequently they are required.

### **2.2.3 Inventory System**

**With reference to objective 1, this section considers inventory system and the management thereof.**

#### **2.2.3.1 Objectives of Production and Inventory Control**

Manufacturing firms focus on three major objectives with the intent on earning profit:

- i) Maximum customer service
- ii) Minimum inventory investment
- iii) Efficient (low cost) plant operation

Maximum customer service can be provided if inventories are raised to very high levels and the plant is kept flexible by altering the production levels and varying production schedules to meet the customers' changing demands.

As part of the ongoing commitment to managing resources with efficiency it is necessary to check on how well the objectives in the system are working.

#### **2.2.3.2 Inventory**

The study of inventory management techniques in enterprise systems has increased dramatically over the last half century (Whitin, 1970; Buffa and Miller, 1979; Seierstad and Sydsaeter, 1987). The use of optimisation techniques in the management of supply/demand networks began with the management of the classical Economic Order Quantity (EOQ) approaches. Since then, decision policies have been developed to accommodate dynamics, production costs, and inventory costs.

As technology is influencing the business, the role of teamwork and communication becomes important in the modern scenario. Inventory management is being influenced by all management factors. The cost of inventory in a company is not being fully identified, tracked, and therefore, effectively controlled, against the expected benefits which the inventory reduction can bring to the company. Accuracy and completeness are important in management of inventory to allow an organisation to make informed investment decisions. By improving inventory management, a business can determine the most efficient and cost effective ways to deliver good quality products to the customer.

New developments within the organisations must be planned and managed in an environment of fast changing technology, markets, regulations and social-economic factors. Team-based work relying on resource and power-sharing is also very crucial (West and Markiewicz, 2004). The project management integrated with the technology gives organisations, the leading edge towards effective management of projects and processes (Zipf, 2003). The business ventures and day to day running of the business can be achieved. Additionally, the roles, knowledge, and skills of team members need to match the real time data based technology (Wiles, 2007). In essence, to be a successful organisation, appropriate tools, techniques and processes (technology) along with sophisticated teamwork skills are required.

Not only teamwork and collaboration, but communication is an integral part of today's successful business. Teamwork is becoming very crucial in the current scenario because it helps both, in communication and collaboration. A team is a small number of people with complementary skills who are committed to a common purpose, set of performance goals, and approach for which they hold themselves mutually accountable" (Katzenbach and Smith, 1993). The benefits of teamwork are getting the work done more efficiently and effectively, fostering innovation as well as helping to change (West and Markiewicz, 2004).

The biggest opportunities for inventory reduction are with excess stock and inventories. These are parts for which there are future requirements while the balances

on hand are actually abundant. In fact, reducing excess inventory or backlogging is essential for improving production planning (Byrne and Hossain, 2005).

Pycraft et al., (1997) state that there are five types of inventory:

- i) Buffer inventory: This is referred to as safety inventory. Its purpose is to compensate for any unexpected fluctuations in supply and demand. The minimum level of inventory covers against the possibility that demand will be greater than expected during the time taken to deliver the goods. This allows for the compensation of uncertainties in the process of the supply of goods into the store, perhaps because of the unreliability of certain suppliers, transport issue or environmental concerns such as natural disasters.
- ii) Cycle inventory: Occurs because one or more stages in the process cannot supply all items it produces simultaneously. So when demand is steady and predictable, there will always be some inventory to compensate for the intermittent supply of each product. Cycle inventory only results from the need to produce products in batches, and the amount of it depends on volume decisions.
- iii) De-coupling inventory: Wherever an operation is designed to use a process layout, the resources move intermittently between specialised areas or departments that comprise of similar operations. The areas can be scheduled to work relatively independently in order to maximise the local utilisation and efficiency of the equipment and staff. Each batch of work-in-progress inventory joins a queue, awaiting its turn in the schedule for the next processing stage. This allows each operation to be set to the optimum processing speed (cycle time).
- iv) Anticipation inventory: Inventory is used to cope with seasonal demand and the differences in the timing of supply and demand.
- v) Pipeline inventory: Pipeline inventory exists because material cannot be transported instantaneously between the point of supply and the point of demand. Inventory exists within processes where the layout is

geographically spread out.

### **2.2.3.3 Inventory priorities**

Slack et al., (2004) state that one common way of discriminating between different stock items is to rank them by the usage value. Items with high usage are deemed to warrant the most careful control, whereas those with low usage value need not be controlled rigorously. Generally, a relatively small proportion of the total range of items contained in an inventory will account for a large proportion of the total usage value. The Pareto law can be referred to the 80/20 rule where typically 80 per cent of an operations sales are accounted for by the 20 per cent of all stocked item types. The ABC inventory control allows the management to concentrate their efforts on controlling the more significant items of stock.

- Class A items are those 20 per cent or so of high usage value items which account for around 80 per cent of the total usage value
- Class B items are those of medium usage value, usually the next 30 per cent of items which often account for around 10 per cent of the total usage value
- Class C items are those low usage value items which, although comprising around 50 per cent of the total types of items stocked, probably only account for around 10 per cent of the total usage value of the operation (Slack et al., 2004)

### **2.2.3.4 Inventory Information Systems**

Data inaccuracy often poses one of the most significant problems for inventory managers (Slack et al., 2004). Most inventories of any significant size are managed by computerised systems. The many relatively routine calculations involved in stock control lend themselves to computerised support.

Every time a transaction takes place the position, status and possibly the value of the stock will have changed. This information must be recorded so that managers can determine the current inventory status at any time.

Inventory control system can generate regular reports of stock value for the different items stored, which can help management monitor its inventory control performance. Similarly, customer service performance can be monitored and reported on.

Inventory control system can compare actual demand against forecast and adjust the forecast in the light of actual levels of demand.

#### **2.2.4 Material Requirements Planning**

With reference to objective two, this section considers the procurement of raw materials. With regard to objective three the literature concerns material that focusses on determining the impact of the need, to have to place urgent orders for raw materials.

Manufacturing business systems, regardless of their size, have to be able to function in dynamic environments with scarce resources and managers are asked to assign production facilities to parallel activities over time respecting operational constraints and deadlines while keeping resource cost as low as possible (Caramia et al., 2006). As the business world moves closer to a collaborative model and competitors upgrade their capabilities to remain competitive, organisations must improve their business practices and procedures.

A material requirement planning (MRP) system is a computerised information system that provides valuable inventory management information. With the aid of an MRP system it is possible to determine which inventory items are required for the production process, what quantity is required, when it is required and when the orders need to be placed to ensure on-time delivery (Niemand and Bennet, 2007). The inputs into an MRP system consist of three main components:

- Master production schedule
- Bill of Material
- Inventory status file

Plossl et al., 1967 state that an inventory control system for dependent demand items requires a parts list, or bill of materials, so that assembly requirements can be translated into requirements for components.

The inputs into an MRP system consist of three components:

- Master production schedule. The master production schedule provides a complete list of which products the business is planning to manufacture, the quantity it plans to manufacture and when
- Bill of material. The breakdown of the components that will be needed in the final product, the sequence in which they will be needed and the exact number of each component that will be required for each product being manufactured
- Inventory status file. A file that contains information on exactly how many units of each item required for production are available in the warehouse, how much safety stock of each inventory item is on hand, which items are on order from suppliers and the lead times of each inventory item

After feeding all the information into the MRP system, the program calculates which items will be required for the production process, when they will be needed, and if the items are not currently on hand or on order, when the order should be placed to ensure the items arrive in for the production process. (Slack et al., 2004 )

#### **2.2.4.1 What is ERP?**

“Enterprise Resource Planning” is a term originally coined in 1990 by The Gartner Group to describe the next generation of MRP II software. The purpose was to integrate all facets of the business enterprise under one suite of software applications. ERP is a business model that involves all levels and departments in the organisation. ERP process disciplines allow organisations to link customers and top management

decisions all the way through to execution in the supply chain and the factory floor. Well executed ERP not only starts with top management, it is totally dependent on top management (Sheldon, 2005). The strategic element of top management planning is an effective component of ERP, while the rules and spirit of ERP do not dictate strategic policy, but instead insist on strategic linkage to the remainder of the business practices and execution, especially the demand-side and supply-side rules of engagement. Top management ideas must drive activity in the business.

#### 2.2.4.2 ERP business model

Disciplined process linkages within the information flow initiated by the top-management planning process and scheduled through the master scheduling process can allow maximum efficiency and accuracy of inventory.

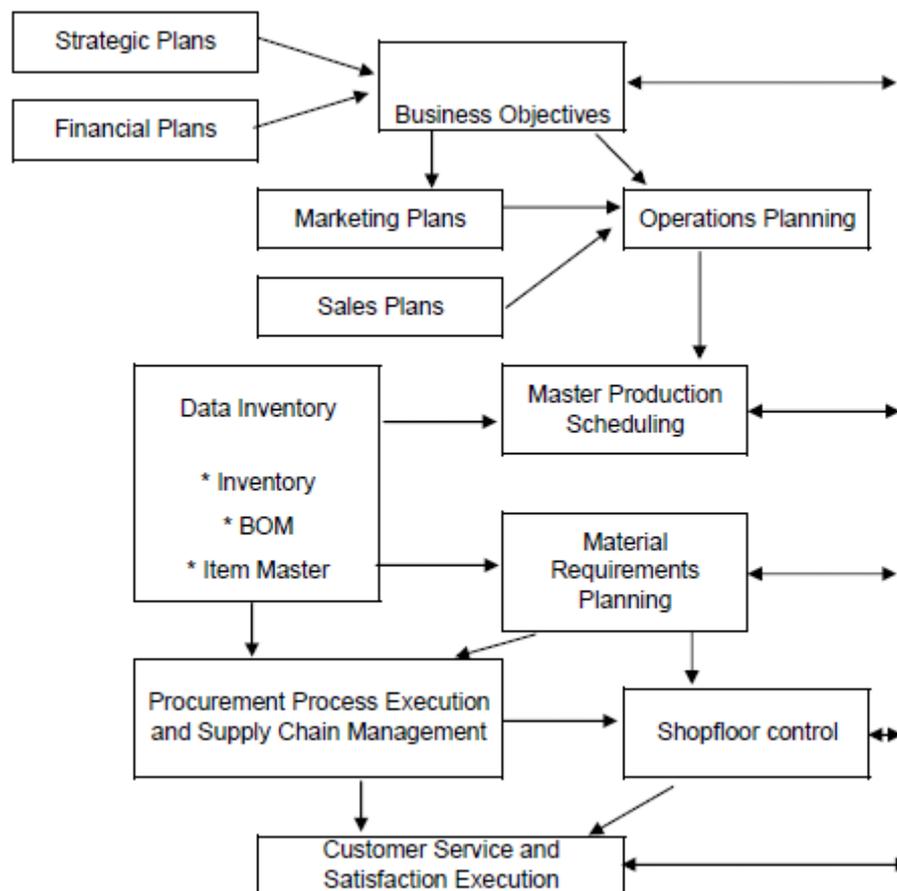


Figure 2.2 ERP Business System Model Source: Sheldon 2005

The business model one can identify the importance of information flow and process linkage from top management planning through to plan execution and customer service and satisfaction.

#### **2.2.4.3 Critical factors for successful ERP implementation**

Numerous authors have identified a variety of factors that can be considered to be critical to the success of an ERP implementation. The prominent of these are described below.

- Clear understanding of strategic goals
- Commitment by top management
- Excellent project management
- Organisational change management
- A great implementation team
- Data accuracy
- Extensive education and training
- Focussed performance measures

#### **2.2.5 Production Planning Schedule**

With reference to objective four, this section considers the establishment of an effective production planning schedule.

The Dictionary of Production and Inventory Control Terms defines production planning as “the function of setting the limits or levels of manufacturing operations in the future...” (Plossl & Wight, 1967). A production plan is a projection of the level of production required for a specific production facility, but it is not a firm commitment to the individual items to be made within the plan. The production plan creates a framework within which inventory control techniques will operate.

Sans 16949:2009 (2009) states that production shall be scheduled in order to meet customer requirements, such as just-in-time supported by an information system that permits access to production information at key stages of the process and is order driven.

When the ERP process works efficiently and effectively, scheduling becomes the linkage rod or transmission connecting the top-management planning engine with the execution wing of the business, normally operations (Sheldon, 2005).

The master scheduling takes the information from the top management and translates them into usable requirements for production planning. It is the master scheduler's job to identify and determine the mix within the product families and lot size and priority of order requirements.

#### **2.2.5.1 Making the production plan**

The production plan should cover product families or groups that are processed by some common manufacturing facilities and should be expressed in the simplest meaningful to plant operating staff.

#### **2.2.6 On Time Delivery To Customer**

With reference to objective five, this section considers timeous delivery of product to customer.

Sans 16949:2009 (2009) refers the customer satisfaction within the organisation. The data integrity within the systems, planning procedure, and control procedures are more important for the measures of on-time delivery, while the production policy factor is critical for the objective measure of this goal. From the stock management's point of view providing an appropriate customer service level is the basic goal of creating and keeping the safety stock level. The customer service level is in this case

understood as cycle-service level – the desired probability of not running out of stock in any ordering cycle (Lee and Larry 2002).

### **2.2.7 Economic Lot Sizes**

In inventory and production control analyses, it is convenient and practical to study together those items which fall into natural groups. These groups may be made up of parts processed by common manufacturing equipment, purchased items handled by the same buyer, or material ordered from the same supplier. This is true in determining the sizes of lots in which material is procured. Costs, capital requirements, space needs, operating conditions and other factors which must be considered in setting lot sizes are most meaningful when families of related parts are considered.

One of the basic decisions that must be made in inventory management is that of balancing the costs of inventory investment against those of placing inventory replenishment orders. The question to be answered is “How much should be ordered?” The right quantity to order is that which best balances the costs related to the number of orders placed against the cost related to the size of the orders placed. When these costs have been balanced properly, the total cost is minimized, and the resulting ordering quantity is called the *economic lot-size*, or *economic order quantity* (EOQ).

According to Plossl and Wight (1967), the economic ordering quantity concept applies under the following conditions:

- i) The item is replenished in lots or batches, either by purchasing or manufacturing, and is not produced continuously
- ii) Sales or usage rates are uniform and are low compared to the rate at which the item is normally produced so that an inventory results

### 2.2.8 Inspection and its effect on Production Control

With the globalisation of the markets and the growth of competitiveness in the manufacturing sector, quality of products has become a key factor of success. Moreover, the turbulence of demand leads to the continuous need of modifying production targets. Quality and logistics requirements must be jointly considered while designing a production system.

In order to make a good performance measurement, the first step is to find performance measures. The performance measures could be categorised based on company goals. The measures shown in the table 2.1 below are on a function-based format and are common in early stages of supply chain performance assessment systems.

Financial	Operations	Marketing	Quality
Creditor days	Operations lead time	Market share	Percentage of rework
Debtor days	Inventory	Orders on hand	Percentage of rejects
Dividend cover	Stock turn	Order lead time	Percentage of scrap
Stock turnover	Set up time	No. of complaints	Quality admin costs
P.E. ratio	Labour utility	New product intro.	Liability costs
Net asset turnover	Work in progress	Repeat orders	Recall costs
R.O.C.E.	Employee turnover	Delivery performance	Quality costs
R.O.E.	Direct productivity	Time to market	Laboratory costs
Current ratio	Indirect productivity	Warranty claims	Product testing
Gross profit R.O.O.A.	Supplier performance	Returns	Prevention coss
Return on sales	Variances	Service visits	Performance testing
Sales/sq.m.	Process time	First pick per cent	Percentage of errors
Gearing	No. of accidents	First drop per cent	Percentage of Penalties
		Transport utility	Percentage of non-conformance

Table 2.1: Performance measures based on functional areas (Source: adapted from Morgan 2004)

A decision which is based on forecasting is the production planning decision where managers have to decide upon the level of production to meet demand in a future period. Overproduction can lead to excessive inventory costs while underproduction can lead to loss of business or the need to pay for emergency supplies.

The key role of forecasting is to help decision makers who face uncertainty about the future (Armstrong, 2001). Production planners usually face uncertainty when they have to decide how much to produce to meet customer demand in the future. This decision can be cognitively demanding. If carried out without support, the decision maker needs to: (i) make a prediction of the expected level of demand which will occur in the future period, (ii) assess the uncertainty associated with the prediction, and then (iii) combines this assessment with utility or cost functions, which are usually asymmetric, to determine the optimum level of production.

In a highly competitive environment, manufacturing organizations need a suitable production policy for the control of the production line so that the resources including machines as well as the buffer can be better utilized in conducting the manufacturing activities. The best possible performance in terms of better utilization of resources can be achieved by reducing non-productive time and increasing the customer service level, maintaining throughput and reducing the work-in-process inventory from the implemented policy.

## **2.2.9 Plant Capacity and its effectiveness**

### **2.2.9.1 Production system**

Production is a conversion function by which goods and services are produced. A typical production system comprises of three main components:

- Inputs: men, materials, machines, instructions, drawings, and paper work and instructions
- Transformation process: involves operations, mechanical or chemical, to Change/convert inputs into outputs. It also includes activities that assist conversion. Examples of such activities include:
  - i) Planning and control of factors of production
  - ii) Procurement of materials
  - iii) Receipt, storage and issue of materials

- iv) Material handling (to move materials to the point of use.)
  - v) Inspection of ill-process and parts
  - vi) Assembly and testing of products
  - vii) Storage of finished goods
  - viii) Instructions, authorizations, inspections, information storage/retrieval
- Output: goods and services

The combination of operations and activities stated above employed to create goods and services are known as manufacturing system. A manufacturing system therefore may be seen as an independent group of sub-systems, each sub-system performing a distinct function. Different sub-systems may perform different functions, yet they are inter-related and require to be unified to achieve overall objectives of the organization. The identified manufacturing system needs to interact with both internal and external environment. The internal environment is the combination of engineering, marketing, personnel and accounts activities whereas external environment comprises of customers, competitors, suppliers, labor unions etc. The selection of the manufacturing system is a strategic decision for most organizations since changes at a later date are very expensive to make. The systems selected should be such that it can give the desired output, required quality and is cost-effective.

#### **2.2.9.2 Plant Capacity**

Providing the capability to satisfy current and future demand is fundamental to the management. A balance between capacity and demand can generate high profits and satisfied customers, whereas getting the balance wrong can lead to a failure to satisfy demand, or higher than expected costs. The figure below identifies the essence of the task is to reconcile, at a general and aggregate level, the supply of capacity with the level of demand which it must satisfy.

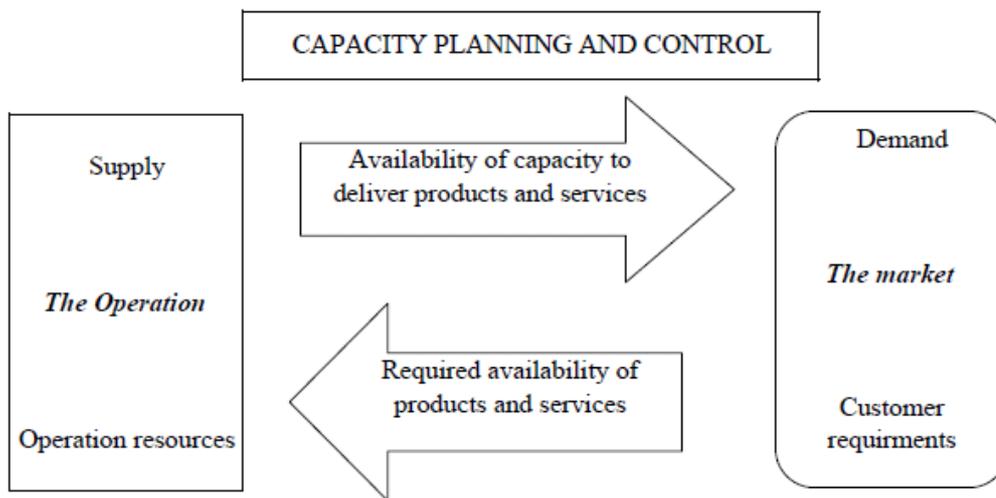


Figure 2.3 Capacity planning and control reconciles the required availability for an operations products and service with the operations capacity to deliver them Source: Slack et.al., 2004:358

The projected sales volume is a major influencing factor in determining whether the business should identify an intermittent or continuous process. The intermittent process: Fixed costs are low and variable costs are high. The continuous process: Fixed costs are high and variable costs are low. It can then be stated that an intermittent process therefore will be cheaper to install and operate at low volumes and continuous process will be economical to use at high volume.

### 2.2.9.3 Effects of operating speed on quality

A key determinant of a manufacturing system's performance is its operating speed. While it is generally assumed that production throughput increases with operating speed, this is not applicable where the quality deteriorates as a result of higher speed. Because operating speed is fundamental to a manufacturing system's performance, it is of keen interest to academic modelers as well as practitioners. Operating speed and its effects on quality have been identified as an important area of research in production system design (Inman et al., 2003). In today's manufacturing environment, it is critical to be productive while maintaining high quality.

Oakland (1994), states that total quality management requires the creation of a corporate identity and a supportive environment. “It involves setting the highest standards for quality at the lowest costs, effective training including teambuilding throughout the organisation, integrating systems and technology with people and the motivation, participation and commitment of staff at all levels of the organisation” (Oakland. 1994).

“Total quality management requires a never-ending process of continuous improvement that covers people, equipment, suppliers, materials, and procedures. The basis of the philosophy is that every aspect of an operation can be improved. Employee empowerment means involving employees in every step of the production process. Consistently, business literature suggests that some 85% of quality problems have to do with materials and processes, not with employee performance. Therefore, the task is to design equipment and processes that produce the designed quality. This is best done with a high degree of involvement by those who understand the shortcomings of the system. Those dealing with the system on a daily basis understand it better than anyone else” (Heizer and Render, 2000).

### **2.2.10 Lean Production**

Lean production is an assembly-line manufacturing methodology developed for Toyota and the automobiles manufacturers. This is known as the Toyota Production System. The aim and goal of lean production is described as “to get the right things to the right place at the right time, the first time, while minimising waste and being open to change.” This methodology leads to improved product flow and better quality. The principle of lean production enables the company to deliver on demand, minimise inventory, maximise the use of multi-skilled employees, flatten the management structure, and focus resources where they are needed.

Two relevant aspects of lean:

- i) Just-In-Time (JIT)
  - Don't produce something unless the customer has ordered it

- Level demand so that work may proceed smoothly throughout the plant
- Link all processes to customer demand through simple visual tools eg kanban
- Maximise the flexibility of people and machinery

The benefit of a just-in-time system eliminates waste and makes the business efficient. The JIT system allows for a good relationship with the suppliers. Emphasis is placed on the finished goods which leads to customer awareness and on time delivery.

ii) Jidoka

This is the automation with a human mind and implies intelligent workers and machines identifying errors and taking quick countermeasures.

“The philosophy behind just-in-time (JIT) is one of continuing improvement and enforced problem solving. JIT systems are designed to produce or delivery goods just as they are needed. JIT is related to quality in three ways: it cuts the cost of quality; it improves the quality; and it improves the quality of work life for employees” (Heizer and Render, 2000)

### **2.2.10.1 Lean Product Design**

Products can be designed with a number of lean attributes. These include (Harrison & Hoek, 2005):

- A reduction in the number of parts they contain and materials from which they are made;
- Features that aid assembly, such as asymmetrical parts that can be assembled in only one way;
- Redundant features on common, core parts that allow variety to be achieved without complexity with the addition of peripheral parts;
- Modular design that allow parts to be upgraded over the product life.

### **2.2.10.2 Lean Facility Design**

The facility within which new products are developed and existing ones are made and delivered should be designed with lean attribute. Among those are (Harrison & Hoek, 2005):

- i) Modular design of equipment to allow prompt repair and maintenance;
- ii) Modular design of layout to allow teams to be brought together with all the facilities they need, with the minimum of disruption, and then subsequently to be dispersed and reassembled elsewhere;
- iii) Small machines, ideally portable, which can be moved to match the demand for them;
- iv) Open system architecture that allows equipment to fit together and work when it is moved and connected to other items.

### **2.2.11 Toyota Production System**

The Toyota Production System defines seven types of waste as:

- i) **Overproduction:** To produce more than demanded or produce it before it is needed. It is visible as storage of material. It is the result of producing to speculative demand.
- ii) **Inventory or Work In Progress:** This occurs when material accumulates between operations due to large lot production or processes with long cycle time.
- iii) **Transportation:** This does not add any value to the product. Instead of improving the transportation, it should be minimised or eliminated.
- iv) **Processing waste:** Asking why a specific processing step is needed and why a specific product is produced should minimise this. All unnecessary processing steps should be eliminated.
- v) **Motion:** Motion of workers, machines and transport is waste. Instead of automating wasted motion, the operation itself should be improved.

- vi) **Waiting:** Waiting for a machine to process should be eliminated. The principle is to maximise the utilisation/efficiency of the worker instead of maximising the utilisation of the machines.
- vii) **Making defective products:** Defective products are pure waste. Prevention of the occurrence of defects instead of find and repairing defects is necessary.

### **2.2.12 Strategic Role of Purchasing**

Purchasing has for a long time been considered primarily as an operational function without any strategic importance (Baily, Farmer Jessop & Jones, 1994). However, in recent years the strategic importance of purchasing has been given more attention. The purchasing function can usually contribute to the competitive position of the company in many other ways than just through cost savings. Van Weele (2005) presents a few of these ways, such as:

- i) *Reduction of quality costs:* Purchasing can reduce quality costs by ensuring that suppliers deliver a product or service that does not need extensive quality control.
- ii) *Product standardisation:* Purchasing can contribute do lower costs by striving for a reduction in product variety. This can be achieved by reducing the number of different components and/or the number of suppliers.
- iii) *Contribution to product design and innovation:* Encouraging interactions between supplier and buyers can contribute to the continuous innovation and improvement of products.
- iv) *Stock reduction:* Through imposing a solid discipline on supplier and enforcing it, purchasing can minimise the need for safety stock of components.
- v) *Increasing flexibility:* If the company wishes to offer flexibility to its customers it might also have to demand it from its suppliers. The use of EDI and synchronised data systems can make it easier to inform supplier about the change in demand over time.

Chen, Paulraj and Lado (2004) states that strategic purchasing is a vital link in a working supply chain. This allows for competitive advantage by enabling the business to:

- i) Foster close working relationships with a limited number of suppliers
- ii) Promote open communication among supply-chain partners
- iii) Develop long-term strategic relationship orientation to achieve mutual gains

Chen et al (2004) states that strategic purchasing will lead to communications with suppliers, a limited number of suppliers and a long-term orientation. They mean that this will lead to a higher customer responsiveness, which means that the buyer gives feedback to the supplier and the supplier makes changes accordingly which leads to mutual gains and ultimately a higher financial performance, see figure below.

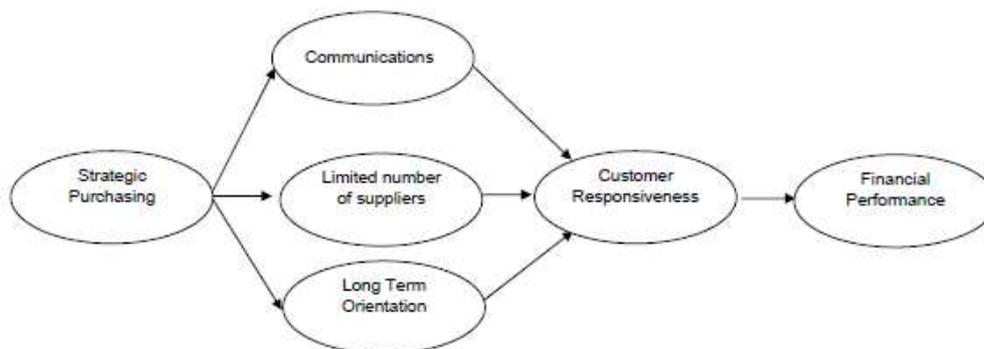


Figure 2.4: The contribution of strategic purchasing to the companies financial performance. (Chen et al, 2004)

Chen et al (2004) proves all of these connections to be significant except for the statement that Long-term orientation leads to higher Customer responsiveness, there is such a relation but the effects are not large enough to be significant.

However Chen et al (2004) has a rather special view on the number of suppliers to be used and marginalise the risks involved in having very few suppliers. They state that the fewer suppliers the better under all circumstances and that the risks of a supplier to act opportunistic is counterweighted by the increase in trust which sounds a bit

naïve. Strategic purchasing can be an important link in the supply chain and contribute to the overall financial results of the company.

#### **2.2.12.1 Strategic Level**

On the strategic level are decisions made influencing the long-term market position of the company. These types of decisions are usually positioned rather high up in the organisation preferably at top management level (Van Weele, 2005)

#### **2.2.12.2 Tactical Level**

The tactical level constitutes of decisions such as supplier selection and supplier evaluation and development. Decisions about purchasing actions that affect products and processes are also usually on the tactical level. (Van Weele, 2005)

Examples of purchasing decisions on the tactical level according to van Weele (2005) are:

- i) Agreement on corporate and/or annual supplier agreements
- ii) Preparing and developing value analysis programs, programmes aimed at design review and product standardisation
- iii) Adopting and conducting certification programmes for suppliers in order to improve the quality of incoming goods and materials
- iv) Selecting and contracting of suppliers in general and programmes aimed at supply-base reduction, in particular.

#### **2.2.12.3 Operational Level**

The operational level contains the daily activities of ordering stock and expediting. This level is also concerned with delivery surveillance and follows up on orders.

Examples of purchasing decisions and activities on the operational level according to van Weele (2005) are:

- i) The ordering process

- ii) All expediting activities related to released orders
- iii) Troubleshooting: solving daily problems on supply and payment in relationship with the supplier
- iv) The monitoring and evaluation of supplier performance.

### **2.2.13 Measuring Purchasing Performance**

Axelsson and Laage-Hellman (1991) states that a suitable way to govern purchasing is through target setting and measuring. They state that this could be done through Key Performance Indicators (KPI). The author divides the KPI into seven categories:

- i) Price related KPI
- ii) Quality related KPI
- iii) Delivery related KPI
- iv) Inventory related KPI
- v) Savings related KPI
- vi) Activity related KPI
- vii) Other

Van Weele (2005) presents two areas in which purchasing performance can be measured, purchasing effectiveness and purchasing efficiency. He states that purchasing effectiveness is a measure of what has been accomplished and purchasing efficiency is a measure of what resources has been used to accomplish this. He divides these two measures further, see figure below.

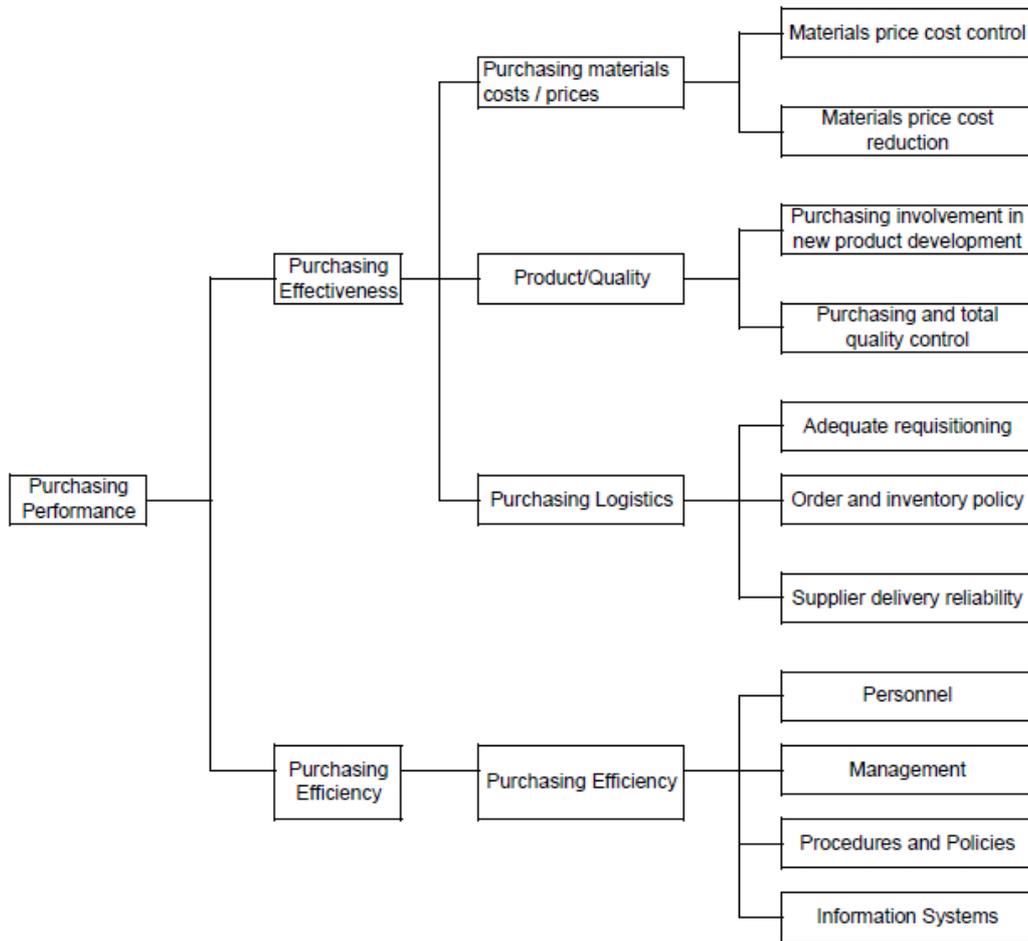


Figure 2.5: Purchasing performance (Source: adapted from van Weele 2005)

### 2.2.14 Training and Development

According to Mullins (2005), the purpose of training is to improve knowledge and skills, and to change attitudes. The author further states that training is one of the most important potential motivators and can lead to many possible benefits for both individuals and the organisation.

“Training can increase the confidence, motivation and commitment of staff; provide recognition, enhanced responsibility, and the possibility of increased pay and promotion; give a feeling of personal satisfaction and achievement, and broaden

opportunities for career progression; and help to improve the availability, quality and skills of staff. Training is therefore a key element of improved organisational competence. It helps to reconcile the gap between what should happen and what is happening – between desired targets or standards and actual levels of work performance” (Mullins, 2005).

According to Noe et.al., (2005), training refers to a planned approach by a company to facilitate employees’ learning of job-related competencies. “These competencies include knowledge, skills or behaviours that are critical for successful job performance. The goal of training is for employees to master the knowledge, skills and behaviours emphasized in training and to apply them to their day-to-day activities. Recently it has been acknowledged that to offer a competitive advantage, training has to involve more than just basic skill development. Training is moving away from a primary focus on teaching employees specific skills to a broader focus of creating and sharing knowledge. That is, to use training to gain a competitive advantage, a firm should view training as a way to create intellectual capital” (Noe et al., 2005).

Literature expresses that training and development should be viewed as an investment in personnel and which, if managed properly, will yield an above average return on investment in the short-, medium-, and long term. This will contribute to the long term survival and success of an organisation.

### **2.2.15 Effectiveness of manufacturing planning and control systems**

Manufacturing planning and control systems (MPCS) is traditionally considered an important element for manufacturing plant performance. MPCS is designed to plan and control materials, labour, and equipment by developing feasible, time-phased plans and monitoring their progress (Vollman et al., 2004). Several studies have suggested that there are two types of benefits associated with MPCS: internal (better internal control measures) and external (better performance to customer requirements) (Ang et al., 1994, Burns et al., 1991, Cooper and Zmud 1989, Cox and Clark 1984,

Sheu and Wacker 2001, Shroeder et al. 1981, Sum and Yang 1993). The internal benefits are improved data performance, supplier performance and shorter lead times. The external benefits increase the market competitiveness through improvement in traditional manufacturing goals performance.

### **2.3 Conclusion**

This chapter has covered the literature relevant to the objectives of the study. The key objectives for the research to evaluate the inventory system, the procurement of raw materials, to determine the impact of the need to place urgent orders for raw materials, to establish an effective production planning schedule and to ensure timeous delivery of products to the customer. The next chapter discusses the research methodology, data collection and data analysis methods. Validity, reliability and ethical considerations of the research process are also addressed.

## **CHAPTER THREE**

### **RESEARCH METHODOLOGY**

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#### **3.1 Introduction**

This chapter describes the qualitative research approach that has been followed to provide answers to the research questions that were presented at the end of the previous chapter. It addresses issues such as the appropriateness of a case study as a research strategy, data that is collected, the source of the data and participants, the data collection method and research bias. According to Bryman and Bell (2007), a research design provides a framework for the collection and analysis of data.

#### **3.2. Aim and Objectives of the Study**

##### **3.2.1 Aim**

The aim of this study is to evaluate the inventory systems, procurement of raw materials, establish an effective production planning schedule which then ensures timeous delivery of products to the customer.

To achieve this aim various objectives were formulated.

##### **3.2.2 Objectives**

The objectives of this research are to:

- i) Evaluate the inventory system
- ii) Evaluate the procurement of raw materials
- iii) Determine the impact of the need to place urgent orders for raw materials
- iv) Establish an effective production planning schedule
- v) Ensure timeous delivery of products to customer

### **3.2.3 Key Research Questions**

The key research questions for this research are:

- i) How is the inventory system measured and monitored?
- ii) How are raw materials procured?
- iii) What causes the impact of the need to place urgent orders for raw materials?
- iv) What effect does poor production planning have on the manufacturing plant?
- v) What problems are caused when stock is not delivered to customer on time?

## **3.3. The Research Plan and the Population and sample**

### **3.3.1 The research plan**

The research plan was designed to elicit responses from a small core of highly skilled Cataler employees at supervision level. This was because they were deemed to be people directly affected by the perceived production planning and control problems.

### **3.3.2 Population and Sample**

The total population of staff at Cataler that were relevant to this research numbered 15. In view of this the total population was interviewed. This has placed a limitation on the research in that the results are not statistically sound enough to be generalised to other similar organisations with confidence.

Respondents were the senior employees in supervision at Cataler South Africa, occupying the following positions:

- o Production Manager
- o Production Control Manager

- Production Control Clerk
- Group leaders
- Team leaders
- Assistant Production Manager
- Assistant Quality Manager

As can be seen the respondents were senior management people and formed part of a judgmental sample based on their position of responsibility within the organisation. As such the information they provided was of immense value and was accurate and reliable.

This small scale study of Cataler South Africa is not statistically sound, due to the small number of respondents. In spite of this it was conducted scientifically and as such Cataler South Africa will be able to consider and implement the recommendations with relative confidence.

### **3.4. Data Collection Strategies**

The research methodology used in this study was essentially qualitative in nature, using an open ended interview schedule. The data collected in this study was descriptive in nature and analysed by non-mathematical procedures. According to Ghayri and Gronhaug (2002), there are two types of data available, secondary data and primary data. The data collected in this research is of primary data. Collection of primary data can take the form of questionnaires, observations and semi-structured or in-depth interviews.

### **3.5 Research Design and Methods**

#### **3.5.1 Description and Purpose**

Saunders, Lewis and Thornhill (2003) describe two main types of research philosophies:

- Positivism

- Relativism

Positivism (Quantitative research) involves an objective way of studying people or situations. This type of research is scientific in nature. Hence the research results are given numerical values and the researcher uses mathematical and statistical analysis to evaluate the results. This approach is usually performed by scientists who carry out experiments. Surveys, questionnaires and interviews with numerical responses can be described as quantitative research.

Relativism (Qualitative research) assumes that the research is subjective because the data gathering process will be difficult and biased. This type of research takes the view that it is difficult for researchers to be independent and objective, since they are a part of the research process. In qualitative research data is usually collected in the form of descriptions. Researchers use non-mathematical procedures to interpret and explain the research findings.

The research philosophy used in this study is essentially qualitative in nature. According to Leedy and Ormrod (2006), qualitative research is a multifaceted approach and given the principles of conceptual blending, the borders between the literature, the researcher, the data and the results may sometimes appear vague. Leedy and Ormrod (2006) further state that the researcher can be considered as a data collection instrument while the literature forms part of the data. The authors further state that although the researcher may try to describe the data, the data sources and data collection separately, some of these descriptions may overlap.

According to Blumberg et al., (2006), qualitative studies base their accounts on qualitative information (i.e. words, sentences and narratives). “When making the choice as to whether to conduct a qualitative or quantitative study you need to consider the following questions: what is the research problem; are you attempting to conduct an explorative, descriptive, casual or predictive study; what is the objective; and what kind of information do you want to obtain?” (Blumberg et al., 2006).

“When we consider the scope of qualitative research, several approaches are adaptable for exploratory investigations of management questions: in-depth interviewing; participant observations; projective techniques and psychological testing; case studies; expert interviewing; and document analysis. When these approaches are combined, four exploratory techniques emerge with wide applicability for the management researcher: secondary data analysis; experience surveys, focus groups and two stage designs” (Blumberg et al., 2006).

According to Leedy and Ormrod (2006), qualitative research is of such a nature that the research questions may develop as it develops. This means that in some cases questions might develop as others are answered. Certain research questions may be answered after the literature review has been completed, while certain questions may arise that would have to be answered during the empirical research.

Saunders, Lewis and Thornhill, (2003) define reliability as the degree to which data collection methods will yield consistent findings and similar observations even if other researchers were conducting the study. Reliability can be assessed by posing the following three questions (Easterby-Smith et al., 2002:53):

- Will the measures yield the same results on other occasions?
- Will similar observations be reached by other observers?
- Is there transparency in how sense was made from the raw data?

Saunders, Lewis and Thornhill (2003) define validity as the extent to which data collection methods accurately measure what they were intended to measure.

Validity is concerned with whether the findings are really about what they appear to be about. The validity and reliability of collection methods for survey data will be easier to assess where you have a clear explanation of the methodology used to collect data.

### **3.5.1.1 Construction of the Instrument**

According to Blumberg et al., (2006), a personal interview is a two-way conversation initiated by an interviewer to obtain information from a participant. “The differences in the roles of interviewer and participant are pronounced. The greatest value lies in the depth of information and detail that can be secured. The interviewer can also do more things to improve the quality of the information received than with any other method” (Blumberg et al., 2006).

Personal interviews were used for collecting information for evidence. The interviews within the questionnaire were of a structured nature where each respondent was asked a fixed set of open-ended questions. The questions that appeared in the interview guide were easy to understand, clear, concise and open-ended. This elicited to a large extent clear and relevant answers from the respondents by enabling them to refer to the past, present and future. The questions posed to each respondent allowed him/her to answer in the context of their specific functional area as well as by referring to the organisation as a whole. The respondents were given a fair and adequate chance to answer the questions posed to them.

The questions for the interview were identified based on the literature and with the objective identifying the problems in the production control department. The questionnaire for this study was based on the literature review (Chapter 2).

### **3.5.1.2 Recruitment of Study Participants**

The empirical research was conducted at Cataler South Africa, based in Prospecton (KwaZulu-Natal). A representative of 15 employees was used. This consisted of employees at different supervision and management levels in the different functional areas of the business. Interviews were held on a one to one basis with each respondent during office hours at the firm’s premises in Prospecton.

The follow respondents were interviewed: production manager, production control manager, production control clerk, group leaders, team leaders, assistant production manager and assistant quality manager. The duration of employment of the interviewees (employment at Cataler South Africa) ranged from 8 to 10 years.

This small scale of study had a sample size of 15 respondents however as they represented 100% of the relevant role players this sample size was deemed to be adequate. The respondents also represent all the relative decision making and key operational posts within the scope of the study. This ensured that adequate information from the respondents was elicited. The respondents possessed a good and thorough understanding of their immediate functional working area.

### **3.5.2 Methodology Adopted**

As previously stated, this research was based on a qualitative nature with the aim to resolve the perceived production planning and control problems at Cataler South Africa. Saunders, Lewis and Thornhill (2003) state the overall suitability must be maintained. This refers to the extent to which the data will be able to provide the information that will be required to answer the research questions.

The benefit of using a qualitative methodology being that the respondents were free to supply more in depth data and detail than would be case with a qualitative study. In addition, as Cataler management had already identified production control as a problem, a quantitative study would not have been of value to the firm.

### **3.5.3 Pretesting and Validation**

No questionnaire should be administered before the researcher has evaluated the likely accuracy and consistency of the responses. According to Hair et al., (2007) the accuracy and consistency of the responses can be achieved by pretesting the questionnaire using a small sample of the respondents with characteristics similar to

the target population. The sample size in a pretest would likely be between 4 to no more than 30 (Hair et al., 2007)

The draft questionnaire used in the interviews was first pre-tested on work colleagues to check its suitability and appropriateness to check its content validity and terminology and modified accordingly. The pilot study respondents were not the same people who took part in the questionnaire interview at Cataler South Africa.

Collis and Hussey (2003) explain the validity and reliability of a measuring instrument are two aspects that are concerned with the findings in the research. The validity of an instrument as per Hair et al., (2007) is the determination of the extent to which the instrument actually measure what it is supposed to measure.

#### **3.5.4 Validation of the Questionnaire**

In order to establish the reliability and validity of the research instrument it is necessary firstly, to clarify these concepts and secondly relate it to this study.

Collis and Hussey (2003) explain that the validity and reliability of a measuring instrument are two aspects that are concerned with the findings of a research. The validity of an instrument as per Hair *et al.* (2007) is the determination of the extent to which the instrument actually measures what it is supposed to measure. The reliability of a measuring instrument indicates the extent to which the measure is without bias (error free) and hence offers consistent measurement across time and across various items in the instrument (Sekaran 1999). If this research were to be replicated by other researchers in similar circumstances very similar results should be obtained.

There are a number of different ways in which the validity research can be assessed – the three most common being content or face validity, construct validity and hypothetical validity (Collis & Hussey 2003). For the purpose of this research, only face and construct validity will be clarified.

Face validity indicates that the items that are supposed to measure a concept do so on the face of it look like they measure the concept. From the feedback of pretesting of the questionnaire, face validity was met in meeting the overall objectives of this research. There was confidence that the initial test had face validity as the overall function of the questionnaire was met from the observed measurements obtained. Respondents were managerial level and were of the view that the questions were relevant to the title and objective of the study.

An instrument has construct validity to the extent that it can testify to how well the results obtained from the use of the measure fit the theories around which the test is designed (Sekaran 1999). Motivation, creativity, racial bias, bedside manner – all of these are constructs, in that none of them can be directly observed or measured (Leedy & Omrod 2005).

### **3.5.5 Administration of the Questionnaire**

Research designs can be classified by the approach used to gather primary data. The two alternatives are to observe conditions, behaviour, events, people or processes or to communicate with people about various topics (Cooper and Schindler, 1998).

Research designs can be classified by the approach used to gather primary data. The two alternatives are to observe conditions, behaviour, events, people or processes or to communicate with people about various topics, (Cooper and Schindler, 1998).

Once ethical clearance (appendix 1) was obtained from the University Ethics Committee, the researcher embarked on the interview process in order to obtain the data. Initially, a written request for consent to conduct the research at Cataler South Africa was emailed to the Human Resource Manager. Once a written consent was obtained from the Human Resource Manager (appendix 2), the respondents were contacted through the heads of department to set up personal interviews with the 15 employees from the different functional areas.

A week before the interview took place with the respondents, a computerized reminder was set up to confirm the date and time for the interview appointment. On arrival, the respondents were reminded of the nature and purpose of the research and that the benefits of the research would be to identify the causes of the production problems in order that recommendations could be made to remedy such causes. This would therefore improve the productivity in the production plant and thus profits. In most instances respondents were ready and willing to participate in the research, however in two or three instances, certain people were called out from the interview due to the production problems that were encountered on the production line. This resulted in a disruption to the interview for an approximate time of 15 minutes. Each of the production problems to which the 3 respondents were called out to underline the significance of this research, as those problems are issues that were investigated in this research. Conducting face to face interviews was beneficial as respondents were able to divulge information pertaining to production and production control problems, without feeling intimidated. Interviews were arranged for a time span of 45 minutes and in many instances, respondents opened up and divulged relevant information to the topic resulting in interviews exceeding to 1.5 hour. As a result of the unpressurised interview environment the respondents volunteered far more valuable information that was expected and as a result added immense value to the study.

The interviews with each respondent took approximately 45 minutes as they were very eager and enthusiastic to answer the questions posed to them. This also allowed the respondents sufficient time to formulate and articulate their responses, while at the same time it allowed the researcher to clarify any 'grey' areas so as to get a better understanding of the responses given. Respondents were informed well in advance of scheduled interviews and they had adequate time to familiarise themselves with the interview questions.

With regard to ethics, respondents signed an informed consent document and were assured that the research was for academic purposes, that they were participating on a voluntary basis and that they were free to withdraw if they chose do so. The respondents were assured that their responses would remain confidential. The

respondents were assured that no harm would come to them as a result of the participating in the research.

In addition, they were advised that the completed questionnaires would be securely stored and ultimately destroyed in accordance with the university guidelines.

### **3.6 Analysis of the Data**

As discussed previously, this study is essentially qualitative in nature. Saunders, Lewis and Thornhill (2003) list three characteristics of qualitative data.

- i) Data is expressed through words and descriptions
- ii) Collection is non-standardised and can be judgemental
- iii) Analysis is conducted through conceptualisation and theory building

There are different approaches to analysing qualitative data. These approaches depend on the level of structure and the procedures that were adopted during the data collection phase. Saunders, Lewis and Thornhill (2003) list two categories of qualitative data analysis.

- i) Deductive qualitative analysis
- ii) Inductive qualitative analysis

Primary data was obtained by means of interviewing the respondents. Primary data provides first-hand Primary data provides first-hand information derived from a formalized research process. “Primary source is the written / oral account of a direct witness of, or a participant in an event, or an audiotape, videotape or photographic recording of it”, Welman and Kruger (2001).

#### **3.6.1 Deductive qualitative analysis**

With the deductive approach, an existing theoretical framework is used to shape qualitative data collection and data analysis. With this approach, the research starts

with and utilises existing theory to guide the study, rather than develop a theory from the study.

Saunders, Lewis and Thornhill (2003) state that starting the research from a theoretical perspective will link the study to the existing body of knowledge and provide an initial analytical framework. The objective is to use an existing theoretical framework as a starting point to develop a framework which will explain the findings of the research.

According to Saunders, Lewis and Thornhill (2003), in the development of the theoretical framework the following issues needs to be identified.

- Main variable, components, themes in the research project
- Predicted or assumed relationships between the variables.

Once the framework has been developed it will be used to direct the analysis of the data. Saunders, Lewis and Thornhill (2003) cite Yin (1994) who describes two deductive procedures:

- **Pattern matching:** involves the prediction of a pattern of outcomes based on theoretical propositions to seek to explain a set of findings. The first step is to establish a conceptual framework using existing theory as a means to explaining results of the study. If the pattern of data matches the prediction of the conceptual framework, then the outcomes of the study can be justified.

On the other hand, if no patterns can be established between the theoretical framework and the results of the study, another analysis technique must be sought.

- **Explanation building:** involves the iterative examination of a number specially selected cases to test a certain postulation. This type of data analysis involves the building of an explanation while collecting data and analysing it. Saunders, Lewis and Thornhill (2003) state that explanation building is still designed to test a theoretical proposal, but in an iterative manner.

According to Yin (1994), explanation building is related to explanatory case studies in that these types of case studies still test hypotheses and are not hypotheses generators like exploratory studies.

### **3.6.2. Inductive qualitative analysis**

Inductive data analysis is the second category of qualitative analysis that was defined by Saunders, Lewis and Thornhill (2003). In the inductive approach, the theoretical framework is developed from empirical data which is obtained from a number of relevant cases.

With this approach, there is no theory or framework at the start of the research. The aim of the research is to postulate a firmly grounded theory, using qualitative data. This approach is used when existing theoretical frameworks are too restrictive or do not reflect the essence of the research. Saunders, Lewis and Thornhill (2003) state that the use of an inductive approach could allow a good fit to develop between the social reality of the research participants and the theory that emerges.

Saunders, Lewis and Thornhill (2003) state the inductive approach may be lengthy and involve concurrent analysis of various ideas in order to develop a valid theory. Also once a theory has been developed using inductive approach it still needs to be compared with the existing body of knowledge.

### **3.6.3 The qualitative data analysis technique used in this study**

The research approach used in this study was the inductive approach. The research data was collected within the research context and the researcher was part of the research process. In addition, most of the data collected was qualitative in nature. As an interview schedule was used, data was analysed according to the open ended questions. This process was done manually relative to each objective as is illustrated in chapter four.

### **3.7 Fieldwork**

There were no problems identified in the actual interview process. However, it was found that there were certain questions which certain departments could not answer which underscored the importance of this research. However, in order for the process to flow smoothly the people involved in the related components parts of the system should have a fairly good comprehension of how their colleagues work and operate and of how the entire system is inter-linked.

It was noted that the quality and production supervision could not answer questions that were relevant to the functional day to day production control activities further confirming the importance of this research.

### **3.8 Conclusion**

This chapter discussed the research methodology followed in conducting the study and reported on the fieldwork. Problems relating to the fieldwork which were minimal were mentioned above. In addition, significant data was yielded from the interview process as a result of the respondents willingly divulging more information than was anticipated when the questionnaire was constructed. The sample consisted of 15 senior Cataler employees who were interviewed to obtain data for this research.

This chapter outlined the research methodology which was a qualitative one, based on open ended questions. The population and sample size were discussed, as were issues of validity and reliability.

Chapter four presents the analysis of the data obtained from the interviews.

## CHAPTER FOUR

### PRESENTATION OF RESULTS

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#### 4.1 Introduction

Chapter four summarises the principal findings of this research study. In this chapter the data was collected from the interviewee responses that are employed at Cataler South Africa. The data was grounded largely in the views of the participants across the supervision levels in the production control, production and quality department. Each respondent was asked the same set of research questions and their responses were recorded objectively.

#### 4.2 Interview Response

An open ended interview schedule was used to get responses (Appendix 3).

Certain questions pertaining to the production control function could not be answered by the quality and production planning department supervision as they lacked appropriate process knowledge. This was to be expected and underlined the importance of this research which was conducted to identify reasons for inefficiencies in the production planning process.

##### 4.2.1 Objective 1: **To evaluate the inventory system**

The following questions were relevant to the above objective: Questions 1; 6; 8

Question 1: What are the steps in the production planning and control system at Cataler South Africa?

Question 6: What is the inventory policy?

Question 8: How are orders monitored ie order vs delivery?

**Findings:**

Respondents in the quality department and production department were not able to critically give an answer; however, the respondents acknowledged that there was a problem with the inventory system.

Respondents in the production control department acknowledged that there was a problem with the inventory system as steps, objectives and monitoring of inventory was not clear and not performed. Respondents acknowledged that there was no inventory policy for raw material and finished goods. The respondents indicated that there was no system in place for the monitoring of the orders against what was delivered.

**4.2.2 Objective 2: To evaluate the procurement of raw materials**

The following questions were relevant to the above objective: Questions 2; 3; 4; 5; 7; 9; 11

Question 2: Is raw material procured locally?

Question 3: Is raw material procured from overseas?

Question 4: What is the lead time of stock delivery from order to Cataler South Africa locally?

Question 5: What is the lead time of stock delivery from order to Cataler South Africa from overseas?

Question 7: How are orders placed on suppliers?

Question 9: What determining factors are used when placing an order on a supplier?

Question 11: Is there a delivery schedule at Cataler South Africa for the suppliers?

**Findings:**

Respondents in the quality department and production department were not able to critically give an answer; however, the respondents acknowledged that there was a problem with the ordering of stock from suppliers.

Respondents from the production control department stated:

- a. Raw materials are procured locally
- b. Raw materials are also procured from Japan, Thailand and America
- c. Lead time varied from stock item to stock item; some materials had lead time of 2 weeks
- d. Lead time varied from stock item to stock item; some materials had lead time of 16 weeks
- e. Orders are placed telephonically; emailed on a spreadsheet or word document
- f. No significant triggers to highlight the re-ordering
- g. No delivery schedule documented

Delays in lead time of raw materials from suppliers has an impact with production delays and output which results in profit losses and all of this implies that Cataler require a more effective system eg SAP system.

The production control department stated that the bill of material was of a poor quality. The information was outdated and inaccurate.

#### 4.2.3 Objective 3: **To determine the impact of the need to place urgent orders for raw materials**

The following questions were relevant to the above objective: Questions 12; 13

Question 12: How are shortages of material handled?

Question 13: What impact does a shortage of material have on production ?

#### **Findings:**

Respondents from production and quality expressed frustration with the significant amount of times where raw materials were ordered urgently. The impact of such an activity results in “rushed” jobs on the manufacturing line which could lead to a quality problem. This is because members are “quantity” focused and not “quality” focused.

#### 4.2.3.1 Cost of airfreight

The respondents from production control had expressed concern with the costs incurred due to the urgency of purchasing material for the production as a result of airfreight. The production control department handled the shortages of raw materials by means of airfreighting the stock to the business.

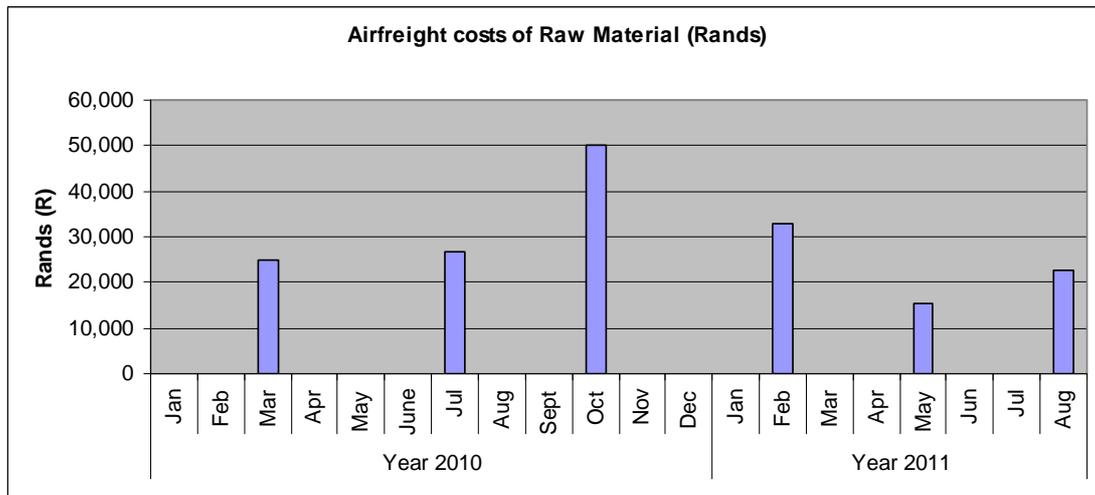


Fig 4.1 Airfreight cost of raw materials

#### 4.2.3.2 Service level agreements

The respondents from production control indicated that there were no service level agreements with the suppliers. The level of ordering was based on business to business transaction with no agreement in place. This was seen as a problem by the respondents and highlighted that attention was required for service level agreements to be put in place.

#### 4.2.4 Objective 4: **To establish an effective production planning schedule**

The following questions were relevant to the above objective: Questions 14; 15; 16; 17; 19; 20; 21; 22; 26; 27

Question 14: What is the impact of incorrect production planning?

Question 15: What are the manufacturing lead times in the production ?

Question 16: What type of production system is used at Cataler South Africa?

Question 17: Is the manufacturing plant flexible to accommodate customer demand?

Question 19: How is the efficiency of lines affected with the poor production planning?

Question 20: Which other departments are affected with the incorrect production planning?

Question 21: What is the impact on the other departments when incorrect production planning takes place?

Question 22: How is the production plan communicated to all the departments at Cataler South Africa?

Question 26: What type of manufacturing process does Cataler South Africa have?

Question 27: Is the manufacturing plant flexible to accommodate customer demand?

#### **Findings**

All respondents had expressed dissatisfaction with the production planning schedule as there were no correct formalities, proper communication and procedures in place at the time. It was noted that the respondents from the production control department were not familiar with the capacity planning for the manufacturing lines, which results in incorrect line balancing and throughput not being sufficient to meet the customer demand. It was noted that all respondents agreed that the just-in-time principle tried to be followed through in the business, but was not a success.

The respondents from quality department expressed frustration that when incorrect / improper production schedules the members on the line would not be focused on quality. This results in parts being processed to the final inspection area where the inspectors were under tremendous pressure to a) inspect the part quick and b) to

ensure that the customer delivery is made on time. The production and quality department were the key departments that are affected with the incorrect production planning.

It is clear that these issues must be streamlined. The system must be adjusted to avoid the loss of time, waste of incorrect parts being manufactured and improve efficiency levels. In addition if action is taken, this should improve the morale of the staff.

#### 4.2.4.1 Number of model change overs experienced

Respondents stated that if parts had to be changed over the line for a different model, then it would be done with no problem, but the problem occurred that there would be left over stock from previous models (excess) and or a shortage of stock due to quality problems on the manufacturing line.

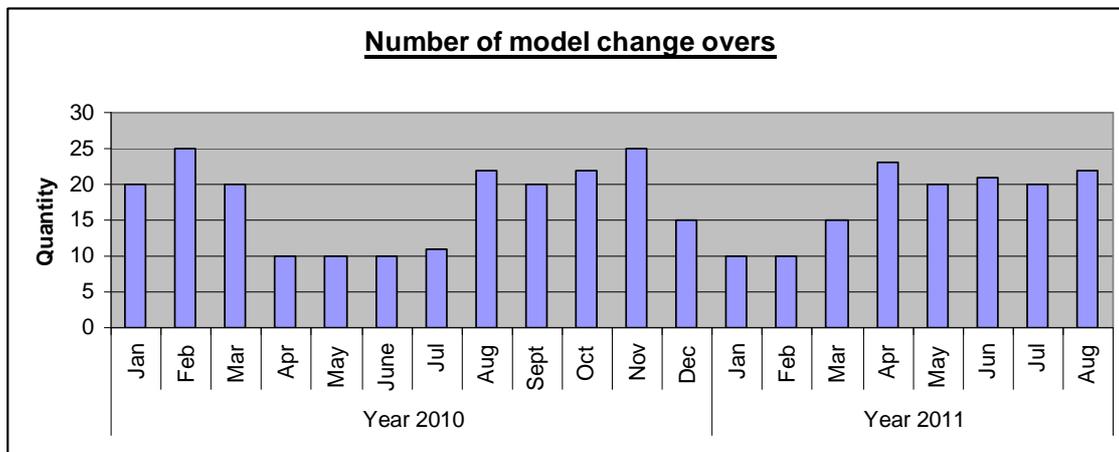


Fig 4.2 Number of model change overs

#### 4.2.5 Objective 5: **To ensure timeous delivery of products to customer**

The following questions were relevant to the above objective: Questions 10; 18; 23; 24; 25

Question 10: How is the volatility in the mix and the volume of the customer demand managed?

Question 18: Does the quality of the product get affected due to incorrect production planning?

Question 23: How are customer orders monitored in terms of delivery?

Question 24: What is the lead time for finished goods stock to be delivered to the customer?

Question 25: When must finished goods stock be delivered to the customer?

#### **Findings**

All respondents from the quality and production department stated that the customer comes first and that delivery to the customer must be made on time. However, this is only achievable if production control issues the material to the plant on time in order to make the parts as the customer demand.

Production control stated no system was in place for the monitoring of the customer delivery against the customer demand. Production control respondents indicated that there was no clear lead time for finished goods stock to be delivered to the customer. They are aware that the finished goods are delivered to the customer on a weekly basis.

The quality department emphasized that when parts were manufactured in a rush manner, the focus on the production line was more orientated at “quantity” and not on “quality”. This results in the quality inspection department having to inspect the part more critically as they are afraid that defective parts could be sent to the customer.

#### 4.2.5.1 Customer delivery performance

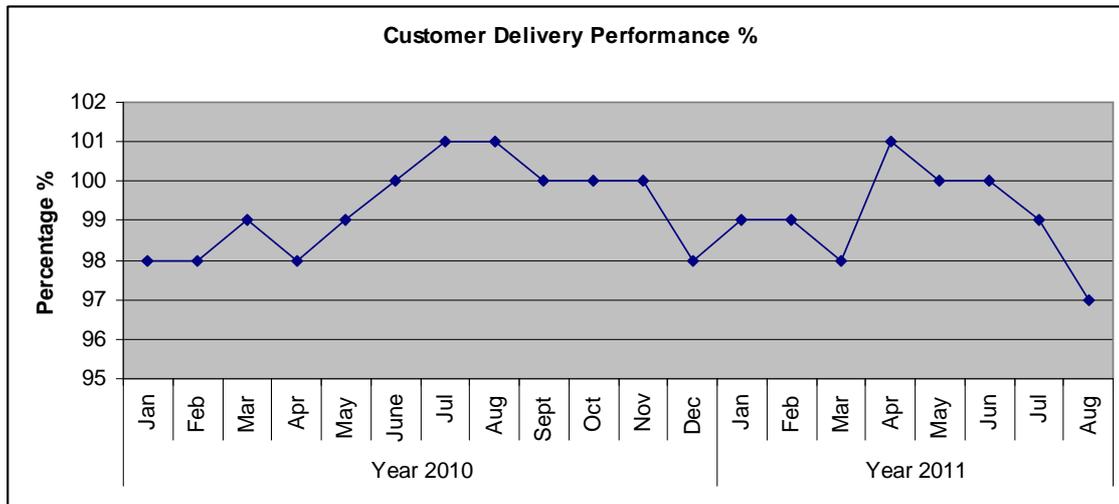


Fig 4.3 Customer delivery performance

The trend in the graph above show that Cataler South Africa has not delivered at 100% on several occasions over the past 20 months.

### 4.3 Conclusion

This chapter presented the findings from the interview process held with the respondents. The results concerning research objectives have been presented in Chapter 4. The findings have indicated specifically what the problems are relevant to the five objectives. The value of the qualitative study is realised in terms of the depth of answers from the small group of respondents who were interviewed. The conclusions relevant to each of the objectives are fully discussed in Chapter 5.

## CHAPTER FIVE

### DISCUSSION OF FINDINGS

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#### 5.1 Introduction

Chapter two of this study presented the literature review and chapter four has presented the empirical data. The data presented in chapter four provides a framework for the interpretations concerning the perceived production planning and control problems at Cataler South Africa. This chapter links the results of the empirical work to the literature review findings in chapter two and thus updates and provides evidence on the research questions within Cataler South Africa.

Therefore the discussion in this chapter is closely related to the research objectives and the pertinent questions this investigation set out to answer. The problem that this study aimed to investigate as stated in chapter one was to evaluate the inventory systems, procurement of raw materials, determining the impact of the need to place urgent orders of raw materials, to establish an effective production planning schedule which then ensures timeous delivery of products to the customer.

The subsidiary questions of this study were guidelines formulated to make it possible for the main research objectives to be achieved. They were meant to clarify the main problem under investigation and are therefore regarded in this study as research objectives. Recommendations relevant to each objective are made in chapter six.

## **5.2 Discussion of Findings**

### **5.2.1 Objective 1**

- **To evaluate the inventory system**

Reference Questions: Questions 1; 6; 8 are relevant to the above objective.

The literature reviewed confirms that manufacturing firms focus on maximum customer service, minimum inventory investment and efficient plant operation. The accuracy and completeness are important in management of inventory to allow an organisation to make informed decisions.

It was found that the inventory system at Cataler South Africa was not monitored correctly. Inventory known as stock is kept at all stages within Cataler South Africa, from raw material, work in process, and finished products. There is no systematic approach or technology based programme that is used. A manual system is used with the MS Excel programme to make spreadsheets and record data based on “walking around” and noting down stock items on paper. This inaccuracy of information results in stock take discrepancies based on what was received into the warehouse, manufactured and sold to the customer.

There is no inventory policy established where objectives can be set and monitored on a weekly basis and reported thereon. At a strategic level, the essential role of inventory is not being used to support the five operations performance objectives of quality, speed, dependability, flexibility and cost.

There is no efficient means of a “trigger” in the inventory system that is managed by the production control department. Respondents highlighted that there was a gap in the “how much to order”, “when to order” and “how to control the system”.

Cataler South Africa has not identified which of the stock items are more important to the business than others in order to prioritise them. Some, for example, might have a very high usage, so if they run out production will halt and shortages will occur resulting in the customer being disappointed and a loss of sales. There are items in the

stock which are of high value content but slow moving which results in high inventory levels and high expenses in terms of cost of capital.

It was noted that the incoming stock upon receipt was not captured onto the “excel spreadsheet”. The delivery notes were handed to the finance department and the capturing would take place once a week. This is a problem as systems have not been activated to show the true reflection of stock available at Cataler South Africa.

In order to measure the success of the inventory system, it is advisable to periodically evaluate and review the objectives that have been set into the system and for the department.

### **5.2.2 Objective 2**

- **To evaluate the procurement of raw materials**

Reference Questions: Questions 2; 3; 4; 5; 7; 9; 11 are relevant to the above objective.

As indicated in literature review, purchasing is important to a business competitive advantage, and that increased profitability, market share and technological innovation can be achieved through an appropriate purchasing strategy. In current purchasing practice, orders from suppliers are placed with the international suppliers months ahead.

Raw materials at Cataler South Africa apply to the chemicals, stainless steel, ceramic substrate, matting and boxes. The respondents indicated that the chemicals that were imported needed to be ordered at least 16 weeks of time before a consignment is received at Cataler South Africa. The feedback given is that no buffer/safety stock is kept or if there is any it is kept to a minimum or worse the incorrect safety stock is kept on site. This is an indication which leads to the poor reporting and monitoring of stock across all levels and not identifying the key policy for inventory.

Replenishment of stock is not ordered on time. Cataler South Africa receives a forecast from Toyota indicating what the expected volume for the one month firm and three months forecast will be. This tool is not being utilised to manage the stock systems for procurement and manufacturing efficiently.

There has been no communication between the production engineering department and the production control department to issue the correct bills of material. The bills of material that is currently being used is outdated and inaccurate.

### **5.2.3 Objective 3**

- **To determine the impact of the need to place urgent orders for raw materials**

Reference Questions: Questions 12; 13 are relevant to the above objective.

Production planning and control are an important managerial function to determine the quantity of outputs that are produced, the expected levels of inventory and work force that are required for the planning period.

Certain key precious group metals at Cataler South Africa which are sourced via Toyota require samples that must be tested by the laboratory and the testing lead time can take up to 2 days with an approval by the customer on the third day. Once the batches are approved, then the consignment can be despatched to Cataler South Africa for further manufacturing in their process. The lead time for despatch can take up to three days. If batches are rejected due to a quality problem and should there be no stock in the system pipeline at Cataler South Africa, it can cause a delay in a shipment of a final product to the customer.

The costs associated with importing material by airfreight are high. The graph presented in chapter 4: 4.2.3.2 shows that in the last 20 months airfreight of stock was requested four times. Specific reference was made to the procurement of mats, which are imported from America and Japan. The same part number for mats are used on a variety of products and when customer demand increases, with no safety stock available, then airfreighting of mats is made. There is no monitoring of the airfreight costs and no follow up of why airfreight has taken place. No corrective measure based on improvement was noted. It is assumed that the customer requires the product, so management airfreight material into South Africa to then make the final product. Better planning would reduce the number of occurrences of such waste.

Enterprise resource planning (ERP) with the aid of the current Pastel system is not utilised properly. No or poor information for the reconciliation of the business's supply of products and services with the demand for them are therefore not integrated on the ERP. The data accuracy and the input of data are not seen as a priority and the Pastel system is not used to its optimum level.

Cataler South Africa have a supplier listing, however, there are no service level agreements in place with any of the suppliers. This is a problem for the production control department as no supplier commitment can be made on orders placed by Cataler South Africa. The local companies that supply chemicals to Cataler South Africa do not see Cataler South Africa as an important business to deal with, which results in bad communication between the two businesses. An example given is when a chemical is ordered, the supplier will not deem it as important. Cataler South Africa will be seen as part of the pool of customers and will be supplied on a 'first come first service'.

#### 5.2.4 Objective 4

- **To establish an effective production planning schedule**

Reference Questions: Questions 14; 15; 16; 17; 19; 20; 21; 22; 26; 27 are relevant to the above objective.

Literature makes reference that a typical production system comprises of three main components, namely, inputs, transformation and outputs. These rely on subsystems within the organisation to achieve the objectives. Providing the capability to satisfy current and future demand is fundamental to the management of the business. The balance between capacity and demand can generate high profits and satisfied customers.

The production department at Cataler South Africa have allocated machines that are flexible to the model change-overs that would be required. However, the need to decrease the amount of model-change overs must be looked into.

The following problems were expressed by the respondents when a production plan schedule is not correctly communicated to the supervision:

- The products on the line have to change, which results in increased change-overs. The impact of this could result in a quality problem
- The line efficiency does not meet the production requirements
- The line is not able to achieve the daily production target
- A line can stand still for up to 15 minutes prior to establishing what it must produce for the day
- A shortage of product to the customer on time due to the “late” manufacturing of a product

The respondents in the production control department had indicated that they were not familiar with the capacity planning, and did not know which products could be manufactured on which line.

When a part is produced with unsatisfactory quality, additional processing is required to remedy the defect or, in some cases, the part is scrapped. The additional processing is handled in two ways: in-line rework or off-line repair. With in-line rework, jobs are routed back through production line for rework. In the case of off-line repair, jobs with quality defects are removed from the main line and sent for repair. This additional process impacts on output for the line and or to the next process due to the additional time spent on reworking or repairing the job. In circumstances where poor quality jobs cannot be salvaged, they are removed from the system as scrap.

Operational performance will be improved on the manufacturing line if the correct quantity of material is issued to the line on time and given sufficient lead time to manufacture the required products.

The respondents stated that operational improvements are required for shorter lead times, high resource utilisation and correct stock levels in the plant.

### 5.2.5 Objective 5

- **To ensure timeous delivery of products to customer**

Reference Questions: Questions 10; 18; 23; 24; 25 are relevant to the above objective.

Pycraft et al, (1997) identifies cost, capacity, timing and quality constraints as constraints within the planning and control activity which apply to most operations.

The Cataler South Africa manufacturing plant will manufacture the product on the three lines as per the order requirement for the day. There is no tracking of the stock that is delivered to the customer. Stock that is manufactured daily is not recorded correctly on the data check sheets. The lead times for the product to be manufactured on the line are dependent on the diameter size of the item and the process it must be followed. Product A can be manufactured in one day with an output of 550 parts per day in an 8 hour shift pattern. Product B can be manufactured in one day with an output of 600 parts per day in an 8 hour shift pattern.

The inspection department in quality responded with the unhappiness that is experienced when priorities for shipment to the customer are not communicated. This shows that there is a breakdown in the communication channels between the departments at Cataler South Africa.

The inspection department are pressured to do inspection but the focus changes to a “quantity” rather than a “quality” priority because the boxes must be shipped to the customer.

Customer delivery is not monitored; no clear objective when parts must be delivered to the customer. The manufacturing plant can take up to one shift to make the parts, it then goes to the inspection quality department for inspection. The inspection of one box can take a minimum of 1 hour and 15 min. However, should there be any quality problems found; it can delay a shipment to the customer. The reason for that being that production need to follow the rework or reject procedure which is based on the type of non-conformance that was found by the inspection department.

Customer expectations and satisfaction is an indicator in the inventory system that must be evaluated and reported on. The inventory system must be capable of showing everything that is currently in the finished good inventory, including what was produced as of the latest parts that were manufactured in production. This will optimise the chances of pulling parts for the customer order in a timely manner and notifying the production control department that the parts are ready to be released. The graph presented in chapter 4: 4.2.5.2 for the customer delivery performance shows that 9 out of the 20 months were delivered at 100%. This is a poor reflection of the business delivery to the customer and reflects that no continual improvement programme is put in place to improve the delivery to the customer. The importance of customer delivery is not seen as an important element in the business. It was noted that this could be due to the relationship between Cataler South Africa and Toyota.

Supplier delivery is not monitored by the production control department. If there is a shortage of raw materials for a product, then it will have an impact on the production line and will result in a short supply to the customer.

### **5.3 Conclusion**

This chapter has presented an analysis of the empirical data in terms of the objectives of the study. The objectives of the study were analysed and compared to the literature review. In this chapter the exploratory data and the responses were reported on and discussed. Problems within the process were identified and discussed. These findings have led to recommendations been made pertinent to each of the objectives, which if implemented and carefully monitored will address the short comings which were identified in the study. The net result will be an improvement on work flow because of out of stock situations being reduced. This will also positively impact on productivity and will minimise inter departmental conflict. The findings and recommendations are further discussed in the next chapter. In chapter six, conclusions of the research are presented, the summary of the research provided and the recommendations limitations put forward.

## **CHAPTER SIX**

### **CONCLUSIONS AND RECOMMENDATIONS**

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#### **6.1 Introduction**

This chapter will conclude and summarise the key lessons learnt from the research, and puts forward recommendations for the improved production planning and control at Cataler South Africa. The chapter also highlights some of the limitations of the study and makes recommendations for further research.

The aim of this study was formulated as: perceived production planning and control problems at Cataler South Africa, to evaluate the inventory system, procurement of raw materials, determining the impact of the need to place urgent orders of raw materials, to establish an effective production planning schedule which would ensure timeous delivery of product to the customer. In order to realise these aims a literature review (chapter 2) was undertaken and this served as the foundation upon which the empirical research was based. The next section will summarise the key findings from the literature reviewed and the analysis of the information shared during the interview by the respondents.

#### **6.2 Recommendations to solve the research problem**

This section will present some recommendations based on the results of this study.

The previous chapter identified various areas that were lacking in the production control planning aspect of the business whilst attempting to continue with day to day functions in production control. The research has established that there is a close link between the production control department and the remaining departments at Cataler. The recommendations thereof are not separated by organisation size but are rather based on a culmination of information gathered from responses received.

### 6.2.1 Objective 1: To evaluate the inventory system

#### **Recommendation:**

Measuring the efficiency and success of the inventory system involves how well the process helps with order placements on suppliers. Cataler need to invest in the upgrade of the current Pastel system and utilise the facilities on the software allowing for the adjustment of the ordering quantities and delivery lead time to match the current performance of the suppliers. Employees in the production control department must be trained on inputting and working with Pastel. Top management must drive the activity in the business identifying the linkage in the demand-side and supply-side of activities and remain competitive in the market.

The performance of the inventory reduction process can be measured in terms of accuracy, completeness and time efficiency. These measures help to identify the problems that exist in the process.

- **Measure of Accuracy:** Accuracy in inventory reduction refers to the accurate cost estimation at the beginning of inventory analysis. This allows the company to determine the approximate cost associated with a required part, further leading to the complete component assembly cost analysis. To determine the true benefits and return on inventory reduction, the total costs of reduced inventory have to be measured against the initial inventory costs. In fact, inaccuracy in inventory leads to reduction in performance (Sari, 2008).

The existing inventory management process in Cataler South Africa does not appear to be accurate since the approach to cost estimation is not precise.

- **Measure of Completeness:** Completeness in the inventory management process is described by tracking every cost throughout the lifecycle of the commodity. This allows the organisation to analyse the amount that was actually spent. Since the price per part are the biggest costs incurred, it is essential to track these costs and look out for the best prices in the market. Other than price per part costs, transportation and warehouse costs are also

required to be captured accurately. Lifecycle-based inventory models are often used for proper use of resources (Gabel et al., 2004).

The existing process in Cataler South Africa lacks completeness of cost-tracking due to inaccurate reporting of transportation costs. These deficiencies make the cost process incomplete as the total actual costs are not recorded.

### **Data Collection for Inventory Management Improvement**

In order to improve the process in its entirety, areas that would need attention are outlined below:

- **Central Governance:** In recent months, Cataler South Africa has begun improving processes by means of new business with better technology to maximize profit, quality and profit. During a time of change and transformation, the business needs to ensure that all processes are being monitored and that employees understand and follow new procedures.
- **Process maps and guidelines:** A policy into the inventory reduction process is required based on the demand and supply.
- **Accountability:** Responsibility and authority charters must be drawn up for employees and must be held accountable for adhering to expectations. Employees should be focused on how their actions will affect the overall performance.
- **Training:** To ensure the employees understand the inventory management procedures, information sessions and training need to be offered to them. Discussion and presentations addressing the importance of accuracy, completeness and time efficiency must be communicated.
- **Strategic Decision making:** Tracking all inventories is a cost effective option to reduce the unnecessary waste in the system.

Training of the production control staff to align their knowledge to inventory management, capacity planning, product knowledge, advanced computer training will advance their systems thinking and ultimately improve the performance of the department. It will allow them to understand the objectives of the department and the

important role the production control department play in the business. The linking of their daily activities has an impact on the business.

The inventory costs that must be managed include cost of placing an order, price discount costs, working capital costs, storage costs, obsolescence costs and production inefficiency costs.

**Stock take:** It is advisable for investigation to take place on all items that have a discrepancy. Do not wait for the following stock take to take place thinking that there won't be another discrepancy. The five why concept must be used for investigating the discrepancy. Corrective measures must be put in place to prevent a mistake or problem from reoccurring.

**Visualisation** of key reports and tracking:

It is suggested that the delivery schedule of the supplier be made available in graphical form and that the actual delivery be indicated thereon. The benefits of this being being that the Cataler staff will then manage their workloads so as to synchronise with inbound delivery schedules. The visualization is a means of a communication to all departments of delivery status.

Stock received at receiving inspection must be captured onto the system to reflect actual stock on hand. This must take place on the day of the delivery and not once a week.

### **6.2.2 Objective 2: To evaluate the procurement of raw materials**

#### **Recommendation:**

The production control department must manage the day-to-day tasks. In managing the inventory system, they must be taught the following decisions:

- How much to order based on when replenishment is required
- When to order; at what point in time at what level of stock should replenishment take place

- How to control the system by means of the procedures and routines that must be installed to help make the decisions

The economic order quantity approach must be used for the replenishment of stock based on the supply and demand for the product. Inventories priorities should use the ABC inventory control system to concentrate the efforts on controlling more significant items of stock.

The bills of material must include all materials. It is advisable that production engineering issue the bills of material to the production control department. This will aid in assuring that all materials can be loaded onto the system and correct usage for each product is recorded.

### **6.2.3 Objective 3: To determine the impact of the need to place urgent orders for raw materials**

#### **Recommendation:**

Cataler South Africa need to follow the strategy that Toyota use for global business development – ‘**learn local, act global**’ – which means learning about unique local needs and requirements and adapt to them while doing global coordination for the operational excellence. This strategy systematically taps tacit local knowledge from various suppliers around the world, blending and integrating it, and finally sharing and applying it on a global scale. Therefore the strategy goes beyond local customization as it is about systematic and continuous way of leveraging local and global knowledge and about co-creating new knowledge with a variety of local and global partners. The cost factor for material will be cheaper which aligns to the Cataler South Africa way of cost reduction activities and will aid in higher profitability. Cataler South Africa could investigate the procurement of certain chemicals from local manufacturers and not have them imported. Special attention must be focused on the quality of the product ensuring that all specifications are as per the drawing requirement. However, service level agreements must be put in place with the local and overseas suppliers in order to secure the business and orders.

It is also recommended to have quarterly meetings with suppliers to discuss the volumes forecast and current issues with ordering processes to make it far more effective and suitable for Cataler South Africa.

#### **6.2.4 Objective 4: To establish an effective production planning schedule**

##### **Recommendation:**

The production plan must be discussed with the production department, identifying which products can run on the lines. The aim of the discussion is to ensure that production control do not give production too many model change-overs on the line.

The production plan must be issued and communicated to the supervision on the Friday of the week, so that the supervision can prepare for the following week. A copy of the production plan must be visualised in the production plant close to the lines. This will allow management to view what is expected to be manufactured on a daily basis.

Advantages of an effective production plan and scheduling:

- reduces staff compliment by eliminating wasted time and improved process flow
- reduces inventory costs by reducing the safety stocks and unnecessary work-in-process inventories
- optimises equipment usage and maximises capacity
- utilises staff to their full potential
- improves on-time deliveries of product to the customer

**Visualisation** of key reports and tracking:

- Delivery schedule of supplier: show plan versus actual
- Customer demand shipment requirements at the quality inspection area
- Production planning schedule at line-side and at the quality inspection area

It is recommended that Cataler embrace lean manufacturing for three reasons. First, the highly competitive, globalised market requires that companies lower costs to increase margins and decrease prices through the elimination of all non-value added aspects of the business. Second, customer responsiveness is important. This means embracing the notion of production efficiency by meeting the Just in Time demands similarly rapid product mix changes and increases in manufacturing velocity. Finally, producing desired goods quickly wont maintain a market share if the product isn't of high and consistent quality. Thus, efficiency, responsiveness and quality are three key goals for lean manufacturing which can be incorporated at Cataler South Africa in future.

Operational excellence is required for the dependent and reliable deliveries, short lead times, resource utilisation and sufficient inventory levels.

#### **6.2.5 Objective 5: To ensure timeous delivery of products to customer**

##### **Recommendation:**

**Visualisation** of key reports and tracking:

- Customer demand shipment requirements at the quality inspection area
- Production planning schedule at line-side and at the quality inspection area

Any changes in the plan must be communicated to the quality department and the shipment requirements that will be visualised must be changed to meet the new customer requirements.

Monthly meetings are recommended with the customer to follow up on the monthly customer delivery requirements. It is recommended that if delivery to the customer is not met, then an investigation must take place and corrective measures be put in place. If Cataler South Africa improves their Pastel system to include a proper inventory management system, this will be triggered in the program.

### **6.3 Recommendations for Future Studies**

Further research might be to investigate the possibility of the bar coding system that can be used for the product which would allow easier scanning of products into the system. This would require investment but in the long term would result in lower costs.

Further research would be proposed as the business increases to look into the effect of organisation size on lean manufacturing and storage of products when additional business is expected in 2015 with a new Original Equipment Manufacturer.

### **6.4 Conclusion**

The production planning and control problems at Cataler South Africa were identified and it was demonstrated that they are critical issues. The costs involved in the airfreight of material, loss of material by not capturing, stock losses and customer dissatisfaction are serious business issues, all of which harm Cataler South Africa's reputation and bottom line. The aim of this study was to evaluate the inventory system, procurement of raw materials, determining the impact of the need to place urgent orders of raw materials, to establish an effective production planning schedule which would ensure timeous delivery of product to the customer.

This research focused on five objectives, all of which were discussed in the literature review in Chapter 2 and shown to be areas of importance. The fieldwork demonstrated that each of the five objectives highlighted weaknesses at Cataler South Africa. In keeping with the literature in terms of best practice, relevant to the identified shortcomings at Cataler South Africa, suitable recommendations have been made to address them.

In spite of the small sample size limitation, this study has investigated the concept of production planning and control at Cataler South Africa. The literature reviewed, and

information obtained from the interviews confirmed that the perceived production planning problems stated in the problem statement do exist.

Suitable and appropriate recommendations have been put made which if carefully implemented and monitored should improve the production planning and control problems at Cataler South Africa. This in turn should contribute to better outputs, customer satisfaction and increased profits.

In chapter six, conclusions of the research have been presented, a summary of the research has been provided and recommendations on how to address the shortcomings at Cataler SA made. In addition the limitations of the research were stated.

## BIBLIOGRAPHY

- 1) Ang, J., Sum, C. and Yang, K., MRP II company profile and implementation problems: a Singapore experience. *Int. J. Pod. Econ.*, 1994, **34**, 35-45
- 2) Axelsson, B. & Laage-Hellman, J. (1991) *Inkop end Ledningsfraga*. Stockholm: Sveriges Mekanforbund
- 3) Armstrong, J.S., 2001. *Principles of forecasting*, Boston, Kluwer Academic Publishers
- 4) Beamon, B.M. (1999), "Measuring Supply Chain Performance," *International Journal of Operations and Production Management*, 19 (3), 275-92
- 5) Blumberg B., Cooper D.R. and Schindler P.S. *Business research methods* 5<sup>th</sup> ed. New York: McGraw-Hill (2006)
- 6) Brown, J.D. 2000, 'What is construct validity?', *The Japan Association For Language Teaching (JALT) Testing and Evaluation SIG Newsletter*, vol.4, no.2, pp. 7-10
- 7) Buffa, E.S., Miller, J.G., 1979. *Production Inventory Systems: Planning and Control*, third ed, Homewood, IL, Richard D.Irwin, Inc
- 8) Burns, O.M., Turnispeed, D. and Riggs, W.E., Critical success factors in manufacturing resource planning implementation. *Int. J. Op & Manage.*, 1991, **11**, 5-19
- 9) Byrne M.D. and Hossain M.M. (2005), "Production Planning: An Improved Hybrid Approach", *International Journal of Production Economics*, Vols. 93/94, pp. 225-229

- 10) Cataler South Africa brochure 2012
- 11) Chen, I., Paulraj, A. & Lado, A. (2004). Strategic purchasing, supply management and firm performance, *Journal of operations management*, 22, p. 505-523
- 12) Collis, J. & Hussey, R., *Business Research, A Practical Guide for undergraduate and postgraduate Students.*, 2<sup>nd</sup> edn, (2003), Palgrave Macmillan, London.
- 13) Cooper, R.B. and Zmud, R.W., (1989), Materials requirement planning system. *OMEGA*, 17, 471-481
- 14) Gabel K., Forsberg P. and Tillman A. (2004), "The Design and Building of a Lifecycle-Based Process Model for Simulating Environmental Performance, Product Performance and Cost in Cement Manufacturing", *Journal of Cleaner Production*, Vol.12, No.1, pp. 77-93
- 15) Ganesan, S. (1994), "Determinants of Long-Term Orientation in Buyer-Seller Relationships" *Journal of Marketing*, 58 (April), 1-19
- 16) Gunasekaran, A., Patel, C. and Tirtiroglu, E. (2001), "Performance Measures and Metrics in A Supply Chain Environment," *International Journal of Operations and Production Management*, 21 (1/2), 71-87
- 17) Heizer. J and Render B. , (2000), *Operations Management* 6<sup>th</sup> ed. New Jersey: Prentice-Hall

- 18) Inman, R.R., Blumenfeld, D.E., Huang, N. and Li, J., 2003, **41**, 1953-1971, Designing productive systems for quality: research opportunities from an automotive industry perspective. *Int. J. Prod. Res.*
- 19) Jacobs, F.R. and Weston Jr, F.C., (2007). Enterprise resource planning (ERP) – a brief history. *Journal of Operations Management*, 25 (2), 357-363
- 20) Katzenach J.R. and Smith, D.K. (1993), “The Discipline of Teams”, Harvard Business Review, March-April Issue, pp. 111-120
- 21) Keeber, J. S. (2000), “The State of Logistics Measurement,” Vol. 2001: Supply Chain & Logistics Journal
- 22) Klopper R. (2006) Research Methodology lecture handout: MBA programme University of KwaZulu-Natal
- 23) Lee, J.K. and Larry, L.P. (2002). *Operations management strategy and analysis*. 6<sup>th</sup> ed. NJ: Prentice Hall
- 24) Leedy P.D. and Ormrod J.E. *Practical Research: planning and design* 8<sup>th</sup> ed. New Jersey: Pearson Education (2006)
- 25) Maloni, M. and Benton, W.C. (2000), “Power Influences in the Supply Chain,” *Journal of Business Logistics*, 21 (1), 49-73
- 26) Morgen, C. (2004), “Structure, speed and salience: performance measurement in the supply chain”, *Business process management journal*, Vol.10. No.5, pp. 522-536

- 27) Noe, R.A., Hollenbeck, J.R., Gerhart B. and Wright P.M. (2005), *Human Resources Management : Gaining a competitive advantage* 5<sup>th</sup> ed. New York: McGraw-Hill
- 28) Oakland, J.S., (1994), *Total quality management* 2<sup>nd</sup> ed. London: Butterworth-Heinemann
- 29) Pinedo, M., (2002), *Scheduling: theory, algorithms and systems*. Upper Saddle River, NJ: Prentice Hall
- 30) Plossl, G.W. & Wight, O.W., *Production and inventory control: principles and techniques*, Prentice Hall
- 31) Sari, K. (2008), “Inventory Inaccuracy and Performance of Collaborative Supply Chain Practices”, *Industrial Management & Data Systems*, Vol. 108, No.4 , pp.495-509
- 32) Saunders, M., Lewis, P., & Thornhill, A. (2003). “Research Methods for Business Students.” Prentice Hall, 3<sup>rd</sup> edition
- 33) Seierstad, A., Sydsaeter, K., (1987). *Optimal Control Theory with Economic Applications*, Elsevier Science, New York, NY
- 34) Sheldon D., 2005. *Class A ERP Implementation, Integrating lean and six sigma*, J. Ross Publishing
- 35) Sheu, C. and Wacker, J.G., Effectiveness of planning and control systems: an empirical study of US and Japanese firms, *Int. J. Prod. Res.*, 2001, **39**, 887-905

- 36) Shroeder, R.G., Anderson, J.C., White, E.M. and Tupy, S.E., A study of MRP benefits and cost. *J. Op. Manage.*, 1981, **2**, 1-9
- 37) Smith, S.F., 2003. Is scheduling a solved problem? *In: Proceedings of first multidisciplinary international conference on scheduling: theory and applications (MISTA)*, 3-18 August 2003, Nottingham, UK
- 38) Stewart, G. (1995), "Supply Chain Performance Benchmarking Study Reveals Keys to Supply Chain Excellence," *Logistics Information Management*, 8(2), 38-44
- 39) Sum, C.C. and Yang, K.K. A study on manufacturing resource planning (MRP II) practices in Singapore. *OMEGA*, 1993, **21**, 187-197
- 40) Tan, K. C., Kannan, V.R. and Handfield, R.B. (1998), "Supply Chain Management: Supplier Performance and Firm Performance," *International Journal of Purchasing and Material Management*, 34 (4), 2-9
- 41) Tooley, D.F. *Production Control Systems and Records*, 2<sup>nd</sup> ed., 1981. Gower
- 42) Van Weele, A. (2005). *Purchasing and supply chain management: analysis, planning and practice*. London: Thomson
- 43) Vollman, T.E., Berry, W.L., Whybark, D.C. and Jacobs, R., *Manufacturing Planning and Control Systems for Supply Chain Management*, 4<sup>th</sup> ed., 2004 (Richard D.Irwin Corp.: Homewood, IL)
- 44) West, M. A. and Markiewicz, L. (2004), *Building Team-Based Working: A Practical Guide to Organisational Transformation*, The British Psychological Society and Blackwell Publishing Ltd., UK
- 45) Whitin, T.M., 1970. *The Theory of Inventory Management*. Greenwood Press, Westport, CT

- 46) Wiles, A. (2007), "Project Management Evolves with Technology", *Applied Clinical Trials*, June, pp. 76-81
- 47) Zipf, P.J. (2000), "Technology-Enhanced Project Management", *Journal of Management in Engineering*, Vol. 16, No. 1, pp. 34-39

## Appendix 1



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10 October 2011

**Ms H Cosme (204515633)**  
**Graduate School of Business**

Dear Ms Cosme

**PROTOCOL REFERENCE NUMBER: HSS/1014/011M**  
**PROJECT TITLE: Perceived production, planning and control problems at Cataler South Africa**

In response to your application dated 5 October 2011, the Humanities & Social Sciences Research Ethics Committee has considered the abovementioned application and the protocol has been granted **FULL APPROVAL**.

Any alteration/s to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form, Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through the amendment /modification prior to its implementation. In case you have further queries, please quote the above reference number.  
**PLEASE NOTE:** Research data should be securely stored in the school/department for a period of 5 years.

I take this opportunity of wishing you everything of the best with your study.

Yours faithfully

.....  
**Professor Steven Collings (Chair)**  
**Humanities & Social Science Research Ethics Committee**

cc Supervisor – Alec Bozas  
cc Mrs. C Haddon

## Appendix 2



### **CATALER SOUTH AFRICA (PTY) LIMITED**

Company Registration Number 2000/025433/07  
PO Box 26371 Isipingo Beach 4115 KwaZulu Natal South Africa  
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22 September 2011

To whom it may concern,

This letter serves to confirm Cataler granting of permission for Miss Holanda Cosme, student number 204515633 to conduct and use our resources for the MBA thesis, titled "Perceived production planning and control problems at Cataler South Africa".

Should you require further clarity, please contact the undersigned

Regards

A handwritten signature in black ink, appearing to read "Andrew Molato Maluleke".

Andrew Molato Maluleke  
Manager: Human Resources and General Affairs  
Cataler South Africa (Pty) LTD  
Tel: (031) 910 7615  
Cell: 082 905 6927

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Directors: M Hattori\* (Managing) R Yoshikawa\* Y Sakamoto\* S Moodley\*  
\* Japanese + South African

## Appendix 3

**This page is to be retained by researcher**

1. What are the steps in the production planning and control system at Cataler South Africa?
2. Is raw material procured locally?
3. Is raw material procured from overseas?
4. What is the lead time of stock delivery from order to Cataler South Africa locally?
5. What is the lead time of stock delivery from order to Cataler South Africa from overseas?
6. What is the inventory policy?
7. How are orders placed on suppliers?
8. How are orders monitored ie order vs delivery?
9. What determining factors are used when placing an order on a supplier?
10. How is the volatility in the mix and the volume of the customer demand managed?
11. Is there a delivery schedule at Cataler South Africa for the suppliers?
12. How are shortages of material handled?
13. What impact does a shortage of material have on production?
14. What is the impact of incorrect production planning?
15. What are the manufacturing lead times in the production?
16. What type of production system is used at Cataler South Africa?
17. Is the manufacturing plant flexible to accommodate customer demand?
18. Does the quality of the product get affected due to incorrect production planning?
19. How is the efficiency of lines affected with the poor production planning?

20. Which other departments are affected with the incorrect production planning?
21. What is the impact on the other departments when incorrect production planning takes place?
22. How is the production plan communicated to all the departments at Cataler South Africa?
23. How are customer orders monitored in terms of delivery?
24. What is the lead time for finished goods stock to be delivered to the customer?
25. When must finished goods stock be delivered to the customer?
26. What type of manufacturing process does Cataler South Africa have?
27. Is the manufacturing plant flexible to accommodate customer demand?

**End of the Questionnaire**

Thank you for taking the time to complete the questionnaire.