AN ASSESSMENT OF INVENTORY MANAGEMENT TOOLS IN SOME SELECTED MANUFACTURING ORGANISATIONS IN KADUNA STATE

TAUHID, SULEIMAN
(M.SC./ADMIN/30970/2001-2002)

A THESIS SUBMITTED TO THE POSTGRADUATE SCHOOL OF AHMADU BELLO UNIVERSITY, ZARIA IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF MASTER OF SCIENCE IN ACCOUNTING AND FINANCE

DEPARTMENT OF ACCOUNTING
FACULTY OF ADMINISTRATION
AHMADU BELLO UNIVERSITY, ZARIA

FEBRUARY, 2009

DECLARATION

I hereby declare that, this thesis for the award of the degree of Master of Science in accounting and finance is a product of my research work. All sources of information are acknowledged. In addition, I take responsibility for any error found in the work

TAUHID, SULEIMAN		13/05/09
Name of student	Signature	Date

CERTIFICATION

This thesis titled "AN ASSESSMENT OF INVENTORY MANAGEMENT TOOLS IN SOME SELECTED MANUFACTURING ORGANISATIONS IN KADUNA STATE" by TAUHID, SULEIMAN meets the regulation governing the award of the degree of Master of Science in Accounting and Finance of Ahmadu Bello University, Zaria. Hence, it is approved for its contribution to knowledge and literary presentation.

.....
Dr. S. Mamman,
Chairman, Supervisory Committee

19/5/09
.....
Date

.....
Mr. S. Akanet,
Member, Supervisory Committee

11/6/09
.....
Date

.....
Dr. S. Mamman,
Head, Department of Accounting

Department of Accounting
Faculty of Administration
ZARIA
Institute of Administration, A.B.U.

19/5/09
.....
Date

.....
Prof. S.A. Nkom,
Dean, Postgraduate School

.....
Date

DEDICATION

To my late, mother MALLAMA ZAINAB TAUHID.

ACKNOWLEDGEMENTS

My profound gratitude is to ALLAH (SWA) for sparing us to this moment and blessing us with the courage to undertake this programme.

It is necessary to acknowledge the effort of Mr. Ishaya Chechet for his comments and corrections which could have not brought this work to this standard. The tireless effort of the Head of Department must also be commended; for his patience and diligence have brought rapid achievement to both staff and students of the department.

The tireless effort and commitment of the coordinator of Master in Accounting and Finance programme, Mall. Ahmad Bello, and the entire staff of the Department of Accounting must be acknowledged. The team spirit in discharging their responsibilities is highly commended.

My gratitude goes to my entire course mates and staff of the various organisations, which I visited for my study.

I must not forget to thank Prof. S.U. Abdullahi, Prof. Sheik Abdullah, Prof. M. Chado, Prof. A. Abdullahi, Dr. C.I. Egwakhide and the entire staff of Nigerian Defence Academy, Kaduna for their infinite contributions toward this study.

I acknowledge the patience, endurance, and prayers of my family throughout my course period.

My gratitude goes to any one who in anyway contributed to the completion of this work.

ABSTRACT

Depression in the manufacturing sector in Nigeria has persistently continued to perpetuate without final curtailment and viable lasting solution. The study assessed the inventory management tools for manufacturing organisation in Kaduna State with the view of finding the immense role of an effective inventory management tool to the successful operation in manufacturing organisation in Kaduna State. Data were collected basically from primary sources through questionnaire and interview. Descriptive statistics and inferential statistics form the basis for presenting and analysing the data. The study found that most of the manufacturing organisations in Kaduna State use the quantitative tools for inventory management. Based on this finding, the study recommends that manufacturing organisations should periodically review their inventory policy and make decisions in respect of adhering to the incorporated tool or make a change. The study recommends that there should be consistence in the adoption of inventory management tool. The study, also, recommends that adequate protection should be provided to manufacturing organisations by the government. Further more, the study recommends that relevant incentives should be provided to manufacturing organisations to enhance then operations.

LIST OF TABLES

Tables	Pages
2.1 Inventory carried by BHEL Company . . .	52
2 2 Total costs of various orders	61
4 1 Policy of inventory appropriate for a firm	105
4.2 Existence of inventory appropriate for organisation.	106
4.3 Manager's determination of appropriate levels of inventory in an organisation.	107
4.4 Variability in inventory requisition in organisations	108
4.5 Applications of inventory management tool in organisations	119
4.6 Types of inventory management tools in an organisation	110
4.7 Effectiveness of the present inventory management tool	111
4.8 Tenure of inventory management tool in organizations	112
4.9 Inventory management tool a prerequisite for Successful operation . . .	113
4.10 Inventory management tool relevancy to inventory policy	114
4.11 Consideration of costs in determining inventory management tools.	115
4.12 Costs not relevant for appropriate inventory management tools.	116
4.13 Advantage of costs reduction using present tools	118
4.14 Inventory management policy and revenue generation	119
4 15 Inappropriate inventory policy and loss of revenue	120
4.16 Stoppage in production by adopting inappropriate inventory policy	121

4.17 Closure of an organization by adopting inappropriate Inventory policy 122

4 18 Responses on inventory management tools a Prerequisite for successful operation 125

4.19 Contingency table. 126

4.20 Responses on effectiveness of inventory management Tools t o inventory policy 129

4.21 Contingency table. 130

f KASRIM IBRAHIM **UBRAftj**

LIST OF FIGURES

Figures	Page
2.1 Costs relationship of inventory costs	57
2.2 Economic order quantity	63
2.3 Re-order point under certainty	70
2.4 Re-order point under uncertainty	72
4.1 Categories of respondents	102

TABLE OF CONTENTS

Title page . . . . . .

Declaration i

Certification ii

Dedication Iii

Acknowledgement iv

Abstract v

List of tables vi

Lists of figures viii

Table of contents ix

CHAPTER ONE

INTRODUCTION

1.1 Background to the study 1

1.2 Statement of the problem 6

1.3 Objective of the study 8

1.4 Statement of the research hypothesis 9

1.5 Research questions 11

1.6 Significance of the study 12

1.7 Scope of the study 13

1.8 Definition of key terms 14

1.9 The plan of the study 16

CHAPTER TWO

LITERATURE REVIEW

2.1	Introduction	18
2.2.1	The nature of inventory.	19
2.2.2	Characteristics of inventory	22
2.2.3	Functions of inventory	24
2.2.4	Importance of inventory	26
2.2.5	Reasons for keeping inventories	28
2.2.5.1	Transactionary motive	28
2.2.5.2	Precautionary motive	29
2.2.5.3	Speculative-motive	30
2.2.6	Costs associated with inventory	31
2.2.6.1	Cost of ordering inventory	32
2.2.6.2	Cost of handling inventory	33
2.2.6.3	Cost of carrying insufficient inventory	33
2.3	Accounting for inventory	35
2.3.1	Specific Identification method	38
2.3.2	First In First Out method.	39
2.3.3	Last In First Out method.	39
2.3.4	Weighted Average method	40
2.4	Nature of inventory management	42
2.4.1	Inventory management problems	45
2.4.2	Objectives of inventory management	45
2.4.3	The process of inventory management	51
2.5	Responsibility for inventory management	53
2.6	Nature of inventory management tools	55
2.7	Tools for inventory management	59

2.8	Steps to reduce safety stock	84
2.9	Internal control activities for inventory	84
2.10	Theoretical framework	86
2.11	Summary	90

CHAPTER THREE

RESEARCH METHODOLOGY

3.1	Introduction	91
3.2	Research design	91
3.2.1	Population of the study	93
3.2.2	Sampling process	94
3.3	Sources of data	95
3.4	Data collection techniques	95
3.5	Data analysis techniques	98
3.6	Justification of the method	98
3.7	Summary	99

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS AND INTERPRETATION

4.1	Introduction	100
4.2	Particulars of respondents	101
4.3	Test of hypotheses	123
4.4	Summary	132

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Summary 135

5.2 Conclusion 138

5.3 Recommendation 140

Bibliography. 144

Appendix A 148

Appendix B 150

CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND TO THE STUDY

The genesis of the formation of every business enterprise commences with the simple thought of the particular kind of value to provide to the society a form of tangible or intangible product. In this regard, adequate strategies and measures must be determined in order to make their safe deliverance to the consumers. The continuity in all organizational operations depends, therefore, on its ability to meet its desired obligation through the maintenance of a sustainable income (Heitger and Matulich: 1980, 574). Indeed, for a business organization to be able to achieve this, it must take into cognisance of how, whom and what manages its network of production and sale operation (Rossell and Frasure: 1980, 250). Thus, commencing from the initial procurement of required inputs through transformatory stages to the completion and final sale and handling to the interested customers.

The retail and service organizations do provide required goods and necessary services commensurate with their customers' immediate daily needs (Hills & Sartoris: 1992, 481). Whereas the

manufacturing concern, in addition to getting the required goods to the desired customers, makes use of natural extractive inputs for the creation of required and adequate goods for the society. It is, therefore, the basic objective of every organisation to satisfy it customers with the required products. The realization of this objective conflicts with the several events that emerge within and outside the organisation. Therefore, most manufacturing organisations in Nigeria hardly achieve this basic objective. In an attempt to achieve this, an organization must make available required inventory of material and finished goods in sufficient quantity and at required destination of business operations (Seizer: 1969, 224).

Inventory in most manufacturing firms consist of the raw materials, factory supplies, work-in-process and finished goods (Pandy: 1999, 885). The raw materials include all the relevant inputs required for the production of an organization's stock of finished goods. The factory supplies are those items required to aid and facilitate efficient production but do not form part of the input necessary for production. The work-in-process, however, refers to those incomplete products of organisations that wait additional processing before they are considered for sale. While, the finished goods inventory is the stock of items produced by the firm and kept in the warehouse awaiting final sale and handling to the desired customer. Usually, in

BRARY

manufacturing operation, raw materials flow to work-in-process and finally converted into finished goods sold to consumers.

Moreover, production of valuable products undergoes several distinct transformatory stages, which takes specific duration before completion (Martins etal: 1979, 270). Processes in the early stages must be accomplished before the uncompleted materials move to the subsequent stages; and each process requires different quantities of material. Therefore, specific effort is required to streamline all the processes of production right from the beginning to the completion of the production operations. At completion, targeted market has to be determined for the fulfilment of the organisation sales operation.

Unfortunately, from the formation of the organization to the end of its production cycle, complexity and stiffness in operation begin from the stage of the acquisition of relevant materials necessary for the production operation. Indeed, the adequacy of the required inventory of raw materials to enable continued production without stoppages is not easily met by manufacturing concerns. This causes undue stoppages and unnecessary delay in the process of production resulting to heavy damages and severe loss to the firm. Inadequate provisions for the completion of inventory of work-in-process results in the unnecessary piling of unfinished goods at production process leading to severe spoilage, damage and loss. The inventories of finished goods are,

also, exposed to the danger of pilferages and damages as a result of inadequate necessary provision. Therefore, managers must plan the most efficient ways of storing, handling and using every inventory as against the risk of exposing the organization to heavy losses and in some event closure or collapsing (Garrison: 1985, 319).

To this end, the management of inventory in every organization must be taken as an object of cardinal importance that will keep both production and sales operation moving smoothly without interruption caused by inventory shortages and other related causes. Emphasis is, therefore, required in the cost of maintaining adequate inventory (Weston and Copeland: 1982, 278). Managers, therefore, must maintain an optimal investment in inventory that balances the cost of ordering, handling and insufficient inventory. In attempt to arrive at favourable causes for preferable decisions involving inventory, several efforts were made in determining the optimal size of inventory order and the optimal time for placing each order. These efforts lead to the development of tools to be used in solving any inventory related problem that may be a bottleneck to production and sales operations.

Inventory management tools are, therefore, those available techniques, devices or tools that are used to plan and manage the inventories of manufacturing organisations. Drury (1995:673) classified inventory management tools into quantitative and qualitative forms.

The quantitative tools of inventory management are scientific in nature necessary for objective decision, for instance, the economic order quantity formula, the economic lots size tool, e.t.c. The qualitative tools are tools of managing inventory based on some imagining of the occurrence of event that may lead to future misfortune. These tools are subjective in nature. Moreover, in most recent time, computers that are necessary for effective human judgment aid decision regarding inventory management.

Hence, the overall objective of the management of organisation inventory lies on the rate at which their customers are satisfied with the product provided to them; and the reduction or control of costs of operations throughout the organisation (Russell and Frasure: 1980, 249). The satisfaction of customers depends on appropriate dates finished goods are made available to them and not forfeited by maintaining very little quantity of finished goods. Since profit results from actual sale of finished goods at the amount in excess of the multiple costs incurred, control of the costs of operations must be maintained. This objective can be achieved by the adoption of a workable inventory management tool and a justifiable inventory policy in the manufacturing organisations.

This study, therefore, aims at assessing those inventory management tools and policy that would permit adequate and

successful operations in manufacturing organisations in Kaduna State. The study, in addition to the existing modalities, provides an insight to possible achievement resulting from efficient and effective use of inventory management tools in manufacturing organisations.

1.2. STATEMENT OF THE PROBLEM:

Manufacturing functions are usually broken into chains of operations. The termination of one function creates way to the next and subsequent ones up until the end of the production process. It is, therefore, necessary to coordinate the series of these manufacturing activities in order to achieve a smooth and successive production operation.

The revenue generated from sales operation that will boost the firm's other functional activities requires a firm's maximum surveillance that will provide a continuous fulfilment of customer's promises in expectation of maximum settlement. The factors leading to crisis in most manufacturing organizations in Nigeria arise; therefore, from any unnecessary malfunctioning of these operations; and the desire to continue the performance of all operations depend on the ability of the organization to maintain a sustainable income.

Unfortunately, many manufacturing organizations hardly achieve this objective resulting to a persistent and unnecessary breakdown in

production operation and raise in production costs. These uncomfortable situations in most cases are traced to the unsatisfactory methods of arriving at the general inventory policy and significant inventory decision. The unwanted situation becomes complex in developing countries, like Nigeria, where despite the development of several new-sophisticated scientific methods in arriving at appropriate inventory decisions many manufacturing organisations are still at infancy.

Furthermore, some of the raw material inventories handled by few manufacturing units for efficient operations are imported from overseas. The higher production costs and risk in assuring the availability of such important components such as packaging material, spare parts of machines and other basic raw material is witnessed.

The government of most developing countries, like Nigeria, in her continuous effort in finding lasting solution to its compounded internal and external crises imposes strict measures on the importation of some major components of production. Coupled with these problems, the achievement of the objective of maximization of shareholders wealth becomes difficult.

Our problem, therefore, is that of the collapsing of manufacturing organisations in Kaduna State; which is as a result of using unsuitable tools for the management of inventory necessary for efficient and

smooth operation. This problem, in consequence, led to the drastic decline in manufacturing activities and organisations in Kaduna State.

1.3. OBJECTIVES OF THE STUDY:

The declining rate of manufacturing organisations in Kaduna State requires a tremendous and feasible urgent effort that will provide a lasting solution. For this purpose, the inventory management tools used by the manufacturing organisations in Kaduna State need to be assessed thoroughly to reveal their efficacy and overcome the inefficiencies that may result from improper usage.

Therefore, the main objective of the study is to assess the existing tools used in determining appropriate inventory in manufacturing organisations in Kaduna State in relationship with the present performance and total inventory policy of the manufacturing organisations. To achieve this, we shall examine thoroughly the existing inventory management tools used by the manufacturing organisations under study. We shall also evaluate the efficacy of tools to discover their strength and areas requiring urgent attention so that lapses resulting from their usage could be resolved.

1.4. STATEMENT OF THE RESEARCH HYPOTHESIS:

The underlying reason for manufacturing organisations in the adoption of inventory management tools, in the management of their inventories is of profound significance to their continued operations. This also, couples with the perpetual wind of competition that engulfs the manufacturing organisations in Kaduna State in particular and the world at large. Most of the organisations within the manufacturing organisations were able to survive this through the application of constructive and appropriate tool in the manipulation of their inventories in order to meet up with the established functions of the organisation. This enables the manufacturing organisations to meet the requirement of employees, investors, government, supplies, consumers, and public at large.

The hypotheses are constructed based on those stated problems faced by the manufacturing organisations in Kaduna State. The hypotheses shall reveal to us the extent to which inventory management tool facilitates the operations of manufacturing organisations. The testing of the hypotheses shall also reveal to us the influence of inventory management tools on the organisation inventory policy. The hypotheses formed for this purpose are:

H_{0_1} There is no significant relationship between the inventory management tools and the successful performance of manufacturing firms.

H_{A_1} There is a significant relationship between the inventory management tools and the successful performance of manufacturing firms.

H_{0_2} There is no significant relationship between the inventory management tools and the inventory policy of the organisation.

H_{A_2} There is a significant relationship between the inventory management tools and the inventory policy of the organisation.

Hypothesis No. 1 is designed in order to reveal vividly how inventory management tools can make manufacturing firms operate efficiently. It will enable us to know the relevance of inventory management tools to manufacturing firms' operations.

The hypothesis No. 2 is designed to find out the relevance of inventory management tools to manufacturing firms' inventory policy. If these hypotheses are tested, it will reveal clearly the influences inventory management tools have on the inventory policies of manufacturing organisations. The result of the test of the hypotheses

shall invariably justify the relevant implications of a viable inventory policy to the manufacturing organisations.

1.5 RESEARCH QUESTIONS:

The nature of inventory management is a complex one. Due to these existing facts, the following research questions were formed to assist in making reasonable and valuable findings in the area of inventory management tools employed by manufacturing organisations.

1. Do managers determine the appropriate level of inventory for a firm?
2. Do manufacturing organisations have any level of inventory?
3. Do the requirements of inventories fluctuate or remain static throughout the period of operation?
4. Do manufacturing organisations in Kaduna State require tools to manage their inventories?
5. Can manufacturing organisations in Kaduna State function smoothly by not employing any proper inventory management tool?
6. Could manufacturing organisations operate successfully without an inventory policy?

RECEIVED

185523

1.6 SIGNIFICANCE OF THE STUDY

The study if successfully carried out will be able to depict clearly the importance derived by every manufacturing organisation in Kaduna State that employs required tools in planning and controlling its inventory, hence achieve success in its operations. The research will reveal the relevance of coordinating effort that contributes to the overall organization's ultimate goal.

The study will reveal to employees of manufacturing organisations how relevant it is to pay more attention to the handling of inventory of their organisation with high regard. This is for the fact that the negligence in its handling may attract losses, which may turn to affect their welfare.

The study will reveal to government that certain measures based on some factors associated with manufacturing input contribute to breakdown in operations of manufacturing concern and in essence, lead to closure. This in essence may lead to losses to government revenue generated from them and increases unemployment to its citizenry.

Moreover, suppliers of some relevant input to manufacturing organisations will realise the adverse effect experienced by firms when they fail to fulfil promises of supply delivery.

The study will also educate customers on the need to be persevering during periods of shortages of inventory of manufacturing organisations; hence, reveal to them how determined manufacturing firms are in fulfilling their customer's promises.

To learning colleagues and other associates, the study, shall provide findings that may add to their existing knowledge in inventory management tool. The finding shall supplement and gear scholars' effort in order to explore other areas of the subject matter which require attention.

The study will reveal those tools that are more relevant in the attainment of organisational goal than others. It will also highlight necessary additional effort required by those organizations and make emphasis on whether to maintain and insist on a particular tool of managing inventory or to change the existing one.

1.7 SCOPE OF THE STUDY

The study is conducted on some manufacturing organisations operating in Kaduna State. Only manufacturing organisations that conduct their production operations in Kaduna State stand the chance of being critically assessed in order to reveal the extent to which inventory management tools contribute to the organisation overall achievement of the organisational goal.

The study shall covers the period 1999 to 2008. This is to allow an objective scrutiny in order to facilitate meaningful findings and conclusion. Our focus, therefore, will be made on how the tools of inventory management are used in the selected organisations to attain efficiency in the production and sales operation. Hence, the study is restricted to assessment of the tools used for planning and controlling inventory in the selected organisations in order to reveal the extent of its meaningful contribution to the overall achievement of the organisational goals.

1.8 DEFINITION OF KEY TERMS:

Carrying Cost: The total costs incurred for the maintenance of a given level of inventory.

Economic Order Quantity (EOQ): The order size for inventory items that result to the optimal inventory costs for the period of production.

Lead Time: The time lag between the placing of an order and the actual delivery of inventories.

Lots Size: The size of order required in replenishing inventory.

Maximum Stock Level:	The level at which stock of inventory is not allowed to exceed.
Minimum Stock Level:	The level at which stock of inventory is not allowed to fall below.
Ordering Cost:	The total costs incurred for the requisition for inventories.
Ordering Cycle:	The time between two successive order placements.
Production Run:	The period of time production is scheduled to commence and terminate.
Re-order Level:	The level of inventory at which order for replenishing inventory is made.
Re-order Point:	The point at which order should be placed to obtain additional inventories.
Safety Stock:	The extra unit of inventory consumed during the period beyond average usage in the production setting with fluctuating demand.
Setup Costs:	The total costs incurred for getting both the material and machine ready for successful production.

Stock out:	The situation at which firm has insufficient inventory to facilitate production and sale operations.
Stock Shortage Costs:	The total cost suffered because of insufficient stock of inventory.
Work-in-Process:	The stock of inventory requiring additional processing before completion.

1.9 PLAN OF THE STUDY:

The tools used in the management of manufacturing enterprises Inventory, form one of the basic requirements for the achievement of their respective objectives in the new millennium. Thus, this research is of major topical interest. The research is divided into five major chapters to provide a precise stream of good comprehension. The work commences with an introductory chapter on the key principle underlying the inventory management tools issued along with a general introduction to the environment of inventory management tools and achievement of the manufacturing organisation's objectives.

The second chapter provides a review of the related literature that is available in the area of inventory management. It reviews all the tools used in the management of inventories by manufacturing organisation alongside with major associated issues that are major

determinants of the planning and controlling processes of the enterprise inventories.

Chapter three discusses the methodology employed in carrying out the research work and for the achievement of a valuable result. Chapter four follows where data are analysed and result presented. Other considerations relating to the tools in the management of inventory in the manufacturing organisation are presented and analysed.

The work terminates in chapter five where the summary of the research, and conclusion are drawn based on the outcome of the research findings and recommendations made. Areas also requiring further consideration on the subject matter are also highlighted.

CHAPTER TWO

LITERATURE REVIEW

2.1 INTRODUCTION

Manufacturing firms activities involve the acquisition of basic raw material inventories from the outside environment to be used for processing of vital products necessary for the satisfaction of customers' need. Inventory of raw materials, goods in process and finished goods is, therefore, a necessity that a manufacturing firm must manage in order to keep production running smoothly and also fulfilling customers' promise and satisfaction.

Moreover, earning is made by offsetting all costs consumed by production. This also leads to the survival of the organisation and the achievement of maximising shareholder wealth objective.

Therefore, the right quantities and the right time of inventory possession has to be considered seriously. For an organisation to achieve this, adequate mechanism has to be established to enhance their proper determination. The basic mechanism employed include both those that are quantitative in nature and those that are qualitative in nature. In this chapter, most of the common tools used for proper planning and controlling of inventory are described and simple illustrations where necessary are given.

2.2.1 THE NATURE OF INVENTORY

Organisations throughout the world are established in order to satisy their immediate society and/or the entire humanity at large through provision of efficient tangible or intangible commodities. These commodities are output of different production processes, which passes several transformatory stages in varied proportions or constituents. Both the input and the output characterise one aspect of organisational component called inventory. Inventory constitutes the most important part of an organisation's current assets.

Pandy (1999:884) sees inventory as stocks of the product a company is manufacturing for sale and components that make the product. Here any items acquired by any organisation to be used for the manufacturing of a desired commodity constitute its inventory. It does signify that not only the pile of organisation's products ready for sale that characterise its only inventory but also units of materials and parts that are used for production of its outputs.

Inventory is, therefore, the sum of the value of raw materials fuels, parts, consumables, work-in-progress and finished goods stocks at any given point of time.

The nature of a business stipulates the kind of inventories it will maintain. In manufacturing business, inventories exist in the form of

raw materials inventories, finished goods inventories and goods in process inventory, (Meigs and Meigs: 1984, 918).

Raw materials inventories constitute those units of various items that were purchased and stored for future further conversion to a desired product or commodity. Mosich (1989:397) sees raw materials as basic commodities, other products obtained directly from natural resources or acquired from others, which will be incorporated physically into the finished product. Products that are also acquired from other organisations for further processing are included in this definition.

Finished goods inventories are those completely manufactured products, which are ready for sale, (Pandy: 1999, 884). These inventory of finished goods are exchanged before an organisation earns its revenue, which will be used in setting off its costs.

The goods in progress inventories are the partially completed products of organisation that need additional processing before completion. The goods in progress also known as work-in-process represents the midpoint between the raw materials inventories and the finished goods inventories. This item can only be found in the manufacturing organisations which process of production involves several stages before a product completion.

Pandy (1999:885) included a fourth kind of inventory known as supplies (or stores and spares) also maintained by firms. Supplies include office and plant cleaning materials like soap, brooms, oil, fuel, light bulb etc. It is necessary for production process only but does not directly form part of the production supplies. This the process of producing product in the sense that its absence may hinders the smoothness of production. The production of desired commodities is facilitated by both inventories of raw materials and work-in-process, which the stock of finished goods is necessary for smooth marketing operations or kept for serving customers on a continuous basis.

Usually, manufacturing organisation will have a substantially high level of raw materials inventories, work-in-process inventories and finished goods inventories. While retail or wholesale organisations will have no raw material and work-in-progress inventories but a high level of finished goods inventories. This is because the manufacturing organisations are not only concerned with the sale operation of the commodities produced but also very much cautious with every step in the production processes.

2.2.2 CHARACTERISTICS OF INVENTORY

In manufacturing and even merchandising organisations, inventory often commands the attention of management because of its

basic characteristics. Heitger and Matalich (1980:574) observe the characteristics of inventory as two types. Firstly, that inventory represents usually very large investment of resources. These resources invested in inventory, could have been invested in other assets necessary for production. Secondly, inventory constantly circulates. Inventory does not remain fixed; it is constantly being used and replenished. Raw materials inventory flows to work-in-process and converted to finished goods that are sold to consumers for the organisation to earn revenue and settle cost of manufacturing operations.

Therefore, any organisations that do not have a good policy on the investment in inventory will be faced with an irrational decision. This decision will not allow optimal investment on inventory of a particular organisation. This will make the organisation concerned to employ resources that could wisely be used for acquiring other assets that would yield substantial revenue rather than wrongly used for the acquisition of those inventory units that would lay idle. Any resources invested on a particular inventory can never be used for the acquisition of any profitable asset that will yield income for the organisation. Instead, it will compile additional and unreasonable costs that will increase the cost of production and inversely reduce sales and revenue of the organisation.

Moreover, inventory from time to time in any viable organisation continues to evolve. It also continues to fluctuate in sizes due to the rate of usage and acquisition. Having a good inventory policy in an organisation will reconcile these changes commensurate with the need of every stage of production, which will result in equitable stability in the production and sales operation. It will also enhance the spreading of resources in the possession of organisation to all its relevant units. A good inventory policy will also oversee the optimal resources of the organisation that will satisfactorily be sufficient for the entire inventory necessary for adequate production. The outcome of having idle resources will then be avoided in the organisation. The issue will be to *determine the inventory level at which resources invested produces* a higher rate of return than it would, if invested in some other phase of the business operation, (Mshelia: 1995, 17).

More so, inventory in manufacturing firms becomes item of major concern that management of such units should constantly be reviewing. The optimal level of inventory should always be the focal point of any manufacturing firm. This will surely lead to maximum utilisation of the limited resources at the disposal of the organisation and the smooth flow of operation. Hence, losses as a result of tied down capital and earning from sales would be avoided.

2.2.3 FUNCTIONS OF INVENTORY

Certain activities of the firms such as the purchase of raw materials and processing of work-in-process and finished goods available for sale have a sequential and physical dependency. The finished goods will depend on the rate at which the work-in-process will be finally completed. The work-in-process also will rely on the rate at which the raw materials available are scheduled for production processing. Hill and Sartoris (1992:481) observe that only maintenance of inventories by the manufacturing firms decouple these functions from each other so that they can be individually planned, scheduled and operated independently. When inappropriate inventory of raw materials are kept in the warehouse the rate of the work-in-process will be low and finished goods of the organisation will not be readily available for customers to buy.

The decoupling of the operations will involve the ready conversion of inputs and raw materials into outputs. This function will allow the successive stages in the purchasing, production and distribution processes to operate independent of any related activities without any reliance on the schedule of subsequent activities in the production process.

Indeed, management can carry out a planned production runs in separate production units in a manner that it utilizes human resources

and equipment considerably more efficiently than if all were tied directly to the final completion stage. For instance, the finished goods inventories, which perform the function of separating the total production process from the distribution demands, gives room on a broader scale to the development of similar efficiencies of production. The result yielded by these inventories should be good services to customers on stock items, lower direct production costs, and lower materials handling costs and at the end, lower purchase price.

However, the simple fact that inventories serve these functions implies that they have uncountable value to the management. These, also, extend to the reason that makes inventories vital in the production of a manufacturing system. Therefore, optimal level should be determined for the inventory. Inventories should not be necessarily minimized because firms that carry low inventory levels may incur very high production and distribution cost. Conversely, inventory should, also, not be unnecessarily increased because it may result to high cost of handling and hence affect cost of production.

2.2.4 IMPORTANCE OF INVENTORY

The Balance sheet of every organisation depicts the true picture of its financial position. The strength and weakness of the firm could be assessed judiciously through its balance sheet. Among the items

grouped in balance sheet are the current assets. These portions of balance sheet constitute cash and other assets such as inventories, debtors, receivable and other marketable securities that have relatively short life or are constantly changing their constitution and are necessary for the day to day trading of the business.

However, within the most important items found on current assets, is inventory, which is usually much larger (Meigs and Meigs, 1984,407). Because of the relatively large size of the inventory found in any organisation, more management attention is required on them than the debtors and the receivables.

Ordinarily, inventory by itself is not an earning asset but its economic value guarantees its requirement in any firm. Inventory must be sold before revenue is generated for the firm (Heitger and Matulich, 1980,574). In relation to this, inventory of raw materials must first be converted into finished goods inventory before the productions can be put for sale. Resources that are available for operation in every organisation are limited. Therefore, the money that is usually invested in inventory is such that cannot be invested in any earning assets such as production facilities and sales facilities.

Moreover, inventory in every organisation is of immense significance. Any adversity in relation to it will mislead the entire operation and even contribute to the production interruptions or

stoppages. An error in calculating inventories may cause material misstatement of financial position and of net income. Error of 10%, for instance, in valuing inventories may have as much effect on the financial statement as would the error of complete omission of cash or Bank balance.

The effect of the lack of appropriate inventories may also lead to excessive loss of capital and the acceleration of the cost of running the daily affair of the firm. In consequence, the overstating or understating of the net income for the period will result.

In relation to the numerous customers of the organisation, adequate inventories of finished goods should be made available at any needing moment. Shortage of these finished goods inventory will reflect in the withdrawal of customers' patronage to the organisation.

In variably, inventory to any manufacturing firm is like the spirit that moves the organisation; which, at any moment of its operations and related activities can be hindered. Viable policy must, therefore, be installed in order to achieve optimal utilisation of an organisation's resources and avoidance of any loss that would be detrimental to the organisation.

2.2.5 REASONS FOR INVENTORIES KEEPING

The significance of inventories to the development and efficient running of the organisations has made them to keep inventories – though the levels may differ in accordance with the nature of each firm's business operations. In Pandy (1999:885) and Drury (1995:671), reasons for keeping inventories have been suggested in serving three motives; the transactions motive, the precautionary motives and the speculative motive.

2.2.5.1 THE TRANSACTION MOTIVE

The transaction motive of keeping inventories by firms implies the reason for keeping inventories to meet both the requirement of production and sales. The keeping of inventories enables the firm to produce efficient commodities at required quantity and at appropriate time. Smooth production is possible only when a firm maintains adequate inventories of raw materials for a continuous supply to the factory. Often, raw materials procurement is not readily made possible at the time it is needed for production and sales operations.

The inventories of work-in-process need to be built up to facilitate the completion of moderate production cycle. Production cycle is the lag of time between the introduction of raw materials into the

production process and the completion of the firm's finished goods. Most firms on a continuous basis improve their production techniques so they can reduce their production cycle. The inventories of work-in-process are, therefore, required until the production cycle terminates.

Similarly, production and sales operation are not instantaneous; inventories of finished goods are also required. The production of finished goods cannot occur immediately or at the time its customers demand the goods. Therefore, to make regular supply of needed finished goods by customers' adequate inventory of finished goods has to be maintained.

2.2.5.2 PRECAUTIONARY MOTIVES

In addition, a firm might decide to keep inventories to cover the possibilities of unpredictable changes in the forces of demand and supply. It may also hold inventories to guard against any underestimation of its future production and sales requirements. These motives for keeping inventories represent a precautionary motive. Therefore, the precautionary motive of keeping inventory is a need for inventories keeping to upset the occurrence of any future event that may jeopardise smooth production and sales operation of the firm. The procurement of inventory of raw material can be delayed by disruption in transportation, strike actions, shortages of supply and other related

factors. Certainly, the organisation should keep and maintain enough inventories of raw material at any given time to prevent production bottleneck.

Furthermore, the nature of the firm's sales may require it to maintain substantial amount of inventories of finished goods. Instances of sudden demands from customers and seasonal sales may require firms to keep inventories of finished goods to meet their requirement. The firm may as a result lose its abundant customers to competing firms, hence, the reduction of a firm's revenue.

2.2.5.3 SPECULATIVE-MOTIVES

The speculative motives to keep inventories by organisations occur on expectation of fluctuation in future prices of input used in the production of its commodities. If there is an anticipation that increases or decrease in the future prices of inventories, a firm might maintain higher or lower inventories level. The expectation by the firm of significant decrease in prices of inputs in the future, would discourage the unnecessary purchase of large amount of inventories raw material to take advantages of the lower future purchase price. At times, the firm would like to accumulate raw materials in anticipation needed for the desired production and sales levels to obtain quantity discounts of bulk purchasing. However, consideration is required to any of these

decisions in relation to future cost saving with the additional cost of keeping inventories.

Nonetheless, the accuracy in the firm's prediction of demand for its inventories and the knowledge of stable prices of inventories in the future, for some reasonable length of time, will make a firm to consider the transactions motives for keeping inventories. However, the environmental forces in which it operates affect the daily routines in each organisation. Therefore, decision regarding the consideration of one motive is difficult. An average manufacturing organisation will constantly be dynamic. It must take cognisance of all the factors that may affect its inventory decisions. Therefore, to take any step, emphasis should be on the savings to be enjoyed and loss to be incurred. A good decision therefore should be the one that would profit the organisation and lessen the uncertainty that could ruin it.

2.2.6 COSTS ASSOCIATED WITH INVENTORY

Inventories of raw material, work-in-process, and finished goods maintained by any firm should result from thorough consideration of the costs that are associated with them. The costs that affect the decision on keeping inventories are grouped in accordance with the functions served. Weston and Copeland (1998:277) classified the cost associated to inventories into three groups. They observed that

inventory decisions are affected by the cost of ordering inventory and the cost of carrying inventory, as well as by the costs of not carrying sufficient inventory.

2.2.6.1 COST OF ORDERING INVENTORY

Cost of ordering inventory represents the cost that tends to accumulate from the initial paper work of placing order of inventory to the final transportation cost to the premises. The paper work includes the cost of clerical-work of placing order for the procurement of the inventory coupled with the cost of preparing and the approving of the purchase order. In most cases, the cost of acquiring recent price quotation of inventory is relevant in determining the cost of ordering them. The transportation costs associated with inventory are those costs expended on inventory from the cost of receiving the inventories from the supplier to the shipment of those inventories to the factory. All other costs that were incurred from the destination of the supplier until the final checking of inventories against the purchase order at the inspection section of the firms are related to the cost of ordering. Inventory decision concerning ordering cost must therefore be optimised before considering the placing of order on any particular inventory needed by the firm.

2.2.6.2 COST OF HANDLING INVENTORY

Furthermore, from the time the inventories reach the warehouse of the firm, other costs associated with the handling of the inventories begin to accumulate. The cost of the total fund invested on the acquisition of the inventories, and the cost of insurance and taxes on inventories are considered in handling or carrying inventory. Interest paid on the money used in the procurement of inventory must be justifiable in relation to the benefits derived. The cost of handling inventory and cost incurred on heating, lighting and depreciation of incurred storage facilities are considered in computing and carrying out cost of inventory. Other costs that are considered as cost of carrying inventories are spoilage of inventory cost and the cost of deterioration and obsolescence in value and usage respectively. The carrying cost associated to inventory should be separately analysed before making valuable inventory decision. These costs are an increasing function of the level of inventory held.

2.2.6.3 COST OF CARRYING INSUFFICIENT INVENTORY

The cost of not carrying sufficient inventory so also referred to as stock-out-cost consists of those costs that a firm incurs or suffers because of shortcomings in one production process or the other. The cost on this group of inventory cost will include the loss of customer's

goodwill and sales. A firm may incur added charges of transportation and penalty costs for late completion of a contract work for a customer. These also include cost of forgoing the discount benefited from bulk purchase. Stock out cost would also include the cost incurred by a firm for substituting raw materials that are more expensive. A firm, because of adequate raw materials would expend additional cost of inefficient production runs.

Therefore, firms must vividly study and analyse all the costs that relate to their inventories before considering the level of a particular one to maintain. For instance, placing order in small quantity will increase the total ordering cost because orders are placed frequently. but total carried costs are low because relatively small amounts of inventory are on hand at any particular point in time. On the other hand, when orders are large, total ordering costs are low but carrying costs are high because the average amount of inventory on hand is relatively large. With these implications, ordering costs are at large a decreasing function of the level of inventories maintained. Since carrying a higher inventory reduces the number of separate orders and therefore the total ordering cost. While the ordering costs of inventories are at decreasing function, the reverse is the case with the cost of carrying inventory. The costs here are at increasing function of the

level of inventory held. Higher inventory level reduces holding cost but increases ordering costs.

However, Martins et al (1979:271) opined that the desire to keep the cost of not carrying sufficient inventories at an acceptable level is one of the prime motivations for holding inventory. Therefore, the losses and suffering a firm gets because of stock out is highly in conflict with its sales strategy, which is to get products available whenever their customers order for them.

2.3 ACCOUNTING FOR INVENTORY

Inventory in manufacturing, merchandising and some services firms maintain, are in order to effectively and in more efficient way achieve the requirement of sales and production. Without sufficient inventory, production of adequate goods to meet maximum sales operations cannot be achieved. The sales of inventory of finished goods enables business firms earn income that will assist them to maximise their owners' wealth, through long-term profitability, which is the ultimate objective of every business. The achievement of these objectives is only possible through long-term profitability.

Furthermore, Mosich (1989:400) opines that the two most important functions of accounting for inventory are to determine the quantity of goods to be included in inventory and the cost of the

inventory at hand. The determination of the quantity of goods to be included in inventory, involves the taking of inventories at hand. The taking of inventory involves the physical counting of inventory to determine the quantity of inventories available for consumption and sale. It can be possible through either the periodic inventory system or the perpetual inventory system. The periodic inventory system involves the taking of inventories on or near the end of the firm's fiscal years. typically at the time when the operation was suspended. The perpetual inventory system involves the counting of inventories throughout the period of the firm's operations. This complex and time-consuming function requires an extensive planning and control to ensure accuracy.

The second function of determining the cost of the inventory at hand involves the valuation of inventory. Inventories are valued in order to ascertain the inventorable costs element of goods purchased or products manufactured. For inventory items acquired from outsiders. the net invoice cost relates to the invoice price of inventory items less any cash discounts available to the firm (purchasing). So also, any cost expected to contribute to the production of revenue must be associated with the inventories acquired. All the indirect cost such as cost of order, freight, handling and storage must be added to the net invoice cost to determine the total cost of goods acquired.

Consequently, the work involving the allocation of inventorable costs often exceeds the benefit derived from the increased accuracy in the valuation of inventory. Additionally, Mosich (1989:400) observes that the allocations of some indirect cost to the acquired inventories are highly subjective. This is highly desirable but unrealistic allocations of these costs are shunned to prevent a false impression of precision in the measurement of inventory costs. Nevertheless, cost incurred necessary for the production of goods and not expected to produce future benefits not material in amount/value should not be included in the inventory. Consideration is required as period cost is deducted from current revenue.

Therefore, every firm's accountant must make division between the cost of inventory acquired and the cost of goods sold and the cost of inventorable items remaining at the end of the period of operation. The accounting for inventory is relevant to business concern in order to determine its actual income for the period. Inventory levels maintained by firms fluctuate throughout the period of operation. The prices and costs related to inventory also vary, and significantly affect the gross profit and hence Net Income of organisations. Any error that is because of the accounting for inventory will affect the income statement as well as the value of current assets in the Balance Sheet. Verily, if the unit prices of inventory and cost associated with it do not

fluctuate, any method adopted for the valuing of inventory will depict an identical result. The resultant value will have no significant difference with each other.

However, there are many devices for accounting for inventory Horngren, Sunden and Stratton (2001:738) identify four major methods for accounting for inventory in most business enterprises as follows:

(i). Specific identification method.

(ii). First-in-first-out method

(iii). Last-in-first-out method.

(iv). Weighted average method

2.3.1 SPECIFIC IDENTIFICATION METHOD

The specific identification method recognises the actual cost paid for the particular inventory item sold. The determination of gross profit depends on the type of inventory the firm sells. The method is easy and economically justifiable for relatively expensive inventories such as automobiles, diamond jewellery, and custom artwork. Specific identification uses physical observation or the labelling of inventory items maintained with individual numbers or codes.

However, most firms have vast segments of inventories that are too numerous and insufficiently valuable per unit to enable such separate individual attention.

2.3.2 FIRST-IN-FIRST-OUT (FIFO) METHOD

The FIFO method assumes that the inventory acquired earliest is disposed first. It is deemed here that the first inventory bought will be sold before the later one regardless of the actual goods delivered to the customer. This also applies to the inventories of raw material purchased for production.

FIFO method tends to provide inventory valuations that closely approximate the actual market value of the inventory at the Balance Sheet date. This is achieveed by using the latest costs to measure the closing inventory. Moreover, FIFO leads to higher gross profit in the period of rising prices, hence declaring higher reported income. This affect investor attitude toward the organisation; and may lead to higher bonuses, salaries or higher status for the management of the firm.

2.3.3 LAST-IN-FIRST-OUT (LIFO) METHOD

The LIFO method assumes that the most recently acquired inventories are sold or used up before those earlier acquired. This method treats the most recent costs as cost of goods sold. The LIFO method is believed to provide a more realistic income figure because the net income combines current sales prices and current acquisition costs.

On the Balance Sheet of firm, the values of the LIFO inventory are less realistic because they depict older costs. The LIFO method during the period of rising prices and growing or constant inventories reported lower income than any other inventory accounting method. This is because recent higher costs of inventory are charged with cost of goods sold. However, when inventories are reduced, LIFO can lead to just the opposite effect. Old values are used for cost of goods sold and net income would be higher under LIFO than under any method.

2.3.4 WEIGHTED-AVERAGE COST METHOD

The Weighted-average cost method assigns the computed unit cost to each item of inventory available for sale or use. The unit cost is computed by dividing the cost of all units of inventory available for sale or use by the number of inventories available. This method produces a gross profit somewhere between that obtained under FIFO and LIFO method. Thus, gross profit obtained using this method is nearly the average of FIFO and LIFO methods. Thus, weighted-average cost method is, therefore, seen as the hybrid of LIFO and FIFO inventory methods.

Based on income determination, this method gives a figure that will be acceptable to all and reduces the uncertainty that will render it to be unrealistic in any circumstance of price fluctuation.

All the inventory methods have different strengths and weaknesses. The decision to choose one type of method for accounting for inventory is difficult. Every firm is faced with the specific problem of knowing the particular method that will make provision for the highest reported net income and the most flexible that affects earning. Firms are faced with the problem of the method that would produce an inventory valuation that approximates the actual value of the inventory. In discharging its civil obligation, a firm, also finds it difficult to determine the method that best affects its income tax.

Therefore, it is highly pertinent for firms to consider the link between the cost of goods sold and the valuation of inventory. This is because higher value of cost of goods sold produces lower ending inventory. Another thing to consider in the type of method for accounting for inventory is the way that physical units of inventory flow. Every business firm over the years has found it difficult to be decisive in the use of one method due to the conflicting reasons that overcome each of the methods.

Nevertheless, in finding possible solution to resolve the conflict in relation to the specific method a firm can use in accounting for its inventories, the accounting bodies throughout the world and the accounting profession in general have concluded that firms can use any methods to record the cost of goods sold. The only factor to

consider in applying any method is consistency in the use of method chosen. The American Institute of Certified Public Accountants in its contribution to the development of accounting for inventory concluded that the major objectives of accounting for inventory is the proper determination of income through the process of matching appropriate costs against revenue (Needles, Anderson and Caldwell :1988:298). It should be clear here that the objective of accounting for inventory is not to determine the most realistic inventory value but the best measure of the firm's income. Individual firms should therefore apply any method for accounting its inventory relevant for measuring its income at a consistent period of business operation.

2.4 NATURE OF INVENTORY MANAGEMENT

The desire of every business concern is to achieve its viable stated goals through efficient decision-making. Organisations achieve those sets of goals by the provision of desired product to their willing customers. This is only possible by decision leading to smooth running of the production and sales operations.

Inventory which is one of the major compositions of every firm's current assets, required for the daily efficient operation, must be given adequate attention to enable it to maximise the benefits from the use of available resources, particularly those invested on inventory. The

process of acquisition and converting of input raw material inventory to the production of finished goods is impended by one factor or the other. Therefore, the decoupling of these functions to allow individual functions to operate independently relies upon the accurate planning and controlling of inventory consumed and sold by each organisation.

Seizer (1969:224) sees inventory management as the management ability to effectively manage the problem of maintaining minimum investment in inventory to maximise profit and to maintain large size of inventory for efficient and smooth production and sales operations that help to strike a balance between the cost of holding and ordering inventory. It can be noted here that the question of managing inventory is related to two extreme levels of inventory, which strike to achieve long run profitability through efficient production. The art of inventory management is also seen as the sole ability of management of every organisation. In added development, Gupta (1987:460) opines that inventory management is the planning and utilisation of raw materials work-in-process and finished goods in such a way as to optimise the achievement of the stipulated desired result. Emphasis is also made here in the proper use of inventories for the achievement of optimum results of operations of organisation. Horngren, Foster and Dater (2000:712) see inventory management as the planning, coordinating and controlling activities related to the

organisation. The view of managing inventory is related to the major functions performed by the management of every organisation. An even broader view of inventory management is that of Rossell and Frasure (1985:249) who see it as encompassing wide range of varying activities within a business. In scope, it ranges from the actual planning for purchases of raw materials and goals, through scheduling and control in all stages of production for a manufacturing business, to the ultimate delivery of the product to the customer.

Most of the observations and arguments about the management of inventory are about the means that management of organisations is prone to achieve basic organisational goals through smooth production and sales operations. There exists also relationship between optimisation of resources and achievement of desired results of operation at a minimum cost of operation.

Therefore, the outcome of sound inventory management to every organisation is enormous. The organisation is able to achieve its set goals. The workforce will be satisfied with its inputs. The management will be left to tackle problems that are more serious. Grand strategies, therefore, will be established for off-setting other organisation's emerging problems. Investors' wealth will be maximised, Customers' promises will be timely fulfilled. Moreover, at the end creditors' worries

will be reduced. Infact, every stakeholder to the organisation will be honestly satiated.

2.4.2 INVENTORY MANAGEMENT PROBLEMS

Inventory in every manufacturing organisation forms one of the important constituents of current assets that require adequate consideration for it to achieve a successive and efficient operation. Just like other current assets, the size of inventory may be too small or too large (Martins et al: 1979). The sizes of inventory vary proportionately to the production requirement of the firm. The inefficient management of inventory results in to rigidity in the firm's operation and unbalance inventory. The circumstances increase the level of investment and make the firm less profitable. It can also result in inventory shortages and unnecessary piling of inventory. An efficient management of firm's inventory makes its flexible and easy in achieving desired result.

In a broad conceptual sense, the right level of inventory to carry for any successful and efficient operation is that which minimises the total costs of inventory. This is not however an easy case with every manufacturing organisation. This is because some of those costs are directly in conflict with one another. For instance, as inventory level increases, the cost of carrying it increases but the cost of not carrying

sufficient inventory decreases. In working toward total cost minimisation therefore managers must balance off the three costs against one another.

Hilton (1999:365) stressed that inventory management problem is a key inventory decision in manufacturing, retail and some services organisation. In this sense, the problem of inventory management extends beyond organisations that manufacture and sell products but also affects retail and service organisation. This can be vividly understood for the fact that the activities that are involved therein relate also to the exchange of value between the organisation and the society it serves.

Nevertheless, Garrison (1985:321) observed that inventory management problem has two dimensions. That is how much to order and how often to do it. The right amount of inventory to order relates to the problem of determining the Economic Order Quantity. This is simply answered by a thorough analysis of the cost of ordering inventory and the cost of maintaining certain levels of inventories. The second dimension of inventory management problem arises because of uncertainty that is associated with the future. This seeks to find the optimal trade off between the cost of storage and insufficient stock costs.

Similarly, Dreblin and Burman (1978:158) opine that the two basic inventory management problems are to determine the optimum size of an order or the amount manufactured on a given production run, and to determine the right time to place an order. In this view, the problem of inventory management rests on determining the optimal size range for each type of inventory and the best time to place an order in order to avoid any uncertainty. This also does not preclude retail and some services organisation.

Therefore, the problem of inventory management cannot be avoided in any organisational setting. It remains significantly critical that finding solution to it remains continuous. So also, it is embodied in the operation of every manufacturing organisation. Ignoring inventory management as a problem to the organisation will definitely expose it to so many disadvantages and leads to enormous losses to the organisation. As a result, failure in manufacturing operations and sales objective will not be achieved and hence, income generation to sustain the organisation will thwart efforts.

2.4.3 OBJECTIVES OF INVENTORY MANAGEMENT

The levels of inventories maintained by each firm have often conflicted with the need to decouple operational functions and the possibilities of achieving a desired result from operation. Manufacturing

concerns try to maintain high level of inventories to facilitate efficient and smooth production and sales operations. However, pursuit pursued to maximise profit depends upon maintaining low level of inventories. The situations of lower or excessive inventories maintenance are not usually desirable. At higher levels, additional cost of holding will result. While at lower inventory levels, possibilities such as stoppages in production, loss of sales and revenue, forfeiting of firm customers to competitors etc will also result.

Therefore, a firm should always invest in inventory at which the possible costs are kept at minimum. Since all firms operate with limited resources, money invested in inventory is money that cannot be invested in any earning assets such as production and sales facilities. The objective of inventory management, thus, is to maintain adequate inventory levels at minimum inventory costs, (Dreblin and Burman: 1978,799). It must be noted here that inventory maintained by firms must take cognisance of the costs apart from their necessity to the relative schedule of operation. Where costs of determining and maintaining inventory exceeds the benefit derived from maintaining inventory, decision regarding it should be reviewed. In addition, any efficient firm must always strive to keep all costs associated to its inventory at minimum level.

Moreover, Rossel and Frasure (1985:249) further argue that apart from trying to offset the cost from the gain of keeping inventory, every firm must consider the satisfaction of its customer as an additional objective. Despite the fact that available finished goods are required in order not to forfeit customers' orders and delivery dates, firms must maintain proper product quality during various stages of production. Still, to maximise profit from the sale of finished goods, any additional cost to carry an excessive quantity of inventory must not be incurred.

Pandy (1999:686) in summary argues that the objective of inventory management should be to determine and maintain optimum level of inventory investment. The optimum level of inventory will be between the fragile points of low and excessive inventories, which are not always desirable. The quantity of inventory on hand and the frequency and size of inventory orders are directly related to inventory costs. Managers should try to maintain an optimal investment in inventory that balances the cost of ordering maintaining inventory with the cost of not having sufficient inventory. The balance can be achieved by determining the optimum size or level of an inventory order and the optimum time for placing each order. Optimum time in relation to the optimum order size of inventory refers to appropriate time in placing order for the inventory. The time for placing order

should not be too lengthy or short before inventories are received for production processes. Firm's effort should be made to place an order at the right time with the right source to acquire the right quantity at the right price and quantity.

The aim of inventory management in every firm, thus, should be to avoid excessive and inadequate levels of inventories; and to maintain sufficient inventory required for the smooth and efficient production and sales operations. Any effective inventory management should therefore:

1. Ensure a continuous supply of raw materials to facilitate uninterrupted production.
2. Maintain sufficient inventories of raw materials in periods of limited supply and anticipated future rise in price.
3. Maintain sufficient finished goods inventory for smooth sales operation and efficient customer services.
4. Minimise the cost and time of carrying inventories.
5. Control investment in inventories and kept at optimum level.
6. Guarantee the quality in the finished goods.
7. Enable firms to achieve long run profitability and enhance the wealth of the shareholders.
8. Ensure maintenance of adequate working capital.

2.4.4 THE PROCESS OF INVENTORY MANAGEMENT

Substantial investment of most manufacturing firms is consumed by their inventory. It is never easy for any firm to determine a static inventory policy favourably for its inventory planning and control. Considering the conflicting problem that embodies inventory management, it is therefore necessary to develop suitable inventory management tools to be used in handling inventory.

However, the daily commitment of firms resources in inventory reveals vividly to manufacturing firms certain vital issues that could be hardly known to them: Inventory decision in every organization will therefore continue to vary from time to time as operations of the firm continue. It should, therefore, be realized that inventory management is a managerial process. Pandy (1999:904) describes that inventory management involves continuous planning, coordinating, control monitoring, motivation, etc. He argues that inventory management involves a number of steps in this area.

Therefore, adoption of one particular inventory management tool does not guarantee the successful management of the organization's inventories. The policy has to be the one that will accommodate influences within and outside the organization periodically. This is highly required in order to offset any emerging influences that may lead to wastage of organization's limited resources.

A careful observation of the case of BHEL Company below reveals that inventory management requires a series of steps to the achievement of an efficient and effective result.

Table 2.1 INVENTORY CARRIED BY BHEL COMPANY

	1977-78	1980-81	1990-91	1992-93	1996-97
Inventory	512.9	640.5	1163.6	1240.1	1876.6
Sales	498.6	787.0	3153.6	3508.3	5,893.9
Inventory % of Sales	102.9%	81.4%	36.9%	35.3%	31.8
Days	375.0	297.0	135.0	129.0	116.0

Source: Pandy I.M. Financial Management (1999)

The company carried high level of inventory because of sizeable imported raw materials and compulsory bulk purchase of items in line with availability from some companies. In the 1970's and 1980's the company lacked focus on inventory management policy and proper control. Therefore, inventories carried for 375 days were reduced drastically to 297 days. Realizing that if necessary steps are taken it can reduce the days of carrying its inventories; the company initiated some steps to control its inventories. The steps instituted yielded a marvelous result of reducing its inventories holding days to 116 days in late 1990's. The table above reveals the case more clearly.

2.5 RESPONSIBILITY FOR INVENTORY MANAGEMENT

In the whole history of inventory management, the task of controlling and managing inventories appears to be vested with the purchasing function of companies. These practices of centralizing the entire responsibility of inventory management without giving consideration to the subordinating units that also add value to organisation inventory have been the consequence of several production and sales hindrance.

Moreover, many small and few medium companies are comfortable by distributing the delegation of responsibility of inventory management. The control of raw material inventories is delegated to a central purchasing office; work in process inventories to each plant manager, and finished goods inventories to the marketing manager of each product line. However, these kinds of sharing responsibility do not favour large manufacturing firms.

Heitger and Matulich (1980:574) see the task of inventory management as a coalition effort of production engineers, system engineers, industrial engineers, financial manager and accountants. They, however, stressed that the accountants primary role is to provide relevant cost data to all managers involved in the inventory management process. More emphasis is, therefore, bestowed clearly

on the engineers and the financial managers as the operating contingent.

In seeking favourable solution to all kinds of manufacturing firms, Rossel, and Frassure (1989,252) suggested the need to change the focus of the respopsibility of inventory management. They stress that scientific approach requiring the use and application of financial accounting, and economic data by analytical methods employing statistical techniques and mathematical formulae and models, aided by high-speed computer should be employed for effective inventory management.

In addition, Van Horne (1998:426) concluded that the responsibility of managing inventory is primarily vested upon the operating managers – purchase manager and marketing manager – who are supported by financial manager. The financial manager in this respect should be able to analyse the behaviour of inventory and report its implications to operating managers. He should also ensure that optimum amount of funds is invested in inventory, reduce lead-time, regulate inventory usage and thus minimise safety stock and to be familiar with the inventory management tools. The net effect would therefore be to reduce inventory investment and increase the firm's prospects of making more profits. Hence, the goal of wealth maximisation of shareholders is achieved.

The responsibility of inventory management in all aspect depicted clearly that it is a teamwork requiring collaborative effort of each member. The fallacy of one member affects the rest of the group. Hence, the conscious efforts of other members will therefore be in vain. Every established group design to pursue the task of effective management of any organisation inventory must eliminate any interest that could lead to any setback and eventual losses.

2.6 NATURE OF INVENTORY MANAGEMENT TOOLS

Over the centuries, an organisation's survival and continuity in operation has seemed to depend on the degree of innovation through fast recognition of challenges within and outside its operation environment. Manufacturing activities, indeed, do not occur in vacuum. This is because the need and taste of customers change as the society in general continues to apprehend nature. The technology used for the production of commodity also continues to change speedily. Consciousness of fulfilling customers' promise by providing sufficient finished goods necessitates manufacturing firms in making adequate production input necessary to decouple stages involved in the production process. Therefore, thorough measures to eliminate any circumstances that could jeopardize its sound operation are required.

RECEIVED

185523

These lead to the emergence of the development of tools suitable to solve any inventory management problem.

As summarised by Hartley (1986:782), the purpose of every inventory management tool is to select the order size, production run size that minimises the inventory related cost and to determine the time to place order of inventory. The achievement of this purpose resolves the inventory problems of finding optimal size ranges for each type of inventory and the appropriate time of placing order. Two vital factors are identified here in respect of tool of inventory management: cost and time. These two factors in every endeavour determine its success.

Therefore, inventory decisions are directly affected by the costs associated with the inventory. Inventory decision that will disclose the optimal production run size and order size involves the trade off between the costs of ordering inventory and the costs of carrying inventory. Indeed, the inventory decision regarding the time to place order involves the determination of trade off between the costs of carrying inventory and the costs of not carrying sufficient inventory.

However, the optimal order size of inventory is that order size that is achieved when the total cost of inventory is minimized. The minimum cost of inventory occurs when the cost of ordering inventory is equal to the cost of carrying inventory. This optimal order size of

inventory is in most cases referred to as the Economic Order Quantity (EOQ). Because each inventory item has a different optimal order size, an EOQ may be computed for each inventory item. The relationship between inventory and cost can be easily depicted by the below figure 2.

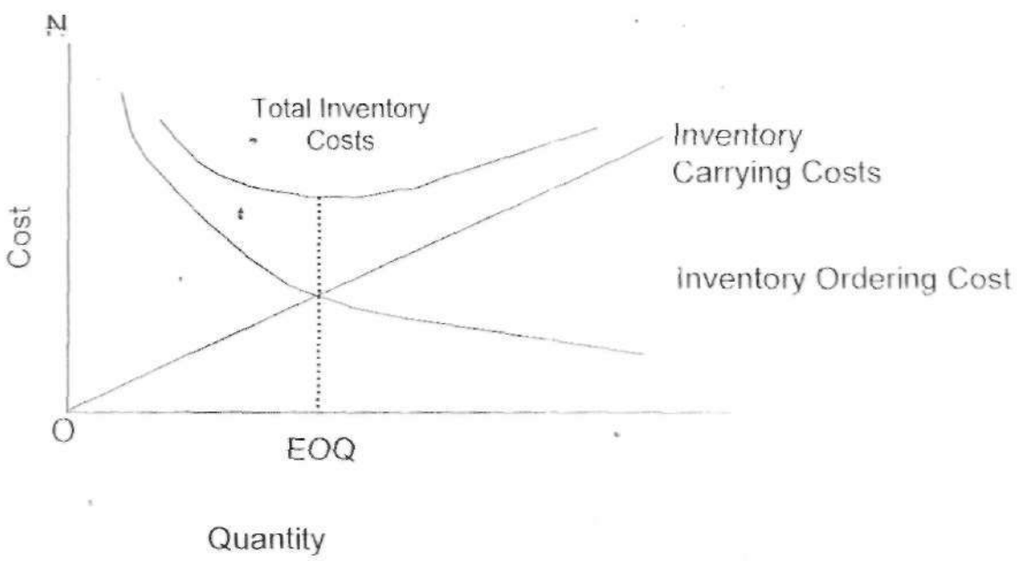


Figure 2.1 Costs relationship of inventory costs

Usually, the size of inventory order determines the total ordering costs of inventory. When the order size is small, total ordering costs become high because orders must be placed more frequently, but total carrying costs are low because relatively small quantities of inventory are on hand at any particular point in time. Likewise, when orders are large, total ordering costs are low but carrying costs are high because the average amount of inventory on hand is relatively large. In the

above figure, the total inventory costs curve is lowest at the intersection of the ordering cost curve and the carrying cost curve. Any point other than the EOQ yields a higher total inventory cost for the period.

Verily, any model to be used for determining inventory levels is rested on some established important assumptions. They include:

(a). A known constant demand.

(b). Ordering costs are known and remain constant.

(c). Carrying costs are known and remain constant.

(d). Production and inventory capacity is unlimited.

In the normal production process, it is very important to determine the optimum number of units that should be manufactured in each production run. Two costs involved in the determination of optimum production run are set-up costs and cost of holding inventory. The optimum number of units that should be manufactured in each production run involves the trade off between these two costs. This is also referred to as the Economic lot (production) size.

The timing for inventory acquisition in every firm is very vital to its inventory decision. Appropriate time for placing order must be determined because sizes of order affect cost of holding inventory and cost of not having sufficient inventory. The trade-off between these two costs will indicate the right time to place order of inventory. This right

time at which a new order is placed for the acquisition of new inventory is called the reorder point. The reorder point cushions the manufacturing firm to place new order for inventory. However, if a firm has the ability to buy and receive inventory items instantly, the reorder point is zero; that is; a new order is placed when there are no more units left in inventory.

Nonetheless, Drury (1995:672) stipulates that consideration should be made to ordering and holding costs involved in the use of any tools for effective inventory management. He specifies that only relevant costs of ordering and holding should be considered when using any quantitative models for the determination of optimum inventory levels. He concludes that only ordering and holding costs that change in relation to order size are relevant for decision making under the condition of certainty. However, when stock usages are not known with certainty, additional inventories should be carried in excess of the expected usage during the lead-time to provide a cushion against running out of inventories.

2.7 TOOLS FOR INVENTORY MANAGEMENT

Tools used for planning and controlling of inventories are described in many ways as approach methods, models, techniques etc. This variability is related to the purposes it suites. The tools

include the following quantitative and qualitative ones discussed by many inventory management authorities (Kaplan and Atkinson: 1982,521), (Pandy: 1999,892), (Horne: 1985,416), (Hongren: 2004,719), (Needles, Anderson and Caldwell: 1994,502), (Raiborn and Barfield: 1999,504), (Drury: 1985,673), (Garrison: 1985,322), (Heitger and Matulich: 1980,583), (Lucey: 2004,470), (Needles and Crossom: 2002,183), (Peters M.O: 2006,120), (Omolehinwa: 2006,96)

1. ANALYTICAL TOOL

This is used as an inventory management tool in the determination of the optimum order size of organisation inventory (Drury: 1995, 673). It involves the computation of total inventory costs at various order sizes. Eventually the optimum order size can be founded or closely approximated by repeating the computation many times. This tool is very effective but very tedious and time-consuming (Pandy: 1999, 889). This analytical tool can be illustrated with the help of the simple table below.

Assuming the following data are for a manufacturing firm:

Estimated annual requirements, A	1200 units
Purchase cost per unit, P(₦s)	50
Ordering cost per order O(₦s)	35
Carrying cost per unit (₦s)	1

Since the firm has several alternatives, it will be ideal to compute the various levels of order total costs of inventory in order to reveal the optimal order size.

Table 2.2 TOTAL COSTS OF VARIOUS ORDERS

Order size (Q)	1200	600	400	300	240	200	150	120	100
Average Inventory (Q/2)	600	300	200	150	120	100	75	60	50
Number of order (A/Q)	1	2	3	4	5	6	8	10	12
Annual carrying costs (Ns) (C x Q/2)	600	300	200	150	120	100	75	60	50
Annual ordering cost (Ns) (O x A/Q)	35	70	105	140	175	210	280	350	420
Total annual costs (Ns)	635	370	305	290	295	310	355	410	470

The Computation in the Table 2.1 shows that the total annual cost is minimum at ₦290 when the number of order in the year is 4. The optimum order size therefore is 300 units. The above analysis indicated that it is only at this point of 4 orders during the year of 300 unit each that the firm can optimise its inventory costs of ordering and holding. Therefore, inventory decision will best be made at this particular point.

This kind of tool is actually very simple and easy to implement in small businesses. Only that it can be tedious when the business begins to grow rapidly. Enterprise with few inventories and diligent

personnel responsible with the management of inventories can therefore implement this tool.

2. GRAPHICAL TOOL

This tool of inventory management allows the relating of the costs and order sizes of inventory to enable the firm determine the right order sizes of inventory. The ordering, holding and carrying costs of inventory are represented on the vertical axis of the graph while the order size or average inventory is presented on the horizontal axis. It could be noted on figure 2.2 that total carrying costs increase as the order size increases, because, on an average, a larger inventory level will be maintained, and ordering costs decline with increase in order size because larger order size means less number of orders. The behaviour of total costs is depicted clearly, since it is a sum of two types of costs, which behave differently with order size. Pandy (1999:891) noted that the total costs decline in the beginning, but they started to rise when the decrease in average ordering cost is more than offsetting the increase in carrying costs. Therefore, the optimum order size of inventory occurs at the point that ordering costs and carrying costs of inventory intersect. This is because at this point the total costs are minimal. Hence, the firm's operating profit is maximised.

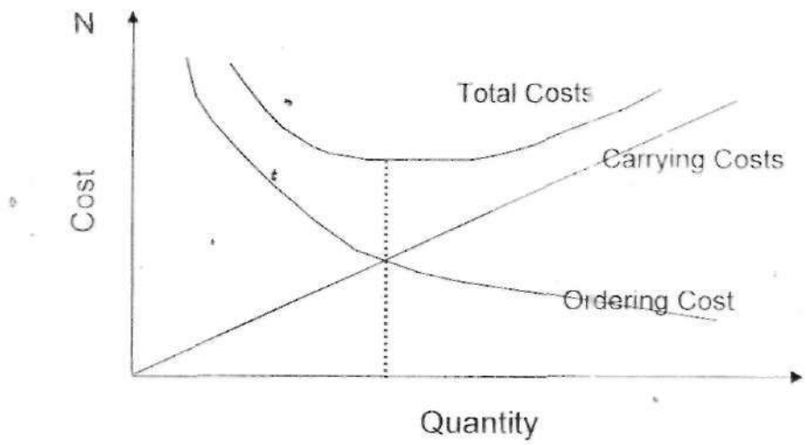


Figure 2.2 Economic order quantity graphs

However, due to flexibility required in inventory decision, Garrison (1985:322) observes that most firms look for minimum cost range and choose an order size that could fall within it, rather than choosing the exact economic order quantity. The primary reason is that suppliers will often ship goods only in round lot sizes. Pandy (1999:892) and Drury (1995:674) observe that total costs of inventory are insensitive to moderate changes in order size. It may therefore be concluded that using the graph as a tool of inventory planning and controlling helps in determining an economic order ranges rather than economic order point of inventory. It is usually done by changing the order size by some percentages and a vivid studying of the impact of total cost is made. Pandy (op cit) also examines that if the total costs

do not significantly change, the firm can change the economic order quantity within the range without any loss occurring.

Certainly, the advantage in using graphical tool is apparent in the sense that organisation can strictly plan and completely monitor and control its inventories. With the aid of computer now, graphs of inventory can be easy to plot. At every point also, with this tool the most economical ranges of inventories can be easily identified.

3. FORMULA TOOL

The formula involves the use of mathematical equation derived from calculus to yield the optimum order quantity of inventory. This tool incorporates the basic relationships between carrying and ordering costs and order quantities (Drury: 1999, 674). The formula mean is the easiest way of determining the order size of inventory. To illustrate the formula, let A represents total annual demand and Q the order size, assuming ordering cost per order, O, is fixed. The number of order will be A/Q and the total order costs will be:

Total ordering cost = (Annual demand x per order cost) / order size

$$TOC = \frac{AO}{Q} \qquad (1)$$

Assuming further that carrying cost per unit, C, is constant. The total carrying costs will be the product of the average inventory units and the product of the average inventory units and the carrying cost per unit.

$$TOC = \frac{AO}{2} \qquad (2)$$

The total inventory cost, then, is the sum of total carrying and ordering costs.

$$TC = \frac{AO}{Q} + \frac{Qc}{2} \qquad (3)$$

To derive the formula, equation (3) is differentiated with respect to Q.

$$\frac{dTc}{dQ} = \frac{c}{2} - \frac{AO}{Q^2} \qquad (4)$$

Set Equation (4) to zero

$$\frac{c}{2} - \frac{AO}{Q^2} = O$$

$$c\,Q^2 = 2AO$$

$$Q^2 = \frac{2AO}{c}$$

$$Q = \sqrt{\frac{2AO}{c}}$$

Hence $EOQ = \sqrt{\frac{2AO}{c}}$

Source: Garrison, RH Managerial Accounting 1985

However, Garrison (1985:323) concluded that despite the ease in the obtaining of data using this tool, it does not provide a great range of information as provided by analytical and graphical methods. In addition, the EOQ is computed by estimating the costs involved. Estimates of costs are not really accurate and easy to be arrived at. Lucey (2003:286) argued that correct EOQ might not be gotten because of wrong estimate of cost. Caution must be made therefore and provisions be made to accommodate any distortion.

Drury (1999, 675) pointed out that despite the fact that the EOQ formula is vested under certain assumption, minor variations in the cost predictions may not significantly affect total costs. The essence of this is to strengthen the advantage of the EOQ formula in the determination of an optimal inventory to be carried by a firm.

To illustrate the use of this formula, let us use the data supplied for the computation of Table 2.2 Estimated annual requirement 1200 units, purchase cost per unit ₦35 and ordering cost of ₦1, the optimal order size will be:

$$\sqrt{\frac{2 \times 1{,}200 \times 35}{1}}$$

EOQ = 290 units

This means that the firm can minimise its costs only when it orders 290 units of inventory.

It must however be emphasised here that the important measure to take using the EOQ formula tool is to be very cautious and wherever there is variation, it will not significantly affect the total costs. With the aid of computing machine in this era, this tool can be exploited judiciously.

4. ECONOMIC LOTS SIZE (ELS) FORMULA TOOL

The EOQ formula can also be used to establish the economic production size that can be manufactured at a production run. The formula is derived by simply substituting the order costs per order of inventory by set-up costs. The set-up costs includes all the activities

involved in preparing and processing the stock orders, drawing and specification, tooling machine set-up, handling machines, tools equipment and materials, overtime e.t.c. The most economic production size will be where the total costs and carrying costs are at minimum level (Pandy: 1999,893). Garrison (1985:834) also relates that the most economic lots size allows the accurate decision regarding the appropriate time to start and stop production.

The formula is thus: $ELS = \sqrt{\frac{2AS}{C}}$

Where ELS = Economic lots size

A = Total estimated production

S = Set-up costs

C = Carrying cost

The Economic Lots size (ELS) formula can be illustrated as follows:

Suppose the estimated production is 400,000 units, set-up cost per production is ₦50 and carrying cost is ₦1 per unit, the economic lot size will be:

$$ELS = \sqrt{\frac{2 \times 1,200 \times 35}{1}}$$

20,000 units per production run.

This indicates that this firm will minimise its overall costs by producing in lots of 20,000 units each. Any production that is above, therefore, 20,000 units or below is a disadvantage to the firm.

With the ELS in operation in any firm, organisation can optimise both its financial resources and the right time to initiate and end production. The effective ELS allows any manufacturing organisation to ensure the fulfilment of its customers and possible satisfaction of other objectives.

5. RE-ORDER POINT (ROP)

This inventory level tells the manager when to place an order or when to initiate production to replenish depleted inventories. Horngren (2004:714) points out that it is the point of inventory that triggers a new order for inventory. The re-order point is zero if a firm has the ability to buy and receive inventory items instantly (Heitger and Matulich 1980. 583). At this instant, a new order is placed when there are no more units left in inventory. This is very possible because there is no lag between the placement of order and the reception of the inventory. Pandy (1999:894) relates this point to the non existence of lead time.

Unfortunately, only few firms are able to get instant deliveries on orders. Sometime is required between the time the order is placed and the time inventory is received. This time is called the lead-time. If this is

known and the daily demand is known, the reorder point is easy to determine. The re-order point is determined considering: (a), lead-time, (b), average usage, and (c), economic order quantity. Re-order point is, therefore, computed using the following formula:

$$ROP = LT \times AU$$

Re-order point = Lead time x Average usage. To illustrate the above, let us assume that a firm has an EOQ of 500 units, lead time of 3 weeks and an average usage of 50 units per week.

$$\text{Re-order points} = 3 \times 50$$

$$= 150 \text{ units.}$$

The re-order point of 150 units above indicates that new order for inventory is placed at this point i.e. 3 weeks before the end of the inventory usage. This can also be depicted graphically.

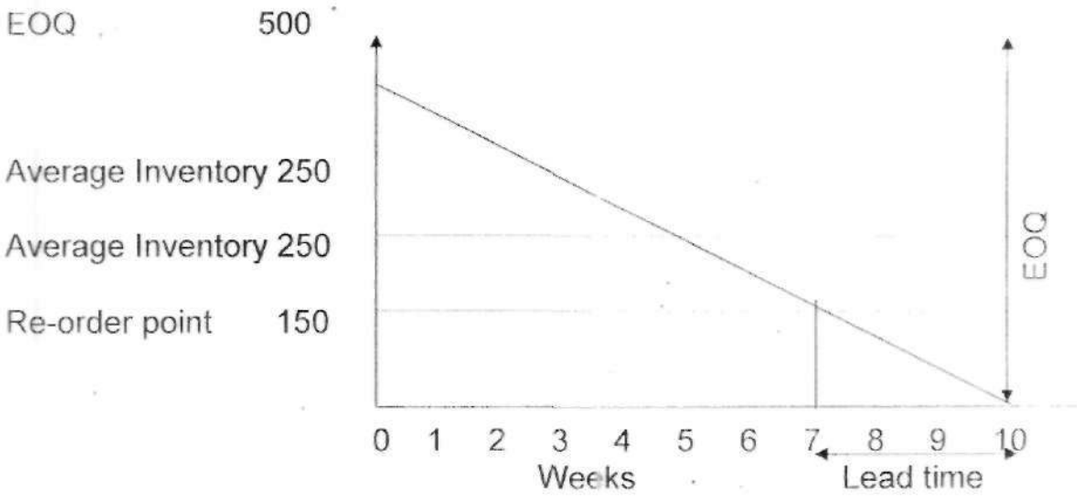


Figure 2.3 Re-order points under certainty.

In practice, demand, processing or delivery of orders are usually associated with degree of uncertainty. To protect itself from conditions of uncertainty, a firm will maintain a level of safety stocks for raw materials, work in progress and finished goods inventories. Thus, safety stocks are amount of inventories that are carried in excess of the expected usage during lead-time to guard against stockouts. (Garrison: 1985, 324) opines that safety stocks serve as a kind of insurance against greater than usual demand and against the problem in the ordering and delivery of inventories. Therefore, the re-order point will be determined by adding the safety stock to the product of lead-time and the average usage. Thus, the formula to determine the reorder point for safety stock is as follows

Reorder point = (Lead time x Average usage) + Safety stock.

With this, the formula for determining maximum usage also changes to maximum usage = EOQ + Safety stock.

To illustrate this using the previous example of a firm with the information can be:

EOQ	500 units
Lead-time	3 weeks
Average usage	50 units

Assuming the firm's reasonable expected stock out is 25 units per week. The firm should maintain safety stocks of 75 units (25 units x 3 weeks). Thus the reorder point will be

Re-order point = (3 x 50) + 75

= 225 units

This means that instead of the firm waiting for its inventory to drop to 150 units, the firm should initiate order for new inventory at the point that its stock is 225 units.

In addition, the maximum usage of the firm now will be the sum of the EOQ and the safety stock. i.e.

500 units + 75 units = 575 units.

The above explanation can be graphically illustrated.

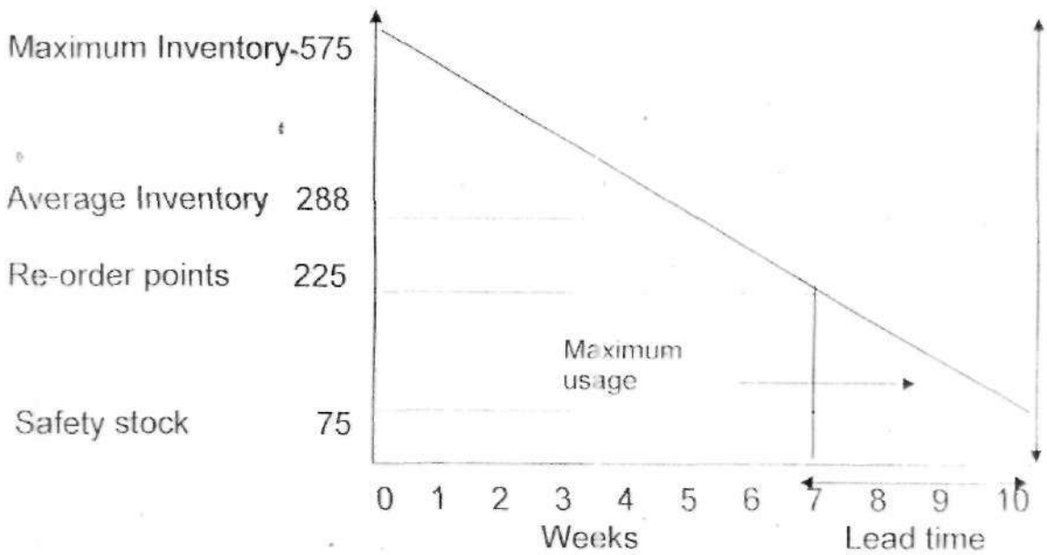


Figure 2.4 Reorder point under uncertainty.

Drury (1995:679) observes that maintaining high safety stocks may not be in the company's best interest if the cost of holding the excessive stocks exceeds the costs that will be incurred if the firm runs out of stock. It is desirable for a manufacturing firm to establish a good quantitative tool for determining an acceptable level of safety stocks.

However, it is difficult to estimate stock out costs. When a stock out occurs for raw materials and work in progress, the cost of being out of stock is the stoppage in production and the resulting inefficiencies that occur. In the case of finished goods, the effect of stock out costs will consist of a loss of contribution if customers take their business elsewhere because orders cannot be met when requested. Regarding regular customers, the effect of stockout is the loss of contribution on future sales.

6. QUANTITY DISCOUNT

Circumstances frequently occur where suppliers encourage their customers to place large orders by offering them quantity discount. With quantity discount, the firm will have to increase its order size more than the EOQ level leading to increase in its holding costs. Drury (1995:677) pointed out that, the firm will save on the per unit purchase price consisting of the total amount of discount for the period; and a reduction in the total ordering cost because fewer orders are placed to

take advantage of the discounts. For any discount to be worthwhile, the cost savings must be larger than the carrying costs incurred i.e. the net return has to be positive.

Pandy (1999:893) argues that no matter the decrease in ordering costs there is additional cost incurred in carrying the bulky stock that is acquired for production. Where the carrying costs are too bulky, it will be of no use for the firm to implement this tool. Lucey (2003:289) observes that since the computation of discount became complicated, the best way is to consider the cost with the costs at each succeeding discount point and so ascertain the best quantity to order.

The net return (NR) is given by the following mathematical equation.

$$NR = DPA + O\left(\frac{A}{Q} - \frac{A}{Q^*}\right) - \frac{C}{2}(Q^* - Q).$$

Where NR = Net Return

D = Discount Rate

P = Purchase Price per Unit

A = Annual Demand

C = Carrying Cost

O = Ordering Cost

Q = Economic Order Quantity

Q^* = New Order Quantity

Source: Pandy I.M. Financial Management 8ed 1999.

Suppose a firm's annual requirement for raw material per unit cost of N7 is 900,000 units. The ordering cost and carrying cost is N5.00 and N4.00 respectively. A quantity discount of 2% is available for orders in excess of 10000 units. Decide whether the firm should order in batches of 10000 units and benefit from the quantity discount.

Let determine the EOQ first

$$EOQ = \sqrt{\frac{2AO}{c}}$$

where A = Annual Demand
O = Ordering Costs
C = Carrying Costs.

$$= \sqrt{\frac{2x\ 900,000 \times 5}{4}}$$

$$= 1500 \text{ units}$$

Since the EOQ is 1500 units, let us compare the saving from purchase price and ordering cost with the carrying cost to determine the Net Return.

$$NR = DPA + O\left(\frac{A}{Q} - \frac{A}{Q^*}\right) - \frac{C}{2}(Q^* - Q).$$

$$= (0.02 \times 7 \times 900,000) + 5\left[\frac{900,000}{1500} - \frac{900,000}{10,000}\right] - 4\left[\frac{10000 - 1500}{2}\right]$$

$$= 126,000 + 25,500 - 17,000$$

$$= 151,500 - 17,000$$

❖ NR = ₦134,500.00

Since the total savings exceed the carriage cost, the firm can consider to order in excess of the EOQ.

This tool is very adequate for inventory which may not be available throughout production period; and which may also be difficult to get during its scarcity. Firms may though find it difficult, it is wise to seek the savings and boost their income.

7. ABC CLASSIFICATION

ABC Classification is an effective tool for inventory management used by most manufacturing firms. The tool involves the proper evaluation of the composition of a firm's inventory into categories of Naira importance. Inventory items' total purchase costs for the period are estimated and grouped in decreasing order.

ABC system classified items are scheduled for very frequent receipt that constitutes 10 to 15% of the items in stock that account for 70 and 80% of the total value of purchase as item A. At the other extreme, item schedule perhaps for only few times a year receipt that constituted 70 and 80% of the items in stocks to account for approximately 10% of the total value, are classified as C items. In between these extremes is the B item.

It follows that the greatest degree of control should be exerted over the A-Categories items. (Drury: 1995, 681) suggested that

attempts should be made to maintain low safety stocks consistent with sophisticated quantitative methods of controlling stocks. While the C-Categories items of inventory be based on a subjective ground, the objective being to minimize the expense in controlling these items. The ABC classification emphasised that considerable easiness is achieved on the control of inventory if it is concentrated on that small proportion of stock items that accounts for the high investment costs. This can be illustrated by the following schedule.

CLASSES OF COST	NUMBER OF ITEMS IN STOCK		TOTAL	
	No	%	Amount (N)	%
A	10,000	10	7,300,000	73
B	20,000	20	1,900,000	19
C	70,000	70	800,000	8
	100,000	100	10,000,000	100

From the above schedule it can be seen that class A items constitutes only 10% of the total stock items of the firm but consumes 73% of the total inventory investment. Class C, which constitutes 70% of the total stock items, is only tied to 8% of the total investment. What this is suggesting is that control measure should be emphasised much on the class A than the last two classes that constitute 90% of the total

inventory items. That is why Pandy (1999:902) contends that ABC approach to inventory management concentrates on important items of inventory.

Invariably, this approach to inventory management does not preclude the inventory items that are of little importance in value. However, since it is a matter of fund sunk on little inventory of high importance, measure should be very high on very important inventories than other categories of the inventory items.

8. MATERIAL REQUIREMENT PLANNING (MRP)

Lucey (2000:471) describes material requirement planning as a computerised information planning and control system which has the objective of maintaining a smooth production flow. The system determines the quantity and timing of finished goods demanded and then determines the phased requirement of the demand for material component and subassemblies over a specified planning time horizon. Drury (1995:683) notes that the MRP specifies that the requirement of items of material should not be planned independent of each other. Unlike the traditional EOQ model the demand for material is dependent upon the demand for assemblies for which they are a part.

However, the EOQ model cannot be used to determine the economic lots size to be manufactured or purchased to meet the

schedule requirement unless where the MRP schedule indicates that the demand for a part during a planning period is reasonably constant Drury (1995,684).

Moreover, Lucey (op cit) elaborates that the system requires the following for it to be efficient.

i. Master production schedule showing the quantity and timing required for the finished goods.

ii. Bill of materials (Bom) which shows the breakdown of each finished goods into subassemblies component and raw materials.

iii. Inventory file containing the balance on hand, schedule receipts and numbers already allocated for each subassembly, component and type of raw material.

iv. Parts manufacturing and purchasing file containing lead times of all purchased items and lead times and production sequences of all subassemblies and components produced internally.

The material requirement planning if effectively implemented in a firm will be concerned with the following achievements:

(a). Maximising the efficiency in the timing of orders for raw material, parts that are placed with external suppliers.

(b). Efficient scheduling of the manufacture and assembly of the final product.

9. JUST–IN-TIME PURCHASING AND MANUFACTURING

Just-in-time operating system requires that all resources, including materials, personal and facilities be acquired and used only as needed. Needles and Crossom (2002:183) conclude that its objective is to reduce or eliminate waste. This is possible by arranging with fewer suppliers for more frequent deliveries of smaller quantities of material of high quality and reliable deliveries. It also requires placing of long-term purchasing order that assures supplier long-term sales that enable them plan to meet this demand. Considerable savings in material handling expenses can also be made by requiring suppliers to inspect material properly before their delivery and guaranteeing their quality.

Drury (1995:684) opines that the effect of implementing the JIT purchasing is substantial reduction in investment. Other effects include a substantial saving in factory space, large quantity discounts and a reduction in paperwork arising from blanket long-term orders to fewer suppliers.

JIT manufacturing is aimed to produce the required product of high quality exactly at the time they are required. Lucey (2000:472) observes that the JIT system is characterised by the pursuit of excellent at all stages with a climate of continuous improvement. The system has also been applied to reducing the optimal number of units that should be scheduled for each production run. The effect of this enables set-up times, set-up costs and the capacity lost during a set-up to be considerably reduced. Limiting the set-up time to zero enables a firm to produce an economic batch size of one unit which eliminates the need to maintain stocks. At this stage, it will be unnecessary to produce more than the amount of finished goods needed for current consumption.

Kaplan and Atkinson (1998:560) conclude that with JIT implementation, lots size is optimised by attempting to drive set-up time to zero. In JIT, inventory is viewed as a form of waste, a cause of delays, and a signal of production inefficiencies. Inventories are, therefore, created to buffer production stages from one another.

However, Raiborn and Barfield (199:505) specify that JIT depends on accurate market data since a tight linkage is required between sales and production volume. They also observe that JIT cannot be implemented overnight. It must take some significant years to be developed before significant benefit is derived from it.

The application of this tool can be possible where most of the inventories required for production are much of locally accessible. The assurance of the suppliers is very relevant so that suppliers of inventories raw material should not cause any stoppage to production processes.

10. SHORTAGE OF FUTURE SUPPLIES

A firm anticipating unforeseeable circumstance of strike action by staff of major suppliers or restriction because of importation problems or transportation difficulties may over-order inventory of raw materials. Drury (1995:682) supports that this is to enable a firm have sufficient raw materials on hand to meet production where future supplies are uncertain. These actions can be seen as increasing the holding cost but in another end reduce the risk of not having sufficient inventory for production and eventually sales operations.

It is relevant here to note that consideration must be made to trade-off between the additional carry cost and the stock out cost. Where the advantage of carrying surplus inventory is high, the tool can be implemented.

11. INCREASES IN FUTURE PRICE

The announcement of a price increase that will be effective at some future date by a supplier may be in the firm's interest to buy in

excess of its immediate requirement before the increase becomes effective. Certainly, in times of rapid inflation firms might have an incentive to carry huge amount of raw material inventory than would otherwise be necessary.

Manufacturing firms using inventories of raw materials that are very sensitive to price variability are at advantage in implementing this tool. Attention must also be paid to carry costs of the bulky inventory acquired and the differential price expectation. Firms must, therefore, be very careful in determining accurate price trends in using this tool.

12. OBSOLESCENCE

Certain types of inventories are characterised by fading away after a short time. Drury (1995:682) points out that technological changes might make a particular component worthless. So also, change in fashion may cause a clothes retailer to sell stocks at considerably reduced prices.

Therefore, where the probability of obsolescence is high or goods are of a perishable nature, frequent purchase of small quantities and the maintenance of low stocks may be appropriate, even when the EOQ model may suggest purchasing larger quantities and maintaining higher stock levels.

However, implementing this tool may attract high ordering costs. Nevertheless, it is highly advantageous to incur ordering cost than to lose huge quantities of inventory acquired but could not guarantee further usage.

2.8 STEPS TO REDUCE SAFETY STOCKS

Situation of uncertainty in demand can lead a firm to maintain a higher safety stock. However, reduction in safety stock can occur if the purchasing department can find new suppliers who will promise quicker and more reliable delivery. On the other hand, the existing suppliers may be pressurised for faster delivery. As a result of these, the safety stock carried by the firm will be reduced and the total investment in stocks will fall. These will automatically result to improvement in company's earning.

2.9 INTERNAL CONTROL ACTIVITIES FOR INVENTORY

Manufacturing firms encounter certain losses resulting from their piles of inventory due to dubious activities emanating from both their customers and employees. Inventory can be stolen by customers or even taken away by employees for personal use. These acts led many companies to tag their merchandise so that an alarm will sound if the inventory is removed from the store without being purchased.

Expensive merchandise may be kept in locked cabinets or in special area where customers can be watched carefully. Manufacturing materials and extra merchandise can be locked in storage facilities until needed. Regarding employees however, the must sign forms showing the type and quantity of material inventory removed from these facilities. Unauthorised personnel are not permitted access to them.

Robert et al (2001:433) concluded that inventory material can be tagged, coded or barred so that individual items can be tracked from the time they are received from suppliers until they are transferred to other departments or to customers. These control systems will assist in early detection of any criminal act by both customers and organisation's employees.

Moreover, inventory can be used as a basis for committing fraud by top management in some established firms. Misstating inventory is one type of fraud committed by top managers. Such fraud is often hard to be detected because these managers can manipulate reported accounting numbers and supporting documents. These cases often involve millions of Naira and, once detected, usually cause severe damage to a firms finances and reputation. As seen in the case of Comptronix Corporation, a computer software developers in USA, where its stockholders won a $10m settlement from the company

because of overstating earning. The top managers inflated the company's earnings by reporting fictitious sales. To balance the company's accounts they overstated inventory and other assets. Inventories are popular targets for manipulations by unscrupulous managers because the amounts often are large and misstatement can be concealed. Typically, the managers report inventories that do not exist, resulting in overstating assets, understated expenses and overstated net income.

To prevent over statement, a company should periodically count the inventory and compare the actual amounts with the accounting records. In addition, analysis of accounting numbers can reveal major problems that can be concealed and hardly detected from the financial reports.

2.10 THEORITICAL FRAMEWORK

For any meaningful result to be achieved in any viable manufacturing organisation there is the need to efficiently manage its costs of operation. Among the total costs of operation incurred by manufacturing firms is the cost of inventory. Cost incurred on inventory consists of ordering holding costs and stock out costs (Heitger and Matulich, 1980:575); (Garrison, 1985:319); (Pandy, 1999:888: (Lester and Serge, 1984:319).

Inventory depicts the necessary input required by organisation to establish effective production to enhance sales. In any instance, revenue from sales must supercede the cost incurred during production, which is necessary for growth. The significance of the inventory to the organisation's operation compiles any organisation not to only be concerned with the costs of its inventory but to determine the appropriate tools used for optimal inventory decision necessary for its operation.

Inventory management tools refer to all the aids, methods, devices and techniques used for planning and controlling inventory. There are two approaches to inventory management tools. Thus, the qualitative and the quantitative tools (Drury, 1995:672).

The qualitative tools attribute its decision on inventory on mere simple facts related to any future circumstance that could affect inventory. The circumstance could be irregular change in prices of inventory, uncertainly of demand, technology e.t.c. Thus, this approach does not rely upon inventory related element that can be accurately estimated for feasible decision. Hartley (1986:782) argues that estimate increases the risk associated with running business. Hence, this exposes business to high risk and greater losses.

The work of Haris in 1915 brought to light reasons for developing scientifically oriented quantitative tools of inventory management.

Raymond later extended his work in 1930. Since then many quantitative tools have been developed in order to provide accurate information that will minimise possible risk that can disrupt the operation of a manufacturing firm. The advocate of this approach concluded that it provides management with ranges of inventory levels that allow choice (Pandy, 1999:892). Needles and Crossom (2002:183) depict that some of these tools ultimately reduce or eliminate wastage. Qualitative tools allow the determination of appropriate time at which order of inventory is made.

However, in many cases, some of the costs elements needed for inventory models may have to be subjectively estimated. However, the work of Hartley (1986:782) reveals that error may not result in as much displacements from optimum costs as may be suspected.

Experience has shown that many small manufacturing organisations are comfortable using the qualitative tools of inventory. This is evident in the work of Rossel and Frasure (1985:252). The work of Pandy (1999:884) also showes that simple inventory management tools could reduce levels of inventory to a considerable degree.

However, these considerations are criticised by some scholars on the ground that mere simple qualitative inventory tools adversely affect growth. Drury (1995:683) and Needles and Crossom (2002:183) argue that to manage a business very effectively the employment of

quantitative tools of managing inventory must be instituted. The work of Maiturare (1988), Mshelia (1995:70) Abdulaziz (2006:89) and Joseph (2006:50) highly recommended the use of more scientific inventory tools for a meaningful and positive achievement. This is made after reflecting the complex nature of the entire Nigerian economy.

In the overall consideration, emphasis is made more on quantitative tools for efficient inventory management, despite all the benefits found with qualitative tools. Rossel and Frasure (1985:253) emphasise the significance of human judgement necessary for consideration of many factors affecting our complex society. The argument here is that no matter how tools are efficient in determining appropriate inventory levels, there is the great requirement for an articulated and conscientious judgement by man. Man appropriate decision is therefore a major prerequisite for a successful inventory management decision. Managers are required to be versatile and sound in the deliverance of their judgement regarding any aspect of inventory.

2.11 SUMMARY

Activities in the manufacturing firm can be seen as centred on the responsibility of curtailing any difficulty that could hinder them from production and sales operation necessary for its continuity. All therefore that is available for them are the basic tools that they would employ in saving them from making any decision that could be detrimental for their existence. All the inventory management tools described therein are necessary for efficient planning and controlling of the inventory that are required by any firm. Functioning firms therefore will adhere to only those tools that provide them with the required utility necessary for their successful operation.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1. INTRODUCTION

Making finding, no matter how little it may be should embody objective basis that will enhance acceptability and validity by the generality of people. Verily, to successfully conduct reasonable finding on the assessment of the tools used for efficient planning and controlling of inventory in manufacturing organisations for smooth operation, relevant data, facts and figures, suitable for analysing problems found must be collected.

In this chapter, the stream of activities ranging from the method used for the collection and sourcing of relevant data and information to the type of appropriate instrument used for analysing the data obtained for meaningful and objective conclusion are presented. At the end, the justification of using all those available methods and techniques for the arrival at acceptable result is discussed.

3.2. RESEARCH DESIGN

Human endeavours are numerous and in most situations complex. It, therefore, requires a distinct procedure to guide those

involved in making reasonable result that will be of benefit to the immediate environment in particular and to the world in general. Jimoh, Salihu & Oyebanji (2005:127) concluded that meaningful research design specifies the procedure to be used in gathering, analysing and interpreting data. Any appropriate contribution that will improve or supplement the understanding of phenomena in a clearer and simpler form will require a feasible procedure that would aid in guiding those that are involved in the research work. In addition, the design should be relevant to the event in question.

Basically, there are five major research designs available for social sciences research. Thus:

(a). the experimental research design.

(b). the explorative research design.

(c). the descriptive research design.

(d). the historical research design and

(e). the survey research design.

The descriptive research design is used in this study. This is because it is the only design that reduces data so that the result of observation may be made much more immediately, meaningfully and presented in a form that will make interpretation and comparison easy and unambiguous by means of tables, graphs and numeral measures.

The analysis through the descriptive design gives a clearer picture of a situation. Therefore, this design can be depended upon for making a wide range of policy decisions.

3.2.1 POPULATION OF THE STUDY

Population denotes name given to the collection of items about which we require information (Robertson: 2002, 14). It includes individuals, household, firms, manufactured goods e.t.c. Osuala (2005:119) describes population as the totality of units having certain defined characteristics in common. Thus, the units of the population in some significant aspect are always alike. The population of the study, therefore, comprises some selected manufacturing organisations in Kaduna State. An approximation of sixty manufacturing organisations operate in Kaduna State. These constitute the population of the study.

The list of the organisations is derived from Kaduna State Ministry of Industries and confirmed by the Manufacturing Association of Nigeria (MAN) Kaduna State chapter. This is done in order to have the genuine operating firms in Kaduna State.

3.2.2 SAMPLING PROCESS

The difficulties involving research is eased by the sampling process which permits the selection of representative units from the total population. Osuala (2005:118) describes sample as a group of units drawn from the larger population. This allows the conducting of otherwise studies that are impossible. Olorunfemi (2005:51) concludes that samples allow analysis that will give the characteristics of the population and therefore lead to the correct inferences.

Asika (2005:51) classifies sampling method into two broad types: the probability sampling and non-probability sampling. The probability sampling allows each member of the population to be chosen at random. The elements have equal chances of being chosen. While, members of the population have no equal chance of being chosen in non-probability sampling.

For the purpose of this study, therefore, the probability sampling process is used where all members of the entire population have the chance of being chosen. The systematic probability sampling process was used in choosing the organisations for the study. The organisations chosen through this process include British American Tobacco company Zaria, General metals products ltd Kaduna, Kaduna aluminium company Kaduna, R.H. Plastic ltd Kaduna, Sunseed Nigeria Plc Zaria and Zaria Industries limited Zaria.

3.3 SOURCES OF DATA

The sources of data describes those avenues in which data use for the conduct of the research are collected. Osuala (2005:137) prescribes the two basic sources of collecting valid data as the primary and the secondary sources.

(a). The Primary sources of collecting data involve the gathering of facts and figures relating to a particular phenomenon to enable the obtaining of exact information. Here terms are carefully defined in order to avoid misunderstanding.

(b). The Secondary sources of data describe those avenues in which data are collected for some purpose usually for administrative reasons. Data collected from these sources must be used with great caution.

However, for the purpose of this research primary source is used in order to optimise qualitativeness in the finding and to enable acceptability.

3.4 DATA COLLECTION TECHNIQUES

A viable and objective study requires techniques to be used for the acquisition of valid data. Usually, data are collected in the normal course of the research administration. The following methods are

available for any social research. Asika (2005:13) identifies four possible means of collecting data as:

1. Observation.
2. Interview.
3. Questionnaire.
4. Telephone.

1. **OBSERVATION:** This involves collection of data through listening, watching and recording behaviour without interference to enable objective analysis and interpretation. This method enables the researchers to record precisely what actually happens while it is happening. Therefore, precision and certainty is maintained and complexity is avoided.

2. **INTERVIEW:** This takes the form of asking relevant and genuine questions aimed at getting the required data and facts for the conduct of the research study. Interview seeks to clarify a lot of hidden data due to the direct contact that is possible with the respondent. In the course of the research many relevant facts are collected through this method.

available for any social research. Asika (2005:13) identifies four possible means of collecting data as:

1. Observation.
2. Interview.
3. Questionnaire.
4. Telephone.

1. **OBSERVATION:** This involves collection of data through listening, watching and recording behaviour without interference to enable objective analysis and interpretation. This method enables the researchers to record precisely what actually happens while it is happening. Therefore, precision and certainty is maintained and complexity is avoided.

2. **INTERVIEW:** This takes the form of asking relevant and genuine questions aimed at getting the required data and facts for the conduct of the research study. Interview seeks to clarify a lot of hidden data due to the direct contact that is possible with the respondent. In the course of the research many relevant facts are collected through this method.

3. **QUESTIONNAIRE:** Questionnaire is a list of questions in a form by nature it takes the form of postal or filled in by enumerator. The respondent in given answers to such questions must be brief in respect of the required answers to the questions. Questions asked are centred on both specific and general ways of managing inventory in the organisations.

4. **TELEPHONE:** This method of gathering information is visible where all the respondents can be reached by telephone. It is fast and incurs little cost. However, it is highly impersonal and the researcher may not be able to ascertain the competence of the respondent.

5. **DOCUMENTARY MATERIAL:** Data of documentary material nature entail the whole of written record on a particular phenomenon. Relevant data and facts are also gathered in the form of reports, review of texts and other useful materials. Journals, official reports, statistics, newspaper, annual year books, are also sources of collecting documentary materials.

In conducting this research, therefore, much of questionnaire and interview are exploited than any other means. Questions are asked in the closed form. The respondents are limited to the structure of the alternatives to minimise the risk of misinterpretation.

3.5 DATA ANALYSIS TECHNIQUES

Materials and data collected for the conduct of any research are insignificant until analysis is made in order to aid meaningful result. Obasi (1999:197) summarises the techniques for analysing data in two forms: the descriptive tools and inferential tools. The descriptive tools such as measure of central tendency and dispersion, ratio, percentages, proportion and coefficient of variation are used to specify the nature of any given phenomena. For this purpose, graphs and percentages were used in the presentation of the data. While, chi-squire was used to analyse the data to guarantee optimal result.

3.6 JUSTIFICATION OF THE METHOD

The justification of using these procedures in making relevant finding in this research aided the researcher to maximise the limited time and opportunity to acquire more useful data and facts to conduct the research. The methods used in the presentation and analysing the data make it possible to bring out clearly the relevant information required for suitable decision-making. This method also makes it possible to reduce data in a form that observation and measurement are made more immediately, meaningfully and presented in a form that will make interpretation and comparison easy.

The chi-squire was used to analyse the data because there are two variables drawn from independent samples each of which is categorised into two ways i.e. Yes or No responses. As part of inferential statistics, it helps us make generalisation about the entire population, which also is a purpose for this research.

3.7 SUMMARY

The research methodology is to determine the appropriate procedures employed in the conduct of the research. The research design specifies the process used in the gathering, analysing and interpreting of data. The research design used for the research is the descriptive design. Data sources are both from primary and secondary sources. The techniques used for the collection of data relevant to the study includes both the questionnaire and interview.

However, compilation of data is irrelevant unless they are analysed in order to provide result that will be meaningful and easy to be comprehended. In this study, therefore, both inferential and descriptive statistical tools are used in analysing the data.

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS AND INTERPRETATION

4.1 INTRODUCTION

The gathering of masses of data becomes meaningful only when it is presented in an appropriate form relevant for its purpose. However, for the purpose of this study, relevant data were collected from some manufacturing organizations in Kaduna State.

Because of the nature of the study, data could only be collected in respect of the major components of their products. These components in such organisations do constitute at least 70% of the production input. The manufacturing organisations visited and data collected are:

(a) British American Tobacco Company Zaria, major producer of cigarette in Nigeria. Its major component is the tobacco leaves and it is sourced locally.

(b) General metal products Ltd Kaduna, producer of simple machines, parts, tankers, drums, gates, doors & windows, lorry body e.t.c. Components of their products include Iron sheet pans, pipe, paints, electrode, rod, angle Iron and Galvanised pan.

(c) Kaduna Aluminium company Kaduna, producer of sliding doors, showcase, bed, door and window. Major component for production include Aluminium silver, Aluminium black, glass, rubber, screw, roller and gas.

(d) R.H Plastic Ltd Kaduna, producer of plastic products and polythene products for both household and industrial purposes. The major component for its production is the liquid natural rubber. It is sourced locally in Nigeria.

(e) Sunseed Nigeria Plc (Oil mills) Zaria, producer of edible oil. Its major constituent is groundnut and cotton seed.

(f) Zaria Industries Limited, Zaria, is the only tarpaulin producer in the country. Its major constituent used for its production is cotton lints.

4.2 PARTICULARS OF RESPONDENTS

The data to be presented here are the data relating to the responses collected from the manufacturing organizations visited. Those data are going to be pooled and tabulated.

Furthermore, for the purpose of clarity, analysis of the responses will be made. This analysis will be used in answering some of our research questions stated in chapter one. The responses to be analysed are those of question 5 to question 22 in the questionnaire.

RECEIVED 485593

Simple percentages form the basis for the analysis of these questions. It is used because of its relative simplicity and easy to understand by anyone.

Subsequently, the hypotheses stated in chapter one was tested using some responses in respect of questions asked in the questionnaire. The hypotheses was tested using Chi-square inferential statistical tool. The result derived assisted in making a realistic decision on the problem.

QUESTION 5:

In which category of management do respondents belong in their organisations?

Fig. 4.1: Categories of respondents

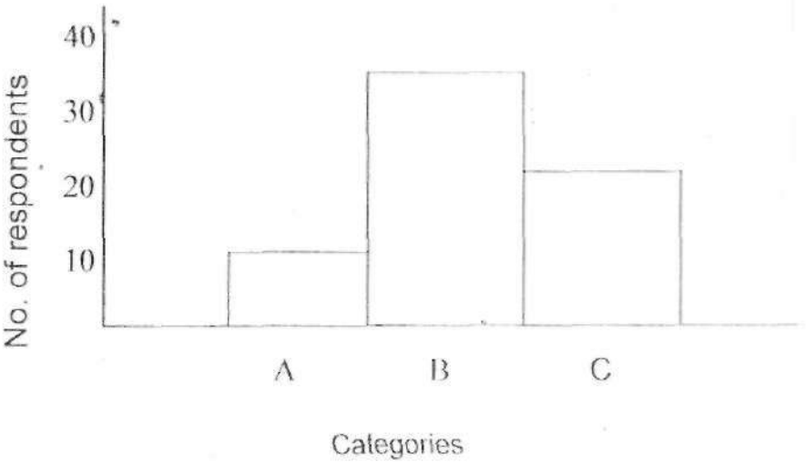


Fig. 4.1 above is a histogram depicting the degree of responses from each category of respondents. Category A represents the upper level management. Category B represents those respondents that are in the middle management level, whereas category C represents respondents at lower level management of organisations.

Category A represents the ten respondents that are in the upper level of management. They represent 15% of the total responses received. While 35 respondents were represented in category B. These also represent 54% of the total respondents. The lower management category is represented by 20 respondents which also represent 31% of the total respondents.

The analysis here therefore is that 69% of the total respondents belongs to the senior cadre of the organisations. This signifies that the responses given were relatively accurate and valid. The upper and middle management levels in most organizations do not only have access to accurate record but also form part of those that formulate and implement viable policies to organizations. However, responses were received across departmental staff and include finance, factory, warehouse, marketing and laboratory.

Table 4.1: Policy of inventory level

Alternative	Frequency	Percentage
Maximum	14	22
Optimum	43	66
Minimum	8	12
Total	65	100

Source: Field work 2008

Table 4.1 shows that 66% of the respondents prefer optimum level of inventory to be instituted for organisation. While 22% and 12% of the respondents place their preference on the maximum level and minimum level of inventory. This is in contrast to the percentage of the respondent that seeks for optimum level of inventory policy to be instituted in the firm. Those respondents suggesting the extremes of inventory level may be ignorant of the dangers associated with them. Moreover, the totalities of those respondents preferring the extreme of inventory are just about one third of the total respondents.

Therefore, the respondent to the optimum level of inventory to be instituted in an organization would be preferred by any organization if all possible considerations would be given to the right individuals that are interested in the organization's progress and development.

In most cases, problem arises in choosing appropriate inventory when those that are concerned are not taken cognisance of the

possible dangers of carrying too much of inventory or not carrying enough. These instances expose organizations to institute inventory level policy that will be detrimental to the manufacturing organization.

Regarding research question 2, this has also helped in answering. Most manufacturing organizations would prefer the optimum level than maximum and minimum level unless where circumstances of cost advantages and perishibility or vulnerability to possible adversities are envisaged.

Table 4.2: Existence of appropriate level of inventory in the organisation.

Alternative	Frequency	Percentage
Yes	58	89
No	7	11
Total	65	100

Source: Field work 2008

The higher percentage response received regarding whether an organization has an appropriate level of inventory signifies the belief with the respondents of their instituted inventory policy. The respondents believe that the level of inventory present in their

organization is very appropriate for successful meaningful manufacturing operation.

From these assessments, it could be reaffirming that organisations may not carry necessary the same level of inventory. But many manufacturing operations would be conveniently carried out with maintenance of optimum level of inventory. In rear cases, only manufacturing operation could be conducted with either maximum or minimum level of inventory. Where these could occur would be associated with the nature of the inventory. Situation may arise where the inventory cannot be acquired in a small quantity or where the inventory is of perishable nature. Circumstances of such nature may prone any organisation to institute the extremes of the inventory levels.

Table 4.3: Manager's determination of appropriate levels of inventory in the organisation.

Alternative	Frequency	Percentage
Yes	57	88
No	8	12
Total	65	100

Source: Field work 2008

A total of 57 respondents representing 88% agree that managers of inventory can determine appropriate level of inventory for a manufacturing firm. Every manager that is assigned the responsibility of inventory can therefore determine the appropriate level of inventory required by his organization.

These high percentages of agreement with the determination of appropriate level of inventory by managers also answer research question one. However, the relatively 12% of the respondents that disagree with the ability of managers to determine appropriate level of inventory is more or less ineffective to the question.

The agreement of respondents to managers in determining appropriate inventory level could be supported by the inventory manager deep thought of possible manufacturing network which is

partly rested upon him. Therefore, he would use modalities and experience to see that he is up to expectation.

Table 4.4: Variability in inventory requisition in an organisation.

Alternative	Frequency	Percentage
Yes	28	43
No	37	57
Total	65	100

Source: Field work 2008

The result of 43% and 57% agreeing and not agreeing indicated that requisition of inventory varies from time to time during operating period. Many consumer products that require daily demand would in no doubt be requested continuously throughout the period of the organisation's operations.

Products that are not of daily consumer need would at certain particular period of season have timely requisition. Where such kinds of products are manufactured, inventory requisition would be wisely preferred around the season it is much demanded.

Moreover, these responses answer research question 3 comfortably. Some manufacturing requirements of inventories are constant where as others vary.

Table 4.5: Application of inventory management tools in an organisation.

Alternative	Frequency	Percentage
Yes	63	97
No	2	3
Total	65	100

Source: Field work 2008

The higher percentage of respondents confirm that their organisations have an inventory management tool. The 97% of the respondents here therefore is almost a total population investigated. In this picture therefore, we can conclude that there is no manufacturing firm that can operate at this competitive era without an operating inventory management tool.

However, inventories vary from organisation to organisation. It does not mean that every organisation uses same kind of tool. But it indicates that such a manufacturing firm has a functional inventory

management tool that seeks to assist it in the proper planning and controlling of its total inventories.

Table 4.6: Type of inventory management tool in an organisation.

Alternative	Frequency	Percentage
Qualitative	9	14
Quantitative	56	86
Total	65	100

Source: Field work 2008

Only 14% of the respondents confirm the use of qualitative inventory management tools. Most of the manufacturing firms in addition to using inventory management tool prefer using quantitative tool. This could be associated with its effectiveness and possibly accuracy and precision in finding feasible means of achieving good inventory results.

The 86% signifies how relevant quantitative tool is to manufacturing firms streamlining its production and sales operation, which would seek to further achievement of even wealth maximization of shareholders. With a good quantitative tool for managing inventory, customer's promises of efficient deliveries would be attained. However, this response answers the research question 4.

Verily, in rear cases are two tools employed in order to allow operation not to be curtailed due to certain shortcoming of the tool in operation.

Table 4.7: Effectiveness of the present inventory management tool

Alternative	Frequency	Percentage
Yes	57	88
No	8	12
Total	65	100

Source: Field work 2008

88 % of the respondents agree to and support the use of the operational tools in their organization. Only 12% of the respondents disagrees with the tools used in managing their inventory. It could be perceived then that the instituted inventory management tools seek to help in achieving manufacturing operation. This could in another way be viewed as in support to question 11.

Table 4.8: Tenure of inventory management tool in an organization

Alternative	Frequency	Percentage
1 year or less	4	6
2 years and above	61	94
Total	65	100

Source: Field work 2008

The institution of inventory management tool should be viewed dynamically. Only 6% of the respondents suggest the changing of the various tools in operation if tangible reason warrants. However 94% of the respondents suggest that the inventory management tool should be reviewed from two years upward. In other words, instituted inventory tools should be reconsidered for another one after at least successful two years operations.

The very reason behind this may not preclude vivid evidence of incompetence of the tool which may be revealed after two years and above. At this period any tools in use that do not satisfy the manufacturing operation of the organisation could be changed and replaced by a feasible one that can deliver the organisation successfully.

Table 4.9: Inventory management tool as a prerequisite for successful operation.

Alternative	Frequency	Percentage
Yes	60	92
No	5	8
Total	65	100

Source: Field work 2008

A high percentage of 92 agrees that the inventory management tool in operation contributes to its successful operation. This question reaffirms questions 11 and 12 of the questionnaire. The use of an effective inventory management tool is the answer to any successful manufacturing, no matter how it could be related. This response indicates that any viable quantitative tools used by any manufacturing organisation can lead to successful manufacturing operations.

With a viable tool for inventory management, all manufacturing organisation operations are categorically achieved. Production will be done smoothly, customers and all other parties such as employee, creditors, and other stakeholders will be relieved of unnecessary burden caused by production bottleneck and other inconsistencies.

Table 4.10: Inventory management tool relevancy to inventory policy.

Alternative	Frequency	Percentage
Yes	60	92
No	5	8
Total	65	100

Source: Field work 2008

Here, 92% of the respondents confirms that the tool used in managing the inventories in their organization is a factor for achieving inventory objectives. It was only 8% percent of respondents that sees the instituted inventory management tool as ineffective for decisions. Those who are in favour of the operating quantitative tools that are in their organization, therefore, see it as the tool that could be trusted for ousting any production curtailment and other sales inefficiencies.

This question also confirms the responses given to question 12 and 14. It will no doubt be seen as the inventory management tool that will be effective in any manufacturing organization which must contribute immensely to the effective management of inventory in the organisation. Hence, apart from casting out any abnormalities in production and sales operation it also leads to attainment of various organisational objectives in costs of production, customers, creditors e.t.c.

Table 4.11: Considerations of costs in determining inventory management tools.

Alternative	Frequency	Percentage
Yes	47	72
No	18	28
Total	65	100

Source: Field work 2008

72% of the respondents confirms the consideration of all the costs associated with inventory in the determination of an appropriate tool of inventory management. Whereas, 28% of the despondents disagrees with considering all the inventory costs.

With this high percentage of 72%, most of the organisations investigated do relate all costs when considering the appropriate tool for managing their inventory. It could be realized here that most of the manufacturing organisations are very cautious when it come to cost consideration. Cost management though relevant to all organisations is a very crucial factor that manufacturing organizations should scrutinize thoroughly in order to permit successful and continued operation. Cost of any operation is never neglected because it may form the basis for further managerial analysis and improvement to other related ones.

Moreso, this assertion confirms the meticulousness of manufacturing organizations in all their various functions. Though 28% of the respondents with varying responses may base their objection due to inability to analyze the significant cost element or the other in several occasions.

Table 4.12: Costs not relevant for appropriate inventory management tools.

Alternative	Frequency	Percentage
Ordering costs	9	14
Holding costs	20	31
Stock out costs	36	55
Total	65	100

Source: Field work 2008

Costs despite their implication to inventory decision are also thought to be avoidable. Here, 14% of the respondent agrees that ordering cost in deciding an appropriate inventory management tool can be avoided. Those that thought of avoiding holding cost are represented by 31% and stock out costs is represented by 55%.

This analysis clearly depicts the relevance of the respective costs in inventory decision. Most probably, stock out cost is thought to be

avoided due to two facts. Firstly, being that the organizations are wary of importance of optimizing their operations. The organizations were able to fulfill their various objectives without failure to procure appropriate inventory necessary for production purposes. Secondly, customers on all occasions are satisfied when ever request is placed; the finished goods were always adequately delivered.

The 31% that suggested holding costs to be avoided may likely be in the premises of those using tools that permit immediate acquisition of inventory raw materials necessary for production purposes. In these instances, holding costs would be irrelevant in making inventory decision.

However, the 14% of the responses clearly shows that in any case ordering costs is very hard to be avoided. Whether avoiding stock costs or holding costs is seen possible, an organization must order for inventory raw materials which is the basis for the production process.

Therefore, manufacturing functions in most cases are outright in the monitoring of their respective costs. This will definitely help in guiding their subsequent operation and in turn enhance their revenue generation.

Table 4.13: Advantages of cost reduction using present tools.

Alternative	Frequency	Percentage
Yes	63	97
No	2	3
Total	65	100

Source: Field work 2008

Cost reduction in any operation, especially manufacturing operation, is a very crucial necessity that cannot be neglected. Incurring costs is one fact and avoiding unnecessary costs is another fact that makes operations involving costs sustainable.

Here, 97% of the respondents shows that the present tool for managing inventory in manufacturing firm helps in reduction of costs. It means therefore that the tools which in most cases qualitative aid in minimizing costs of operations in the manufacturing firm. Only 3% of the respondents disagrees that the tool instituted in a manufacturing organization does not lead to cost reduction.

It will, therefore, be virtually concluded that quantitative tools used in manufacturing firms lead to costs reduction in their various operations. The 3% disagreement is very little to distort this assertion. This question also reaffirms the conclusion drawn in questions 12, 13 and 15. Verily, cost reduction can only be possible where the tool in

use is effective; the tool also forms a basis for successful operation, while the tool is relevant for effective inventory policy.

Table 4.14: Inventory management policy and revenue generation.

Alternative	Frequency	Percentage
Yes	58	89
No	7	11
Total	65	100

Source: Field work 2008

The responses in favour of tools contribution to revenue generation is represented by 89%. While those seeing that the tool instituted for inventory management does not contribute to revenue generation is represented by 11%.

It could be seen that there is also a positive relationship to reduction of costs and aiding in the generation of revenue when using an effective tool for managing inventories. In other words, tool contribution to revenue generation can be highly possible if the tool can contribute to eliminate certain costs that are irrelevant to the planning and controlling of inventory. This assertion therefore reaffirms the responses that were derived in question 18.

Table 4.15: Inappropriate inventory policy and loss of revenue.

Alternative	Frequency	Percentage
Yes	48	74
No	17	26
Total	65	100

Source: Field work 2008

Invariably, factors leading to gaining of revenue may if lacking lead to loss of revenue. As can be clearly seen, 74% of the respondents agrees that any inappropriate tool of inventory management can lead to loss of revenue. Only 26% response to the disadvantage of the tools in use. This question 20 therefore is a check to question 19. This is because it could look contradictory if this response does not favour the responses in question 19. But the response now here, therefore, reaffirms question 19.

Table 4.16: Stoppage of production by adopting inappropriate inventory policy.

Alternative	Frequency	Percentage
Yes	47	72
No	18	28
Total	65	100

Source: Field work 2008

A total of 47 respondents representing 72% of the total respondents agrees that manufacturing functions can experience stoppages as a result of inappropriate policy of inventory that is instituted. Only 28 percent disagrees that inappropriate inventory policy can result to stoppage in production operations.

This assertion also supports questions 12 and 15. Policy regarding inventory management if not appropriate for the purpose instituted can stop manufacturing operation. It can lead to stoppage in production, incur abnormal costs such as stock out costs and even lead to loss of customers. This actually forms the basis for crisis in the life wire of manufacturing organisations.

Table 4.17: Closure of organisation by adopting inappropriate inventory policy.

Alternative	Frequency	Percentage
Yes	59	91
No	6	9
Total	65	100

Source: Field work 2008

The responses in favour of this question are represented by 91% against 9% that disagrees with inappropriate inventory policy leading to closure of manufacturing organisations. The higher percentage got could be easily understood in the sense that if operational efficiency, reduction to costs of operations and good revenue generation are not achieved in any manufacturing organisation, there will be often stoppage in operation and hence closure of the organisation. This assertion is therefore reaffirming questions 12, 14, 15, 18, 19 and 21 respectively.

4.3 TEST OF HYPOTHESES

The hypotheses stated earlier were the null and the alternative hypotheses, which form the basis for investigation in this research. For the purpose of this study null hypothesis will be tested. Where at the end, there is no ground for accepting them on the basis of the analysis, we will therefore accept the alternative hypotheses.

Moreover, in testing the variability between the set of observed frequencies of a sample and corresponding set of expected theoretical frequencies, a Chi-square (X^2) test was used.

Chi-square (X^2) is express as:

$$X^2 = \sum_{i=1}^{n} \left[\frac{O - E}{E} \right]^2$$

Where:

X^2 = Chi-squire

O = Observed frequency

E = Expected frequency

This test was conducted with the aid of contingency tables, based on the rules of probability. The rule however is that null hypothesis of independence may be rejected at the X level of

significance if the computed value of X^2 exceed the critical value of X^2 and vise-versa.

The expected frequencies will be calculated using the formula:

$$Fe = \frac{\text{Column total} \times \text{Row total}}{\text{Grand total}}$$

HYPOTHESIS No. 1

The hypothesis states that:

H_{O_1} There is no significant relationship between the inventory management tool and successful performances of manufacturing firms.

H_{A_1} There is a significant relationship between the inventory management tools and successful performances of manufacturing firms.

To conduct the test, question 14 of the research questionnaire was used. It is because this relates perfectly to the hypothesis. Therefore, the responses received for this question from each category of respondent were computed in the table.

Table 4.18: Responses on inventory management tools a prerequisite for successful operation.

Category	Yes	No	Total
A	10	0	10
B	35	0	35
C	15	5	20
Total	60	5	65

Source: Field work 2008

Table 4.19: Contingency table

Fo	Fe	Fo – Fe	$(Fo - Fe)^2$	$\frac{(Fo - Fe)^2}{Fe}$
10	9.23	0.77	0.59	0.06
0	0.77	-0.77	0.59	0.77
35	32.31	2.69	7.24	0.22
0	2.69	-2.69	7.24	2.69
15	18.46	-3.46	11.97	0.65
5	1.54	3.46	11.97	7.77
				$X^2 = 12.16$

Furthermore, before we make decision regarding the value got in the contingency table, we made a comparison with the computed value in the table of contingency to ascertain whether the calculated X^2 value falls within the critical region.

However, to make this possible we locate the appropriate X^2 value in the Table through the degree of freedom. This is arrived at by using a formula:

$df = (r - 1)(c - 1)$

Where r = number of row and C = number of column

For this test our df

= (3 –1) (2 – 1)

= 2 x 1

∴ df = 2.

To arrive at the table X^2 we take a 0.05 level of significance.

From the X^2 distribution table, the value of X^2 at df = 2 at 0.05 level of significance is 5.991.

INTERPRETATION OF THE TEST

The decision rule states that the null hypothesis is accepted if the calculated X^2 value is less than the X^2 distribution table value. In respect of this computation, the calculated X^2 value is greater than the X^2 distribution table value.

We, therefore, reject the null hypothesis and accept the alternative hypothesis. This is because the calculated X^2 value of 12.16 is more than the X^2 value in the X^2 distribution table of 5.991. Considering the decision rule, the calculated X^2 is greater than value in the table. This means that the difference between the expected frequency and the observed frequency are beyond what would be

expected by chance. In other words, we do have reliable evidence that there is a relationship between inventory management tool and performance in manufacturing organizations.

Therefore, the right decision here is that the null hypothesis is rejected and the alternative hypothesis is accepted.

Finally, with the above result of the analysis we can conclude that:

There is significant relationship between the inventory management and successful performances of manufacturing firms.

HYPOTHESIS No.2

H_{O_2} There is no significant relationship between the inventory management tools and inventory policy of manufacturing firm.

H_{A_2} There is a significant relationship between the inventory management tools and inventory policy of manufacturing firm.

To successfully test this hypothesis, question 15 of the questionnaire is used. This question perfectly reflects the basic features of the hypothesis. Therefore, the responses received for this question is used for the computation of the table required for making the test

Table 4.20: Response on effectiveness of inventory management tools to inventory policy.

Category	Yes	No	Total
A	10	0	10
B	35	0	35
C	12	8	20
Total	**57**	**8**	**65**

Source: Field work 2008

The above table shows the summary of the responses received for the question relating to appropriate test of our hypothesis. The table below is the contingency table suitable for further analysis and the testing of the hypothesis necessary for accurate conclusion.

Table 4.21: Contingency table

Fo	Fe	Fo – Fe	$(Fo - Fe)^2$	$\frac{(Fo - Fe)^2}{Fe}$
10	8.77	1.23	1.51	0.17
0	1.23	-1.23	1.51	1.23
35	30.69	4.31	18.58	0.61
0	4.31	-4.31	18.58	4.31
12	17.54	-5.54	30.69	1.75
8	2.46	5.54	30.69	1246
				X^2 =20.53

The degree of freedom is arrived at by using the formula:

$df = (r - 1)(c - 1)$

Where:

r = number of rows and

c = number of columns.

For this test our df

$= (3 - 1)(2 - 1)$

$= 2 \times 1$

$\therefore df = 2$

To arrive at the appropriate value in the table of X^2, we consider a 0.05 level of significance.

For the X^2 distribution table, the value of X^2 at 0.05 level of significance is 5.991.

INTERPRETATION OF THE TEST

The decision rule states that the null hypothesis is accepted if the calculated X^2 value is less than the value of X^2 distribution table. In respect to our computation, the calculated X^2 value is far greater than the X^2 distribution table value. From our computation, we arrived at $X^2 = 20.53$. Where as, the X^2 distribution table at df = 2 is represented by 5.991.

Apparently, the value of the X^2 in the contingency table is greater than X^2 distribution table: $X^2 > X^2$. This testifies that the differences between the expected frequency and observed frequency are beyond what would be expected by chance. In other words, it indicates that we have reliable evidence that there is a relationship between the inventory management tool and the inventory policy of manufacturing organizations in Kaduna State.

We, therefore, reject the null hypothesis here, also, and accept the alternative hypothesis.

Finally, with the above result and analysis we conclude that:

There is a significant relationship between the inventory management tools and the inventory policy of manufacturing firm.

4.4 SUMMARY

The pooled responses from various staff of the manufacturing organizations studied form the basis for our analysis. This however led to the answering of our research questions and also allow us to test the hypotheses for justifiable purpose. The questions asked were directly in relation to our investigation.

The various questions in each case received at least 70% responses favouring particular option of the alternative given. This definitely justified that those questions favoured represent the majority of those that responded. This also allows us to make assertion on the views and completely make inference for generalization.

Nevertheless, some favoured responses in the investigation were represented by less than 70% but more than 50%. The more reason highlighted in respect of question 9 regarding the constant annual acquisition of inventory was in more way indication of the organization in certain times observed changes in their sales operation. These inconsistencies could be as a result of satisfying the urgent abrupt

customers' need. The responses to question 16 also indicated that costs used in determining inventory policy vary in their implications. These questions are also related in terms of their objective.

Certainly, using appropriate inventory management tools in actual practice reveals that it leads to minimization of costs in the production process. This also extends to maximization of revenue that manufacturing firms earn.

However, the study has revealed that any manufacturing firm using inappropriate inventory policy experiences excessive loss of revenue. This is an indication to stoppage in production of manufacturing firms. Consequently, inappropriate inventory policy adopted by manufacturing organizations leads them to close-up after several months/years of stoppages in production.

Moreso, the hypothesis tested favoured the necessary condition for rejecting the null hypothesis and therefore accepting the alternative hypothesis. Therefore, in all consideration, inventory management tools are very necessary for the successful performance of manufacturing firms. Relevant inventory tools are required in any manufacturing organization so that it can enhance its performances in production operations and sale operations.

The study has revealed that, in any case, inappropriate inventory management policy is implemented in any manufacturing firm. It is

bound to face major difficulties in its operation and finally closure. Inventory policy adopted in manufacturing organizations, therefore, must be constantly reviewed to enable early detection of lapses therein.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 SUMMARY

Manufacturing organization in Nigeria have gone a long way commencing from the colonial era till date. Manufacturing functions require proper and adequate plan and control of inventory to make it result-oriented. The early modern manufacturing organizations in Nigeria are those either owned or managed by the colonial masters. This makes the industries' operations well co-ordinated and smoothly functional ones.

The period of public enterprises in 70's permitted indigenous entrepreneurship in some of the industries. The involvement by Nigerians coupled with problems of management inefficiencies, competition e.t.c. was heightened during mid-eighties when the Structural Adjustment Programme (SAP) was introduced. SAP was to arrest the peculiar existing problems in the economy. At the same time, the dearing world economic recession that engulfed the world contributed to the problems of manufacturing activities in Nigeria. The crisis in so many ways magnifies in complexities living manufacturing firms to struggle hard in order to survive. Among which many could not meet-up therefore stop production for a long time before production commences or even closes-up. The opening of doors and other

benefits (globalization) do in many ways become a threat to our manufacturing firms. Foreign products were continuously smuggled into the country despite measures put in place to counter such activities.

Therefore, manufacturing firms' operations and survival began depleting. The essence, therefore, of introducing viable and sustainable strategies for their continuing functioning becomes enormous. Among which are the tools for managing their inventories. Inventories are sought to be a delicate factor to the entire manufacturing decision. In management, it remains a stumbling stone that requires serious attention. The most common among the tools which are basically of qualitative use became irrelevant. Therefore, need for quantitative tools which are more scientific in nature became important for proper inventory management.

In our studies, tools in most of the manufacturing organizations are of quantitative nature. Most importantly, the tools were used for periods ranging from two years and above before being considered for change. The institution of tools for manufacturing organizations inventories is, therefore, not rigid in nature. It was revealed that in some cases a tool, such as Just-In-Time production and purchase was used at the time of abrupt increase in volume of sales to keep the

production process continually floating. The annual acquisition for raw material inventory does not favour production functions.

The costs incurred for managing inventories were viewed in several ways. Those that incorporate much of Just-In-Time purchase and production tools give less consideration to holding costs and stock out cost in their inventory decision. In most cases, stock out costs receives high attention in the inventory decision. This is seen where either the organisations are left with much inventories in stock or when they are much of Just-In-Time nature. Ordering cost in decision relevant to inventory was seen likely to be avoidable. But the costs of holding inventories remain very critical to inventory decision in Nigeria.

However, the tools employed by the manufacturing organizations are effective for the management of their inventories. Thereby, aiding in reducing the costs of operation and hence improve their revenue generation. Consequently, using tools that are not appropriate in many cases may lead to stoppages in production and if not tackled properly may also lead to the closure of the organisation..

5.2 CONCLUSIONS

The assessment of the tools used for the management of inventories in Kaduna State manufacturing organisations revealed that they maintain optimum level of inventories. Managers of the firms, also, determine the appropriate level of inventories to their firm. These allow them to review the tools that are used for effective management of inventories often. They can, therefore, initiate the change of the tool in operation where serious defect is realized in its adoption.

It further establishes that most of the manufacturing organisations use the quantitative tools for planning and controlling of their inventories. That is, there is a total compliance by manufacturing organisations to maintain costs of operation at a bearest minimum. This, therefore, is in contrast with the former perception of manufacturing organization collapsing as a result of using unscientific (quantitative) tool.

In the course of instituting a tool for inventory management, consideration regarding the time to initiate for change is relevant. Tool is used for at least a period of two years before any consideration for change. This shows that manufacturing functions are not rigid in nature. They are flexible in all aspects of their operations.

Costs for keeping inventory in manufacturing organizations are given relative consideration regarding their relevance to the inventory

decision. Cost of holding stock reveals that its avoidance is very difficult. However, for much implication, stock out costs and ordering cost can be avoided if proper consideration is given to all relevant elements to the decision.

The study establishes that in any circumstances that an inappropriate tool for managing inventory is used, the possibility of abrupt production stoppages and possible closure of the organization may result. The study, therefore, associates with the wrongful adoption of inventory management tool to form the basis of organization eventual collapsing.

The responsibility of the survival of manufacturing organizations is not vested on them alone but also on the government. This is because the wish of any government is the aspiration of any activity that will boost not only their revenue generation but increase productivity which is relevant for the growth and development of the nation.

The study established that it is difficult for a manufacturing organization to make a single annual acquisition of inventory raw materials. This could be in relation to acute difficulties the organization is faced with its holding. The inventory can be exposed to both internal and external harzards.

5.3 RECOMMENDATIONS

Manufacturing firms' operation in Nigeria's development is of imminent importance to the nation's development. Manufacturing organizations are seen daily collapsing or operating below the capacity required. This, however, is not due to their inability to use maximally potential available to them. They can provide relevant economic activities than as seen now if adequate measures are put in place for their continuous existence. Despite the bottlenecks caused by the economic trend, few of them are still operating-though some operate at loss or below production capacity.

Therefore, for the continuity and survival of a manufacturing organization in Nigeria, managers in charge of their inventory management must be alert in order to detect any circumstances that could be detrimental to the instituted inventory policy. They are required to show utmost caution and initiate proper changes where need arises in inventory decision.

Managers should be dynamic in decision relating to their organizations' inventories. Any event that is prejudicial to the inventory decision if envisaged should not be neglected. It should be scrutinized

thoroughly to permit immediate and accurate decision in favour of the organisations' inventory management.

Moreover, there should be consistency in relation to the adoption of the inventory management tool's policy in use in the manufacturing organizations. Inventory management tool in usage should relatively be in use for a period not less than three years. This is in order to make proper assessment of its viability and reliability in assisting adequate planning and controlling of inventory.

However, in no occasion should manufacturing organization make a bulky annual purchase of raw material inventory. Inventory acquisition should be made in accordance with immediate production and sales objectives.

Nevertheless, manufacturing organizations should examine different tools of inventory management to discover the one that benefit them most. This should also be related to the cost of implementing the tool.

Government should come to their aid. This is for the fact that all the possible factors that contribute to the production activities are those that can be remedied by government. The government should adequately show major interest in the operation of manufacturing organizations.

Adequate protection should be given to the manufacturing organizations since the quota regime has come to an end. This will give the locally manufactured products the possibility to dominate and maintain market leadership.

Export Expansion Grant (EEG) due to many manufacturing organizations should be given to them by the government. This boosts the incentive given to them and also encourages them to manufacture not necessarily for local consumption but for export purposes.

The industrial loan given to the manufacturing organizations should be increased and tax of such loan should be exempted. This will definitely encourage expansion of some activities of manufacturing organizations.

The rate at which the Power Holding Company of Nigeria charges manufacturing industries should be reviewed. This contributes to the huge costs of production to the organization. If this is reviewed, it will in most instances reduce the cost of production accruing to the manufacturing firms.

The supplies of diesels and other lubricants necessary for aiding production should be made available by the government. This will in many ways smoothen production operative and reduces the possibility of any break down of machines.

Duties on importation of some necessary parts should also be reduced. Present rates of import duties also increase the costs incurred by manufacturing organisations leading to enormous costs of operations and loss.

BIBLIOGRAPHY

Asika, N. (2004) ***Research Methodology in the Behavioural Sciences***, Longman Ikeja, Nigeria

Brigham, E.F. Kahl, A.L. and Reitz, W.F. (1985) ***Canadian Financial Management***, Holt Rinehart and Winston, Toronto, Canada.

Colin, D. (1995) ***Management and Cost Accounting,*** 3ed. Chapman and Hall London.

Davidson, S et al (1986) ***Management Accounting***. An Introduction to Concept, Methods and Uses 2ed. The Dryden Press U.S.A.

Garrison, R.H. (1985) ***Managerial Accounting.*** Concept for Planning, Control and Decision Making 4ed. Business Publication Inc Plano Texas. U.S.A.

Gopalakrishnam, P. and Sundare, M. (1989) ***Material and Management Integrated approach***. Prentice Hall Inc Englewood Cliff, New Jersey.

Hadley, G. and Whitney, T.M. (1963) ***Analysis of Inventory System***, Prentice Hall Inc Upper Saddle River, New Jersey.

Heitger, L.E. and Matulich, S. (1980) ***Management Accounting*** McGraw-Hill Inc.

Helmkamp, J.C. Imdreke, L.F. and Smith, R.E. (1986) ***Principle of Accounting*** 2ed John Wiley and Son New York. U.S.A

Hilton, R.W. (1999) ***Management Accounting*** 4th ed McGraw Hill Inc, London.

Horngren, C.T., Foster, G. and Datar, S.M (2000) ***Cost Accounting,*** A Managerial Emphasis 10th ed. Prentice Hall Indian.

Ingram, W.R. Albright, L.T. and Hill, W.J (2001) ***Management Accounting***. Information for Decision 2nd ed. South West College U.S.

Kaplam, R.S and Atkinson, A.A. (1998) ***Advance Management Accounting*** Prentice Hall Inc. Upper Saddle River New Jersey. U.S.A.

Lamar, L.J and Dobler D.W. (1977) ***Purchasing and Material Management,*** Text and Cases. McGraw Hill Books New York U.S.A.

Lester, E.H. and Matulich, S. (1980) ***Managerial Accounting*** McGraw-Hill Inc. London.

Lotus, G.R. and Lotus, E.P. (1988) ***Essence of Statistics*** A.A Inc New York.

Loyce, C. and Gossage, E.D. (1984) ***Business Mathematics*** 3rd South-West Publishing Co. Cincinnati, Ohio, U.S.A.

Lucey, T. (2000) ***Management Accounting*** 4th ed. Letts Educational Aldine Palace, London.

Martins and et al(1979) ***Basic Financial Management*** Prentice Hall Inc Englewood Cliff, New Jersey.

Meigs, W.B. and Meigs, R.F. (1984) ***Accounting the Basis for Business*** Decision 6th ed McGraw Hill Inc.New York, U.S.A

Mosich, A.N. (1989) ***Intermediate Accounting.*** McGraw Hill Books New York, U.S.A.

Ndem ,A.A. (2005) ***Fundamentals of Research in Behavioural Science and Humanities,*** Wusen publishers C/Rivers Nigeria.

Needles, B.E., Handerson, H.R and Caldwell, J.C. (1988) ***Financial and Managerial Accounting*** Houghton Boston, U.S.A.

Needless, B.E. and Crosson S.V. (2002) ***Managerial Accounting***, Honghton Boston, U.S.A.

Obasi, I.N. (1999) ***Research Methodology in Political Sciences.*** Academy Publishing Co. Enugu.

Omolehinwa, E.O.(2006) ***Cost Accounting*** Rumark Nigeria ltd Lagos.

Osuala, E.C. (2004) ***Research Methodology*** 3rd ed . Africa Feb Publishers Nsukka, Nigeria.

Pandy, I.M. (1999) ***Financial Management*** 8th ed. Vikas Publishing House Pvt Ltd. New Delhi.

Peters,M.O.(2006) ***Cost Accounting*** *Gbabeks Publishing ltd Ibadan*

Rainborn, C. A. and Barfield, J.T. (1999) ***Introduction to Management Accounting***. South-west publishing Ohio, USA.

Rossel, J.A. & Frassure, W.W. (1986) ***Management Accounting*** Merril Books Inc Columbus Ohio, U.S.A.

Salihu, J.A. Oyebanji, J.O. (2005) ***Basic Issues in Research Methodology*** 3rd . Uni. Press Ilorin, Nigeria.

Sanders, W.B., Dreblin, A.R. and Burham, H. (1978) ***Management Accounting.*** An Introduction 3rd ed. W.B. Senders Co. New York, U.S.A.

185523

Seizer, J. (1969) ***An insight in Management Accounting*** Pengium Book Ltd, Middle-sex London,U.K.

Starr, M.K. and Miller, D.M. (1962) ***Inventory Control and Practice***. Prentice Hall Inc. Englewood Cliff New Jersey.

Van Horne, J.C. (1985) ***Financial Management*** and Policy Prentice Hall, New Delhi, India.

Weston, J.F. and Copeland, T.E. (1998) ***Managerial Financial*** 2nd ed. Cassel Educational Ltd, London, U.K.

Zahradeen, U.A. (2000) ***Research Methodology in Managerial Sciences*** 2nd ed. Munawwar Book Foundation, Kano.

APPENDIX A

Lists of operating manufacturing firms in Kaduna State

1. ABG Electronics Manufacturers Ltd Kaduna
2. Alcan Aluminium Co. Ltd Kaduna
3. Arewa Bottling Co. Ltd kaduna
4. Arewa Metal Containers Kaduna
5. Ardo Plastics (Nig) Ltd kaduna
6. Armeco Co. Ltd kaduna
7. A.Z. Furniturers Co. Ltd
8. Baka Foam Co. Ltd kaduna
9. Belphis Nig. Ltd Kafanchan
10. British American tobacco Co. Zaria
11. Brossette Manufacturing (Nig) Ltd kaduna
12. Chellco Industries Ltd kaduna
13. Cibi Nigeria Ltd kaduna
14. Coast Plastics Ltd kaduna
15. Cristal Hope Co. Ltd kaduna
16. Defence Industries Co. kaduna
17. EMCOM Zaria
18. First Aluminium Co. kaduna
19. Gaskiya Publishing Co. Zaria
20. General Metal Product Ltd Kaduna
21. Gora (Nig) Ltd Kaduna
22. Green Fingers Nig Ltd kaduna
23. Hospital Engineering Ltd Kaduna
24. IBBI Kaduna
25. Ideal Flour Kaduna
26. Inland Containers (Nig) Ltd kaduna
27. Jaffio Industries Ltd kaduna
28. Jamil youghout Kaduna
29. Kaduna Food (Ginger) Co. Ltd kaduna
30. Kaduna Alumiñium Kaduna
31. KFFC Ltd kaduna
32. KEMEF Kaduna
33. Lemaco Industries Kaduna
34. MAB Cables Industries Kaduna
35. Nice Top Paper Industries Kaduna
36. Nigerian Breweries Kaduna

37. Nigerian Automative Parts Co. Ltd kaduna
38. NOCACO Nig. Ltd Kaduna
39. Northern Nigeria Publishing Co. Zaria
40. R.H Plastics Co. kaduna
41. Rigidpak Containers Co. kaduna
42. Safa Foam Co. kaduna
43. Sandax Nig Ltd kaduna
44. Shempate Industries Kaduna
45. Solar foam Co. kaduna
46. SRC Co. kaduna
47. Stable Aluminium Co. Kaduna
48. Star Steel Ltd kaduna
49. Sunglass Co. kaduna
50. Sunseed Plc Zaria
51. Trow Flour Mills Zaria
52. Tower Galvanised Co. kaduna
53. United Nigeria Textiles Plc Kaduna
54. Unisteel Nig Ltd Kaduna
55. United Wires Products Co. kaduna
56. Universal Automobiles Parts Co. kaduna
57. Zaria Ginnery Zaria
58. ZIL Zaria

APPENDIX B

Dear Sir/Ma,

QUESTIONNAIRE

I am, Tauhid Suleiman, a post graduate student with the Department of Accounting, A.B.U Zaria. I am carrying out research on the Assessment of Inventory Management tools in the manufacturing organisations in Nigeria.

The study is purely an academic exercise. Therefore, all data and information collected will be use for the purpose and treated confidentially.

Direction: Please give your response in the appropriate space provided. Tick also correct alternatives where necessary.

Section A

1. Sex: a. Male ( ) b. Female ( )
2. In which department/section do you work in the organisation? .....
3. What position do you occupied?
4. How long have you being with the organisation? .....
5. In which category of the management do you belong in the organisation?
   a. Upper level ( ) b. Middle level ( ) c. Lower Level ( )

Section B

6. Which level of inventory appropriate for a firm? a. Maximum ( )
   b. Optimum ( ) c. Minimum ( )
7. Do your organisation have appropriate level of inventory? a Yes ( ) b. No ( )
8. Do Managers determine appropriate level of inventory for your organization? a. Yes ( ) b. No ( )
9. Is the inventory requisition constant throughout the period of operation in your organization? a. Yes ( ) b. No ( )

10. Do you have an operational inventory management tool in organisation?

a. Yes ( ) b. No ( )

11. Which inventory management tool is operational in your organization?

a. Qualitative ( ) b. Quantitative ( )

12. Do you consider the effectiveness of the present tool? a.

Yes ( ) b. No ( )

13. How often do you think appropriate to change the kind of inventory management tool in use? A.....Month B.....years

14. Is your present inventory management tool prerequisite for your successful operations? a.Yes ( ) b. No ( )

15. Is your inventory management tool relevant for effective inventory policy?

a.Yes ( ) b. No ( )

16. Do you consider all costs (Holding, ordering, stock out) in deterring appropriate inventory management tools for your organisation?

a. Yes ( ) b. No ( )

17. Which costs do you think is/are not relevant in the determination of appropriate inventory management tools for your organisation.

a. ordering cost ( ) b. Holding ( ) c. stock out ( )

18. Do the use of the present tool lead to costs reduction?

a. Yes ( ) b. No ( )

19. Do you think the present tool contribute immensely to revenue generation?

a.Yes ( ) b. No ( )

20. Do in appropriate inventory policy lead to loss of revenue?

a.Yes ( ) b.No ( )

21. Do organization experience any stoppage in production as a result of inappropriate inventory policy in use? a.Yes ( ) b.No ( )

22. Can inappropriate inventory policy lead to closure of organisation?

a.Yes ( ) b.No ( )