THE IMPACT OF INVENTORY MANAGEMENT ON THE PROFITABILITY OF FIRMS IN THE NIGERIAN PHARMACEUTICAL INDUSTRY

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(SPS/11/MAC/00022)

BEING A DISSERTATION SUBMITTED TO THE DEPARTMENT OF ACCOUNTING, BAYERO UNIVERSITY KANO, IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF MASTER OF SCIENCE (M.Sc.) DEGREE IN ACCOUNTING

NOVEMBER, 2015

DECLARATION

I hereby declare that, this work is the product of my own research efforts, undertaken under the supervision of Prof. Bashir Tijjani and has not been presented anywhere for the award of a degree or a certificate, except in partial fulfilment of the requirements for the award of Master of Science degree in Accounting, Bayero University Kano. All sources and materials used have been duly acknowledged in the references, and any act of commission or omission wasn't intentional and highly regretted.

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APPROVAL/CERTIFICATION

This dissertation entitled "The Impact of Inventory Management on the Profitability of Listed Firms in the Nigerian Health Care Industry" by Usman,RashidaDakyes has been read and approved as meeting the requirements for the award of Master of Science Degree in Accounting, Bayero University, Kano and is approved for its literary presentation and contribution to knowledge.

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ACKNOWLEDGEMENTS

All Praises are due to Allah the Almighty, most beneficent, most merciful to whom belongs whatever is in the heavens and the Earth and whatever lies between them. I am very grateful to Him for sparing my life and granting me good health, wisdom and fortitude to accomplish this task. I owe all my efforts and success unto Him. May Allah's peace and blessings be upon the noble Prophet Muhammad, his household and all those who follow his guidance till the day of Resurrection. Amen.

I am glad to use this opportunity to express my profound gratitude to all those, whose efforts have been helpful to me towards a successful accomplishment of this work. My sincere appreciation and gratitude goes to my supervisor, Prof. Bashir Tijjani, who, out of his tight schedule, found time to give me the necessary guidance and assistance, throughout the period of this research work. And to my Internal Examiner, Prof.Junaid Muhammad Kurawa, I extend my heartfelt appreciation for his constructive criticisms all the time, may Allah reward them all abundantly.

My special thanks also goes to all staff of the Department of Accounting, Bayero University, Kano for their support and priceless contributions towards the successful completion of this work.

I also appreciate the support and immense contributions of my course mates to the successful completion of this work, especially LukmanIsma'ilAdesina, an easy going gentleman who was ever ready to render any kind of support within his capability. My sincere appreciation also goes to our able class chairman, in person of AbdurRahmanSaheed (Alfa), who has worked diligently and tirelessly for the successful completion of our course work. To my colleagues and classmates, SaniSa'idu, Jameelu Umar, Umar Salisu and Ibrahim AliyuGololo, I extend my profound gratitude to them all. And to the rest of my classmates, too numerous to mention here, I say a big thank you. You are all wonderful!

I would also like to express my sincere appreciation to my Dearest and loving Husband, in person of Engr. Abubakar Usman Babuje for his uncommon patience, love and understanding, which really paved way for me towards the successful accomplishment of my coursework as well as this research work. May Allah (SWT) reward and crown all your efforts with a well-deserved success. I love you! To my little kids, Umm-kulthum, Fatima and Abdul-Samad, I appreciate and love you. May Allah (SWT) bless and keep you for me.

I would also like to express my appreciation to my dearest Mother, HajiaHabiba Ibrahim, for her love, care and support. What a priceless gift I have, I thank Allah for her. May He continue to keep, protect and bless her for me. To my late father, step mother, mother-in-law brother and sister, Mal. Usman Dakyes, MamanMinta, Mama Kaltume, Lawal and Rukayya and all other departed muslims, I pray for Allah's mercy upon their souls. May Allah (SWT) grant them and us AljannatulFirdaws.Ameen.

My profound gratitude and appreciation also goes to the family of Dr.Saminu I. Bala, of the Mathematical Science Department, Bayero University Kano. He really made my stay in Kano a joyful one, may Allah (SWT) continue to elevate him to greater heights. And to my aunty, HajiaBilkisu Ibrahim, I shower my countless appreciation to her. She gave me a motherly accommodation throughout the period of my research. I also extend my sincere appreciation to my dear friend and sister, HajiaZainabDanlami and family for their care, love and support. May Allah (SWT) reward you all abundantly and grant all your good desires in life.

Finally, my warm gratitude and appreciation goes to my brothers, sisters and well-wishers too numerous to mention here, for their prayers and words of encouragement all the time. May Allah (SWT) reward you. You are all great!

DEDICATION

I dedicate this work to my dear Mother, HajiaHabiba Ibrahim, a hard-working, caring and committed mother, who has been a source of inspiration to me. I pray for Allah's endless blessings and protection upon her throughout this life and beyond. Ameen.

TABLE OF CONTENTS

CONTENTS PAGE

COVER PAGE …… I

DECLARATION ……..…… II

APPROVAL/CERTIFICATION ……..... III

ACKNOWLEDGEMENTS …… IV

DEDICATION ……..……..……VI

TABLE OF CONTENTS ……..……..… VII

LIST OF TABLE ……..……..…….. X

ABSTRACT ……..…… XI

CHAPTER ONE ……..…….. 1

INTRODUCTION ……..……... 1

1.1 Background to the study ……..…….……. 1

1.2 Statement of the research problem ……..……... 9

1.3 Research objective ……..…….…….. 10

1.4 Hypotheses of the Study ……..……...…… 11

1.5 Significance of the Study ……..……..…… 11

1.6 Scope of the Study ……... 12

CHAPTER TWO ……..… 13

LITERATURE REVIEW ……. 13

2.1 Introduction …….. 13

2.2 Conceptual Framework ……... 13

2.3.1 Inventory Management Practices ……..…... 15

2.3.2 Challenges of Inventory Management ……. 21

2.4 Supply Chain Management (SCM) ……. 22

2.4.1 Fluctuations in the Supply Chain ……. 23

2.5 Demand Management ……..… 24

2.5.1 Independent and Dependent Demand ……...…... 24

2.5.2 Demand Forecast ……. 25

2.6 Inventory Stock-Out …… 25

2.7 Safety Stock ……. 26

2.8 Inventory Turns …… 27

2.9 Inventory Carrying Costs ……. 27

2.10 Classification of Inventory …… 28

2.11 Order Timing ……. 30

2.12 Reorder Point (ROP) System …… 31

2.13 Determination of Order Quantity ……. 32

2.14 Alternative Order Quantity Approach ……..…. 33

2.15 Warehousing …… 33

2.16 The Operating Cycle Concept ……. 35

2.17 The concept of Corporate Profitability ……..…….. 36

2.18 The Pharmaceutical Sector …….. 38

2.19 Review of Empirical Studies …… 39

CHAPTER THREE ……. 49

RESEARCH METHODOLOGY …… 49

3.1 Introduction …….. 49

3.2 Research design …… 49

3.3 Data collection methods ……. 49

3.4 Population of the study ……..…….…….. 49

3.5 Sampling and sample size …… 50

3.5 Variables and their measurement ……..…….……... 50

3.6 Techniques of Data Analysis ……. 52

3.7 Model of the Study ……. 54

CHAPTER FOUR …….. 56

RESULTS AND DISCUSSION ……. 56

4.1 Introduction ……..… 56

4.2 Descriptive Statistics of the Variables of the Study …….. 56

4.3 Correlation between the Variables of the Study ……..…….. 58

4.4 Impact of Raw Material Inventory Turnover Period on Profitability ……... 59

4.5 Impact of Work-in-Process Turnover Period on Profitability ……...62

4.6 Impact of Finished Goods Inventory Turnover on Profitability…….64

4.7 Impact of the Overall Inventory Turnover Period on Profitability ……..……. 66

CHAPTER FIVE …… 69

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS …….……. 69

5.1 Summary …….……. 69

5.2 Conclusions …….……. 73

5.3 Recommendations …… 74

REFERENCES ……..…… 75

APPENDIX …… 81

= LIST OF TABLES

Table 3.1: Sample size of the study …… 50

Table 3.2: Variables and their measurement ……..……..... 51

Table 4.1: Descriptive Statistics of the Variables ……... 57

Table 4.2: Correlation Coefficients of the Variables …….. 58

Table 4.3: Regression Results of the Impact of Raw Material Inventory Days on Profitability …… 60

Table 4.4: Regression Results of the impact of Work-in-Process inventory turnover on Profitability …….…… 62

Table 4.6: Regression Results of the impact of Finished Goods Inventory Turnover on Profitability …….…… 64

Table 4.7: Regression Results of the impact of the Overall inventory turnover period on Profitability …… 66

ABSTRACT

This study examines the relationship between Inventory Management, specifically, the discrete components of inventory and firm Profitability for the Nigerian Pharmaceutical sector. The study is carried out based on the historical panel data analysis. To achieve the objective of this study, an ex-post factor research design was employed. Data was generated from secondary sources, specifically, the annual reports and accounts of quoted pharmaceutical firms from 2004 to 2013 and the Nigerian Stock Exchange Fact book. Descriptive statistics, Pearson correlation as well as multivariate regression techniques were utilized as tools of analysis in this study. The study revealed that Inventory Management affects the profitability of Nigerian Pharmaceutical companies significantly.The significant relationships found among all the discrete components of Inventory and profitability, evidenced by lower p values and higher t values, implied good inventory turnover for the studied companies. The study recommends that pharmaceutical companies in Nigeria should sufficiently plan and control their operations as regard proper management of the different components of inventory and to utilize the services of professionals in complex business areas especially in the use of modern sophisticated inventory management techniques such as the Just-in-Time, Material Requirement Planning, and The ABC inventory categorization and so on in order to maintain the tempo and remain competitive both locally and internationally.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Inventory represents one of the most important assets that most businesses possess, because the turnover of inventory represents one of the primary sources of revenue generation and subsequent earnings for the company's shareholders/owners.A business's inventory is one of its major assets and represents an investment that is tied up until the item is sold or used in the production of an item that is sold.In the cost structure of most of the manufacturing concerns, the cost of materials exceeds 50% of the total cost (Ramakrishna, 2005 cited in Monday, 2012). Such a large investment requires considerable planning and control of materials so as to minimize wastage which invariably affects the performance of organisations. According to Muller (2003), inventory brings with it a number of costs. These costs can include:Dollars/cash, Space,Labour to receive, check quality, put away, retrieve, select, pack, ship, deterioration, damage, obsolescence, theft and so on. Thus, the management of these materials so as to reduce the costs associated with them is what the study refers to as Inventory Management.

Inventory Management encompasses all operations management functions from purchasing of raw materials through the production processes to the final delivery of the end products. It deals with the overseeing and controlling of the ordering, storage and use of components that a company will use in the production of the items it will sell as well as the overseeing and controlling of quantities of finished products for sale. Inventory Management is a tool to optimize performance in meeting customer service requirements at the same time adding to profitability by minimizing costs and making the best use of available resources. The basic objective of inventory Management as explained by Banjoko (2000) and Jacobs, Chase &Aquilano(2009) is to ensure that the right item is bought and made available to the

manufacturing operations at the right time, at the right place and at the lowest possible cost. They stressed that adequate planning for materials resources is an indispensable factor for the overall performance of an organization.Effective inventory management entails holding an appropriate amount of inventory. Too much inventory consumes physical space, creates a financial burden, and increases the possibility of damage, spoilage and loss. On the other hand, too little inventory often disrupts business operations, and increases the likelihood of poor customer service (Dimitrios, 2008).

Every enterprise, be it big, medium or small needs finance to carry on its operations and to achieve its target. Materials management is one tool that can be used effectively in promoting profit maximization in a company. The objective of materials management is to maximize the use of the firms' resources by ensuring adequate supply of materials for production process and also minimizingcost of holding excessive inventories (Ogbadu, 2009). This objective when achieved, leads to cost reduction and improve profitability.It is pragmatically evident that the profitability of any business organization depends largely on the ability of management (of the concerned organisation) to exercise efficient purchasing and inventory control (Egberi&Egberi 2011). However, the problem of most companies is the lack of "know- how" in this area of business operation, which has been responsible to many business failures. Furthermore, most Organizations have difficulty in maintaining the right quantity of inventory for optimal productivity, growth and profitability due to poor vision, inadequate market forecast and effective planning. The result has been either under or over-capacity utilization which often spell doom on the corporate existence of such organization. Any industry that fails to observe the rule of Inventory Controland Management, is heading towards a doom.

Businesses in the Nigerian manufacturing sector have wobbled over the years due to lack of adequate management commitment to timely funding of materials procurement coupled with unethical practices of some executives (Oba 2008 in Monday2012). According to a survey carried out in 2010 by the Manufacturers Association of Nigeria (MAN), 834 manufacturing companies have shut down their operations in 2009 across the country due to high manufacturing costs created by exorbitant price of raw materials among other reasons (Adeloye 2010 in Monday2012). The few surviving manufacturing firms are faced with stiff competition in the current markets. This has led to the need for effective managing and measuring how material resources are utilized by various jobs or products, and therefore be able to eliminate any wastage in the value chain. The researcher, therefore, intends to studyprofitability through effective management of inventory using quoted firms in the Nigerian pharmaceutical industry.

1.2 Statement of the Research Problem

Effective inventory flow management in supply chains is one of the key factors for success. The goal of inventory management is to balance the supply of inventory with demand. A company would ideally want to have enough inventories to satisfy the demands of its customers that is, no lost sales due to inventory stock-outs. On the other hand, does not want to have inventory glut, due to cost of carrying inventory. Enough but not too much is the ultimate objective (Coyle, Bardy& Langley 2003). Many manufacturing firms have an excessive amount of cash tied up to accumulation of inventory sitting for a long period of time due to poor inventory management practices or inability to control the inventory efficiently (Monday 2012). Although a lot of studies have been conducted in the area of Operational Management in Nigeria, most of these studies centred on Working Capital Management and firm performance/profitability. These studies include Owolabi&Alu

(2012); Ani, Okwo&Ugwunta (2011); Paul &Agbo (2014); Nwidobie (2012), Osundiba (2014) andFalope&Ajilore (2009). All these studies investigated the impact of working capital management on firms' performances using different sectors of the Nigerian manufacturing industry. Inventory management, which constitute a larger portion of working capital management, has only been investigated to a limited degree.Adeyemi& Salami (2010) whose study employed variance analysis, the EOQ model and the chi-square methods to determinewhether or not inventories in the Nigeria Bottling Company, Ilorin Plant can be evaluated and understood using thevarious existing tools of optimization in inventory management.Their findings revealed that the companyoperates a policy of making orders on a quarterlybasis within a period of one year and that the company does notalways adopt the EOQ model in placing ordersfor its raw materials and this account for thevariations between the calculated EOQ and theexpected order sizes of the company. For at leastthree years out of the five years under study, theexpected value was greater than the observedvalue for each product. This implies that theNigeria Bottling Company, Ilorin Plant has excess investment in inventory. It was also observed that there was a positive correlation between sales andinventory usages. This means assales increases, inventory usages should also beon the increase.AbdulRaheem, Isiaka&Aliu (2011), assessed inventory management in selected small businesses in Kwara State of Nigeria. Regression model was employed to measure the effect of inventory value on profitability over a period of ten years; the study revealed that a naira change in stock would cause almost a naira (92 kobo) change in the profitability of the selected businesses. This result indicated a strong positive relationship between inventory management and profitability of the sampled companies.Egberi&Egberi (2011), studied the link between efficient inventory management and organizational productivity, and by extension, profitability using Eternit Limited as a case study. The study spotlighted the objectives of inventory control,

characteristics of good inventory control and symptoms of poor inventory control. A well-structured questionnaire was designed and used as instrument for data collection. The population of the study comprised 216 members of staff out of which 140 respondents were randomly selected. Two hypotheses were formulated. Tables, Simple Percentage and Chi- Square were the statistical tools adopted for data analysis and interpretation. The findings revealed among others that there is significant relationship between inventory control and profitability; as well as a significant relationship between inventory control and cost of production; Monday (2012) whose empirical analysis focused on the Nigerian Bottling Company Plc (NBC), being one of the largest manufacturing firms in Nigeria. Data was collected through a structured questionnaire, supported by interview. Using Chi-square ($\chi 2$) test of independence, the results provided evidence of a positive significant relationship between efficient Materials Management and firm success. The implication of this is that through efficient management of materials, a manufacturing firm can achieve significant cost saving, improvement in production efficiency, and increase in profitability.

Ogbo, Onekanma& Wilfred (2013) who generated and tested four research questions and four hypotheses at 10% significance level using descriptive statistics and non-parametric test. The result of the analysis showed that flexibility in inventory control is an important approach to achieving organizational performance. It was found that organizations benefits from inventory control by way of easy storage and retrieval of material, improved sales effectiveness and reduced operational cost. The study also found that there is a relationship between operational feasibility, utility of inventory control in the customer related issues of the organization and cost effectiveness technique are implemented to enhance the return on investment in the organization. Effective inventory control is recognized as one of the areas

that management of any organization should acquire capability. It is recommended that organizations should adopt the inventory management method that best suit their operations.

All of the above studies examined inventory management and financial performances of firms in different sectors of the Nigerian economy. To the best of the researcher's knowledge, no research has so far been conducted on the impact of inventory management on firm's financial performance in the Nigerian Pharmaceutical sub-sector, being one of the key sectors in the Nigerian manufacturing industry. More importantly, no local study has so far investigated the impact of the discrete components of inventory managementi.e Raw materials, Work in Process and Finished goods on the financial performance of firms in Nigeria. The essence of this categorization is to monitor inventory at every stage of production and to inform management about different degrees of control to place on each category.Therefore, the intention of this research is to evaluate the impact of inventory management, using Inventory Turnover Period (in days) for Raw Material, Work-in-Process and Finished Goods – (RMD, WIPD and FGD) on the financial performance of firms inthe Nigerian Pharmaceutical industry in order to fill this gap.

1.2 Research Objectives

The primary objective of conducting this research is to evaluate the impact of inventory management on the profitability of quoted firms in the Nigerian Pharmaceutical sub-sector. To achieve this objective, the following specific objectives were developed as guide to the study:

i. to examine the impact of Inventory Turnover Period (in days): Raw Material Days, Work-in-Process Days and Finished Goods Dayson the firms' Return On Investment (ROI)

ii. to examine the impact ofInventory Turnover Period (in days): Raw Material Days, Work-in-Process Days and Finished Goods Days on the firms' Gross Profit Margin (GPM)and

iii. to examine the impact of Inventory Turnover Period (in days):Raw Material Days, Work-in-Process Days and Finished Goods Days on the firms'
Net Profit Margin (NPM)

1.4 Hypotheses of the Study

Based on the above stated objectives, the following null hypotheses were developed:

H_{O1}: there is no significant effect of the discrete components of inventory management on the ROI of listed pharmaceutical firms

H_{O2}:there is no significant effect ofthe discrete components of inventory management on the GPM of listed pharmaceutical firms

H_{O3}: there is no significant effect of the discrete components of inventory management on the NPM of listed pharmaceutical firms

1.6 Scope of the Study

This study centres on the relationship between Inventory Management and the Profitability of Nigerian Pharmaceutical companies. The study specifically considers the relationship between Raw Material Inventory Days (RMD), Work in Process Inventory Days (WIPD) and Finished Goods Inventory Days (FGD) as Inventory Management proxies and Return on

Investment (ROI), Gross Profit Margin (GPM) and Net Profit Margin (NPM) as Profitability Proxies. The study covers a ten year period from 2004 to 2013.

1.5 Significance of the Study

The purpose of conducting this research specifically is to investigate theimpact of inventory management practices on the financial performance of listed companies in the NigerianPharmaceutical Industry. The research is expected to be of immense benefit to many. This study will be of great relevance to the firms under study as well as other players in the manufacturing industry in setting up better inventory management policies for better performance. To the body of existing literature, this study is no doubt a plus because, to the best of the researcher's knowledge, no study has so far examined the effect of the individual components of inventory on profitability. Also, it is the first to consider the pharmaceutical sector. Production and Financial managers will benefit from this study as they play very important role in the management of inventory with a view to driving profitability for the success of their companies. Shareholders, investors and financial analysts will also find this study useful in evaluating their investment decisions. It will hopefully assist financial managers in planning and designing policy relating to credit purchase and credit sales on the basis of inventory management.The study will also contribute to the existing literature and serveas a reference material in the field of operations management, especially with regards to the role of effective Inventory Management policies in enhancing firms' financial performance.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter reviews relevant literatures concerning the subject matter. It covers conceptual issues on inventory management as well as some empirical findings of previous research works.

2.2 Conceptual Framework

2.3 The Concept of Inventory Management

Inventory management is the process of efficiently overseeing the constant flow of units into and out of an existing inventory. This process usually involves controlling the transfer in of units in order to prevent the inventory from becoming too high, or dwindling to levels that could put the operation of the company into jeopardy. It encompasses all operations management functions from the purchase of raw materials, through the production processes to the final delivery of finished products to end users.

Effective inventory management is essential in the operation of any business (Bassin, 1990). Inventory as an asset on the balance sheet of companies has taken on increased importance because many companies are applying the strategy of reducing their investment in fixed assets, like plants, warehouses, equipment and machinery, and so on, which even highlights the significance of reducing inventory (Coyle, Bardi& Langley 2003). Changes in inventory levels affect return on assets (ROA), which is an important financial parameter from an internal and external perspective. Reducing inventory usually improves ROA, and vice versa if inventory goes up without offsetting increases in revenue (Coyle, Bardi&Langley 2003).

Inventory or stocks are a crucial make-up of current assets. Manufacturing firms usually contain in their inventory: raw materials, works in progress or finished goods. In most cases, it is a balancing to keep inventory for sales and having less inventory to improve working capital. When there is less stock and a customer's demand has to be met immediately, the company will lose out on revenue if the customer's demand is not met. On the other side, holding too much inventory will have an opportunity cost and may give rise to obsolescence. The management of inventory is one of the most difficult tasks for working capital managers who, if they may well decide, would like to reduce the inventory to the extent that will possibly shorten the C2C cycle and decrease costs. The danger of reducing an inventory downwards to a stage close to zero is that it increases the chance of running out of resources required in the production or running short of finished goods at some point in a high demand. Such condition would be expensive for every company because of the revenues they would lose (Maness &Zietlow, 2005).

The average number of days of inventories stands for the time that goods are held by the firmsbefore they are sold. To assist cut down the C2C cycle, a lower number of days are better. The average quantity of inventory is received by taking the sum of the opening and closing balance of inventory for a year, and divide by two, to obtain the average. The average amount of inventory is then divided by the cost of goods sold to observe how much part of cost goods sold that comes from the inventory. In order to get the outcome of the C2C cycle in days the amount given is multiplied by the average amount of days in a year, usually 365days (Rimo&Panbunyuen, 2010). The most important recognition factor of the Working Capital Management is inventory turnover (especially in manufacturing companies). Research conducted by Padachi (2006) shows that about 67% of the time between cash outflow from purchase of goods to cash inflow from the sale of goods depends on the

inventory turnover. We can say that manoeuvre power of companies in accounts receivable period and accounts payable period is much lower than inventory turnover. Because firms can easily reduce this period using advanced technologies and modernization and have tried to lower the C2C cycle which will lead to increased Return on Assets (Padachi 2006).

2.3.1 Inventory ManagementPractices

More and more manufacturers and distributors are starting to understand that adopting the best practices in inventory management is very important if they want to survive these tough economic times (Bai&Zhong 2008). A business owner who encounters different issues, such as delayed customer orders, inaccurate inventories and high return processing costs, should look into inventory management best practices to understand how to make the most out of implementing them. Among these practices include:

i. **Just-In-Time (JIT) and Lean Production.**

JIT is a Japanese management philosophy which has been applied in practice since the early 1970's in many Japanese manufacturing organisations (Javadian, Nagendra&Fooladi 2013). It was first developed and perfected within the Toyota manufacturing plants by TaichiiOhno as a means of meeting consumer demands with minimum delay (Goddadrad, 1986 in Javadianet al, 2013). For this reason, TaichiiOhno is frequently referred to as the father of JIT. The Toyota production plants were the first to introduce JIT. It gained extended support during the 1973 oil embargo and was later adopted by many organisations.

Just-In-Time (JIT) is a very simple idea but one that is essential in modern supply chain management. JIT sets out to cut costs by reducing the amount of goods and materials a firm holds in stock. JIT involves:producing and delivering finished goods 'just in time' to be sold;partly finished goods 'just in time' to be assembled into

finished goods;parts ‘just in time’ to go into partly finished goods; andmaterials ‘just in time’ to be made into parts.

The principle that underpins JIT is that production should be ‘pulled through’ rather than ‘pushed through’. This means that production should be for specific customer orders, so that the production cycle starts only once a customer has placed an order with the producer. Stocks are delivered when they are needed. Consequently, this approach requires much more frequent delivery of stocks. Developing a JIT approach requires sophisticated planning and considerable experience in this field. This is why leading companies contract out their supply chain management to a specialist company with considerable experience of this area.Just-In-Time is the key element in what is termed lean production. Lean production is a philosophy and a way of working involving eliminating all forms of waste (where waste is defined as anything that does not add value in the production process and supply chain).

The idea behind lean production stems from Japan where for many years supply chain managers have been seeking to eliminate ‘muda’ i.e any activity which involves wasted effort, materials and time. Exel is particularly effective in ensuring lean production because it is able to reduce ‘muda’ at every stage in the supply chain from designing efficient warehousing systems, to sophisticated tracking methods in freight forwarding, developing e-commerce links, and cutting out any wasteful processes at any stage of distribution.

A further advantage of JIT is the benefit derived from eliminating line-side storage of parts and the associated “clutter” which inhibits efficient movements to/from the production line. By reducing the storage of parts at the production line, a manufacturer is often able to increase the speed of the production line and produce

more cars with the same number of resources, lowering the overall unit cost of production.

ii. Material Requirements Planning (MRP)

Material Requirements Planning (MRP) is a computer-based production planning and inventory control system. MRP is concerned with both production scheduling and inventory control. It is a material control system that attempts to keep adequate inventory levels to assure that required materials are available when needed. MRP is applicable in situations of multiple items with complex bills of materials. MRP is not useful for job shops or for continuous processes that are tightly linked.

The major objectives of an MRP system are to simultaneously:

1. Ensure the availability of materials, components, and products for planned production and for customer delivery,
2. Maintain the lowest possible level of inventory,
3. Plan manufacturing activities, delivery schedules, and purchasing activities.

Sahari, Tinggi&Kadri (2012) in their survey of inventory management practices of Malaysian Construction Firms noted that MRP is especially suited to manufacturing settings where the demand of many of the components and subassemblies depend on the demands of items that face external demands. Demands for end items are independent,in contrast, demand for components used to manufacture end items depend on the demands for the end items. The distinctions between independent and dependent demands are important in classifying inventory items and in developing systems to manage items within each demand classification. MRP systems were developed to cope better with dependent demand items.

The three major inputs of an MRP system are the Master Production Schedule (MPS), the product structure records, and the inventory status records. Without these basic inputs the MRP system cannot function. The demand for end items is scheduled over a number of time periods and recorded on a master production schedule (MPS). The master production schedule expresses how much of each item is wanted and when it is wanted. The MPS is developed from forecasts and firm customer orders for end items, safety stock requirements, and internal orders. MRP takes the master schedule for end items and translates it into individual time-phased component requirements. The product structure record, also known as bill of material records (BOM), contains information on every item or assembly required to produce end items. Information on each item, such as part number, description, quantity per assembly, next higher assembly, lead times, and quantity per end item, must be available. The inventory status records contain the status of all items in inventory, including on hand inventory and scheduled receipts. These records must be kept up to date, with each receipt, disbursement, or withdrawal documented to maintain record integrity.

MRP will determine from the master production schedule and the product structure records the gross component requirements; the gross component requirements will be reduced by the available inventory as indicated in the inventory status records.

iii. The ABC Analysis

According to Heizer, and Robert (2006), **ABC analysis** divides on-hand inventory into three classifications on the basis of annual dollar volume. ABC analysis is an inventory application of what is known as the **Pareto principle**. The Pareto principle states that there are a "critical few and trivial many." The idea is to establish inventory policies that focus resources on the few criticalinventory parts and not the many trivial ones. It is not realistic to monitor inexpensive items with the same intensity as

very expensive items. According to Bloomberg et al. (2002), inventory classification systems help allocate time and money in inventory management and allow firms to deal with multiple product lines and multitude of stock-keeping units (SKU). The most widely used classification model is ABC analysis. ABC analysis is an inventory classification technique in which the items in inventory are classified according to the value generated in annual sales (Fuerst, 1981).

According to Onwubolu and Dube (2006), when ABC analysis is applied to an inventory situation, it determines the importance of items and the level of control placed on the items. The ranking is determined by two factors, the usage rate for an item and its unit value. These two factors can be multiplied to give the annual usage value (AUV), which is the total value of the annual usage. The bigger each factor, the more top ranking is the item. Therefore, close control is more important for fast moving items with a high unit value. To the contrary, for slow moving, low unit value items the cost of the stock control system may exceed the benefits to be gained and simple methods of control should be substituted.

By dividing a company's inventory into different classifications-A, B, or C, Onwubolu et al. (2006) indicates that managers can focus on the items that account for the majority of the inventory. Heizer and Robert 2006, describe generally the class A items as those on which the annual doller volume is high. Although such items may represent only about 15% of the total inventory items, they represent 70% to 80% of the total dollar volume usage. Class B items are those inventory items of medium annual dollar volume. These items may represent about 30% of inventory items and 15% to 25% of the total value. Those with the least annual dollar volume are the C class, which may represent only 5% of the annual dollar volume but about 55% of the

total inventory items. Onwubolu et al. (2006) also mentioned, when we are doing an ABC classification, different types of inventory should be analyzed separately, such as, finished goods analysis is done separately from raw materials.

2.3.2 Benefits and Pitfalls of ABC Analysis:

Onwubolu and Dube (2006) further stated that the advantage of dividing inventory items into classes allows policies and controls to be established for each class. Policies that may be based on ABC analysis include the following:

(a) The purchasing resources expended on supplier development should be much higher for individual A items than C items.

(b) A items should have tighter physical inventory control; perhaps they belong in a more secure area, and perhaps the accuracy of inventory records for A items should be verified more frequently.

(c) Forecasting A items may warrant more care than forecasting other items. Better forecasting, physical control, supplier reliability, and an ultimate reduction in safety stock can all result from inventory management techniques such as ABC analysis.

But Fuerst, (1981) argued that there are also some pitfalls of ABC analysis:

1. Although an item is classified as a C item, this does not necessarily mean that this item can (or should) be eliminated from the product mix. For example, a retail establishment may not be able to eliminate a particular item even though it is a C item because customers expect to be able to purchase that item in that store.
2. In manufacturing endeavours, a stock-out of a C item may cause serious delays in the completion for a finished product.

3. Some inventory situations do not lend themselves to classification. If the inventory situation does not reasonably reflect the underlying basis of the ABC techniquei.ethe "important few" and the "trivial many", then such a technique should not be employed. As Onwubolu and Dube (2006) emphasized that inventory management techniques should address two important questions: (i) when to order, and (ii) how much to order.

iv. Vendor Managed Inventory (VMI)

Vendor Managed Inventory or VMI is a process where the vendor creates orders for their customers based on demand information that they receive from the customer. The vendor and customer are bound by an agreement which determines inventory levels, fill rates and costs. This arrangement can improve supply chain performance by reducing inventories and eliminating stock-out situations. Put in another way, VMIis a means of optimizing Supply Chain performance in which the manufacturer is responsible for maintaining the distributor's inventory levels (Wikipedia). The manufacturer has access to the distributor's inventory data and is responsible for generating purchase orders.

Unlike under the typical business model, when a distributor needs product, they place an order against a manufacturer. The distributor is in total control of the timing and size of the order being placed i.e the distributor maintains the inventory plan. Under VMI model however, the manufacturer receives electronic data (usually via EDI or the internet) that tells him the distributor's sales and stock levels. The manufacturer can view every item that the distributor carries as well as through Point of Sales (POS) data. The manufacturer is responsible for creating and maintaining the inventory plan. One of the keys to making VMI work is shared risk. In some cases, if the inventory does not sell, the vendor (supplier) will repurchase the product from the buyer (retailer). In other cases, the product may be in the possession of the retailer but is not owned by the retailer until the sale takes place, meaning

that the retailer simply houses (and assists with the sale of) the product in exchange for a predetermined commission or profit (sometimes referred to as consignment stock).

Under this system, all parties involved stand to benefit in one way or another. Vendors benefit from more control of displays and more customer contact for their employees; retailers benefit from reduced risk, better store staff knowledge (which builds brand loyalty for both the vendor and the retailer), and reduced display maintenance outlays. Consumers benefit from knowledgeable store staff, who are in frequent and familiar contact with manufacturer (vendor) representatives when parts or service are required. Store staffs have good knowledge of most product lines offered by the entire range of vendors. They can help the consumer choose from competing products for items most suited to them and offer service support being offered by the store.

From the foregoing deductions made by previous studies, it can be agreed beyond reasonable doubt, that for any business especially a manufacturing one to excel, adequate attention need to be given to proper management of inventory being a greater component of the working capital.

2.3.3 Challenges of Inventory Management

The wholesalers and retailers that are major actors involved in downstream distribution channels face a special challenge in keeping inventory at reasonable levels due to the difficulty of forecasting demand and expectations of customers about product availability (Coyle et al., 2003). The challenge grows even bigger when we think about the diversity of products in terms of their colour/design, package type, size and so on. To further explain the problem, we assume there is an accurate demand forecast; however, the aggregate demand needs to be broken down by various specifications of the product into sub-total demand forecast to guide the stock keeping units (SKUs) in the company in order to fulfil the final

customer's order. But the sub-total demand forecasts could be diverse, reaching dozens, hundreds, or even thousands of categories; in that case, they become truly difficult, complex and time-consuming. The difficulty of forecasting demands accurately naturally results in two problems, which are in opposite extreme, overstock and stock-out of inventory. As companies strive to avoid lost sales from stock-out of inventory, there is a tendency to overstock. Nevertheless, because keeping inventory is costly which definitely reduces the profit margin, companies try to reduce the inventory level, so appears the tendency to stock-out of inventory. We can get an overview of inventory management dilemma, where two opposing powers keep pulling the inventory towards their own direction. It is hard to balance the two powers all the time and station the inventory at the right level constantly.

2.4 Supply Chain Management (SCM)

The term "supply chain management" has become a popular buzzword, probably first used by consultants in the late 1980s and then analysed by the academic community in the 1990s (Burt, Dobler& Starling, 2003 in Bai and Zhong, 2008). Supply chain management is a set of approaches utilized to effectively integrate suppliers, manufacturers, logistics, and customers for improving the long-term performance of the individual companies and the supply chain as a whole (Chopra and Meindl, 2001 in Bai and Zhong, 2008). In other words, Supply Chain Management could be seen as the management of the interconnections of organisations that relate to each other through upstream and downstream linkages between the processes that produce value to the ultimate consumer in the form of products and services (Slack, Chambers and Johnston 2010 in Porter, 2011). Supply Chain Management includes the link between upstream (such as supply and manufacturing), and downstream (such as logistics and distribution) value chain entities. Activities in the supply chain include sourcing materials and components, manufacturing products, storing products in warehouses and distributing products to customers. The management of the supply chain involves the

coordination of the products through this process which will include the sharing of information between interested parties such as suppliers, distributors and customers. Successful supply chain management requires the integration of these value chain entities to create cooperative and collaborative environments that facilitate information exchanges, materials and cash flows (Kukalis, 1989).

2.4.1 Fluctuations in the Supply Chain

The behaviour of supply chains that are subject to demand fluctuations has been described as the 'bullwhip effect' and occurs when there is a lack of synchronisation in supply chain members, when even a slight change in consumer sales will ripple backward in the form of magnified oscillations in demand upstream (Porter, 2011). The bullwhip effect occurs because each tier in the supply chain increases demand by the current amount, but also assumes that demand is now at this level, so increases demand to cover the next week also. Thus, each member in the supply chain updates their demand forecast with every inventory review.

According to Porter 2011, there are other factors which increase variability in the supply chain. These include a time lag between ordering materials and getting them delivered, leading to over ordering in advance to ensure sufficient stock are available to meet customer demand. Also, the use of order batching i.e when orders are not placed until they reach a predetermined batch size can cause a mismatch between demand and the order quantity. Price fluctuations such as price cuts and quantity discounts also lead to more demand variability in the supply chain as companies buy products before they need them. Porter, 2011 also noted that the bullwhip effect or supply chain variability can be limited chiefly, by proper sharing of information amongst members of the supply chain. All members of the supply chain should recognise that they can gain more if they act as a whole, which requires trustful collaboration and information sharing.

2.5 Demand Management

Demand managementmay be thought of as “focused efforts to estimate and manage customers’ demand, with the intention of using this information to shape operating decision.” (Blackwell & Blackwell, 1999; cited in Coyle,Bardi and Langley 2003).

2.5.1 Independent and Dependent Demand

Independent demand is that whose usage is based on external market requirements rather than related to other items’ demand. The market demand for consumer goods is a typical example of independent demand. Dependent demand is determined by the requirements of other items in the manufacturing process. The requirement of components or parts is based on the demand for the finished products (Toomey, 2000). The inventory corresponds to independent demand is called distribution inventory/ finished product inventory, while dependent demand inventory is known as manufacturing inventory/raw material inventory and work-in-process (WIP) inventory (Simchi-Levi, Kaminsky, Simchi-Levi, 2004 and Toomey, 2000 in Bai and Zhong, 2008).

Inventory is kept to meet demand, in light of dependent demand and independent demand, different approaches to managing inventory should be applied to align inventory supply with demand. Just-in-Time (JIT) approach and Materials Requirements Planning (MRP) system are typically associated with managing manufacturing inventory to serve dependent demand. Cross-docking is a typical approach for managing distribution inventory efficiently. Nevertheless, Vendor-managed-inventory (VMI) approach is applicable both for manufacturing inventory and distribution inventory.

2.5.2 Demand Forecast

Sufficient data result in more effective forecasts. The traditional way to forecast demand is to refer to the historical record of demand. All forecasting techniques are characterized by the fact that the more data are observed, the more we modify the estimates of the average demand and demand variability, and the more accurate these predictions can be (Simchi- Levi et al., 2004). Of course, forecasts are never completely accurate. Indeed, the following rules of forecasting hold (Nahmias, 1997; cited in Simchi-Levi et al., 2004):

1. The forecast is always wrong. It is very unlikely that actual demand will exactly equal forecast demand.
2. The longer the forecast horizon, the worse is the forecast. A forecast of demand far in the future is likely to be less accurate than a forecast of near-future demand.
3. Aggregate forecasts are more accurate.

2.6 Inventory Stock-Out

Stock-out is a situation in which the demand or requirement for item/items cannot be fulfilled from the current inventory.A stock-out or out-of-stock (OOS) event is an event that causes inventory to be exhausted. While out-of-stocks can occur along the entire supply chain, the most visible kinds are retail out-of-stocks in the fast moving consumer goods industry. Stock-outs are the opposite of overstocks where too much inventory is retained.

If stock-out occurs, different scenarios will happen. Subject to distribution inventory stock-out or manufacturing inventory stock-out, the impact on the supplier and the customer is different in terms of extent and scale, i.e. the impact is greater and more serious for one party than the other one. So the attitude toward stock-out varies accordingly. For instance, if there is a manufacturing inventory stock-out in the manufacturing companies like Ford and Toyota, the result is critical. The production line will be shut down and start-up costs are very high.

Hence such stock-out is prohibited. In case of distribution inventory stock-out, the impact on the customer is usually not big and serious, e.g. it is not a big deal when consumers encounter such a stock-out, therefore their counterparts-the suppliers, such as wholesalers and retailers, tolerate stock-outs. When a supplier is unable to satisfy demand with available inventory, one of four events may occur: (1) the customer waits until the new replenishment arrives; (2) the customer back orders the product; (3) the sale is lost; (4) the customer is lost (Coyle, Bardi and Langley 2003). For most companies, the four results are listed from best to worst in terms of the impact.

2.7 Safety Stock

According to Toomey (2000), safety stock is one kind of inventory which can protect against fluctuations in demand or supply. And he also indicated that 'the quantity of safety stock is built into the reordering system's calculation in a manner that the inventory is not planned for consumption under normal (perfect) circumstances.'(Toomey, 2000, p.47) Because of the situation of uncertainty in demand or delays in lead time or inadequate delivery, the company needs a small amount of safety stock on hand. In other words, the basic function of safety stock is to avoid stock-outs. Another reason for setting safety stock is it could affect customer service level. When the actual order quantity from the customer is more than prediction, the safety stock needs to be held to avoid customer service problems (Krajewski&Ritzman, 2002). But Bloomberg et al. (2002) argued that the customer service levels vary by industries which mean the customer acceptance for stock-out is different.

The setting of safety stock will base on the trade-off between service level and inventory investment. The quantity of safety stock should cover more than normal demand during the replenishment lead time. There are some parameters that should be considered when calculating the suitable quantity of safety stock, such as recent demand needs, lead time and the target service level (Krajewski and Ritzman 2002).

2.8 Inventory Turns

Inventory turns indicates the number of times per year the companies such as retailers and manufacturers are able to sell off or use up their complete inventory of raw materials or finished goods (Coyle, Bardi and Langley 2003). To maximize sales with the least amount of inventory, the company should try to meet demands by ordering smaller quantities more frequently from the suppliers, thus achieving more inventory turns, which refer to the annual number of times that average inventory sells (Goldsby and Martichenko 2005). The inventory turns can be expressed mathematically as:

Inventory turns = Sales volume at cost/Value of average inventory.

Increasing inventory turns means the company is holding fewer inventories on average, at the same time being able to fulfil the customer demand. The company's finance desires to reduce inventory, increase inventory turnover, and yield high capital return on assets (Coyle, Bardi and Langley 2003). But the company should note that there is no such a conclusion that the more inventory turns, the better the inventory policy. Again, individual company should recognize an appropriate number in their best interest.

2.9 Inventory Carrying Costs

There are costs associated with holding all inventories, and the costs go beyond the expenditure of the inventory investment, inventory carrying costs form an interesting concept, representing both accounting costs and economic costs (Goldsby, and Martichenko 2005). Accounting costs are explicit and call for a cash payment. Economic costs are implicit, not necessarily involving an outlay but rather an opportunity cost. The components of inventory carrying cost include the following:Capital cost i.e. inventory investment, inventory service costs e.g insurance and taxes, inventory risk costs e.g obsolescence, damage, pilferage, relocation costs, Storage space costs e.g warehouses.

The capital cost is the single biggest factor of inventory carrying cost. It is opportunity cost; to clarify its sense, just think about what else could be done with the amount of capital if it were not tied up in inventory? Inventory is viewed as an asset on the balance sheet; hence, many state governments impose property tax rates on inventory. Insurance premiums are paid to provide coverage against loss or damage to inventory. Obsolescence reflects the real possibility that inventory value may decline in the course of being kept. Storage costs in this figure just refer to variable costs of storage. Fixed warehousing costs, which do not change with the volume of inventory maintained, are not included in inventory carrying costs but are calculated as warehousing costs in a total logistics cost.(Goldsby and Martichenko 2005).

2.10 Classification of Inventory

Minner (2000) introduces three types of motives of inventory control, and based on which classifies inventories into five categories. The three motives are transaction, safety, and speculation motives. The transaction motive is a result from the fact that ordering and manufacturing decisions are made at certain points of time instead of being performed continuously. The safety motive emerges in uncertainty where lead-time, demand and production yield are unknown at the time when decisions are made. The speculation motive generally refers to the special uncertainty in prices, if there is an anticipation of price increase for purchased goods, order are made in advance.

In light of the three motives, inventories are divided into five groups (Minner, 2000):

i. **Cycle stocks**: The cycle stock induced by batching alternates between an upper level when a batch has just arrived and a lower level just before the arrival of the next batch. Cycle stocks mostly attribute to economies of scale of purchasing and transportation, and technological restrictions in production (Minner, 2000).

ii. **Pipeline stocks**: Order processing times, production, and transport rates contribute to pipeline stocks, also called process inventories. Materials that are in

process, in transport, and in transit to another processing unit belong to pipeline stocks (Minner, 2000).

iii. **Safety stocks**: The safety stock is interpreted as the expected inventory just before the next replenishment arrives. It is caused by the uncertainty of demand, processing time, yield and other factors. And its major function is to protect business performance from forecasting errors (Minner, 2000).

iv. **Speculative stocks**: Expected price increase may result in earlier supply than would have been experienced under constant price, meaning there are more inventories on hand than actual demand at certain period of time, the redundant inventory is speculative inventory. And additionally, stimulated by the possible higher selling price, speculative stock may also appear (Minner, 2000).

v. **Anticipation stocks**: Some products are characterized with seasonal demand, this fact, rather than expectations, generate anticipation stocks. A time varying demand pattern asks for balancing of overtime and inventory carrying cost in order to deal with the demand peak (Minner, 2000). Companies with significant seasonality find it more efficient to use smaller plants and produce prior to demand, which obviously means accumulation of inventory (Coyle et al., 2003).

Despite the above seemingly clear classification, it is difficult to determine to which of the categories a certain item belong. This problem arises from the fact that stocks may originate from more than a single inventory control motive and that there exists a certain degree of substitution (Minner, 2000).

2.11 Order Timing

Continuous review and periodic review are two main types of models for companies to decide when to order. According to Simchi-Levi et al. (2004), in continuous review model,

inventory should be reviewed every day. Then management makes the decision whether the company needs to order more. And different from the continuous review policy, the periodic review is the policy in which the inventory is reviewed at regular intervals, and an appropriate quantity is ordered after each review.

Simchi-Levi et al. (2004) also mention that both of the above two models have a common basis, which is the concept of inventory position. The inventory position in real time is the actual inventory at the facility plus items ordered by the company but not yet arrived minus items that are back ordered.

2.11.1 Continuous review model

This inventory review model is characterized by two parameters-the reorder point (ROP) "s" and the order-up-to level "S". Whenever the inventory position is at or below the reorder point "s", an order should be placed to increase the inventory level to the order-up-to level "S" (Simchi-Levi et al., 2004 inBai and Zhong, 2008).

2.11.2 Periodic review model

In many real situations, the continuous review is generally not practical. The more popular way is that the inventory is reviewed periodically, at regular interval. For example, the inventory level may be reviewed at the end of each month and an order may be placed at the same time. The review period can be set according to the company's actual situation. Since the inventory levels are reviewed at a periodic interval, the fixed cost of placing an order is a sunk cost and hence can be ignored (Simchi-Levi et al., 2004). Since fixed cost does not play a role in this review model, one parameter for inventory is the base-stock level. The company determines a target inventory level, the base-stock level, and each review interval point the

inventory position is reviewed, and the replenishment order is placed for an amount large enough to bring the inventory level back to the base stock level (Bai and Zhong 2008).

The base-stock level consists of two components:

(1) average demand during an interval of time equal to the review period plus the lead time and

(2) safety stock, which is the amount of inventory that the company needs to cover deviations from average demand during the same period (Simchi-Levi et al., 2004).

They also remind us that it is difficult to determine the appropriate safety stock level, as it is affected by a variety of characteristics, like the service level. The service level is a critical factor in relation to safety stock determination. If a higher service level is desired, more safety stock will be required. Also, if demand is highly variable (frequently much higher or lower than average), it is also important to hold more safety stock. Similarly, if lead time is long, more safety stock is needed to guard against possible stock-outs during lead time.

2.12 Reorder Point (ROP) System

Davis et al. (1983) pointed out the reorder point (ROP) system determines when to place orders based on the number of component units on hand. The reorder point consists of two components. The first is the average demand during lead time, and the second is the safety stock. The safety stock is the amount of inventory that the company needs to keep at the warehouse and in the pipeline to protect against deviations from average demand during lead time (Simchi-Levi et al., 2004). ROP is calculated using lead time, average demand, and safety stock. Lin (1980) suggested if demand has no seasonal fluctuation, and the supplier's lead time is reliable, the reorder point is just the demand during lead time (DDLT) plus a small amount of safety stock. Following above mentioned, the formula can be described as:

ROP = AD x MLLT + SS where: AD = the average demand of the coming season

MLLT = the most likely lead time and SS = the safety stock

2.13 Determination of Order Quantity

There are some techniques introduced for managers to determine how much should be ordered for replenishment orders.

2.13.1 The EOQ Model

According to Onwubolu&Dube (2006), EOQ technique is based on several assumptions: (1) demand is known and constant; (2) lead-time is known and constant; (3) receipt of inventory is instantaneous, that is, inventory from an order arrives in one batch, at one time; (4) quantity discounts are not possible; (5) the only variable costs are cost of placing an order and the cost of holding inventory; and (6) stock-outs can be completely avoided if orders are placed at the right time. With these assumptions, the graph of inventory usage over time has a saw tooth characteristic. The significant variable costs constituting acquisition cost are ordering cost and holding cost.The more the quantity of materials that is ordered at a time, the less the ordering or replenishment cost, and the more holding cost and vice-versa. The combination of above objective functions should be optimized as follows:

Min Σ {ordering costs + holding costs}

This optimization leads to the following deductions:

(1) minimum acquisition cost is a compromise of cost of ordering versus cost of storage and

(2) minimum total costs (acquisition cost) will be achieved by the economic order quantity.

2□□□□□

Where:

D=annual demand (units per year), Co= cost/order, and *Cc* = variable holding or carrying cost (cost/unit/year). The simplified classical EOQ model assumes that stock is replenished just at the point when inventory is zero. This zero inventory before replenishment is known as stock-out (Onwubolu et al., 2006).

2.14 Alternative Order Quantity Approach

For small business, the inventory control systems should be inexpensive, easy to understand, easy to use, and not too time-consuming. From the managers' aspects, the ideal systems are those that allow them to set policies, rules, and procedures easily, and have them implemented by the subordinate without any difficulty (Lin, 1980). The application of the EOQ formula for a small business is much more difficult than that for a large corporation. Some estimating parameters, like order cost and inventory carrying cost for EOQ are not easy when records of various costs are inadequate or non-existent. EOQ might have to be re-calculated each time there is a change in interest rate, price, or demand. This will increase the order cost, and is not suitable for a small business (Lin, 1980).

2.15 Warehousing

The warehouse is a point in the logistics system where a firm stores or holds raw materials, semi-finished goods, or finished goods for varying periods of time.(Coyle et al., 2003, p.285).

2.15.1 Three Basic Functions of Warehouse

According to Lambert and Stock (1993), there are three basic functions of warehouse:

1. Movementis necessary to store a product properly. It can be divided into three activities:

i. Receiving inbound goods from transportation carriers and performing quality and quantity checks.

ii. Transferring goods from the receiving docks and moving them to specific storage locations throughout the warehouse.

iii. Shipping the goods outbound to customers by some forms of transportation.

2. Storageis the second function of warehousing. It can be performed in two different ways:

i. Temporary storagemeans that storing a product, which is necessary for inventory replenishment.

ii. Semi-permanent storageis used for inventory in excess of immediate needs. It is the safety or buffer stock.

3. The last function of warehouse is the **information transfer**. When the product is moved and stored, this function occurs at the same time. It is important for the management to have timely and accurate information in order to administer the warehouse activity. The information can cover a lot of things like inventory levels, throughput levels, and data of the customer, facility space utilization and also about the personnel (Lambert, et al., 1993).

2.15.2 Types of Warehouse

One of the warehouse decisions is choosing the type or combination of types to use. There are three basic types of warehousing: private, public and contract (Bloomberg et al., 2002).

i. **Private warehouse**: The firm producing or owning the goods owns private warehouses. This type of warehouse is mainly focused on storing the firm's own goods until they are delivered or sold (Bloomberg et al., 2002). Coyle et al. (2003) also stated that stability of warehouse demand must be examined over multiple products and another advantage of using a private warehouse is the ability to maintain the physical control over the facility.

ii. **Public Warehouse**: If a company without large inventory accumulations or a very seasonal need for warehousing space that they could not utilize a private warehouse consistently and efficiently, they would find a public warehouse.

Or if a company shipping in small quantities for long distances would also usually find a public warehouse. The reasons for using public warehousing which are: (1) avoid the capital investment and financial risks; (2) flexibility of public warehousing (Coyle et al., 2003).

iii. **Contract Warehouse**: 'Contract warehousing is one specialized form of public warehousing. Some reasons for the growth of contract warehouses are:

(a) product seasonality;

(b) geographic coverage requirements;

(c) flexibility in testing new marketing;

(d) management expertise and dedicated resources;

(e) off-balance sheet financing;

(f) reductions in transportation costs.' (Bai&Zhong, 2008).

2.16 The Operating Cycle Concept

According to Akinsulire (2011) and Pandey (2008), the operating cycle is the length of time it takes to acquire inventory of raw materials, convert them to finished products, sell them and collect cash from sales. Pandey (2008) posited that operating cycle is the amount of time it takes for a company to turn cash used to purchase inventory into cash once again. This number is calculated by adding the age of inventory (the number of days that inventory is held prior to sale) with the collection period (the number of days required to collect receivables). A company with a short operating cycle is able to quickly recover its investment, while a company with a long operating cycle will have less cash available to meet any short term needs, which can results in increased borrowing and interest expenses. It has been argued that the flow concept of liquidity can be developed extending the static balance sheet analysis of potential liquidation value coverage to include income statement

measures of a firms operating activity. In particular, incorporating accounts receivable and inventory turnover measures into an operating cycle concept provide more appropriate view of liquidity management than does reliance on the current and acid-test ratio indicators of solvency. These additional liquidity measures explicitly recognize that the life expectancy of some working capital components depend upon the extent to which three basic activities: productions, distribution (sales) and collection are instantaneous and unsynchronized.

2.17 The concept of Corporate Profitability

Earning a profit is the fruit of a business, it indicates how well a business or company is performing. It measures thesuccess of a business (Prasana 2002 in Yusuf 2012). A company or business may not be performing in some important aspects butonce it generates profit, other inadequacies are ignored (Yusuf 2012). Profitability reflects the final result of business operations. There are two types of profitability ratios: Profit Marginratios and Rate of Return ratios. A profit margin ratio shows the relationship between profit and sales. The two popular profit margin ratios are gross profit margin ratios and net profit margin ratios. Rate of return ratios reflects therelationship between profit and investment. The important rate of return measures are Return on Total Assets (ROA), Earning power and Return on Equity (ROE) (Prasana 2002 in Yusuf 2012).

2.17.1 Measures of Corporate Profitability

A company should earn profit to survive and grow over a long period of time. Profits are essential, but all management decisions should not be profit centred at the expense of the concerns for customers, employees, suppliers or social consequences. Profit is the differencebetween revenues and expenses over a period of time (usually one year).

Profitability ratios are a vital measurement of a company's growth and management performance. They are used to assess a business' ability to generate earnings as compared to expenses over a specified period of time. These ratios give stakeholders a picture of the business' performance, specifically in terms of efficiency of resources employed to generate profit and shareholder value.

Generally speaking, profitability ratios may be lumped into two main categories. Those based on sales information and those based on a business's investment practices.In the first category, indicators such as profits and expenses are analyzed.Interest is always placed in this type of information because although a company may be demonstrating an increase in profits, they may not be doing a good job of controlling their operating costs. High overhead costs can easily erode any benefits realized from an increase in a company's sales.

The second category deals with indicators focused on a company's investment practices. It provides us with insight as to how effectively a company is able to generate returns given their available capital base. In either case, we look to the figures available to us on an organization's financial statements to calculate these ratios.

Of the numerous profitability ratios, the most prominent ones include: Return on Assets (ROA), Return on Investment (ROI), Return on Equity (ROE), Gross Profit Margin, Operating Profit Margin, and Return on capital employed ("ROCE").

2.17.1.1 Return on Investment (ROI)

The term investment refers to total assets or net assets. The fund employed in net assets is known as capital employed. Net assets equal to net fixed assetsplus current assets minus current liabilities excluding bank loan. The conventional approach of calculating return on

investment is to divide profit after tax (PAT) by investment. Investment refers to pool of funds supplied by shareholders and lenders, while PAT represents residue income of shareholders.

2.17.1.2 Return on Equity (ROE)

Common or ordinary shareholders are entitled to theresidue profits. The rate of dividends is not fixed; the earnings may be distributed to shareholders orretained in the business. Nevertheless, the net profit after tax represents their return. A returnon shareholders' equity is calculated to see the Profitability of owners' investment. The shareholders' equity or net worth will include paid up share capital, share premium and reserves and surplus less accumulated losses. Net worth can also be found by subtracting totalliabilities from the total assets. The ROI is net profit after taxes divided by shareholders' equity which is given by net worth.

2.17.1.3 Return on Assets (ROA)

Return on Assets expresses the net income earned by a company as a percentage of the total assets available for use by that company. ROA suggests that companies with higher amounts of assets should be able to earn higher levels of income. ROA measures management's ability to earn a return on the firm's resources (assets). The income amount used in this computation is income before the deduction of interest expense,since interest is the return to creditors of the resources that they provide the firm. The resulting adjusted income amount is the income before any distribution to those who provided funds to the company. ROA is computed by dividing net income plus interest expense by the company's average investment in asset during the year. Return on Assets (ROA) is a widely used financial tool to determine the level and intensity of returns that a firm has generated by employing its total assets.

According to Ali 2011, firms are usually considered well off when they generate returns that can attract further investors and lenders, and in trouble if they need to raise the finance required for growth or capital needs, or if their ROA does not convince financiers.

2.18 The Pharmaceutical Sector

The pharmaceutical sector is one of the important sub-sectors of the Health Care industry. It is the largest of the three sub-sectors in the HealthCare sector before health care providers and medical supplies. It has a market capitalisation of 28.883 Billion Naira. It is made up of the following quoted pharmaceutical firms: Evans medical PLC, Fidson Healthcare PLC, GlaxoSmithKline Consumer (Nig.) PLC, May and Baker Nig. PLC, Nigeria-German chemicals PLC and Pharma-Deko PLC. (NSE Fact Book, 2012).

2.19 Review of Empirical Studies

This section reviews relevant empirical studies conducted on inventory management and firm performance in Nigeria as well as other parts of the world.

2.19.1 Empirical Studies on Inventory Management and Profitability in Nigeria

In a research conducted by Olufemi, Jamike and Monday (2012), on Materials Management, the result revealed that inter-departmental coordination, training, good relationship with vendors, R and D in inventory management, state of the art facilities/ICT and professionalism are the key factors that promote effective inventory management in an organisation. They also discovered that effective inventory management practices have drastically reduced wastage which in turn reduced the cost of production and increased profits. In a similar research conducted by Monday, (2012), the result pointed to the significance of effective material management on the overall profitability of the company. The study also revealed the

importance of certain inventory management practices such as Just-In-Time system as an effective tool for preventing wasteful practices of ordering and receiving or storing materials many weeks or months before they are actually needed.

Using a case study of 7 up Bottling Company Enugu, Ogbo, Onekanma and Wilfred (2003) suggested that organisations stand to gain a lot from effective inventory control system, some of which include: optimal use of resources, cost reduction, improved profitability, improved sales effectiveness, and reduction of waste, easy storage and retrieval of stock and high inventory utilization. They however pointed out that for organisations to achieve these and more, they have to maintain flexible inventory service.

In another Nigerian study, Abdulraheem, Isiaka&Aliu(2011) assessed inventory management in selected small businesses in Kwara State, Nigeria. Using a regression model to explain the effect of inventory value on performance proxy by profit overa period of ten years, the study revealed that a Naira change in stock would cause almost a Naira (92 Kobo) change in Profitability of selected businesses. This result indicated a strong positive relationship between inventory and Profitability of small businesses in Kwara Stateof Nigeria. They thus, concluded that small businesses are likely to generate higher profit ifan effective inventory management is put in place.

Egberi&Egberi (2011), studied the link between efficient inventory management and organizational productivity, and by extension, profitability using Eternit Limited as a case study. The study spotlighted the objectives of inventory control, characteristics of good inventory control and symptoms of poor inventory control. A well-structured questionnaire was designed and used as instrument for data collection. The population of the study

comprised 216 member of staff out of which 140 respondents were randomly selected. Two hypotheses were formulated. Tables, Simple Percentage and Chi- Square were the statistical tools adopted for data analysis and interpretation. The findings revealed among others that there is significant relationship between inventory control and profitability; as well as a significant relationship between inventory control and cost of production; Monday (2012) whose empirical analysis focused on the Nigerian Bottling Company Plc (NBC), being one of the largest manufacturing firms in Nigeria. Data was collected through a structured questionnaire, supported by interview. Using Chi-square ($\chi 2$) test of independence, the results provided evidence of a positive significant relationship between efficient Materials Management and firm success. The implication of this is that through efficient management of materials, a manufacturing firm can achieve significant cost saving, improvement in production efficiency, and increase in profitability. The study also found that inter-departmental coordination, effective inventory management, good relationship with vendors, and state-of-the-art facilities/ICT were significant success factors of Materials Management. This study showed that for manufacturing industries to experience remarkable success in their performance, priority must be given to Materials Management as a total concept.

Adeyemi& Salami (2010) whose study employed variance analysis, the EOQ model and the chi-square methods to determinewhether or not inventories in the Nigeria Bottling Company, Ilorin Plant can be evaluated and understood using thevarious existing tools of optimization in inventory management.Their findings revealed that the companyoperates a policy of making orders on a quarterlybasis within a period of one year and that the company does notalways adopt the EOQ model in placing ordersfor its raw materials and this account for thevariations between the calculated EOQ and theexpected order sizes of the company. For at

leastthree years out of the five years under study, theexpected value was greater than the observedvalue for each product. This implies that theNigeria Bottling Company, Ilorin Plant has excess investment in inventory. It was also observed that there was a positive correlation between sales andinventory usages. This means assales increases, inventory usages should also beon the increase.

Falope&Ajilore (2009) aimed to determine the effect of WCM on Profitability performance using panel data of the sample of non-financial Nigerian firms for the period 1996-2005. They found a negative relation between operating Profitability and the number ofdays of inventories, account payables and account receivables for a sample of fifty Nigerian firms listed on the Nigerian Stock Exchange. They also found that there is no significant difference between small and larger firms in terms of shortening theirC2C cycle to enhance profitability.

Samson, Josiah, Yemisi, and Erekpitan (2012) investigated the impact of Working Capital Management on the Profitability of 30 sampled Nigerian small and medium sized firms covering the year 2009. Using multiple regression analysis, the results suggest that managers can create value by increasing their firms' inventories and receivables turnover. Similarly, a shorter C2C cycle improves the firm's Profitability.

Uremadu, Egbide, &Enyi (2012) presented empirical evidence of the effect of Working Capital Management and liquidity on corporate profits of quoted Firms in Nigeria Evidence from the Productive Sector using a cross-sectional time series data for the period 2005-2006, using descriptive statistics and OLS methodology. The authors found a positive effect of inventory conversion period (ICP) and other components of working capital management on Return on Assets which is a mirror of corporate profitability.

Owolabi&Alu (2012) examined the existence of firms based on liquidity and Working Capital Management of Selected Quoted Manufacturing Companies in Nigeria, adopting Ex-post facto research involving trend analysis of five years financial statements of five manufacturing companies was carried out using purposive sampling technique by means of Multivariate analyses. The result indicated that each Working Capital component affected the company's level of Profitability at varying rates, but, these effects when pooled together are not significant. It was recommended that the companies should adequately plan and control their operations, adjust the shortfalls as noted, consider the principles of finance in their decision making, employ the services of experts (analysts) in complex business areas, and conduct periodic stock taking if possible every twoweeks.

2.19.2 Foreign empirical studies on Inventory Management and Firms' Profitability

Baveld (2012) in his research on the impact of working capital management on the profitability of public listed firms in the Netherlands during the financial crisis, revealed that inventory is best managed if it is kept to a minimum during non-crisis periods in The Netherlands. This is based on the negative significant relation found during this period. During the crisis period, a stronger, negative and significant effect of inventories is found on the profitability of a firm. This means that the impact of inventory level on the profitability of a firm is higher during crisis periods. For this reason firms should even give more attention to the inventory levels during crisis periods, and make sure, the levels of inventories are kept at a reasonable minimum. Other components of the Cash Conversion Cycle (CCC) such as the Account Receivables (AR), Account Payables (AP) also showed a significant negative relationship. The analyses of the relation between the cash conversion cycle and firm's profitability indicated that during the non-crisis period firms can create profit by keeping

their cash conversion cycle to a minimum. The results of the crisis period showed that there was no significant relation between the CCC and a firm's profitability during this period. This is likely to be caused by the changed effect of the accounts receivables during the crisis period. Also the negative effect the accounts payables have on a firm's profitability for both periods might disturb the effect of the CCC.

Weiss,Capkun and Hameri (2009) conducted a research on the relationship between inventory management and financial performance using a large sample study of US-based firms over a 26-year period from 1980 to 2005.They analyse the relationship between inventory performance, both INV (overall inventory) and its discrete components (RMI, WIP, and FGI), and financial performance. The results show a strong correlation between inventory performance and financial performance across a broad array of manufacturing industries. Performance of total as well as all three discrete components of inventory is positively associated with financial performance. However, the strength of the correlation differs between inventory types. FGI performance has the strongest correlation with financial performance. Between WIP and FGI performance, WIP inventory performance has a stronger correlation with the GP measures of financial performance, while finished good inventory performance has a stronger correlation with operating profit measures of financial performance. The results support the operations management literature's claim that a managerial focus on operations performance – in particular, increases in inventory performance correlates with significant value creation.

Several studies have found that JIT Inventorymanagement hasapositive impact on firm performance.A studybyFullertonet al. (2003) provides empirical support that firms thatimplement higher degrees of JIT manufacturing practices should outperform competitors

who do not;it was alsofound that a positiverelationship exists between firm profitability and the degree to whichwaste-reducing production practices, such as reduced set-up times, preventive maintenance programs and uniform workloads are implemented. These findings indicate that enterprises employing JIT manufacturing techniques are consistently more profitable than their counterparts.Another study suggestingapositive relationship between inventory management and performance was Eroglu and Hofer (2011),whichusedtheEmpirical Leanness Indicator (ELI) as a measurement for inventory management.They argued that inventory leanness is the best inventory management tool. Lean production itself considers inventory as a form of waste that should be minimizedand it hasbecome synonymouswith good inventory management. Their study on US manufacturing firms, covering the period of 2003–2008,found that leannesspositivelyaffects profit margins.

According to Eroglu and Hofer (2011), firms thatareleaner than the industry averagegenerally see positive returns to leanness. They found that the effect of inventory leanness on firm performance is mostly positive and generally non-linear. Their study also implies that the effect of inventory leanness is concave,which is in line with inventory control theory that there is an optimal degree of inventory leanness beyond which the marginal effect of leanness on financial performance becomes negative.On the other hand, a study by Cannon (2008)introducedcontradictoryfindings. That studyfocused on assessing the relationship betweeninventory performance and overall firm performanceandit was argued that inventory performance should not be measured as a robustindicator of overall performance.In doing so, it tested theincorporation of firm's annual percentage change in inventoryturnover as a measurement for inventory management towardsreturn on assets (ROA) as a measurement of performance. The study(Cannon, 2008) indicated thatwhen the effects of time were taken into account, turnover improvement on average had a slightly negative effect on ROA.

Additionally, turnover improvement exhibited a prominent random effect, with result indicating that approximately 95% of the firm's turnover-improvement slopes would fall within anegative range. This was interpreted as evidence that substantialvariability existed across firms with regard to turnover improvement and its performance effects, with some turnover improvement associated with increased ROA and other turnover improvement associated with decreased ROA.

Moreover, Cannon (2008) also further explored the turnover-ROA dynamic by including capital intensity as potential source of variability.It was foundthat capital-intensive firms tended to be below average with regard to ROA and the variable'spresence in the model did not significantly alter the relationship between turnover improvement and ROA overtime. Hence, this lent additional weight to the conclusion not to support the hypothesis that improved inventory performance will be associated with improved overall firm performance.Consistent with Cannon (2008), another study (Kolias et al,2011) found that inventory turnover ratio (as a measurement of inventory management), is negatively correlated with gross margin. Kolias et al. (2011) is based on an econometric analysis conducted on a sample of financial data for Greek retail firms for the period of 2000–2005.They found a negative relationshipbetween gross margin and inventory turnover.Thisimplies that retailers' trade off gross margin for inventory turns to achieve similar return on inventory investment since,if inventory turnover ratio is lower than targeted, given the level of gross margin, then management should be alarmed with this inefficiency. Consequently, it was likely that the coefficient of grossmargin differs between sectors.

In their research on "Improving Inventory Management in Small Business", Bai and Zhong (2008) sampled out the sales report data of twenty items of HEM-SOL Ltd to test the

applicability of ABC analysis. They discovered that demand variability among the items was big in fact.After ABC classification, treatments became different for different category items. For instance,more attention needs to be paid to A items and less review on C items. It is an efficientapproach to saving costs, time and efforts for management.Following ABC classification, different review periods could be set in accordance with eachcategory's specific characteristic. A items have the first priority to be reviewed as they account for 20% of total amount of items, but with more than 50% of total dollar value.More frequent review can help management to better control these items to minimizestock-out or excess stock occurrence. They also concluded that the EOQ model was not applicable to this case because the necessary inputs were not available. Instead, the desired covering period approach is applied regarding order quantity determination.

Grablowsky(2005) in his research on "Financial management of inventory" surveyed small business inventory management practices and compared with techniques commonly employed by large corporations. It appears that smaller firms rely on simple controls. Large businesses rely more on quantitative techniques, such as EOQ and linear programming, to provide additional information for decision-making, while small firms are more likely to use management judgment without the quantitative back-up. Of those small firms which did not use quantitative methods for determining inventory order and stock levels, the most common qualitative methods were "past experience" and "executive judgment".

Soekhoe (2012), tried to investigate the linkage between the Working Capital Managementand Dutch Firm's Profitability by using a sample of 70 firms of different sectors for theduration 2006 to 2010. He used pooled and fixed effect model of regression analysis anddescriptive statistics with correlation analysis. All of these models' results showed that

C2Ccycle positively correlated with Profitability and inventory conversion period have positivesignificant relationship with Profitability which indicates higher level of inventory leads toincrease in profits.

Julius, Sharma, Dinesh &Hari(2004) discussed Supply Chain (SC), which involves the configuration, coordination, and improvement of sequentially related set of operations in establishments, integrates technology and human resource capacity for optimal management of operations to reduce inventory requirements and provide support to enterprises in pursuance of a competitive advantage in the marketplace. This paper addresses the structures of supply chain management (SCM) and the activities involved in SCM decisions that help promote profound improvement in efficiency and effectiveness in business operations. In broader context, the paper examines the types of activities involved in SCM decisions; the dynamics of the traditional SCM, the complementarities of technology in achieving effective management of operations through enablers of electronic data interchange (EDI) and quick response (QR) disciplines to implement Just-in-Time (JIT) management techniques; and integrated SC and inventory control as it relates to capacity imbalances and transaction costs.

Azam and Haider (2011) in their research on the impact of working capital management on firm's performance using non-financial institutions of KSE, found that inventory turnover in days have negative relationship with both Return on Assets (ROA) and Return on Equity (ROE) which means that companies' performance can be enhanced by reducing inventory in days. They also found that creditors' Average Payment Period (APP) has a significant positive relationship with both ROA and ROE, indicating that if time period of suppliers' payment is increased, then overall firm performance also improves. Cash Conversion Cycle

(CCC) and Net Trading Cycle (NTC) showed significant negative relationship with ROA and ROE showing that firm performance can be enhanced with short size of both of them.

Alipour (2011), in Iran studied the relationship between Working Capital Management withinthe time frame of 2001-2006 using a sample of 1063 out of 2628 companies using multiple regression and Pearson's correlation. He found a negative significant relation between inventory turnover in days and Profitability.

In a research conducted by Lwiki, Ojera and Wachira (2013), on the impact of inventory management practices on firm performance of sugar manufacturing firms in Kenya, using eight sugar manufacturing companies for a period of six years from (2002-2007), the result showed that virtually all the eight companies studied, have embraced lean inventory systems such as MRP, with a general mean of 3.075. Strategic Supplier Partnership and the use of Information Technology recorded a mean of 2.75 each, which indicates that the sugar companies have embraced these practices to some extent. According to them, the most widely used policy is that of involving suppliers early in product design. However, only a few firms are using Electronic Data Interchange (EDI) and Point of Sales (POS) technologies. As regards financial performance, two firmshave recorded negative average return on sales (ROS) and return on equity (ROE) over the six year period. The rest haverecorded positive average ROE and ROS.The findings suggested that there was generally more than averagepositivecorrelation between inventory management practices and financial performance of sugar companies as reflected in the calculated correlation coefficient between inventorymanagement practices and ROS (r= 0.740)and that betweeninventory management practicesand ROE is 0.653. It was also observed that predictorvariables of the inventory management practices are correlated.

Rimo&Panbunyuen (2010) investigated the effect of company characteristics on the Working Capital Management in Swedish listed companies by employing quantitative method. The selected 40 companies in the large capital investment segment listed on Stockholm Exchange with 2007 and 2008 financial data using regression analysis, their results indicate that there is a significant positive relation between number of days inventory and Profitability which is in contradiction to the findings of (Deloof, 2003; Raheman& Nasr, 2007; and Lazaridis&Tryfonidis, 2006) who documented a negative relationship.

Warnes (2013) examined the impact of Working Capital Management on the Profitability over the period of five years from 2007-2011 by utilizing the data of Conglomerate manufacturing firms listed at Karachi Stock Exchange (KSE). Multiple regression models are applied and the findings of the study validated a negative relationship between inventory turnover days as one of the components of Working Capital Management and Profitability of Conglomerate manufacturing firms. Number of days inventory (DINV) significantly and positively impacted on Return on Asset(ROA). C2C cycle also has positive and significant impact on ROA that means reduction inC2C cycle will lead to increase in the profit of the firms. ROA regression model shows thatAccount payable in days (DAP) has significant and negative impact on ROA of the firms.Results suggest that by reducing the period of C2C cycle at a certain level, Profitability ofcement manufacturing firms can be increased.

From the foregoing deductions made by previous researchers, there is a general consensus among them that inventory management has a significant relationship with firms' profitability and that inventory is best managed if it is kept to the minimum possible. Inventory Days (ID), which is an efficiency ratio that measures the average number of days a

company holds its inventory before selling it, is frequently used as a proxy for inventory management. Just in Time (JIT) production is another inventory control tool suggested which has proven good in waste and cost reduction which in turn, improves financial performance.

2.20 Theoretical Framework

This section discusses theories as well as prior works in which relevant theories to thisresearch topic are used. This research work will be based on cash management theory(monetary theory and financial theory) and cash cycle theory. This is aimed at viewing therelationship that exist between dynamic liquidity measures in cash management and cashcycle theories.

2.20.1 Monetary Theory

Numerous theories have evolved to explain the cash management behaviour of firms.Almost all of these theories can be generalized into a proposition of the existence of a stablerelationship between a few important independent variables and the stock of moneydemanded. The two basic transaction models most commonly accepted in the financialliterature are the deterministic Baumol-Tobin and the stochastic Miller-Orr inventory models.

These models are presented in monetary theory and are consistent with the theory of the firm (Raheman& Nasr, 2007).

Baumol (1952) as cited in (Raheman& Nasr, 2007) suggested that cash balances could betreated in the same way as inventories of goods. A stock of cash is its holder's inventory, and

like an inventory of a commodity, cash is held because it can be given up at the appropriatemoment, serving as processor's part of the bargain in an exchange. The firm is

presumed tohold the amount of money, which minimizes the interest cost by holding money rather thaninvesting it in short-term investments and the transaction costs associated with transferring between securities and cash.

In this framework the firm is assumed to finance its expenditures by selling securities or byborrowing and the firm has a steady stream of expenditures but has no receipts. In practice,the behaviour is more complicated and the cash balances are the result of the imperfectsynchronization of expenditures and receipts, which are often uncertain. This uncertainty isincluded in the stochastic cash management model derived by Miller and Orr in 1966 ascitied by (Raheman& Nasr, 2007). This approach permits net cash flows to fluctuate in acompletely stochastic way. Unfortunately, this feature is offset by the fact that the model isonly capable of dealing with two types of assets – cash and marketable securities – and doesnot incorporate payables.

Both models referred to above, imply that there are economies of scale in the use of moneyor, equivalently, that the elasticity of the demand for money with respect to transactions isless than one. In these models the scale operator is transactions volume, mostly measured bysales. There are, however, alternative measures presented in the demand for money literature,such as wealth, production, and market capitalization.

In their model, Attanasio, Guiso, &Japelli (2002) measured transaction costs with the timecosts. The cash manager is assumed to need time to make transactions, and that money is away of saving on transaction time, and optimal money balances are chosen in order to tradeoff the time cost of transactions against the cost of holding money instead of an interest-bearingasset yielding a nominal return per period. The cash manager chooses money

tominimize the sum of the cost of transaction time and forgone interest, subject to a transactiontechnology.

They present behavioural cash management models, such as deterministic and stochasticmodels as follows:

$m = (\omega A \beta / R) 1/(1+\beta) c(\beta + \gamma)/(1 + \beta)$ ... (2.20)

Where *m* is the real money balances, *R* is the nominal rate of return,*A* is a measure oftechnology improvements, *c*is the scale operator. The equation is based on an assumption thatthe cash manager behaves as *min* $\tau\omega + Rm$, subject to $\tau = Ac\gamma(c/m)\beta$ (where $\tau\omega$ = transactiontime, τ = the time cost of transaction ω, and *Rm* = forgone interest).This equation encompasses several models. By setting $\gamma = 0$ and $\beta = 1$, one obtains theBaumol-Tobin square root formula. If $\gamma = 0$ and $\beta = 2$, Equation (2.20) reduces to Miller-Orrsolution (Attanasio*et al.* 2002).

The effects of the exogenous factors on the strategic cash management decisions can beexamined by transforming Equation (2.20) to the estimation form and testing its stability.In the empirical equation the variable *A* can be seen as error term as well as index of the stateof financial sophistication in the firm (Attanasio*et al.* 2002).

2.20.2 Financial Theory

As a representative for the liquidity management, cash management can be linked to financialtheory by considering its importance in an imperfect market. This can beone, by adding it to

the financial theoretic models, such as the Capital Asset Pricing Model (*CAPM*) or theModigliani-Miller (*MandM*) model. The effects of the inclusion of cash balances in

thesetheoretical models show the importance of liquid assets for the value of a firm (through the

systematic risk component) and for the optimal capital structure (through the liquidity slackconcept). In addition of the reasons for cash balances presented in monetary theory (andaccepted in financial theory), financial theory considers some strategic reasons closely related

to the Keynesian speculation motive of money. More recently Titman (2002) applied theModigliani and Miller theorem and studied the effect of financing and risk management onthe firm value and impact of suppliers of capital on capital structure choices during capitalmarket imperfection.

2.20.3 Cash Cycle Theory

As cash is often the ultimate determinant of company death or survival, the explicit focus oncash management often safeguard for the management of growth and liquidity. Cash flowsand managing operating cash cycle are vital components for a company in introductory andrapid growth phase. For a growth company, the degree to which the firm can take advantageof available cash directly determines the self-financeable rate of growth liquidity (Churchill& Mullin, 2001). Moreover cash flows and cash days can be used to concisely demonstratethe effect of (liquidity) in and on business process, in a way that is both meaningful andfamiliar to people.

Churchill & Mullin (2001) model for effective cash management and cash cycle theory relieson three levels that can be “pulled” to affect the self-financeable growth (SFG) rate. Theydemonstrate how the mechanisms allow for an intuitive and respective method for releasingcash for growth and monitoring performance for survival.

Firstly, affecting the duration that cash is tied up in the operating cash cycle (OCC) byexample decreasing inventories will release cash as will stricter account receivable policies.The absolute amount of cash tied for the said duration constitutes the second lever.Thirdly, the income level of how much cash is generated from sales and other activity duringa cycle is considered.The business process component of the proposed model is based on the overall process. ThePDM category is concerned with solution creation, 5cm with acquiring the required inputsand CRM with identifying acquiring and retaining customers.

To illustrate the use of the model and concept behind it, a company facing a set of interlinkedbarriers to growth and liquidity may be considered. For example, to develop their suppliernetwork ties, the management decide to hire a new sourcing agent, for this, they will needcash. Ways to release cash from OCC into growth and liquidity may be from persuadingexisting network partners to renegotiate terms on accounts payable, or selling off inventoryand the urgency of the matter is a determinant. Similarly, a newly hired sourcing agent maybe able to shift component stocking to the suppliers, releasing cash from OCC by a relationalmarketing exchange.

Ganesan (2007), hypothesized that firms with more debt hold more cash (generated fromsales) able to service it, and that firms simultaneously allocated some of the extra cashsavings and some to debt payments (to suppliers). Working capital, acquisitions and capitalexpenditures work in the same way as expected. Less Profitability firm hold less cash,showing that an important source of liquid assets is the current cash flow. Moreover,uncertainty expressed through higher volatility of both cash flow and cash conversion forces

firms to hold more cash. The length of the C2C cycle, the dividend dummy and the ratio oflong term debt to total debt are not significant. Conversely, intangibles have a negativeimpact on cash showing that they may affect cash at the firm level through other channelsthan assets specificity. For example, a high value of goodwill (included in intangibles) is asign that the firm made a string acquisition in the past, depleting its intend sources. There isstrong evidence that the specificity of assets in an industry affects the propensity of firms tohold cash.

In a nutshell, the study identifies theories that were found relevant to the research such asmonetary theory, financial theory and cash cycle theory, where the monetary theory furtheridentifies two basic cash management models of deterministic Baumol-Tobin and StochasticMiller-Orr Inventory models that explain demand for money motive of maintaining cash.Financial Theory identifies CAPM Model that explains the risk and cost of holding cash,while the cash cycle theory explains the relationship between working capital, operatingcycle, C2C metric and its components in managing liquidity.

From the foregoing therefore, the researcher is of the opinion that among the theoriesthat relate to inventory management strategies, monetary, financial, and cash-cycle theories were thetheories that best explain this research work. These three theories when applied to thisresearch, view the relationship in terms of cash (Liquid Asset) and Liquidity Management(Monetary Theory), Cash Management and Liquidity (Financial Theory) and among dynamicliquidity indicators; days of inventory, days receivable outstanding, days payable outstanding,C2C metric and cash management (cash-cycle theory).

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter describes the methodology adopted in conducting the study. It covers the research design,the population, sample size and sampling technique, method of data collection, description of variables and their measurement and the statistical tools used in presenting and analysing the data.

3.2 Research Design

The research design employed in this study is ex-post facto, which is a quasi-experimental study examining how an independent variable, present prior to conducting the study, affects a dependent variable. For the purpose of this study, the data used for the computation of the dependent andindependent variables were obtained from the documented annual audited financial reports and accounts of the selected firms.

3.3 Data Collection Methods

For the purpose of this research, data was collected mainly from secondary sources.This data was obtained primarily from the Fact-book maintained by theNigerian Stock Exchange (NSE) and the published annual reports and accounts of the sampledFirms. Data collected from these sources is used for the computations of the ratios that were used to measure the Inventory Management and Profitability of the listed Nigerian Pharmaceutical companies.

Thedata covered such items as turnover, cost of sales, profit before and after tax, total assets,trade debtor, trade creditor, stocks, fixed asset, current asset, current liability, and long-termliability.

3.4 Population of the Study

The population of this study consist of all the seven listed pharmaceutical companies in the pharmaceutical industry namely: Evans Medical PLC, Fidson Healthcare PLC, Glaxo SmithKline Consumer (NIG) PLC, May and Baker Nig. PLC, Neimeth Intl Pharmaceuticals PLC, Nigeria-German Chemicals PLC and Pharma-Deko PLC as shown below.

Table 3.1 Population of the Study

S/N	Name of Company	Year of Incorporation	Year Listed
1	Evans Medical PLC	23/04/1954	1979
2	Fidson Health Care PLC	13/03/1995	4/6/2008
3	GlaxoSmithKline Consumer Nigeria PLC	23/06/1971	07/1977
4	May & Baker Nigeria PLC	04/09/1944	10/11/1994
5	Neimeth International Pharmaceuticals PLC	30/08/1957	21/09/1979
6	Nigeria-German Chemicals PLC	10/01/1964	08/1979
7	Pharma-Deko PLC	18/12/1969	08/1979

Source: NSE Factbook, 2013

3.5 Sampling and Sample Size

For the purpose of this study, purposive sampling was used in the determination of the sample size. Of the total of seven (7) companies that made up the industry, five companies were selected. Two criteria were used in the selection of thesample. For a company to be

selected, it must have been quoted on or before January 1st, 2004 and must have its complete annual reports and accounts for ten year period from 2004-2013. Applying these two criteria, the following firms emerged as the working population.

Table 3.2 Sample Size of the Study

S/N	Name of company
1	Evans Medical Plc
2	GlaxoSmithKline Consumer Nigeria Plc
3	May and Baker Nig. Plc
4	Neimeth International Pharm. Plc
5	Pharma-DekoPlc

Source: NSE Factbook

3.5 Variables and their Measurement

For the purpose of this study, the dependent variables and proxies for financial performance were measured by Return on Investment (ROI), Gross Profit Margin (GPM) and Net Profit Margin (NPM) while the independent variables and proxies for inventory management were measured by Inventory Days (I.D), otherwise known as the Inventory Turnover Period for thethree major discrete components of inventory,i.e Raw Material inventory (RM), Work in Process inventory (WIP) and Finished Goods Inventory (FG). The control variablesused are SIZE measured by logarithm of sales and LEV measured by DEBT. Table 3.2provides the summary of the variables used and their respective measurement. Inventory Days (ID) or Days in Inventory (DII) or Inventory Turnover Period is an efficiency ratio that measures the

average number of days the company holds its inventory before selling it. It is given by the formula:

I.D = Average Inventoryx 365 days
Cost of Goods Sold

Hence, the lower the number of ID, the better the inventorymanagementand thismay cause better firm performance. This measure of inventory management has been used by many researchers such as Eroglu& Hofer (2011); Sahari, Tinggi&Kadri (2012); Fullerton, Mcwatters&Fawson (2003); Cannon (2008); Cachon& Fisher (2000) among others.

Table 3.2: Variables and their Measurement

THE DEPENDENT VARIABLES	
Variable	**Measurement**
Return on Investment (ROI)	Net Profit After Tax Total Assets
Gross Profit Margin (GPM)	Gross Profit / Sales * 100
Net Profit Margin (NPM)	Net Profit After Tax / Sales * 100
The Independent Variables	
Raw Material Days (RMD)	Raw Material(COGS/365 days)
Work in Process Days (WIPD)	Work in Process (COGS/365 days)
Finished Goods Days(FGD)	Finished Goods (COGS/365 days)
Thus, INV = RM + WIP + FG/ (COGS/365 days)	
The Control Variables	
SIZE	Natural logarithm of sales
LEVERAGE	Total Debt Total Assets

Adopted from the work of Baveld (2012)

3.6 Techniques of Data Analysis

Descriptive statistics,Pearson Correlation Coefficient as well as Multivariate Regressionswere used in analysing the data.

3.6.1 Descriptive Statistical Analysis

Descriptive statistics was used in this study to compute the summary statistics thatdescribe thecentral tendency, as well as how the data spread out around this value, or the variability. The descriptive statistics applied in describing the dependent and independent variables are minimum, maximum, mean and standard deviation.Stata version 12 was used in performing this task.

3.6.2 Pearson Correlation

Pearson Correlation analysis is particularly useful in ascertaining the strength and direction of association between variables one-on-one. This was used by the researcher to determine the nature of relationship between all variablesi.e dependent, independent and control variables under study, so as to understand their individual relationship with one another before regressing them. The value ranges from -1 to +1,i.e from perfect negative to perfect positive relationship.

3.6.3 MultivariateRegression Techniques

In an attempt to determine the variations in any of the dependent variables (Profitability ratios) due to variationsin the independent variables (i.e. Days of: Raw material (RM), Work in Process (WIP) and Finished Goods (FG), theresearcher used multivariate regression analysis. This is because multivariate regression is expectedto explain the variations in each of the dependent variables due to variations in all of the independentvariables. However, theselection of the appropriate statistical technique among the manymultiple statistical tools that are available depends on the measurement of theresearch variables. It predicts the

dependent variables, using the information derived fromthe analysis of the independent variables. The coefficient of correlation (R) indicates theextent of the relationship between the independent variable and dependent variable in eachmodel. The coefficient of determination (R^2) also indicates the extent to which theindependent variable explains, in each model, the variability in the dependent variable.Lastly, the coefficients of the independent variables show the amount of change in theindependent variables.

Each null hypothesis, designed to assess the significance of the relationship between each independent variable and Profitability was tested using the MultivariateRegression Statistics. The researcher examined the combined impacts of the independent variables on each substituted dependent variable.The following statistics were used in the regression models to analyse the combined effect of all the independent variables on the DVs, and to test the utility of the hypotheses.

i. R – Square (R^2): This is called the multiple coefficient of determination. The $R^2$of a regression model is the fraction of variation in the dependent variable that is accounted for or capable of being explained by all the independent variables in the regression model.

ii. t- Statistics: This is the famous student test. It is used in regression model to test the significance of each independent variable in the model. Generally, regression soft wares compare t-statistic, as computed from the data, with students t distribution (i.e. critical value of t) to determine the probability (p-value) of t- statistics. This scenario or technique is used to test hypotheses about independent variables. Thus value of t-statistic is compared with critical value of t at a particular level of significance (e.g 5%).

iii. Fishers' test: This is called the overall F test. T is used to assess the utility of the regression model by testing the significance of the relationship between the

dependent variables in the model. F statistic is used to test the model's general null hypothesis e.gnone of the independent variables (x_1, x_2, x_3, x_4, ----- x_n) is significantly related to the dependent variable (y). The condition for rejecting this null hypothesis is that F (value) > (critical F value) at a specified level of confidence. Note that being a multiple regression model; all the above mentioned statistics (i-iii) will be used on each hypothesis in analysing the effect of each individual factor on DV, and to test theutility of the hypotheses.

3.7 Model of the Study

In order to evaluate the strength of the relationship between the inventorymanagement measures on one hand, and Profitability on the other, the study adopts Return onInvestment (ROI), Gross Profit Margin (GPM) and Net Profit Margin as proxies for Profitability. The dependent as well as the independent variables werederived from the Published Annual Reports and accounts of the companies under study.

The control variables used are SIZE and LEVERAGE. Since other factors apart from the explanatory and identified control variables are likely to affect the companies' Profitability, the coefficient of determination (R^2) is computed to explain the extent to which the independent variables explain the dependent variable. All other things that affect the Profitability score is incorporated into the relationship by adding an error term, □. The functional relationships among these variables are therefore defined as:

$ROI_{it}, GPM_{it}, NPM_{it} = f(RMD, WIPD, FGD, SIZE, LEV)_{it} + □_{it}$

From this general form of the regression equation, three models, each designed to test onehypothesis is developed. These models are consistent with the works ofSahari,

Tinggi&Kadri (2012), Baveld (2012),Padachi (2006), Garcia–Teruel and Martinez-Solano (2007), Falope&Ajilore (2009), Hayajne&Yassine (2011) among others.

$ROI_{it} = \beta_0 + \beta_1 RMD_{it} + \beta_2 WIPD_{it} + \beta_3 FGD_{it} + \beta_4 SIZE + \beta_5 LEV + \varepsilon_{it}$ Model 1

$GPM_{it} = \beta_0 + \beta_1 RMD_{it} + \beta_2 WIPD_{it} + \beta_3 FGD_{it} + \beta_4 SIZE + \beta_5 LEV + \varepsilon_{it}$ Model 2

$NPM_{it} = \beta_0 + \beta_1 RMD_{it} + \beta_2 WIPD_{it} + \beta_3 FGD_{it} + \beta_4 SIZE + \beta_5 LEV + \varepsilon_{it}$ Model 3

WHERE:

ROI, GPM and NPM measure the firms' profitability, SIZE – stands for the company size measured by the natural logarithm of sales, LEV– Debt, RM – Raw Material, WIP – Work in Process, FG- Finished Goods, β_0 – fixed intercept element, β_1 – the ratio of change in any of the dependent variables to a unit change in RMD, β_2 – the ratio of change in any of the dependent variables to change in WIPD, β_3– the ratio of change in any of the DVs to change in FGD, β_4–ratio of change in any of the DVs to change in SIZE, β_5 – ratio of change in any of the DVs to change in LEV, i– number of companies in the panel data, t – time periods of the panel data and ε - error variable of the regression analyses.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents the analysis made on the data generated and the tests of thenull hypotheses. The Statistical PackageStata version 12 was used to analyse the relationship between the dependent and the independent variables using Pearson Correlation Coefficients and Regression analytical tools. It also presents the descriptive statistics results which provide summary statistics for the variables of the study. The correlation coefficients result in an effort to establish the nature of the relationship between the dependent and the independent variables and also to ascertain the presence or absence of multi-collinearity among the variables. The analyses begins with the presentation of the robustness test followed by the descriptive statistics and correlation analyses and lastly, with the presentation and discussion of the regression results.

4.2 Robustness Tests

The two major robustness tests carried out in this study are Heteroskedasticity and Multicollinearity tests. These tests were carried out in a bit to reach a valid statistical inference.

a. **Heteroskedasticity test**–this test was carried out to ensure that the regression model fits all the values of the independent variables and this is only possible if the residuals do not vary with the independent variables and thus, random in nature. A p-value of less than 5% indicates the presence of heteroskedasticity, while a p-value of greater than 5% indicates homoskedasticity. This is shown in appendix 3(a, b and c) where there is the presence of heteroskedasticity in all the models hence corrected using the OLS robust test.

b. **Multicollinearity test** – this was carried out to check whether there's strong correlation among the independent variables which will mislead the outcome of the study.Multicollinearity affects the predictive power of the individual predictors in a model. This test was carried out using the Variance Inflation Factor (VIF) and it follows that a VIF of more than 10 indicates the presence of multicollinearity. The result of this test as presented in appendix 5 indicates absence of multicollinearity.

4.3 Descriptive Statistics of the Variables of the Study

Table 4.1 provides summary of the descriptive statistics for the variables of the study. The descriptive statistics include measures of central tendency, such as the mean, and the measures of dispersion (the spread of the distribution), such as the standard deviation. All the variables were computed from the relevant balance sheets and income statements of the sampled companies.

Table 4.1: Descriptive Statistics of the Variables

Variable	Obs	Mean	Std. Dev.	Min.	Max.
ROI	50	0.184357	0.2196116	-0.37056	0.97427
GPM	50	49.1794	19.89777	5.28549	94.18364

NPM	50	0.169758	0.2065259	-0.28387	0.79249
RMD	50	82.6729	53.639	9.6154	224.1192
WIPD	50	24.31062	35.08111	0.08314	135.6835
FGD	50	75.14479	77.74645	1.30067	32.9796
SIZE	50	0.6970722	0.01614	0.01614	1.62076
LEV	50	15.09436	13.81753	13.81753	17.18912

Source: Generated by the researcher using (Stata Version 12)

Table 4.1 reveals that the return on assets of the five pharmaceutical companies over the ten year period to 2013 have an average of 18.44% ranged from a negative return of -37.06% to a maximum of 97.43%. This means that for every one Naira worth of net investment, the industry had at worst made a loss of 37.06 kobo and had at best earned a maximum of 97.43 kobo. Every firm in the industry could earn an average of 18.44% on its net investment with a high degree of risk, as returns varied at both sides of the scale by as large a margin as 21.96%. It took an average of 83 days to convert Raw Materials to Work-in-Process inventories. While at a particular time, some firms in the industry were able to shorten this range to 10 days, others could not turn Raw Materials to the next stage of production till after 224 days. For the Work-in-Process inventory, it took an average of 24 days to turn to Finished Goods. While some firms could perform this process in a day, others could not till after 136 days. An average of 75 days is taken for the finished goods to be converted to cash from its sales. This is in line with the work of Capkun, Hameri& Weiss (2009).

4.3 Correlation between the Variables of the Study

In an effort to establish the nature of the correlation between the dependent and theindependent variables and also to ascertain whether or not multi-collinearity exists as a resultof the correlation among variables, Correlation analysis assesses the inter-relationship

andassociation between variables. The Pearson correlation analysis is used here to assess therelationship between the variables of Inventory Management and Profitability, Table4.2 is computed for this purpose. The correlation matrix in Table 4.2 provides some insightsinto which of the independent variables are related to the dependent variables.

Table 4.2: Correlation Coefficients of the Variables

Variables	ROI	GPM	NPM	RMD	WIPD	FGD	SIZE	LEV
ROI	1.000							
GPM	-0.2307	1.000						
NPM	0.6665	-0.2901	1.000					
RMD	-1.1678	0.1132	0.1683	1.000				
WIPD	0.0476	0.7287	-0.2353	-0.2408	1.000			
FGD	0.0696	0.0078	0.3318	0.7160	-0.3044	1.000		
SIZE	-0.1453	0.0932	-0.4258	-0.5152	0.0292	-0.2456	1.000	
LEV	-1.1119	0.3445	-0.2156	-0.3446	0.4289	-0.4199	0.0063	1.000

Source: Generated by the researcher using (Stata Version 12)

From the above Table 4.2, the values on the diagonal are all 1.000, indicating that eachvariable is perfectly correlated with itself. The highest correlation with ROI is for FGD (0.0696) which implies absence of multi-collinearity with ROI and allvariables. Likewise, the correlations within the explanatory variables prove lack of multi-collinearityas the highest correlation coefficient is that of FGD and RMD with a positive value of 0.7160.With regard to the nature of the correlation between the dependent and the independentvariables, the relationship between ROI and RMD shows a negative amount of -1.168 which is less than

117%, which implies as RMD reduces by less than 117%, ROI will increase by the same percentage. Also, the correlation between WIPD and ROI is positive with about -0.476 coefficients, which implies that as the period of WIP decreased, the Profitability of Pharmaceutical companies in Nigeria may increase by 47.6%. Similarly, the nature of the correlation between ROI and FGD show a negative and insignificant amount of only -0.094 which is less than 9.4%, which implies as FGI days decrease by less than 9.4%, ROI will increase by the same percentage.

4.4Impact of Inventory Turnover Period (RMD, WIPD and FGD) on Profitability (ROI)

In order to determine the impact of the discrete components of inventory on ROI as one of the profitability ratios, the first regression equation,

Profitability $(ROI)_{it} = \beta_0 + \beta_1 RMD_{it} + \beta_2 WIPD_{it} + \beta_3 FGD_{it} + \beta_4 SIZE + \beta_5 LEV + \varepsilon_{it}$ in the model is run. The regression results of the combined impact of the discrete components of inventory on profitability is evaluated from the model summary as presented in Table 4.3

Table 4.3: Regression Results of the Impact of RMD, WIPD, and FGD on Profitability (ROI)

Table 4.3: Model Summary

Equation	Obs	Parms	RMSE	R^2	F	P
ROI	50	6	.2003399	0.2527	2.976107	0.0212
GPM	50	6	11.07225	0.7220	22.84925	0.0000
NPM	50	6	0.1707859	0.3859	5.530744	0.0005

Source: Generated by the researcher using (Stata Version 12)

In appraising the Model 1, based on the regression result in Table 4.3, the coefficient of determinations “R-square” shows 25.27% indicating that the variables considered in the model accounts for about 25.27% change in the dependent variable that is ROI, while the remaining of the change is as a result of other variables not addressed by this model. From the sameresult in Table 4.3, it can be seen clearly that p-value of the variables is 0.02121 is

lower than 0.05 (for a 95% confidence level), thus, the null hypothesis will be rejected as the p-value is lower than 5% that means the explanatory variableshave significant influence on the dependent variable as the lower the p-value, the higher the relevance of the variable. Thus, considering both correlation and regression outcomes, it can be concluded that the relationship between the discrete components of inventory and profitability, measured by ROI, is negative and significant.

This is in line with Narware (2004) and Gill, Biger&Mathur (2010), who found a statistically significant association between Profitability and inventory turnover and in line with the findings of Alipour (2011); Deloof (2003); Lee, Song, & Lee (2009); Panigrahi (2013); and Usama (2012) who discovered an inverse relationship between the inventory turnover period and Profitability. However, opposed to Ali (2011); Gill, Biger&Mathur (2010); Padachi (2006); Rimo&Panbunyuen (2010); Soekhoe (2012); and Warnes (2013) who found a positive relationship. Thus, the model equation can be written as:

Profitability (ROI)$_{it}$ = 1.999167$_{it}$ – β_1 0.003119$_{it}$+ $\beta_2$0.007043$_{it}$ + $\beta_3$0.0012595$_{it}$ - $\beta_4$0.1052373 – 0.1168744 +ε_{it}

In the overall, considering the regression results, the p-value revealed a significant relationship between RMD, WIPD and FGD and ROI. Thus, it can be concluded that relationship between the explanatory variables and Profitability of listed Pharmaceutical Companies in Nigeria is negative and significant.

4.5Impact of Inventory Turnover Period (RMD, WIPD and FGD) on Profitability (GPM)

In order to determine the impact of the combined components of inventory measured by inventory days as a technique of inventory management, on the Profitability of Pharmaceutical companies in Nigeria, the second regression equation,

$GPM_{it} = \beta_0 + \beta_1 RMD_{it} + \beta_2 WIPD_{it} + \beta_3 FGD_{it} + \beta_4 SIZE + \beta_5 LEV + \varepsilon_{it}$in the model is run, using multivariate regression. In appraising model 2 based on the regression equation in table 4.3, the

coefficient of determination, R^2 shows 0.7220 which is more than 72%, indicating that the variables considered in the model accounts for 72.20% change in the dependent variable, while the remaining change is as a result of other variables not addressed by the model. The p value of this model is 0.0000 which is less than 5% for a 95% confidence level.Thus, the null hypotheses will be rejected as the p-value is lower than 5%. This means the explanatory variableshave significant influence on the dependent variable, as the lower the p-value, the higher the relevance of the variable. Going by the correlation and regression results, it can be concluded that the relationship between the discrete components of inventory and profitability, measured by GPM, is negative and significant. Therefore, the model equation can be written as:

$$\textbf{Profitability (GPM)}_{it} = 2.392004_{it} - \beta_1 0.003119_{it} + \beta_2 0.0007043_{it} + \beta_3 0.0012595_{it} - \beta_4 0.1372237 - \beta_5 0.1168744 + \varepsilon_{it}$$

4.6 Impact of Inventory Turnover Period (RMD, WIPD and FGD) on Profitability (NPM)

In order to determine the impact of the combined components of inventory measured by inventory days as a technique of inventory management, on the Profitability (NPM) of Pharmaceutical companies in Nigeria, the third regression equation,

$NPM_{it} = \beta_0 + \beta_1 RMD_{it} + \beta_2 WIPD_{it} + \beta_3 FGD_{it} + \beta_4 SIZE + \beta_5 LEV + \varepsilon_{it}$ in the model is run, using multivariate regression. In appraising model 3 based on the regression result in table 4.3, the coefficient of determination, R^2 shows 0.3859 which is 38.59%, indicating that the variables considered in the model accounts for 38.59% change in the dependent variable, while the remaining change is as a result of other variables not addressed by the model. The p value of this model is 0.0005 which is less than 5% for a 95% confidence level. Thus, the null hypotheses will be rejected as the p-value is lower than 5% that means the explanatory variableshave significant influence on the dependent variable as the lower the p-value, the higher the relevance of the variable. Going by the correlation and regression results, it can be concluded that the

relationship between the discrete components of inventory and profitability, measured by NPM, is negative and significant. Therefore, the model equation can be written as:

$$\textbf{Profitability (NPM)}_{it} = 2.392004_{it} - \beta_1 0.0022216_{it} - \beta_2 0.0008629_{it} + \beta_3 0.0013154_{it} - \beta_4 0.1372237 - \beta_5\, 0.660327 + \varepsilon_{it}$$

These findings are in line with Narware (2004) and Gill, Biger&Mathur (2010), who found a statistically significant association between Profitability and inventory turnover and in line with the findings of Alipour (2011); Deloof (2003); Lee, Song, & Lee (2009); Panigrahi (2013); and Usama (2012) who discovered an inverse relationship between the inventory turnover period and Profitability. However, opposed to Ali (2011); Gill, Biger&Mathur (2010); Padachi (2006); Rimo&Panbunyuen (2010); Soekhoe (2012); and Warnes (2013) who found a positive relationship.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Summary

Effective inventory management is vital for business survival and ultimate growth. Inventories constitute a significant portion of the overall manufacturing costs (50-60)%. Such a huge investment requires adequate planning and control in order to avoid wastage which invariably affects profitability. The financial management decisions of companies are basically concerned with three major areas: capital structure, capital budgeting, and Working Capital management. Among these major areas, the Working Capital Management (WCM) of which inventory management is an indispensable component of, is an area of great significance for every company as it virtually affects its overall Profitability and liquidity.

Chapter one comprises of 6 sections, thus: background to the study, statement of the research problem, objectives of the study, hypotheses of the study, scope and the significanceof the study. Under the background to the study, it is explained that inventories constitute the lifeblood and heart of every manufacturing concern which also constitute a greater percentage of the working capital. It is stated under the problem of the study that dearth of or perhaps inadequate empirical evidence on the effect of Inventory Management on firm Profitability in Nigeria and in particular, in the Nigerian Pharmaceutical sector (to the best of the researcher's knowledge), as well as lack of local empirical studies conducted on the impact of the individual components of inventory on corporate Profitability provided the reason for this study. The study therefore, is an attempt to fill this gap. It is explained, under the scope of the study, that the study examines the relationship between Inventory Management, measured by inventory days or inventory turnover period and the Profitability of Nigerian Pharmaceutical Companies. The study used Raw Material, Work-in-Process and Finished Goods Inventory

Turnover Periods as Inventory Management Proxies and Return on Investment (ROI), Gross Profit Margin and Net Profit Margin as profitability proxies. The time frame of the study is from the year 2004 to 2013.

Chapter two covers the concept of Inventory Management, Inventory Management practices; Supply Chain Management and the Operating Cycle among others. It also reviewed foreign and local Empirical Studies on Inventory management and Profitability. The findings of the studies reviewed in chapter two revealed diverse outcome, where most of the studies used multiple regressions and the frequently used proxy for Profitability was ROI, while for Inventory management, the frequently used variables are: Raw Materials Inventory Turnover Period (in days); Work-in-Process Inventory Turnover Period (in days); Finished Goods Inventory Turnover Period (in days) and the Overall Inventory Turnover Period (in days).

In Chapter three, Ex-*post facto* design was adopted in order to establish the nature of relationship between Inventory management and Profitability of the listed Pharmaceutical Firms in Nigeria. The population of this study as stated comprises of all the 7 listed Pharmaceutical firms on the Nigerian Stock Exchange. Two criteria were set in the selection of the sample size: a company must be listed on or before Jan. 1st 2004 and must have its complete annual reports for ten year period. This criterion was established with a view to ensuring that the firms selected have published their financial statements for the period covered by this study in order to ensure the availability of relevant data. As a result of this filter, 5 firms emerged as the sample of this study. Accounting data were obtained primarily from the published annual reports and accounts of the firms. Also, Chapter three stated the Dependent and Explanatory Variables. The dependent variables adopted in the study are the companies' Profitability measured by ROI, GPM and NPM which is in consistent with the

works of Folinas&Shen (2014), Sahari, Tinggi&Kadri (2012), Falope&Ajilore (2009) and Afza&Nazir (2009). The explanatory variables consist of independent and control variables. The independent variables of Raw Material Inventory Turnover Period, Work in Process Inventory Turnover Period and Finished Goods Inventory Turnover Period (in days) as measures of Inventory management, were used in previous studies of Capkun, Hameri& Weiss (2009), Sahari, Tinggi&Kadri (2012) and Folinas and Shen (2014). Also, this study adopted two control variables relating to the companies. The measure of the logarithms of total sales of the companies is adopted for SIZE as one of the control variables. The second control variable is leverage which is measured by the ratio of total debt to total assets. These measures were used in Raheman& Nasr (2007), Dong & Su (2010) and Gill, Biger&Mathur (2010).

Three techniques of data analysis were used to analyse the generated data. They are Descriptive Statistics, Pearson Correlation, and Multivariate Regression. Descriptive statistics was used to compute the summary statistics for the variables of the study; Pearson Correlation was used to establish the nature of the relationship between the dependent and the independent variables and also to ascertain whether or not multi-collinearity exists as a result of the correlation among variables. Multivariate regression was also used to predict the value of the dependent variablesbased on the values of the explanatory variables.

In Chapter four, null hypotheses have been tested, and results of the processed data were presented and discussed. Firstly, the test results of the first null hypothesis of the study which states that RMD, WIPD and FGD do not have significant effect on the Profitability of the listed Pharmaceutical Firms in Nigeria. Using Pearson correlation and multivariate regression, the results of the first regression equation revealed that RMD, WIPD and FGD

have negative but significant relationship with the Profitability (ROI) of the listed Pharmaceutical Firms in Nigeria. The result of the second equation revealed that RMD, WIPD and FGD have negative and significant relationship with profitability (GPM) of the sampled firms. Lastly, the result of the third regression equation revealed that RMD, WIPD and FGD have negative relationship with profitability of the sampled firms. Therefore, the study concludes that RMD, WIPD as well as FGD do have a significant impact on the Profitability of the listed Pharmaceutical Firms in Nigeria based on the documented evidence.

5.2 Conclusions

Inventory management is a vital aspect of firms' financial management decision. The ability of a firm to continuously operate in longer period is dependent on how it deals with investment in Inventory management. The optimal Inventory management could be achieved by firm that manage the trade-off between Profitability and level of inventory. Based on the analysis made in chapter four, the following conclusions are drawn:

i. Raw Material Inventory Turnover Period (RMD) is negatively related to Profitability of the listed Pharmaceutical Firms in Nigeria; and the relationship is significant based on the documented evidence. When a company maintains a high level of inventory with generous trade credit policy, the sales are likely to increase, hence improving the Profitability of the company. However, the increases in Raw Material Inventory Days means a longer period is taken for the Raw Material inventory to be converted to the next level of production, hence, increasing the storage costs and other negative costs associated with keeping inventory e.g deterioration, pilferage, insurance costs, obsolescence and so on.

ii. Work-In-ProcessInventory Days (WIPD) is also negatively related to Profitability of the listed Pharmaceutical Firms in Nigeria; also, the relationship is significant.

Increases in the Work in Process Days have negative impact on company's performance, as semi-processed goods remain idle for a longer period of time, which ties down cash that may be used to finance other viable projects.

iii. Finished Goods Inventory Days is negatively related to Profitability of the listed Pharmaceutical Firms in Nigeria also the relationship is significant. Due to the nature of pharmaceutical products, this component of inventory is expected to have a very short gestation period. This is evidenced by a high correlation coefficient between it and ROI as one of the profitability proxy.

iv. In the overall, it can be deduced that Inventory Management impacts on the Nigerian Pharmaceutical companies' Profitability significantly.

5.3 Recommendations

Based on the findings of this research, there is an impressive inventory management in the sampled firms of the study. Despite this, the following recommendations are offered based on the research findings:

i. In the case of high cost/level inventories, there should be periodic stock taking so as to discover in time, the slow moving stocks (if any) to avoid over investment in such stocks. Further, in case of dwindling demand for obsolete stock, prices should be written down to promote sales.

ii. Proper communication among members of the Supply Chain should be maintained in order to avoid the "Bull Whip Effect" a situation that leads to unwarranted accumulation of stock along the Supply Chain.

iii. The ABC inventory categorization should be adopted by the firms in order to differentiate between the fast moving top ranking goods from the average and

slow moving goods. The essence of this is to help management in assigning different level of control to different category of goods.

iv. Similarly, companies should sufficiently plan and control their operations, amend the shortfalls as noted, consider the principles of finance in their decision making and

v. Utilize the services of professionals in complex business areas

REFERENCES

Akbar, J. (2013).Just-in-Time Manufacturing System: From introduction toimplementation.*International Journal of Economics, Business and Finance.*Vol. 1, No. 2

Alipour, M. (2011). Working Capital Management and Corporate Profitability: Evidence from Iran. *World Applied* Science *Journal*, 12(7), 1093-1099.

Atrill, P. (2006). *Financial management for decision makers,*(4th Ed), Prentice Hall.

Azam, M.,&Haider S.I (2011).Impact of Working Capital Management on Firms' Performance: Evidence from Non-financial Institutions of KSE*InterdisplinaryJournal of Contemporary Research Business,* Vol. 3, No. 5

Bai, L. &Zhong, Y. (2008).*Improving Inventory Management in Small Business*.Master's Thesis in International Logistics and Supply Chain Management.Jonkoping University, Sweden.

Balakrishnan, R., Linsmeier, T.J. &Venkatachalam, M. (1996).Financial benefits from JIT adoption: Effects of customer concentration and cost structure", *The Accounting Review,* Vol. 71 No. 2, pp. 183-205.

Banjoko, S.A (2000). *Production and operations management.*Saban publishers, Lagos.

Barcodesinc. (n.d). Retrieved from http://www.barcodesinc.com/what-is-inventory management.htm

Barker, T. (1989). *Essentials of Materials Management.* McGraw Hill Book Company, London.

Bartezzaghi, E., Spina, G. &Verganti, R. (1995), Lead-time models of Business Processes *International Journal of Operations & Production Management,* Vol. 14 No. 5, pp. 5-20.

Barton, F.M., Agarwal, S.P. & Rockwell, L.M. (1988), Meeting the challenge of Japanese management concept,*Management Accounting,* Vol. 74, pp. 49-52.

Bassin, W. M. (1990). A Technique for Applying EOQ Models to Retail Cycle Stock Inventories.*Journal of Small Business Management*, *28*(1),pp 48-55.

Baveld, B.B., (2012). *The impact of Working Capital Management on the profitability of public listed firms in The Netherlands during the financial crises*.A master's thesis in the Department Of Business Administration, University of Twente, Netherlands.

Boyer, K. (1996).An assessment of managerial commitment to lean production.*International Journal of Operations & Production Management*, Vol. 16 No. 9, pp. 48-59.

Callen, J.L., Fader, C. &Krinsky, I. (2000), "Just-in-time: a cross-sectional plant analysis", *International Journal of production Economics*, Vol. 63 No. 3, pp. 277-301.

Cannon, A.R (2008).Inventory improvement and financial performance.*International Journal of production economics* 115, pp 581-593.

Capkun, V., Hameri, A. & Weiss, L. (2009).On the relationship between inventory and financial performance in manufacturing companies.*International Journal of Operations and Production Management*, Vol. 29 No.8, 2009, pp 789-806.

Chan, K. & Chen, N. (1988).An unconditional asset-pricing test and the role of firm size as an instrumental variable for risk, *Journal of Finance*, Vol. 43 No. 2, pp. 309-25.

Chan, K., Chen, N. & Hsieh, D. (1985).An exploratory investigation of the firm size effect, *Journal of Financial Economics*, Vol. 14 No. 3, pp. 451-71.

Chen, H., Frank, M.Z. & Wu, O.Q. (2005).What actually happened to the inventories of American companies between 1981 and 2000? *Journal of Management Science*, Vol. 51 No. 7, pp. 1015-31.

Christensen, W.J., Germain, R. &Birou, L. (2005).Build-to-order and just-in-time as predictors of applied supply chain knowledge and market performance.*Journal of Operations Management*, Vol. 23 No. 5, pp. 470-81.

Claycomb, C., Germain, R. and Droge, C. (1999). Total system JIT outcomes: Inventory, organization and financial effects.*International Journal of Physical Distribution & Logistics*, Vol. 29 No. 10, pp. 612-30.

Coyle, J. J., Bardi, E. J., & Langley, C. J. Jr. (2003).The Management of Business Logistics:A Supply Chain Perspective(7th ed.). Mason: South- East.

Deloof, M. (2003). Does Working Capital Management Affects Profitability of Belgian Firms? Journal of Business, Finance and Accounting, pp 573-588.

Eroglu, C. & Hofer, C. (2011).Lean, Leaner, Too Lean? The inventory link revisited. *Journal of operations management*. 29, pp 356-369.

Fama, E.F. & French, K.R. (1997). Industry cost of equity.*Journal of Financial Economics*, Vol. 43 No. 2, pp. 153-93.

Fama, E.F. &MacBeth, J.D. (1973).Risk, return and equilibrium: Empirical tests.*Journal of Political Economy*, Vol. 81 No. 3, pp. 607-36.

Forrester, J. (1961).*Industrial Dynamics*.MIT Press, New York, NY.

Fullerton, R.R. &McWatters, C.S. (2001). The production performance benefits from JIT implementation.*Journal of Operations Management*, Vol. 19 No. 1, pp. 81-96.

Fullerton, R.R.,McWatters, C.S. and Fawson,C. (2003). An examination of the relationships between JIT and financial performance.*Journal of Operations Management*, Vol. 21No. 4, pp. 383-404.

Garcia–Teruel, P. J. & Martinez-Solano, P. (2007).Effects of Working Capital Managementon SME Profitability.*International Journal of Managerial Finance,* 3(2), 164 –177.

Gaur, V., Fisher, M.L. & Raman, A. (2005).An econometric analysis of inventory turnover performance in retail services.*Journal Management Science*, Vol. 51 No. 2, pp. 181-94.

Gill, A., Biger, N. &Mathur, N. (2010). The Relationship Between Working Capital Management and Profitability: Evidence from the United States. http://astonjournals.com/bej accessed on 4th April, 2014.

Goldratt, E.M. & Cox, J. (1984).*The Goal*, North River Press, New York, NY.

Goldsby, T., &Martichenko, R. (2005).*Lean Six Sigma Logistics: Strategic Development to OperationalSuccess*. Boca Raton: J. Ross Publishing, Inc.

Grablowsky, B.J.(2005). Financial Management of Inventory.*International Journal of Production Economics*, Volume 93-94, pages 239-252.

Hakansson, H., &Persson, G. (2004).Supply Chain Management: The Logic of Supply Chains and Network. *The International Journal of Logistics Management, 15*(1), 11-26.

Heizer, J. & Render, B. (2006).*Operations Management*(8th ed.).Prentice-Hall, Chicago, IL.

Hendricks, K.B. &Singhal, V.R. (2003).The effect of supply chain glitches on shareholder wealth.*Journal of operations Management,* Vol. 21 No. 5, pp. 501-22.

Hopp, W.J. & Spearman, M.L. (2001).*Factory Physics*(2nd ed.).McGraw-Hill, New York, NY.

Huson, M. & Nanda, D. (1995).The impact of just-in-time manufacturing on firm performance in the US.*Journal of Operations Management*, Vol. 12 Nos. 3/4, pp. 297-310.

Jacobs, R. F., Chase, R. B. &Aquilano, N. J. (2009).*Operations and Supply Management*, McGraw Hill, Boston.

Javadian, A.K., Nagendra, K.B,&Fooladi, H.T(2013).Just-In-Time Manufacturing System: From introduction to implementation.*International Journal of Economics, Business and Finance*.

Juan, P. G., & Martinez, S. (2002). Effects of working capital management on SME profitability.*Journal of Business Finance & Accounting, 30 (3–4), 1-14*. Retrieved from http://www.sagepublications.

Julius A. Sharma, Dinesh K. S. &Hari P.(2004).Role of Supply Chain Management decisions in effective inventory control.*Journal of Academy of Business and Economics*.

Ketokivi, M. & Schroeder, R. (2004).Manufacturing practices, strategic fit and performance: A routine-based view.*International Journal of Operations & Production Management*, Vol. 24 No. 12, pp. 171-91.

Koufteros, X.A., Vonderembse, M.A. & Doll, W.J. (1998).Developing measures of time-based manufacturing.*Journal of Operations Management*, Vol. 16 No. 1, pp. 21-41.

Krajewski, L.J. &Ritzman, L.P. (2005).*Operations Management*, 7th ed., Prentice-Hall, Chicago, IL.

Lambert, D.J., Cooper, M.C. &Pagh, J.D. (1998).Supply Chain Management, implementation issues and research opportunities.*International Journal of Logistics Management*, *9*(2), 1-19.

Lawrence, J.J. &Hottenstein, M.P. (1995).The relationship between JIT manufacturing and performance in Mexican plants affiliated US companies. *Journal of Operations Management*, Vol. 13 No. 1, pp. 3-18.

Lazaridis, I., &Dimitrios, T. (2005).The relationship between working capital management and profitability of listed companies in the Athens Stock Exchange.

Lee, H.J., Song, S.H & Lee, H.J (2009). Correlation Between Supply Chain Management and Financial Performances: Evidence from Korean Companies. *Journal of Operations Management*, Vol. 10 No. 5, pp. 5-21.

Lee, L. &Dobler, D.W (1977).*Purchasing and Material management*, McGraw Hill Inc., U.S.A.

Lieberman, M.B. &Demeester, L. (1999).Inventory reduction and productivity growth: Linkages in the Japanese automotive industry",*Journal of Management Science*, Vol. 45 No. 4, pp. 466-85.

Lieberman, M.B., Helper, S. &Demeester, L. (1999).The empirical determinants of inventory levels in high-volume Manufacturing.*Journal ofProduction and Operations Management*, Vol. 8 No. 1, pp. 44-55.

Lining B. & Ying Z. (2008).*Improving Inventory Management in Small Business*.Master Thesis in International Logistics and Supply Chain Management.Jonkopin University.

Lwiki, T., Ojera, P.B, Mugenda, N.G &Wachira, V.K (2013).The impact of inventory management practices on Financial Performance of sugar Manufacturing Firms in Kenya.*International Journal of Business, Humanities and Technology*, Vol. 3 No. 5.

Maness, T.S. &Zietlow, J.T. (2005).*Short-Term Financial Management*.3rd edition. Ohio:South-Western/Thomson Learning.

Muller M. (2003).*Essentials of Inventory Management*.Amacom publishers,1601 Broadway, NewYork.

Mendelson, H. &Parlakturk, A.K. (2008). Product-line competition: Customization vs Proliferation.*Journal of Management Science*, Vol. 54 No. 12, pp. 2039-53.

Monday, J. U. (2008).*Effects of Efficient Materials Management on Performanceof Firms in Food & Beverage Manufacturing Industry in Nigeria*. MBA Dissertation, ObafemiAwolowo University, Nigeria.

Nahm, A.Y., Vonderembse, M.A. &Koufteros, X.A. (2003).The impact of organizational structure on time-based manufacturing and plant performance.*Journal of Operations Management*, Vol. 21 No. 3, pp. 281-306.

Naylor, J.B., Naim, M.M. and Berry, D. (1999).Leagility: Integrating the lean and Agile Manufacturing Paradigms in the total Supply Chain.*International Journal of Production Economics*, Vol. 62 Nos 1/2, pp. 107-18.

Neil, G. & O'Hara, J. (1987).The introduction of JIT into a high technology electronics manufacturing environment.*International Journal of Operations & Production Management*, Vol. 7 No. 4, pp. 64-80.

Norris, D.M., Swenson, R.D. & Chu, Y. (1994).Just-in-time production systems: a survey of managers.*Production & Inventory Management Journal, Vol. 35 No. 2*, pp. 63-6.

Ogbadu, E. E. (2009). Profitability through Effective Management of Materials.*Journal of Economics and International Finance*, 1(4): 099-105.

Ogbo, A.I., Onekanma, I. V. & Wilfred, I.U. (2003).The effect of Effective Inventory Control Management on Organisational Performance.*Mediterranean Journal of Social Sciences*, Doi : 10.5901/mjss 2013 v 5 n 10 p109.

Onwubolu, G.C., &Dube, B.C. (2006).Implementing an Improved Inventory Control System in a Small Company: A case study.*Journal of Production Planning and Control*, 17(1), 67-76.

Owolabi, S.A. &Alu, C.N. (2012). Effective Working Capital Management and Profitability: A Study of Selected Quoted Manufacturing Companies in Nigeria.*Economics and Finance Review, 2(6), 55 – 67.*

Padachi, K. (2006). Trends in Working Capital Management and its Impact on Firms' Performance: An Analysis of Mauritanian Small Manufacturing Firms. *International Review of Business Research Papers, 2(2), 45 – 58.*

Palepu, K., Peek, E., Bernard, V. & Healy, P. (2007).*Business Analysis and Valuation: Using Financial Statements*, Thomson Learning, London.

Pandey, I. M. (2004).*Financial Management* 9th (ed), Vikas Publishing House PVT Ltd.

Panigrahi, A.K. (2013). Cash Conversion Cycle and Firms' Profitability: A Study Cement Manufacturing Companies of India. *International Journal of Current Research* 5(6), pp 1484-1488.

Rajagopalan, S. &Malhotra, A. (2001).Have US Manufacturing Inventories really Decreased? An empirical study.*Journal of Manufacturing and Service Operations Management*, Vol. 3 No. 1, pp. 14-24.

Rajeev, N. (2008). An Evaluation of Inventory Management and Performance in Indian Machine Tool SMEs: An Exploratory Study. *4th IEEE International Conference on Management of Innovation and Technology, 2008. ICMIT 2008, 21-24 Sept. 2008, Bankok, Thailand, pp. 1412-1417.*

Rimo, A., &Panbunyuen, P. (2010).*The Effect of Company Characteristics on Working Capital Management: A Quantitative Study of Swedish Listed Companies.* UMEÅ School of Business Spring Semester Master Thesis, Two-Year, 15 hp

Roumiantsev, S. &Netessine, S. (2007). What can be learned from classical Inventory Models: A cross-industry exploratory investigation.*Journal of Manufacturing and Service Operations Management*, Vol. 9 No. 4, pp. 409-29.

Sahari, S.,Tinggi, M. &Kadri N. (2012).Inventory management in Malaysian Construction Firms: Impact on performance.*SIU Journal of management*, vol. 2, no. 1 ISSN: 2229-0044.

Samson, A. A., Josiah, M., Yemisi, B. &Erekpitan, I. O. (2012). The Impact of Working Capital Management on the Profitability of Small and Medium Scale Enterprises in Nigeria. *Research Journal of Business Management, 6(2): 61-69.*

Simchi-Levi, D.,Kaminsky, P. &Simchi-Levi, E. (2004).*Managing the Supply Chain: The Definitive Guide for the Business Professional*, New York: McGraw-Hill.

Soekhoe, S.G (2012). The Effects of Working Capital Management on the Profitability of Dutch Listed Firms.International Research Journal of Finance and Economics, 2012(66) pp 1450-2887.

Sushma,V.&Bhupesh, S. (2007). *Effect of Working Capital Management Policies onCorporate Performance: an Empirical Study*. Global Business Review, 8 p.267.

Uremadu, S.O, Egbide, B.C., &Enyi, P.E (2012).Working Capital Management, Liquidity and Corporate Profitability among quoted Firms in Nigeria Evidence from theProductive Sector. *International Journal of Academic Research in Accounting,Finance and Management Sciences, 2(1), 80-97.*

Usama, M. (2012).Working Capital Management and its Effects on Firms' Profitability. In other Foods Sector of KSE.Arabian Journal of Business and Management Review. 1(12) pp 62-73.

Warnes, S. (2013). The impact of Working Capital Management on Firms' Profitability: Empirical Evidence from Cement Sector of Pakistani Stock Exchange. American Journal of Governance and Politics, 3(2), pp 46-55.

Yusuf, A. (2012). Determinants of Inventory Management as a component of Working Capital in ensuring Corporate Profitability: A conceptual approach. *Journal of Finance and Accounting* Vol. 3 no. 1

		EVANS MEDICA																	
YEAR	TURNOVER	COST OF SALES	PAT	TOTAL DEBT	F/A	C/A	T/A	C/L	RMI	WIP	FGI	INV	SIZE	LEV	ROA	RMD	WIPD	FGD	INVD
2004	1009091	529247	46652	1883744	1358315	2032555	3390870	1653588	157197	26632	43422	227251	6.00393	0.555534	0.013758	108.4123	18.367	29.94638	156.7257
2005	1068624	536279	14223	1735962	1304235	1988585	3292820	1530668	201201	14931	31094	247226	6.028825	0.527196	0.004319	136.9406	10.16228	21.16307	168.2659
2006	2908469	1354039	132204	2178476	1404258	2415119	3819377	2023317	414824	70680	33231	518735	6.463664	0.570375	0.034614	111.8216	19.05277	8.957877	139.8322
2007	3151753	1639485	-317019	3023873	1598611	2826595	4425206	2569577	424406	71676	361837	857919	6.498552	0.683329	-0.07164	94.48588	15.95729	80.56609	190.9993
2008	4465237	2015865	-510098	3873419	1135509	2683911	3819420	3116300	486169	85521	107233	678923	6.649845	1.014138	-0.13355	88.02756	15.48475	19.41601	122.9283
2009	2193563	1300328	-622697	3452079	1638470	2159723	3798193	3165666	526198	24326	85578	636102	6.34115	0.908874	-0.16395	147.7029	6.828269	24.02161	178.5528
2010	2594838	1392783	169846	3327849	1642792	2201017	3843809	1579566	427599	14729	122414	564742	6.41411	0.865769	0.044187	112.0588	3.859959	32.08045	147.9992
2011	2757873	1540541	15196	3431395	1695272	2267278	3962550	1801576	448686	17321	44389	510396	6.440574	0.865956	0.003835	106.3071	4.10386	10.51707	120.928
2012	3030540	1433957	27795	4023665	4210125	2410162	6620287	2190451	370585	30149	51900	452634	6.48152	0.607778	0.004198	94.32886	7.674139	13.21065	115.2136
2013	3120847	1435986	388995	4013775	4209135	2430264	6639399	2290652	380584	303246	53780	737610	6.494272	0.604539	0.058589	96.73713	77.0793	13.66984	187.4863
			PHARMA-DEKO PLC DATA SHEET																
YEAR	TURNOVER	COST OF SALES	PAT	TOTAL DEBT	F/A	C/A	T/A	C/L	RMI	WIP	FGI	INV	SIZE	LEV	ROA	RMD	WIPD	FGD	INVD
2004	712481	223589	30619	830544	368499	733490	1101989	733878	43713	82346	28118	154177	5.852773	0.753677	0.027785	71.3597	134.4265	45.9015	251.6877
2005	564944	328592	8216	759576	498663	734380	1233043	732888	42711	95686	18119	156516	5.752005	0.616017	0.006663	47.44338	106.288	20.12659	173.858
2006	648868	535689	-337330	1351678	616516	340195	956711	270102	32194	137149	7495	176838	5.812156	1.412838	-0.35259	21.93588	93.4486	5.106834	120.4913
2007	790399	491272	-242284	1564037	652283	417705	1069988	1205058	25160	84454	4076	113690	5.897846	1.461733	-0.22644	18.69311	62.74673	3.028343	84.46818
2008	1105570	752634	-197972	1672466	622556	488137	1110693	1404041	44966	98726	2682	146374	6.043586	1.505786	-0.17824	21.80687	47.8785	1.300672	70.98604
2009	501930	418791	-461497	1891812	910110	335295	1245405	1636842	71032	132895	35775	239702	5.700643	1.519034	-0.37056	61.9084	115.8255	31.17993	208.9138
2010	494457	383006	464094	3047495	881174	1055820	1936994	2070468	71026	142377	54752	268155	5.694129	1.573312	0.239595	67.6869	135.6835	52.17798	255.5484
2011	1261876	692673	42158	3245755	808956	1240293	2049249	2177412	67982	17723	71196	156901	6.101017	1.583875	0.020572	35.82272	9.339032	37.51632	82.67807
2012	1037463	546712	740945	1839379	2128112	654699	2782811	1839379	92035	8882	68597	169514	6.015973	0.660979	0.266258	61.4451	5.929868	45.79725	113.1722
2013	1251987	683574	45360	3143364	805976	1246282	2052258	2180489	71047	17973	72017	161037	6.0976	1.531661	0.022102	37.93613	9.596832	38.45407	85.98704
			MAY AND BAKER DATA SHEET																
YEAR	TURNOVER	COST OF SALES	PAT	TOTAL DEBT	F/A	C/A	T/A	C/L	RMI	WIP	FGI	INV	SIZE	LEV	ROA	RMD	WIPD	FGD	INVD
2004	1900865	1800395	91139	76803	409452	926837	1336289	417883	83296	113237	260821	457354	6.278951	0.057475	0.068203	16.88687	22.95691	52.8771	92.72088
2005	1996974	1243478	101759	492559	644129	1302006	1336289	492554	245350	60652	179631	485633	6.300372	0.368602	0.07615	72.01796	17.80327	52.72736	142.5486
2006	2253389	1215293	211470	225948	1664154	2300418	1336289	986923	306822	74297	231147	612266	6.352836	0.169086	0.158252	92.15064	22.31429	69.42248	183.8874
2007	3859749	2363690	208318	21562	1778032	2676969	1336289	1582729	467302	165231	82066	714599	6.586559	0.016136	0.155893	72.16058	25.5149	12.6726	110.3481
2008	5439910	3529046	417962	472674	2300418	3429738	1336289	2138612	459307	223877	164923	848107	6.735592	0.353721	0.312778	47.50492	23.15501	17.05755	87.71749
2009	4604458	2878932	232081	427483	3506376	2647472	1336289	2637900	311416	219523	354792	885731	6.663179	0.319903	0.173676	39.48229	27.83181	44.98164	112.2957
2010	4639202	2770229	192977	1066023	4158408	2658508	1336289	2693127	436384	191680	280153	908217	6.666443	0.797749	0.144413	57.49711	25.25539	36.91242	119.6649
2011	4749617	2808205	253062	746899	5037202	1996463	1336289	2940557	353408	96672	214507	664587	6.676659	0.558935	0.189377	45.93465	12.56507	27.88082	86.38054
2012	5484925	3455499	82282	2165805	4968740	3103110	1336289	2768543	393827	258524	298680	951031	6.739171	1.620761	0.061575	41.59945	27.30756	31.54919	100.4562
2013	6253986	4026568	-78116	1889692	4782075	3374525	1336289	3207522	693309	195280	322387	1210976	6.796157	1.414134	-0.05846	62.84702	17.70173	29.22371	109.7725
			CLAYCOURT HOUSE DATA SHEET																

GLAXOSMITHKLINE DATA SHEET

YEAR	TURNOVER	COST OF SALES	PAT	TOTAL DEBT	F/A	C/A	T/A	C/L	RMI	WIP	FGI	INV	SIZE	LEV	ROA	RMD	WIPD	FGD	INVD
2004	7149033	4350526	955261	3504261	2122516	3899467	6021983	2975635	1120340	34606	1005230	2160176	6.854247	0.581911	0.158629	93.99417	2.903371	84.33669	181.2342
2005	8273679	5109759	881903	4802924	2695056	5105818	7800874	3734763	1115013	23105	924056	2062174	6.917699	0.61569	0.113052	79.64754	1.650435	66.00711	147.3051
2006	10012127	6052067	957091	4675132	3114388	5210621	8325009	3417071	1594337	53641	936400	2584378	7.000526	0.561577	0.116167	96.15442	3.235087	56.47426	155.8638
2007	9915400	6041660	836877	4117210	3515775	5203386	8719161	3331697	758606	11503	1413799	2183908	6.99631	0.472203	0.095981	45.83032	0.694941	85.41305	131.9383
2008	12545129	7177239	1277441	4159822	3961996	5649286	9611282	3321911	921268	0	1326204	2247472	7.098475	0.432806	0.132911	46.85128	0	67.44438	114.2957
2009	14952445	8444296	1701829	5495121	4788426	7289936	12078362	4625976	1457778	24487	2846915	4329180	7.174712	0.454956	0.140899	63.01164	1.058437	123.0563	187.1264
2010	16489111	9270385	2326484	6407504	6880710	7273188	14153898	4576644	1159544	3512	2447005	3610061	7.217197	0.452702	0.164371	45.65437	0.138277	96.34517	142.1378
2011	21148210	12314048	2671444	8934844	7262238	10447981	17710219	6610469	1204464	2805	2121511	3328780	7.325274	0.504502	0.150842	35.70145	0.083143	62.88359	98.66818
2012	25127000	14990778	2754863	11129661	8835220	12736048	21571268	9449552	1940578	15694	2552532	4508804	7.400141	0.515948	0.12771	47.24978	0.382122	62.14982	109.7817
2013	29183675	17581625	2915896	13867949	12122017	13900136	26022153	11753615	2247240	9864	3359236	5616340	7.46514	0.532929	0.112054	46.6534	0.20478	69.73878	116.597

NEIMETH PLC DATA SHEET

YEAR	TURNOVER	COST OF SALES	PAT	TOTAL DEBT	F/A	C/A	T/A	C/L	RMI	WIP	FGI	INV	SIZE	LEV	ROA	RMD	WIPD	FGD	INVD
2004	1002024	912869	59175	532459	54800	896653	951453	54800	247846	5799	358897	612542	6.000878	0.559627	0.062194	99.09833	2.318662	143.5008	244.9178
2005	1241949	1088347	98427	469304	58571	938002	1010223	72221	273135	5342	364896	643373	6.094104	0.464555	0.097431	91.60155	1.791552	122.3755	215.7686
2006	1203530	482231	82228	335301	48874	2560917	2609791	724390	296102	6102	372075	674279	6.080457	0.128478	0.031508	224.1192	4.618596	281.6231	510.3609
2007	1503857	608099	116415	311840	95261	2523278	2618539	794897	293193	13815	543090	850098	6.177207	0.119089	0.044458	175.9836	8.292194	325.9796	510.2554
2008	1946513	652136	98267	751199	155438	2958259	3113697	885158	397158	13345	425299	835802	6.289257	0.241256	0.03156	222.289	7.469186	238.0395	467.7977
2009	1731820	713456	-455206	1792983	182334	2640091	2822425	1238852	419737	19112	476196	915045	6.238503	0.635263	-0.16128	214.735	9.77759	243.6191	468.1318
2010	1871667	990350	-48839	1805889	300648	2578239	2878947	1255065	454078	20565	475901	950544	6.272229	0.627274	-0.01696	167.3534	7.579366	175.3964	350.3292
2011	1898501	791692	113077	1796576	394163	2523433	2917596	1763187	320977	24143	551055	896175	6.278411	0.615773	0.038757	147.9826	11.13084	254.0572	413.1706
2012	2330203	1028283	-59936	1315262	556443	2341112	2897555	1098513	396873	25958	499366	922197	6.367394	0.453921	-0.02069	140.8743	9.214069	177.2553	327.3496
2013	2016522	959225	130578	1110870	506189	2384890	2891079	919505	321464	53143	294628	669235	6.304603	0.384241	0.045166	122.322	20.22174	112.1105	254.6543