

INVENTORY MANAGEMENT IN MANUFACTURING
INDUSTRIES: A CASE STUDY OF ZARIA PHARMACEUTICAL
COMPANY LIMITED, ZARIA.

BY

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DECLARATION

I hereby declare that this project was written by me, and that it is a record of my own research work.
To the best of my knowledge this project has not been presented to any post - graduate school for
the award of a higher Degree.

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CERTIFICATION

This project titled "INVENTORY MANAGEMENT IN MANUFACTURING INDUSTRIES: A CASE STUDY OF ZARIA PHARMACEUTICAL COMPANY LIMITED ZARIA BY SHEHU AUWALU, meets the Regulation Governing the Award of the Degree of Master of Business Administration (MBA) of Ahmadu Bello University, Zaria and is Approved for its Contribution to the Knowledge and Literary Presentation.


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DEDICATION

The work is dedicated to my beloved family members; Hajiya Amina Mohammed(Mother), Abdullah Abubakar (Uncle), Hannatu Ibrahim (Wife); Dalhatu Auwalu (brother), and Nuhu Mohammed Auwalu (brother).

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ABSTRACT

This dissertation covered the inventory management in manufacturing industries: A case study of Zaria Pharmaceutical Company Limited. Interviews were conducted to obtain the data needed which was complemented with taking a closer look at the records maintained by the company.

The essence is to examine to what extent the manufacturing industries have been applying inventory management techniques and how it worked in practical terms. It was also geared towards providing suggestions that will be of help to the company in improving the effective management of her inventories.

Some Inventory management techniques like fore-casting methods, inventory control systems were examined. The findings revealed that no Scientific methods of Inventory management has actually been put in practice but rather these has been more of the use of the rule of thumb in the management of her inventories.

The firm is faced with some problems which to a great extent affects their ability to effectively utilize the scientific methods and these includes, the general state of the economy, foreign exchange problems.

As a result, I recommended the adoption of simple inventory models to minimise carrying and ordering costs, provision of adequate transportation of the stock and a careful analysis of cost especially the human and mechanical efforts.

CHAPTER ONE

1.1 INTRODUCTION

Inventory Management is designed to answer questions like what level of inventory to order, how often should re-orders be raised, what minimum stock level to maintain and what maximum stock level to maintain and what maximum stock level to order. Therefore, the major goal of inventory management is to discover and maintain the optimum level of inventory investment.

The inventory management in the Nigerian manufacturing industries has seen many chains either folding up or closing down. Of the remaining manufacturing industries operating in the Nigerian condition of high rate of the embargo on the importation of raw materials have been some of the bottlenecks being faced by the manufacturing industries in the area of the inventory management's

Inventory can be regarded to constitutes significant portion of a firm's asset and its existence in the form of finished of the flow of production to maintain stable production operations, provide customers with adequate service, and keep investment in stocks and equipment at reasonable levels.

1.2 Historical Background of Zaria Pharmaceutical Company Limited, Zaria.

Zaria Pharmaceutical Company Limited began its operation on 21st May, 1996. The Kaduna State Government owns the company under a signed credit facility agreement with consortium voest Alphine Machinery Construction Engineering (MCE)/Austroplan of Austria for the Supply and installation of the machinery for syringe and needle plant at a credit facility base of Austrian shillings ATS 389.47 million which is equivalent to seven hundred and fourteen million (N714, 000,000) Nigerian Naira.

Zaria Pharmaceutical Company is the largest syringe manufacturing company in Africa. Its main products are syringes and hypodermic needles, which are marketed at economical and affordable prices.

The syringes are manufactured in three different sizes: 2ml, 5ml, and 10ml. And are according to German standard (DIN 13098-A-LN). The brand is professionally known in the medical cycle as ZARINJECT.

The factory has a combined capacity to produce one hundred and thirty five million (135,000,000) pieces of syringes and needles per annum.

1.3 STATEMENT OF THE PROBLEM:

The downfall of every business in the manufacturing industries is usually attributed to poor management and control of its resources. Inventories which usually account for about 20-30 percent of the typical industrial firms' assets pose a great challenge and problem to management as to how to effectively

manage and problem to management as to how to effectively manage and control them to allow business to operate costs, frequent stock out situations, high capital tied up in inventory, high premium freight costs, obsolescence, etc. are all manifestations of inefficient and ineffective inventory management system. These problems are also aggravated by the fact that the sources of raw materials are external and thus companies face licensing and import duty problems. This then results in high procurement costs and materials and other basic raw materials.

Since inventory constitutes a significant part of a firms asset and each inventory has its own characteristics; there is a great need its adequate management.

1.4 **Objectives of the Study:**

The general objective of this project is to find out how the Zaria Pharmaceutical Company Zaria (ZPC) manages the different classes of inventories maintained by the company as well as to find out the strength and weakness that are associated with the operations.

The research work is designed to:

- i. Find out if the firm engages in any form of forecasting (planning) prior to acquiring their items for stock
- ii. Find out the type of inventory control systems installed in the firm:

- iii. Effort will be made to detect problems the company faces in its inventory management:
- iv. To give useful recommendations that will improve the firm's current inventory management practices.

1.4 Significance of the Study:

The study shall be of great value to all the manufacturing firms as it shall enhance their inventory management and aid them to solve their inventory planning and control problems.

Zaria Pharmaceutical Company was used as a case study to expose the fact, since as a manufacturing company, it is bound to maintain all form of inventory. More so, since inventory is one of the largest current assets that appears on the balance sheet and that inventory problems of too great or too small quantities can cause difficulties to the firm.

The need for the study is relevant especially in a developing country like Nigeria, where inflation is constantly rising and inadequate management of inventories leads to cost maximization or loss of high profit to a firm due to improper inventory management.

1.6 Scope and Limitation of the Study:

The dissertation focuses on the Management of Inventory by Zaria Pharmaceutical Company (ZPC). The firm was chosen mainly due to its status as a manufacturing industry: which means that the firm is bound to hold all kinds

of inventory. In addition to that close proximity of the firm to the researcher was another strong attraction for its selection.

The major limitation of the study was the reluctance of the principal officers of the company to release vital information necessary for detailed analysis of the study.

Their reason for not releasing specific quantitative data was for fear of exposing vital statistical data to their competitors. This further hampered the possibility of including certain numerical data in the analysis of the company's inventory control system.

1.7 Methodology:

Questionnaires, interviews and observation are the primary sources of obtaining the data for this study. Zaria Pharmaceutical Company's (ZPC's) bulletin and pamphlets constitutes other sources of data of the finding.

The questionnaires cover ZPC's types of inventories maintained, inventory techniques, Planning and control. The questionnaires were for production, marketing account and corporate affaires departments of the firm.

Interviews were for the various heads of department of the firm and some of their sectional heads; regarding the duties of their respective departments concerning the inventory management's of the firm. In addition observation also formed part of the methods for collecting data.

1.7.1 Data Collection:

The task of getting to the respondents was not an easy one because of the company's policy of restricting the outflow of what they consider sensitive information. Moreover, the exercise was difficult and time consuming due to the tight schedule of those who had to respond to the questionnaire, interview and even allow the researcher to go round the factory for observation.

Basically the company has nine departments each being headed by a manager. And as of now it has a staff strength of about 170 people, out of which nine are expatriates (Engineers/technicians) left behind on completion of the Project by the technical partners. The expatriates render training to the Nigerians who would subsequently take over from them after two years after its inception.

And the factory has three machines for the production of 2ml, 5ml and 10ml model of syringes and needles. Moreover, the factory sources its raw material (100%) from Austria since its inception but the company has made an effort to obtain its raw material locally from Nigeria (National Petroleum Company (NNPC) Port Harcourt) and it has even got a sample and tested it and found to be up the standard.

The company uses High density polyethylene (HDPE) and Polypropylene orange/polypropylene gas Paper, Paper foil for the productions of the syringes and needles. In that regard, the contracting firm has supplied the

raw materials that was enough for the production of 135,000,000 pieces of needles and syringes for two years a was agreed in the contract term.

Besides that the company uses diesel oil for its generating plant for the production in order to curtail irregularities in the electricity supply for the production. There upon a 33,000 litres capacity of a tank was provided monthly for the diesel as safety stock. Moreso, it has a water tank of 10,000 litres capacity in order phase out any eventuality in the water supply. And it has enough storage spaces for both the raw material and the finished goods. Moreover, the company sources its packaging facilities from a neighbouring company known as RIGID PAK Manufacturing Company, Zaria.

1.8 Statement of Hypothesis

The optimum level of inventory to have in stock at any given point in time, the most economic quantity to order when replenishing the inventory, and the most appropriate time to place the order can only be achieved effectively and efficiently through the use of scientific inventory models.

1.9. Definition of Key Terms:

- 1) **Inventory:** "The aggregate of those items of tangible property which are held for sale in the ordinary course of business, or are in process of production for such sale, or are to be currently consumed in the production of goods to be available.

- 2) **Ordering Costs**:- “Those incremental costs associated with inventory replenishment”.
- 3) **Carrying (Holding) Costs**: “Those cost that associated with holding a given level of inventory on hand, and vary with the level and length of time inventory is held. Include the opportunity costs on capital tied up in inventory: Storage costs product determination or obsolescence: Taxes, depreciation and insurance”
- 4) **Set up costs**: The incremental costs associated with producing the item(s) in-house. From the initiation to the termination of a production run”⁴
- 5) **Re-order Level**:- “The level of stock at which a further replenishment order should be placed”².
- 6) **Manufacturing Industry**: Industry that transforms materials into other goods through the use of labour and facilities”²
- 7) **Fixed Order Quantity System**: “A system in which the order quantity is the same on each occasion an order is placed but the interval between the placing of orders varies”²
- 8) **Lot Size**: “The size of the order that will be purchased to replenish inventory”²

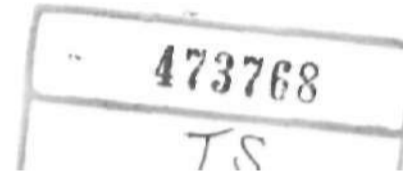
- 9) **Maximum Stock Level:** “A stock level calculated as the maximum desirable which is used as an indicator to management to show when stocks have raised too high”²
- 10) **Perpetual Inventory Method:** Is the method of recording stores balances after every transaction”²
- 11) **Cyclical Ordering System:** “A time based which involved scheduled periodic reviews of the stock level of all inventory items”⁽²⁾
- 12) **Lead Time:** The period of time between ordering and replenishment”²
- 13) **Economic Order Quantity:** “Refers to the most economic lot size the firm should order when replenishing inventory”²
- 14) **Order Cycle:** “Refers to the time period between two successive order placements.”²
- 15) **Safety Stock:** “Extra inventory held to save a buffer against possible stockout situation”.²
- 16) **Salvage Value:** The value attached to unsold item that is to be carried over to the next time period”²
- 17) **Stock Out (shortage) Costs:** These are costs incurred when customer’s demand can not be fulfilled because the inventory is

completely depleted. The stockout consists of loss of goodwill and loss of profit from that sale”²

- 18) **Purchase Requisitions**: “A document issued by an authorized person in a firm to the buyer, instructing him to buy specified goods”²
- 19) **Purchase Order**: “A document issued by a buyer to a supplier, ordering the supply of specified goods and generally specifying the quantity required and the price”²
- 20) **Minimum Stock Level**: “The level above which stocks should not be normally allowed to fall.”²
- 21) **Bill of Material**: “ A list showing all the parts that must be provided to complete one or more of a particular assemble or list of the parts or materials used to manufacture a product.”²
- 22) **Inventory policy**: “A firm’s stock holding mine how and when certain decisions concerning the holding of stocks should be made. This series of rules is known as a inventory policy”⁵
- 23) **Bin Card**: “Record maintained in inventory control, is the bin card, which is a card kept on the shelf showing the number of units received and issued and the balance for each item is stock”⁶

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CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 INTRODUCTION:

The primary objective of inventory management is to provide service to operating functions and this must be fully appreciated. It must be designed to suit particular needs of the firm it serves. If production and delivery of goods are instantaneous, there will be no need for inventory management except as a hedge against price changes. The inventory management function is set up in any concern to assist in the production of goods or services and no organizational undertaking of substantial size can be efficiently managed without it.

The management of inventory can be a crucial factor in the success or failure of any manufacturing concern. For example insufficient inventory can seriously disrupt the production distribution cycle that is so crucial to the survival of all manufacturing companies. On the other hand, excessive inventory can cripple a firm's cash flow and, thus, endanger its liquidity a serious challenge to the production capacity of manufacturing firms.

In the majority of industries, inventories account for a sizeable proportion of their assets. Next to plant, building and equipment, inventories constitute the bulk of the assets value of a firm. Consequently, inventories need to be effectively managed if efficient operation is to be achieved.

2.2 DEFINITION OF INVENTORIES:

It can be defined as the quantity of goods or other economic resources that are store for use. That is to say they are used within the production system or in the operation of the business. They includes; basic raw materials, supplies of component or spare parts, work#E in#E process and finished goods.

The American institute of Accountant defines inventory as the aggregate of these items of tangible property which: -

- Are held for sale in the ordinary area of business
- Are in process of production for such or
- Are to be currently consumes in production of goods or services to make it available for sale.

2.3 CLASSIFICATION OF INVENTORY:

- a). Raw Materials inventory:- They are goods required for production that have not yet been committed into the production process in a manufacturing firm.
- b). Goods in#Process Inventory:- They are categories of materials already committed into production but on which work has not been completed.
- c). Finished Goods Inventory:- They are completed product that are awaiting sales.

d). **Operating Supplies Inventory**:- They are consumed in the production process (e.g. spare parts, oil).

In addition to such physical goods; patients waiting in a doctors office can also be regarded as inventory. The rate at which the doctor sees and treat the patient is the demand process. As this is occurring, new patients arrive to replenish those that have been seen and treated.

2.4 **MANUFACTURING INDUSTRIES IN NIGERIA**

The Nigerian business environment of the manufacturing industries has witnessed tremendous growth in size, scope and complexity of operation for the past decades. Local individualistic herbalist has been replaced with giant multimillion naira Pharmaceutical Companies like Zaria Pharmaceutical company, Dangi Pharmacy, Doyin Pharmacy companies with daily production capacities of thousand product to various locations in the country.

An integral consequence of this revolutionary change is that as the complexity and specialization in an organization increase it becomes more and more difficult to allocate its available resources to its various activities in a way which is most efficient for the organization as a whole.

Manufacturing activities relies heavily on the use of capital, machinery, equipment, large space of land, electricity, water and adequate transportation facilities of which the requirement favoured the location of the industries in centres not only of large population concentration and accessibility to big

markets, but also with the supply of necessary production and services inputs. The consequence of the development is that manufacturing industries have found themselves increasingly located areas like Lagos, Kaduna, Kano, Jos, etc. Mainly, there are types of industries in Nigeria:

- a). **Import Substitution Industries**:- Those that import the raw material and processed it in the country e.g Textile,
- b). **Primary Productions processing Industries**:- Those that sourced their raw material in the country and processed it e.g. groundnut, cocoa.
- c). **Exported oriented industries**:- Those that sourced their raw material in the country, and export it e.g. Gas, Plywood, Timber.

Manufacturing industries due face many obstacles in Nigeria; these are high cost of foreign exchange, high rate of importation of finished product, the value judgement of Nigerians i.e not appearing anything made in Nigeria, deregulation policy. Structural Adjustment Programme.

2.5 **FUNCTION OF INVENTORIES**:

- 1). It provides good customer service and smooth production flow by providing on time delivery and avoiding costly stock shortages.
- 2). Inventories ordered in large quantities can result in lower freight charges and price discount.
- 3). It acts to decouple organisational activities, thereby achieving lower cost of operations.

- 4). When inventories are displayed they serve as promotional investment.
- 5). Inventories are accumulated to hedge against price rises inflation and stockout i.e inventories serve to smooth out irregularities in supply.
- 6). Inventories allow flexibility in production scheduling, thus relieving the pressure on the production system to get the goods out and at any cost.
- 7). Inventories help in leveling production activities stabilizing employment and so help in improving labour relations by storing human and machine efforts.

2.6 INVENTORY COSTS

The main concern of a firm is to develop an inventory policy that will minimize the total operating costs of its operations. There upon two inventory decision have to be taken;

The quantities to order at one time;

And when to order quantity

Therefore, to keep an optimal level of inventory, an effective balance between the different inventory cost must be maintained. The firm must neither keep to little nor to much in inventory. The cost a firm incurs as a result of established stocks policies are divided into three classes of costs these are:-

- a). **Ordering Costs (Acquisition Costs):-** They are costs of getting an item into the firms inventory and those incurred each time an order is placed.

They include cost of preparing and typing out an order, cost of postage, or cost telephoning or sending a telex to the supplies.

- b). **Carrying Costs:-** These are costs incurred on the course of maintaining inventories. They are foregone opportunities for profit and out of pocket expenses. They includes cost of storage, rent, insurance, depreciation, breakage, taxes interests obsolescenes etc. this cost per unit may be expressed as a fixed percentage of the unit of the item. In some cases , it may be expressed in naira value.
- c). **Outage costs (cost of stockout):** They are costs of running out of stock. It result in decreased customer service level, less efficient production operations, and high costs resulting from crash procurements. It has no definitive rules for computing them so it is difficult to quantity its exactness.

Due to the sensitivity nature of the inventory management in a manufacturing industry; inventory decisions are investment decisions. Consequently management has to decide on the minimum rate of return that will result from a given investment in an inventory management of the firm below which it would not prepared to invest. Policy statement on that will be an enormous important to the rate of profitability of the firm.

2.7 INVENTORY MANAGEMENT:

In the context of inventory management, the firm is faced with the problem of meeting two conflicting needs; (i) to maintain large size of inventory for efficient and smooth production and sales operations and (ii) To maintain a minimum investment in inventory to maximize profitability. Both excessive and inadequate inventories are not desirable. They are two danger points within which the firm should operate. The objective of inventory management should be to determine and maintain the optimum level of inventory investment. The optimum level of inventory will lie between the two danger points of excessive and inadequate inventory. The firm should always aim at making just sufficient investment in inventory. Effort should be made to place an order at the right time with the right source to acquire the right quantity at the right time with right source to acquire the right quantity at the right price and quality.

Therefore, inventory management consists of two basic functions; planning for inventories and control of inventories. Planning and control for inventories depend on the state combination on what is actually happening to demand and the forecasting of what is assumed to occur.

2.7.1 INVENTORY PLANNING

its consist of set of related activities that entails diverse responsibility such as what to store or produce, which are the best source for procurement of

goods ; what are the most economical and desirable arrangement for; transportation, storage, inspection etc.

Generally, the objective of the inventory planning is to maintain the investment in inventories at the lowest amount which is sufficient to meet the production , sales and financial requirement of the firm. Basically two decisions are required concerning inventory planning. First is the selection of vendor and considers factors such as quality, price, credit facilities and discount, the second is deciding on the likely demand for the various classes of inventory the firm Posses, this will include forecasting the pattern of demand. Selecting the best source. Sources of supply is usually preceded by demand plans concerning the various classes of inventory items keeps in the company.

2.7.2. FORECASTING:

It is a probabilistic statement with a certain degree of precision and reliability on what is going to happen in future events. It is an integral part of managerial planning in general and production planning in particular. It is a continuous process. As changes occur, operating forecast are modified to reflect current events. And production plans are based on a forecast of expected level of future demands.

Prior to committing so much money on financing a new product, there must exist a certain expectation as to the possible demand or sales level which can usually be obtained through forecasting. Besides, forecasting is useful in

balancing sales and production requirements , thus helping to minimize the considerable problems caused by unexpected gap between units produced and units sold. In addition, and depending on the fluctuating level of demand, forecasting allows the operation manager to move resources from one activity (or product) to the other as one product decreases in demand and the other increases in demand.

Forecasting mostly depends on sufficient historical data to enable one to described the record in statistical terms. Consequently, the decision taken on the forecast help to smoothen seasonal fluctuation in demand, price, competition in economic activity .

Moreso, the forecasts depend on the nature of the firm, its mission, size, the type of customers its serves, the type of suppliers and the quantity of goods and services offered.

2.7.3 TYPES OF FORECAST:

There have been various forecasting technique ranging from crude judgmental approach to the complex econometric models. The choice of any particular forecasting method depends on such factors as the availability and relevance of historical data, the degree of accuracy and desirability the time period, the cost / benefit effect to the firm and the time constraint within which the firm will make decision .

There are , broadly, three main forecasting techniques:

- 1). Qualitative, techniques
- 2). Time series analysis and projection techniques
- 3). Casual forecasting .

- 1). **Qualitative Techniques**

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They are used when data are scarce. The objective is to bring together in a logical unbiased and systematic way all information and judgements which relates to the factors being estimated. Make use of qualitative data (e.g expert opinion) and information about special events and may or may not take the past into consideration. They are typically applied to forecasts long range and new product s sales.

The qualitative methods dealt with; Delphi method, market research , panel consensus, visionary forecast and historical analogy.

- (a). **Delphi Method**:- Designed to obtain expert consensus for a particular forecast , without the problem of submitting to pressure to conform to a majority view. The panel of experts is interrogated by a sequence of questionnaire are used to produce the next. It eliminates bandwagon effect of majority opinion . it has fair to good accuracy in the short and long term.
- (b). **Market Research**:- it is a systematic, formal and conscious procedure for evolving and testing hypothesis about real markets. It has excellent accuracy in the short term but in the long term the accuracy decreases.

The procedures for it are; opinion survey, analysis of market data, questionnaires designed to gauge the reaction of the market to a particular product design, price etc. . market research accuracy diminishes because of the changes in the peoples attitudes and intentions.

- (c). **Panel Consensus:-** This is based on the assumption that several experts can arrive at a better forecast than one person. There is no secrecy and communication is encouraged. However, the forecasts are sometimes influenced by personal factors and may not reflect a true consensus.
- (d). **Visionary Forecast:-** It is subjective guess work and imagination and is non-scientific. It is based on personal insights, judgement and when possible, the facts about different scenario of the future. It has poor accuracy.
- (e). **Historical Analogy:-** it is a comparative analysis of the introduction and growth of similar, new products that based the forecast on similarity patterns. It has poor accuracy in the short term but it improves in medium and long term. Clearly, considerable care is needed in using the analogies which relate to different products in different time period, but the techniques may be useful in forming a broad impression.

Time Series forecasting:-

The basic assumption of these techniques is that, existing patterns will continue into the future. It is based on the assumption that

past history is an indicator of future expectations. It is defined by how a certain production indicator varies with time. And most of existing methods do not separate trend from cycles. The techniques can not accurately predict turning point, when the rate of growth in a trend will change significantly.

It is a set of chronological ordered points of raw data, e.g a division sales of a given item by month, for several years. It helps to identify and explain:-

- i. Any regularity or systematic variation in the series of data which is due to seasonality.
- ii Cyclical pattern that repeat any two or three years
- iii Trends in the data
- iv Growth rates of these trends.

The assumption of these techniques is more valid in the short run than in the future, these techniques provide reasonably accurate forecasts for immediate future. the techniques consist the following methods: moving Average, Exponential smoothing, Box- Jenkins, X-II, Trend projections.

(a). **Moving Average**:- it is based on projection from time series data smoothed by a moving average, taking into account of trends and seasonal variations. The moving average of a number of consecutive points of the series, where the number of data points is chosen so that the

effects of seasonal and or irregularity are eliminated, it has poor accuracy and is used for inventory control of low-volume items.

- (b). **Exponential Smoothing**:- It is similar to moving average except that more recent data points are given more weight, thus minimizes the need to carry large data. Its accuracy ranges from fair to very good depending on the length of time. It is employed in product and inventory control as well as forecast of margins. It has many variations and they differ in complexity, versatility and computer time requirements.
- (c) **Box-Jenkins**:- Here the time series is fitted with a mathematical model that is optimal in that it assigns smaller errors to historical than any other models. It is the most accurate statistical routine presently available but it is costly and time consuming, it is applied in production and inventory control for large volume items and forecasts of cash balances.
- (d). **X-II**:- This system breaks a time series into seasonals, trend cycles and irregular elements. It is typically used in detailed time series analysis but its use is extending to forecasting, tracking and warning by incorporating other analytical methods, it is most effective for medium term forecasting (three months to one year).
- (e) **Trend Projections**:- This system fits a trend line into a mathematical equation, there are several variations and its accuracy is generally good it

is used in new product forecasts (particularly intermediate and long term.)

(f). **Fourier Series Least Square Fit:-** The speed , economy, and storage capacity of present day computers have made it feasible to use fairly sophisticated mathematical models for forecasting. One such model is least squares Fourier forecasting model. This model fits a finite Fourier series equation to empirical, data, projecting trend and seasonal values. It is used in new product forecasts; particular short and medium.

2 **Causal Model:-** The model demonstrate the relationship between a set of known inputs and outputs in a system and to use the relationships as a basis for forecasting , it expresses mathematically the relevant casual relationships and may include inventory considerations and make survey information. It can incorporate the result of a series analysis.

Using enough information analysis from historical data an explicit relationship between the factor to be forecast and other factors can be determined and that often results in the construction of a casual model. A casual model is continually revised as more knowledge about the system becomes available. They are by far, the best for forecasting turning points and preparing long-range forecasts, the various types of casual models are:-

(a). **Regression Model**:- it is an equation that is estimated demand using least square methods which functionally relates sales and other economic, competitive or internal variables. The rational can be general or specific. For example in the sales of strings and needles we might postulate that sales are related to rate of disease outbreak. If the outbreak is up, sales will increase or if new market is opened (vice versa). Relationship selected for testing on rational grounds are analyzed statically. It has good accuracy over the short and medium term and is typically applied to forecast sales by product classes lend margins.

(b). **Econometric Model**:- it is an interdepartmental regression equation, equations that describes some section of economic sales or profit activity. The parameter of the equation are usually estimated simultaneously. That the models are useful in determining the cause and effect relationships existing among some variable.

In simplest terms, econometric forecasting methods is an extension of regression equations. They help to identify those causative factors which can best explain changes in the variables we are interested in and which in turn, can be used for predictive purposes. For example, a rise in the sales volume of syringes and needles set can be explain either by a general rise in disease outbreak (or patients) or a drop in per unit price of the syringe. Similarly, an increase in number of patients per period can be

expected to be followed by an increase in , for example, the sales of syringe.

- (c). **Input#0# Output Model:-** This method is concerned with the inter-industry or indepartmental flow of goods or services in the economy or a company and its markets. It shows the flow of inputs that must occur to obtain certain outputs. it is used in forecasting Company sale and division for industrial sector and subsectors. Its problem is that to use the model properly , additional details, not normally available, must be obtained if they are to be applied by specific businesses.
- (d). **Leading Indicator:-** this is a time series of an economic activity whose movement in a given direction precedes the movement of some other time series in the same direction. It has poor accuracy and is typically used to forecast sales by product class.
- (e). **Life cycle Analysis:-** This is the analysis and forecasting of new products growth rates based on 5#E curves. The phases of product acceptance by various group/innovators early adopters, early majority, late majority and laggards are central to the analysis.
- (f). **Diffusion Index:-** The percentage of economic indicators that are going up or down, this percentage then becoming the index. It has poor accuracy and is used typically to fore-cast sales by product class.

2.8 INVENTORY CONTROL:-

It is defined as the science based art of ensuring that just enough inventory is held in an organization to meet both its internal and external demand commitments economically .

The main objective of inventory control is to strike a balance between the costs of holding too little and too much inventories in order to minimize costs. Other reasons include the need to maximize profit, avoid stockouts, avoid overstocks, keep inventories within available storage capacity, control capital investment , minimise human effort and maximise sales or share of the market . there upon it is a framework for integrating the necessary information and data for the purpose of minimizing total inventory cost.

2.8.1 INVENTORY RECORDS:-

The development of a complete inventory catalog(record) for inventory control of items is an inevitable for the firm. It is the duties of the stores to maintain records of all goods received into the store and the issuance of the various demand centres. Three main documents are often used are:-

- i) Bin Cards
- ii) Stores material Control Record
- iii) Store ledger cards.

(1). **Bin Cards:-** Records the physical movement of each inventory item, that is receipt and issuance. Materials are kept in appropriate bins or drawers. A separate record is kept on a bin card for each of these inventory materials. It gives information or maximum and minimum stock level of the materials being carried , the balance of stock, the recorder level.

i) **Store material Control Card:-** It is alternative of bin cards. It is worked in a loose stores and /or by production control in a loose leaf book or card file. Only quantities are recorded in the card.

ii) **Store Ledger Card:-** It is kept in the cost department and is identical with the bin cards. It is only the monetary values that are shown. The ledger is usually of the loose#leaf or card type. Each item of the materials has an account representing it.

Inventory records help to produce complete records for identical parts if it carefully developed and maintained . it also help in the communication process of the various personal involved in stock control.

2.9.2 ABC ANALYSIS

It is a system that analyses stock by value categories, so as to ensure that adequate attention are been paid to important stock items. All items of the stock are listed in order of descending value of the materials. The firm classify inventories to identify which items should received the most effort of the firm in controlling.

The classifications are made; labelled A, B and C; that is why it is called as ABC approach to the control of inventories and it tends to measure the cost significance of each inventories. #DAC categories consists of items of considerable value and would be under tightest control the #DBC categories of medium value would be under reasonable attention of management and the DCC categories of low value would be under simple control.

The classification (ABC) puts approximately 10 percent of the items in category #DAC account for 70 percent of the total value; 35 percent in category #B account for 25 percent of the total value and 55 percent in category #C account for 5 percent of the total value.

The ABC analysis is illustrated in the chart below:

Category	% of total Value	% of total Quantity
A	70	10
B	35	35
C	55	55

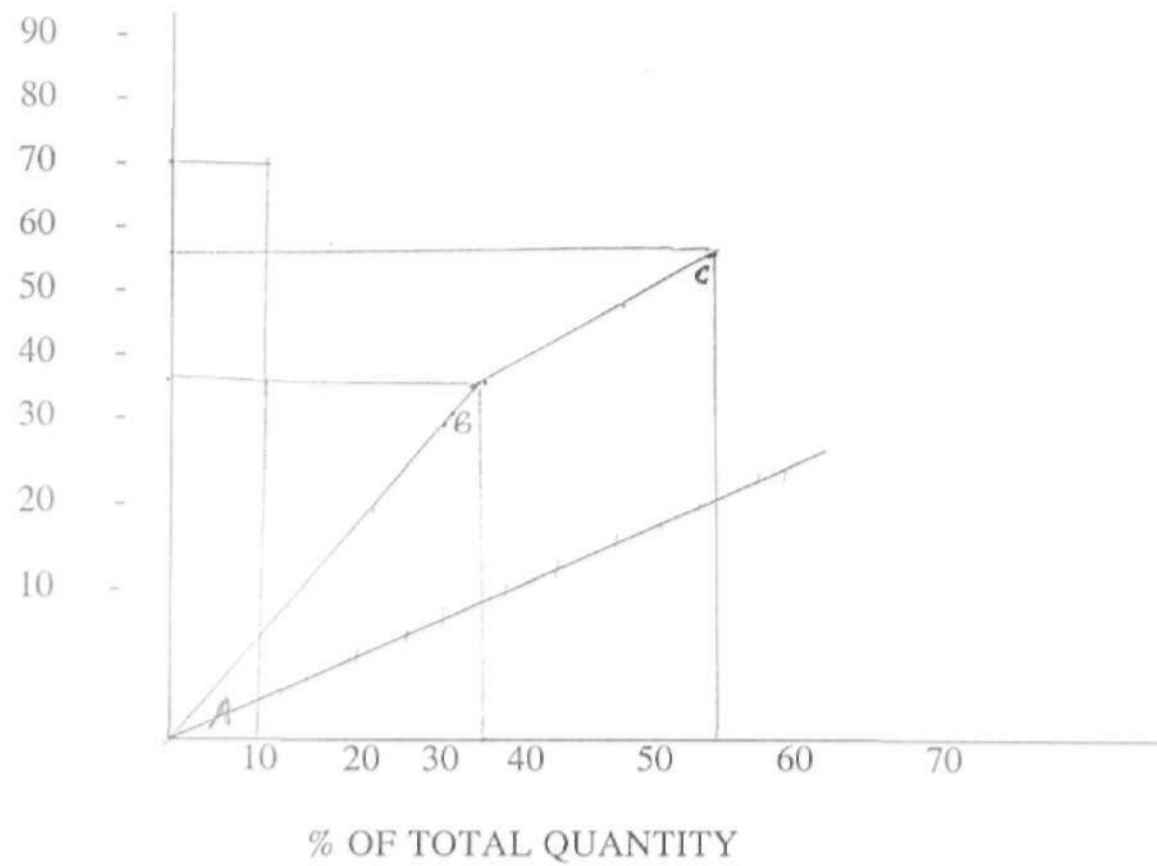


Figure 1

Source: Wheldons cost Accounting by LWJ OWLER and Brown . Macdonald and Evans Ad, (1984) pp. 43.

The classification provides an effective means of allocating funds and time of personnel with respect to the refinement of control over the individual inventory items. Control in this sense may take several forms.

It may be reflected in minimizing inventory investment in minimizing indirect cost associated with inventory, in utilizing personnel effect, or in assuring effective storage handling, and delivering of materials to production operation as scheduled. The concept allows a number of divisional operations, purchasing , production control, stores, and accounting. Moreover, ABC

analysis highly reduces the possibility of error in judgements by directly pointing up the specific item on which management can make reasonable profits.

2.9.3 INVENTORY MODEL:-

They are of two techniques the deterministic models and the stochastic probabilistic models.

2.9.3.1 THE DETERMINISTIC MODELS:-

deterministic models are those based on the assumption that both demand and lead time are known with certainty. They are further subdivided into six sub-categories:

- i. Classic EOQ model (shortage not permitted)
- ii. EOQ model shortage permitted
- iii. EOQ model with quantity discount
- iv. EOQ model production run; multiple products
- v. EOQ model for production runs; single product
- vi. EOQ model with resource constraints.

THE CLASSIC EOQ MODELS:-

The classic economic order quantity (EOQ) model attempts to arrive at a cost which equates the cost of ordering with the cost of storage of inventory.

The cost of placing orders decrease with the size of orders placed at a time while the cost of holding inventories is thus least at that point where the cost of ordering equates the cost of carrying inventory and the quantity at that point is the economic order quantity.

This can graphically be illustrated as figure 2 below

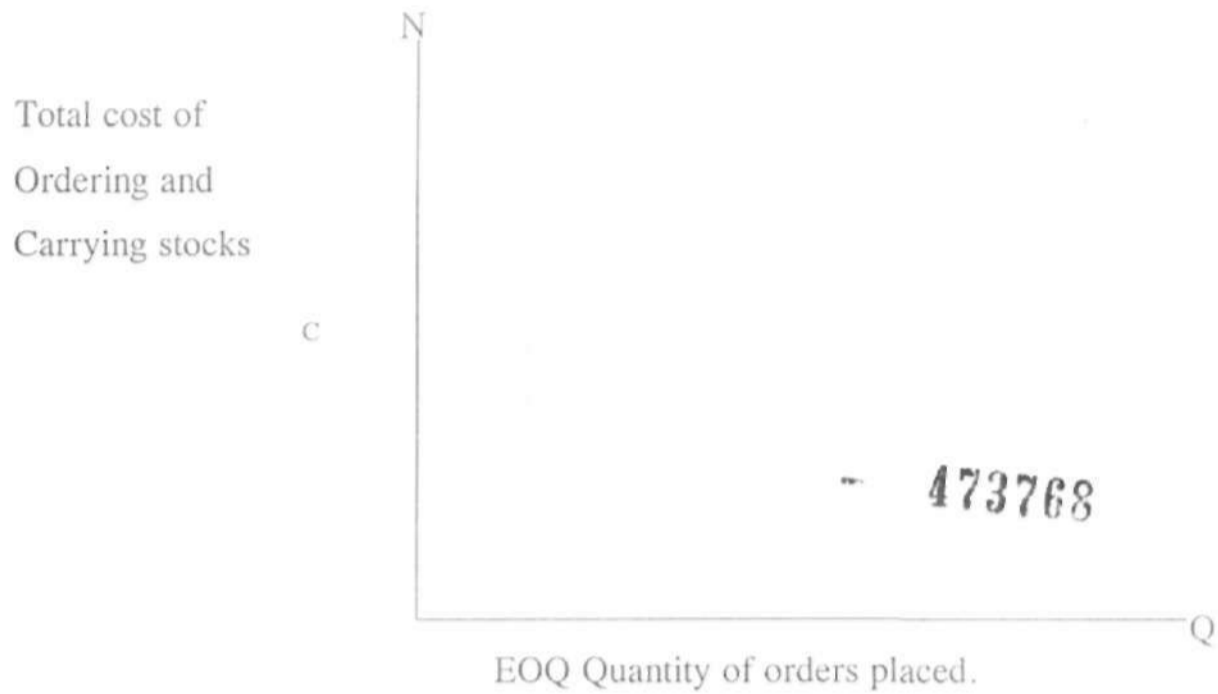


Figure 2:

Source: Essentials of managerial Finance (1979) by J. F. Weston and E.F. Brisham pp. 193.

The derivation of the EOQ model depends on a number of assumptions which are as follows:-

Inventory is replenished when inventory is exactly equal to zero (no shortages)

Usage rate is known and constant

Lead time is known and constant

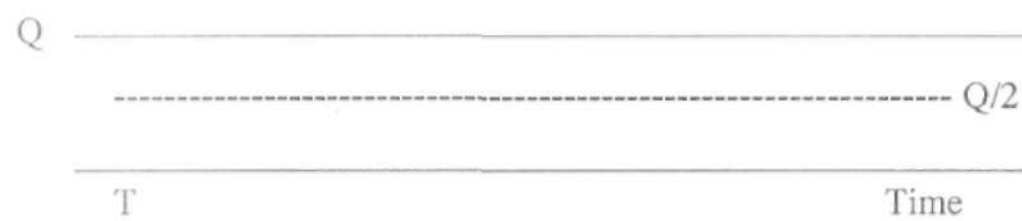
Carrying cost is in linear throughout the entire inventory range and varies with average inventory.

Price is independent of quantity of product purchased

Ordering of the product has no relationship with ordering other products.

Even though most of the aforementioned assumptions are violated in practice, this does not render the model occur in practice.

Figure 3:



Source: Scientific inventory management (1977) by J. Burchen etal Pp. 123.

The above graph illustrate the differences of the inventory level over time for the classic EOQ model. The down-ward shopping curves indicates that the inventory level is being reduced at a constant rate over time (assumption 1 above).

When inventory level reaches the re-order point, level Q units of goods are ordered. The order is renewed at the time when inventory level is reduced to zero during the lead time (L). this raises the inventory to Q and the cycle is repeated.

The EOQ model can be formulated mathematically as follows:-

Let Q = Order quantity

D = Demand on annual cost

C_c = Inventory carrying Cost

C_o = Inventory ordering cost

TIC = Total Inventory Associated costs

P = Purchase cost.

The following linear equation represents the inventory associated cost:-

$$\begin{aligned} \text{TIC} &= \text{Average cost} + \text{carrying cost} + \text{purchase cost} \\ &= C_o D/Q + \frac{1}{2} C_c + PD \end{aligned}$$

differentiating the TIC and setting it to zero

$D/dQ (\text{TIC}) = 0$, we obtain

$$\frac{1}{2} C_c = C_o \frac{D}{Q^2}$$

$$C_c Q^2 = 2 C_o D$$

$$Q^2 = \frac{2 C_o D}{C_c}$$

$$Q = \frac{\sqrt{2 C_o D}}{C_c}$$

The classic model has thus been formulated. The re-order point is simply lead time x (Time) utilization per day.

2.9.3.2 THE PROBABILISTIC (STOCKASTIC) MODELS

It assumes that the demand and lead time are uncertain, back orders are permitted (stock out are penalize but not cost) and unit price, ordering costs, unit inventory carrying costs, unit stock out costs are constant.

The determination of the EOQ and reorder point is more complex under this system, the estimates of costs, unit stock out costs are constant.

The determination of the EOQ and reorder more complex under this system. The estimates of costs of being out of stock must, therefore, be led into the probabilistic inventory model.

When the item demand and lead time are uncertain, the determination of the economic order quantity, Q, and reorder point, R, becomes considerably more complex, because of the uncertainties involved, a probability, distribution of demand during lead time (DDLT) must be determined. These uncertainties cause an interaction between order quantity, Q, and re-order point, R, which produces their independent determination.

The formula as follows:-

$$TEC = \frac{C_o E(D)}{Q} + C_c Q/2 + R/E E(DDLT) + C_s E(S) E(D)/Q$$

$$Q = 2E(D) \frac{C_o + C_s E(s)}{C_c}$$

P(S)*

$$P^*(S) = \frac{C_c Q}{C_c E(D)}$$

Where

TEC = Expected total annual inventory cost.

$E(D)$ = Expected (average) demand

$E(DDIT)$ = Expected demand during lead time

$E(S)$ = Expected stockouts during lead time

R = re-order point

$P(s)^*$ = Probability of a stockout for a given re-order point.

The two equations for Q^* and $P(s)^*$ cannot be solved independently.

Rather, they interact in a slow way, and thus must be solved a back and forth trial and error procedure. That is assume an R^* and solve for Q^* now solve again for R^* using the Q^* with new R^* solve again for Q^* , and so further until the solutions "settle down" giving consistent results

2.9.4 THE ROLE OF ELECTRONIC DATA PROCESSING:

Once quantitative decision rules are developed, inventory management becomes a natural area for application of mechanized data processing. A computer can be used for reviewing the inventory status of each item, performing calculations quickly and accurately. And taking action (such as providing a re-order notice) only when action is required.

It can also be useful for forecasting using the methods described above. It can prove a great aid in monitoring the current activity to determine when decision rules should be redefined. For example recomputing buffer stock when there is change in the pattern of sales variation.

In the computing the economic order quantity using a computer, it is normal to divide the component parts of inventory using the ABC analysis. Three sets of decision are usefully necessary in the setting up a computer based inventory control system, namely the use of customer service required for each item, the rules to be used in determining order quantities and the total size of inventory which the business is currently able to support.

- (a). Inventory Recording : This record inventories according to it type in master files and these quantities are automatically adjusted after every transaction and when variations arises after physical stock counts.
- (b). Inventory Values:- Periodically, the computer will programme report on information relevant to the value of inventory. Depending on the system this can include information as to excess stock, obsolete stock and how moving stock behaves.
- (c) Inventory Counting: When inventories are processed by computer it is easier to ensure their reliability and continuos stock taking becomes more likely. The following methods are usually employed.

- (i). The stock is counted and compared with the most recent point out of the balance in the file after adjusting for outstanding issues and receipts. Adjusting can be done manually or by the computer. Differences are processed by the input of an adjustment and a manual record is also kept of items to counted.
- (ii). The stock is counted, compared and adjusted processed as in (I) above, at the same time the data of count and produces regular report of items which have not been counted for a specific period.

The stock is counted and details of the physical balanced are input, the computer calculated any different between the physical and book inventory balances. The differences are automatically treated but in some cases different over a specified amount are reported. It should be noted that the above component are usually integrated to form a whole system. Many organization have produced software packages for inventory control purposes suitable for various needs.

2.9.5 STOCK LEVELS

The aims of inventory control is to ensure that stockouts is eliminated and that surplus stock are not carried due to the high cost associated with either of the two conditions. There upon some companies attempt to achieve effective inventory management by intuition or guess work,

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however, most of the large companies have tried a scientific approach by adopting a system of stock level. And it can be discussed under the following:-

(a). **Maximum Stock Level**

It is the level above which should not normally rise. It is desirable that the level should be as low as possible, but it must allow for forecast usage of the inventory and time lags in delivery. And the maximum stock level has the following formula: $\text{maximum stock level} = \text{reorder level} - (\text{minimum consumption} \times \text{minimum reorder period}) + \text{reorder quantity}$.

The best possible expected condition are used in fixing the maximum stock level, so as to ensure that even if there is a quick delivery from suppliers, and there is also a low demand for the inventory, stock should not rise higher than maximum stock level authorized.

(b) **Minimum Stock level:-**

it is the level below which stocks should not be allowed to fall. otherwise a very real danger of a "stockout" may be experienced. it is a "buffer stock" which would be available in emergencies. And it has the following formula: $\text{minimum level} = \text{reorder level} - (\text{Normal Consumption} \times \text{Normal /Reorder period})$.

Average or normal condition are been used in fixing the minimum stocklevel, so as to ensure that normal conditioned, the “ buffer stock” would be needed for usage.

(C). Reorder Level:-

it is a point at which the worst possible expected conditions are used in fixing it (Reorder level); so as to ensure that stockout does not happen at least in the short run.

It is the point at which it is essential purchase requisition for fresh supplies of the inventory. the point will be higher than the minimum stock level, so as to cover such emergencies as abnormal usage of the inventory or unexpected delays in delivery of fresh supplies. Moreso, it will also be cover than the maximum stock level otherwise excess stock would be carried. The reorder level has to the following formular.

Reorder level = maximum consumption times (X) maximum reorder period.

Generally, in setting these stock levels (Reorder level, maximum level, minimum level) the following of factors must be considered.

The consumption rate of the inventory;

The time necessary to obtained delivery of the inventory;

The reorder quantity for the delivery of them.

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CHAPTER THREE

3.1 Introduction

In carry out the study, questionnaire was distributed to the departmental managers and their subordinates, storekeepers, and sales officers. The researcher conducted interviews with the staff in the departments that were relevant to the study. Observation was among the other methods of research that were used to complement the responses to the questionnaire.

The presentation of the data for the company was carried out in line with the discussions made in chapter two in terms of inventory; types of forecasting, planning and control.

3.2(A) Types of Inventories Used in ZPC

The respondents were asked on what type of inventory they hold and their responses were presented in table 3.1 below.

ZPC maintains all the categories of inventories as a manufacturing company. But each inventory type is under the control of a different department. Engineering department maintenance, Repairs, Operating Supplies (NRO) inventories and in process inventories, and in process

inventories, marketing department is in charge of finished goods inventories and production department cares for production inventories.

(B) Production Inventories

Questions under this section were answered by the production manager of the company.

- (i) The respondent was asked what specific production inventories are used in the company for production.

This shows that ZPC maintains the following types of inventories: Production Inventory, Maintenance repairs, and an operating Inventories; In-process Inventories, and finished goods inventories.

It is also believed that, the frequency of raw materials usage in ZPC is daily. The distribution and delivery system of the inventories is rate very good. This means that stock are easily purchase. The marketing department is efficient and organized to adequately cater for the numerous customers.

The demand rate of the finished products is high in the case of 5ml and medium in case of 2ml and 10ml.

In addition the cases of in-process inventories were determined to be an inhibition to the smooth activities being carried out during the production period.

The company has 80% Direct Import as a source of its inventories (raw material, inprocess and spare parts). And uses 20% as local sources of its

inventories. The firm imports needles from Germany, which amounted to 150,000,000. Pcs annually, and imports Gas paper from Austria amounting to 100,000.00 and also import. Etox from the Austria of about 130 cylinders annually.

The firm sources that packages and stripping carton locally (from Rigid pack company limited, Zaria) Regarding the stability of the supply of both imported and local raw materials the company adopts fixing re-order level annually. And the firms inventories investment that constituent production inventories ranges about 25%.

The quality of the product produced was rated high by the National Agency for Food Drugs Administration and control (N^AFDAC) Plus the Pharmaceutical Group of Manufacturing Association of Nigeria (PGMAN).

3.2 Inventory Planning

On whether the firm embarks on any type of forecasting before purchasing stock for production it was found that the company attached importance to the planing for inventory by using input/output model-a causal techniques for forecasting inventory requirements. The aim determine how much of polyethelene to store, the amount of syringes and needles to produce and possible the procurement or the fabrication of spare parts to maintain the maintain the machines to meet the production target.

Both short term forecasting and long term forecasting are being used by the company. Therefore, the firm employs exponential smoothing in predicting its inventory requirement. And it provides inventory investment requirement. And it provides inventory investment annually in its annual budgetary planning.

3.3 Inventory Control

The issue of inventory control is very paramount in the activities of the firm. Thus the Management attaches much significance to the service rendered by the store and warehouse. The firm control the inventories by making use of Bin cards and material transfer note. Consequently also make stocktaking every morning of the operation days.

3.4.1 Origination of Inventory Control Action:

Inventory control actions all initiated by the three main department of the firm; namely the finance department production department and marketing department.

The production department makes use of both fixed order system and cyclical ordering system in controlling their inventories. This is due to the difference in the individual parts maintained. The finance department operates the fixed order quantity system because inventories purchases are based on demand (usage rate). The marketing department operates the cyclical ordering system

because the demand rate of ZPC finished products (5ml, 2ml, and 10ml) fluctuates mostly in rainy seasons.

3.4.3 Cost Associated with Inventory

Two costs were identified namely:

Carrying cost and ordering cost

Carrying Cost:

The cost associated with carrying or holding inventory are found to be storage cost, obsolescence/deterioration cost insurance, stock checking and accounting cost, and cost of money tied up in capital in each of the departments.

Ordering Cost:

For each of the three departments the costs of transportation, clerical and administrative work and import duties were identified.

Safety Stock:

We found that the company keeps safety stock to guide against possible stock-outs.

3.4.4. Methods of Inventory Control:

The various tools used in inventory control are: the production and finance departments were each found to be using both inventory records and inventory

models and computers to control inventories. The marketing department used only inventory records.

Generally, Bin cards, and material transfer note are the inventory records kept.

3.4.5 Ordering Quantity Determination:

The ways in which the firm determines the appropriate order quantity is presented for each of the departments.

The information show that ZPC, relies on the use of stock levels; Minimum, Maximum and re-order levels to determine the quantity to re-order at any given time. It was also discovered that the company neither uses any statistical model nor the EOQ concept in inventory control.

The company relies on the periodic method of stock taking and the decision to insure the company's stock is mostly determined by Management.

The use of the financial resources available was the purchase as efficient also and purchases of the inventories were made by a committee of which the members were made from all the departments of the firm.

The company does not benefit in price discount from both the local and foreign suppliers of its raw materials because the purchase was on credit term and the company makes stock insurances with the national Insurance Company (NICON) for its raw materials. Delivery experience of the firm's raw materials was described

as slow due to the problems of foreign exchange, and distance of the source of imported ones. Moreover, delivery experience of finished goods of the firm was described as good (80%). The company extends credit to its customers so also it extends discount of 10% or Instant cash payment of the total value purchased. ZPC, Enjoys credit facilities from its suppliers of raw material and parts but not on consumable materials (e.g. Diesel Oil). The company does not encounter problems with the storage of the purchased materials and that of the finished products in terms of space, security and finance.

3.5 Inventory Management Problems in Zaria Pharmaceutical Company

The manufacturing sector is worst hit by the harsh economic environment in Nigeria. The inflationary growth, the depreciation of the naira and the difficulty in the purchase of foreign exchange have hampered productivity in this sector.

Consequently, a number of problems were discovered in the Inventory Management of Zaria Pharmaceutical Company Limited in the course of the study as follows:

- (a) Frequent changes in government policies to create a situation whereby long term planning is made difficult:
- (b) Rising costs such as those of electricity, telephone, salaries and wages, transportation, have eroded the profit margins of the firm.

- (c) There are many risks associated with carrying inventory such as spoilage's, pilferage's, fraud which heavily eat into the profit of the company.
- (d) Price changes continuously and the principal consideration is no longer purchase cost but replacement costs. This is in addition to the diminishing purchasing power.
- (e) There is problem of lack of enough diesel supply for running the machineries.

3.7 **Observation:**

Investment in inventory is one such area that is vital to the profitable operation of manufacturing industry. This is because cost associated with inventory holding, if not properly controlled, could spell doom for the business. It is in the light of industry is very important.

Zaria Pharmaceutical Company Limited as one of the manufacturing industries is not left out in the experience of harsh economic environment in Nigeria.

Today. The uncertainties about the political and economic direction of the country, scarcity of foreign exchange. The costs of running businesses have been rising leading to the erosion of the profit margin that could ensure the profitability of the company.

Looking at Nigerian environment, one finds a situation whereby many manufacturing industries are performing below standard or almost at the point of collapsing due to problems not unrelated to the management of their inventories.

This work has tended to highlight the importance of inventory management to the operation of inventory in manufacturing industry. In the literature review which is in chapter two, the theoretical work of what inventory management should entails was explained with the view to lay a foundation upon which the work could be based. ZPC as a manufacturing industry was selected with the hope of finding whether they use scientific inventory management practices to practically solve inventory problems of the company.

From the data analysis and research findings, one can now test the validity of the hypotheses set up in chapter one. Theoretically speaking, inventory decisions are geared towards minimising total relevant cost achieved through the twin objectives of planning (how much to buy?) and control (when to buy?). These objectives in most cases use predetermined formulas like economic order quantity, re-order level, maximum stock, and safety stock to determine how much to order? And when to buy.

But from the research carried out, these objectives are achieved, but not by the use of these predetermined formulas. As a manufacturing company where continuous production process is used, any possibility of stockouts should be

opposed vehemently by the Management. To fight that, the management developed the habit of over-stocking raw material. This is done bearing in mind other costs associated with stock such as carrying cost, cost of incurring shortages. To achieve its goal of minimum total relevant cost, the management become astute in its supervision of their incidental cost.

However, in the area of the use of inventory model, the firm does not even use the EOQ model in computing the most economic quantity to order. The reason for not using the EOQ model was informed as a result of the agreement of supply for the raw materials for two (2) years (May, 1996 – May, 1998) under a credit facility with the Voest Alpline Machinery Construction Engineering (MCE/Austron plan of Austria. And since the inception of the firm it was operating at needle per annum). This shows that the company has the bulk stock of the raw materials that can be used for the next six months (June, 1999). The lack of the use of EOQ model could be generating some costs which could have been avoided by the firm. If all carrying costs and ordering costs to be incurred by the firm are used in calculating the quantity to be ordered. This might be the reason why the company managers rated the inventory control system in the company's respective stores as ineffective since avoidable costs are incurred by the firm are used in calculating the quantity to be ordered. This might be the reason why the

company managers rated the inventory control system in the company's respective stores as in effective since avoidable costs are incurred.

In planning material requirement requisitions lead-time must be determined for every item of the stock. On the inventory planning system carried out by the firm, it was discovered that, the firm's personnel are appreciative of the role of forecasting in inventory planning. The short and long range plans of the firm are made, using data from his historical experience and some times through pure intuition. This is because ZPC depends on market conditions, customer preferences before coming out with a decision on how much inventories to keep the finished goods.

The answer to the question on how the quantity to be ordered (in-process, consumer stock and spare parts) at any time, is determined by the use of minimum stock level, reorder stock level and then assure lead-time based on historical consumption pattern for that item before calculating the quantity to order.

From observation, however, it is discovered that it is only the finance department in ZPC, that is computerized and thus renders occasional services to the production and marketing in printing out lists of inventory item in stock and those that are ordered and yet to be received and also produces the departments IDENT STATUS REPORT.

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CHAPTER FOUR

CONCLUSION AND RECOMMENDATIONS:

4.1 Conclusion

Conclusively inventories in from of raw materials, components, spare, work-in-process or finished goods are vital ingredients of the production system. They involve a lot of investment and, hence, require proper and effective management as too little or too much of it can causes some problems. Inventories are kept because they perform such functions as guiding
Inventories are kept because they perform such functions as guiding uninterrupted production, helping to meet variation or fluctuations in demand as a hedge against future price increases and as an aid in leveling production activities. An attempt was made to look into inventory management in the ZPC with a view to determining its effectiveness and also the area the improvements could be made. It can be said that though there is a conscious effort on the part of the company to plan and control its inventory there are rooms for improvement and the firm should consciously take steps to make the necessary improvements in order to ensure its continuous profitable growth.

4.2 Recommendations

The cost of inventory control should not be overlooked by the firm. Different control systems have different costs and produce different results. These considerations should be a factor in determining which system to use.

- (a) The company should adopt simple inventory models to minimize carrying and ordering costs, provision of adequate transportation for its stock and a careful analysis of the costs of inventory control:
- (b) The store section of the firm should adopt a method of recording stores balances after every receipt and issue; to facilitate regular checking and to obviate closing down for stocktaking (continuous inventory):
- (c) It is essential that all stores issued should be promptly recorded, so that accurate material cost may be obtained. Materials should be issued by the store keeper only on presentation of an authorized document (material requisition note):
- (d) Excess stock leads to high carrying cost, pilferage and obsolescence. In a firm with continuous production process and high consumption of stock a standard order is advisable, so as to have constant supply and as little relevant cost as possible.

- (e) Stock should be controlled by detailed unit records. The general ledger records establish the overall naira accountability, and are the basis for developing variations in amount when the result of a physical stock taking are used to adjust the book and physical inventory indicates how accurately both physical quantities and the related book records have been handled during the year.

This stratification is aimed at making more control on the relative materiality of the constituent sections of stocks.

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APPENDIX IV

Institute of Administration,
Faculty of Administration,
Department of Business Admin.
Kongo – Campus,
Ahmadu Bello University,
Zaria.

Dear respondent (s),

QUESTIONNAIRE FOR A PROJECT

I am an M.B.A. Student from the Ahmadu Bello university, Zari undertaking a research on INVENTORY MANAGEMENT IN MANUFACTURING INDUSTRIES A CASE STUDY OF ZARIA PHARMACEUTICAL COMPANY LIMITED, ZARIA. These questions are designed to aid in my data collection exercise and they are purely for academic purpose. Your cooperation in answering these questions shall be of great assistance to me.

Thank you.

Yours faithfully,

S Amthé
SHETA Amthé

Tick Yes

OR NO

PERSONAL DATA:

NAME:.....

DESIGNATION:.....

DUTIES PERFORMED:.....

STATION:.....

GENERAL:

1) What form of inventories do you normally handle?

(a) Production inventory

(b) Maintenance, repairs, operation supplies

(c) In process inventories

(d) Finished Good Inventories

(e) All of the above

(f) None of the above

PRODUCTION INVENTORIES

2. What are the specific production inventories used by your company for production?

.....

3. What are your sources of inventories and the percentage (%)?

(i) Direct imports: %

(ii) Local sources: %

(iii) All of the above: %

4. If the Company imports (some of its) raw material please state ones imported, the name of the Country and what percentage of the annual requirement is imported?

Name	Country	Amount demand per year
i		
ii		
iii		
iv		

5. What raw materials are sourced locally and how do you obtain them? And state their respective percentages.

Source: KARACHI LIBRARY

Name	Sources
i	
ii	
iii	
iv	

6. What provisions are made by the Company to ensure constant supply of both imported and local raw materials?

.....

7. How often does the company make use of these raw materials?

- (a) Very often
- (b) Fairly often
- (c) Less often
- (d) Seldom

8. What percentage of inventory investment constituent production inventories?

- (a) 10% - 25%
- (b) 25% - 40%
- (c) 40% - 55%
- (d) 55% - 70%

- (e) If exact percentage is known, please indicate.....%
9. State how much production inventories do you demand usage per year for.
- (a) Syringe
- (b) Needle
- (c) Packages
10. How much do you spend for carrying cost per year for each of the above per year.
-
11. How much do you spend on holding cost per year for each of the above per year.....

FINISHED GOOD INVENTORIES:

12. What are the main products produced by your company?
- (a) (b) (c) (b)
13. To what extent are your products differentiated?
- (a) Highly
- (b) Moderately
- (c) Lowly
- (d) No
14. How do you rate the quality of the product produced?
- (a) High
- (b) Moderately
- (c) Lowly
- (d) No

15. How do you rate the distribution and delivery system of your company?
- (a) Excellent
 - (b) Very good
 - (c) Fair
 - (d) Poor
16. What provisions do you make to ensure constant supply of both locally sourced and imported raw materials.
-
-
-

INVENTORY PLANNING:

18. Does your Company embark on any of forecasting of their inventory requirements?

- (i) Yes
- (ii) No

19.If YES, is it?

- (i) Short term
- (ii) Long term
- (iii) All of the above
- (iv) Others (specify).....

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20.Do you use any of the casual techniques for forecasting your inventory requirements

- (i) Regression mode
- (ii) Econometric model
- (iii) Input output model
-

- (iv) Anticipation survey
- (v) Leading indicator
- (vi) Life cycle analysis

21. What type of scientific time series forecasting techniques does your Company/Unit employ in predicting inventory requirement?

- (i) Exponential smoothing
- (ii) Moving average
- (iii) Linear regression method
- (iv) None of the above
- (v) Other (specify).....

22. Do you employ different forecasting techniques to the different Inventory classifications, If yes enumerate?

.....

21 Do you have budgets for inventory investment?

- (i) Yes
- (ii) No

INVENTROY CONTROL

23. Do you have an inventory control unit?

- (i) Yes
- (ii) No

24. Where do inventory control actions originate?

- (i) Account Department
- (ii) Central Warehouse
- (iii) Merchandise controllers
-

(iv) Store managers

(v) Others specify.....

25. What type of inventory control system do your company use?

- (i) Fixed order quantity system
- (ii) Cyclical system
- (iii) Optional replenishment

Do you employ different control system to various inventory sources? If Yes what system do you employ for?

- (i) Director/Catalogue
- (ii) Local Sources
- (iii) Central Depot
- (iv) Others specify

26. How effective has the system been?

- (i) Very effective
- (ii) Fairly effective
- (iii) Just effective
- (iv) No effective

27. What costs of carrying inventory do you encounter in your company?

- (i) Storage costs
- (ii) Breakages/Damages and obsolescence
- (iii) Insurance and Taxes
- (iv) Stock taking, reordering and accounting cost
- (v) Cost of money tied down in inventory
- (vi) All of the above
- (vii) Others (specify).....

28. Which of these approaches are employed by the company to determine the stock levels?

- (i) Minimum level
- (ii) Maximum level
- (iii) Re-order level

29. Which of these approaches are employed by the company to determine the stock levels?

- (i) Transportation
- (ii) Import duties
- (iii) Clerical/Administrative costs
- (iv) Others (specify).....

What tools do you use to maintain effective inventory records?

- (i) Inventory records
- (ii) Inventory models
- (iii) Computers

30. What type of inventory models do you employ?

- (i) Perpetual
- (ii) Periodic

31. How do you determine quantity of raw materials to order?

.....
.....
.....

32. What inventory cards are maintained by the stores department?

- (i) Bin Cards
- (ii) Store control records
- (iii) Store ledger card

33. What is the most determinant of your company stock insurance decision?

- (a) Management decision
- (b) Government policy
- (c) Financial Stands of the company
- (d) Pressure from insurance company

34. Which of the following methods of determining stock level is mostly used?

- (a) Experience in sales
- (b) Importance or the item
- (c) Usage rate
- (d) Arbitrarily

35. What are your company's considerations in setting the minimum and the maximum stock level?

- (a) Value of the item
- (b) Usage rate
- (c) Production capacity
- (d) Available finance capacity

36. How many times do you place order per year for the inventories (Name & times)

- (i)
- (ii)
- (iii)
- (iv)

37. How would you describe the use of the financial resources available for the raw materials in your company?

- (a) Inefficient
- (b) Efficient
- (c) Quite efficient
- (d) Quite inefficient

38. Who makes stock purchase in this company?

- (a) Purchasing manager
- (b) Factory/production manager
- (c) Marketing manager
- (d) Finance specialist

39. What factor does your company consider most before stock order is placed?

- (a) Market situation
- (b) Production need
- (c) Competitor's output
- (d) Stock price reduction

40. How does your company determine up to date stock level of materials?

- (a) Stock are itemised through Bin card
- (b) Stock are packed in standardized cases
- (c) Physical counting
- (d) Daily records from warehousing

41. Which method(s) does your company uses to take advantage of price discount

- (a) Prompt payments
- (b) Excess booking of materials
- (c) Written agreements with the supplier
- (d) Prevailing price of materials

42. Does your company made stock insurance for your finished good or raw materials or both?

43. Delivery experience of raw materials of your company can be best described as

- (a) Quick
- (b) Delay
- (c) Slow
- (d) Moderate

44. Delivery experience of finished goods of your company can be best described as.

- (a) Quick
- (b) Delay
- (c) Slow
- (d) Moderate

45. Do you extend credit to your buyers?

46. Do you extend discount to your buyers and at what rates

.....

47. Does the company encounter delay in the sell of the finished good.

.....

48. Does your company enjoy credit facilities from its suppliers of:

- (a) Raw Material
- (b) Spare parts
- (c) Consumed materials

49. Does your company enjoy discount any value added from it suppliers? Explain.

.....

50. How often does the company encounter delay in the sell of the finished goods?

- (a) Very often
- (b) Quite often
- (c) So often
- (d) More often

51. How often does the company encounter problems with the storage of the purchased material – in terms (of space finance, security)

.....

52. Which type of quantitative forecast do you employ?

- (i) Researching expert opinion
- (ii) Delphi technique
- (iii) Scenario
- (iv) Morphological technique

53. How much safety stock of each inventory item do you maintain to prevent stock out?

- (i) Finished good
- (ii) Raw material
- (iii) Spare-parts
- (iv) Consumed material

How many times do you place order per month/year.

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