**AN APPRAISAL OF INVENTORY MANAGEMENT AND CONTROL IN MANUFACTURING FIRMS. A STUDY OF NIGERIA BREWERIES AND UNILEVER PLC.**

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**ENUGU STATE.**

**JULY, 2018**

**TITLE PAGE**

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**BY**

**AGBOWO, CHISOMUAGA HANNAH**

**U14/MSS/ACC/023**

**A PROJECT REPORT SUBMITTED TO THE DEPARTMENT OF ACCOUNTING/FINANCE, FACULTY OF MANAGEMENT AND SOCIAL SCIENCES. GODFREY OKOYE UNIVERSITY, UGWUOMU-NIKE ENUGU STATE.**

**IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF THE BACHELOR OF SCIENCE (B.Sc) DEGREE IN ACCOUNTING.**

**JULY, 2018**

**DECLARATION**

I, Agbowo, Chisomuaga Hannah with the Registration Number U14/MSS/ACC/023 is a student in the Department of Accounting & Finance, Faculty of Management and Social Science, Godfrey Okoye University. I declare that the research work entitled ‘’An Appraisal of Inventory Management and Control in Manufacturing Firms in Nigeria’’. A study of Nigeria Breweries and Unilever Plc. Submitted by me in partial fulfillment of the requirement for the reward of Bachelor of Science (B.Sc) in Accounting and Finance is my original work and has not been submitted either in part of full for any other degree or diploma either in this or any other tertiary institution.

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_**

**Agbowo, Chisomuaga Hannah Date**

**DEDICATION**

This project is dedicated to Almighty God who saw me through my stay in Godfrey Okoye University.

**ACKNOWLEDGEMENTS**

I thank God Almighty for life.

I sincerely thank Professor. S.A. Eyisi; my supervisor for her concern, constructive criticism, and reconstruction of her schedule in my favor, your time and advice towards ensuring the successful completion of my project.

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To my indefatigable vice chancellor, Rev.Fr. Profressor. Christain Aneke, the Dean of Management and Social Science, Profressor Onyema Ocheoha

and the entire staff of Godfrey Okoye University. I say a very big thank you

 My friends, roommates, departmental, well wishes. You are amazing, thank you for being part of my success.

**CERTIFICATION**

This is to certify that this project has been read and approved by the department of Accounting and Finance, Faculty of Management and Social Science having satisfactory met the requirement.

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**External Examiner Date**

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**ABSTRACT**

*The research work titled “Appraisal of Inventory Management and Control in Manufacturing Firms”. The general objective of this study is to appraise inventory management and control in manufacturing firms of some selected manufacturing firms. The specific objectives are to: examine the effectiveness of the various tools and techniques (Economic order quantity and Economic Batch Quantity) used by manufacturing firms in inventory management and ascertain the extents to which inventory control contribute to profitability in manufacturing firms. This study adopted the ex-post factor and descriptive research design. This study is anchored on theory of Economic order quantity (Wilson EOQ). The area of the study is manufacturing firms’ precisely two manufacturing firms Nigeria Breweries and Unilever plc. The instruments used were main sources from both Primary data and Secondary data. The primary data was obtained using oral interview and properly structured questionnaire while the secondary data for the study were obtained mainly from textbooks, journals and internet articles. A simple percentage approach was employed to analyze the questionnaire while the hypothesis were tested using Regression Analysis at 5% level of significance. The analyses were performed using the Statistical Package for Social Sciences (SPSS) Version 20. The study found that the various tools and techniques of inventory management adopted in manufacturing firms are effective since the significance value (p-value) of 0.046 < 0.05. it further found that inventory control has contributed significantly to the net profit of manufacturing organization**(Nigeria Breweries plc) with (p-value) of 0.005 is less than 0.05 while revise is the case of Unilever plc. It therefore recommended that manufacturing firms should diversify their inventory system to suit specific needs of production and at the same time ensure that maximum attention is paid to inventory management so as to avoid or reduce the amount of loss that would be gotten from damaged goods in inventory.*

**CHAPTER ONE**

**INTRODUCTION**

* 1. **Background to the study**

Inventory control was not seen to be necessary. In fact excess inventories were considered as indication of wealth. Management by then considered stocking beneficial. But, today firms have started to embrace effective inventory control due to its strategic role. Inventory constitutes the major part of a Nigeria manufacturing firm’s current assets due to the big size of inventories kept by firm’s most part of an organization’s fund is being invested into it. Inventory plays a significant role in the growth and survival of an organization in the sense that ineffective and inefficient management of inventory will mean that the organization loses customers and sales will decline. Prudent management of inventory reduces depreciation, pilferage and wastages while ensuring availability of the materials as at when required (Ogbadu, 2009). Efficient and effective management of inventories also ensures business survival and maximization of profit which is the cardinal aim of every firm. More so, an efficient management of working capital through proper and timely inventory management ensures a balance between profitability and liquidity trade-offs (Aminu, 2012). Specific performance indicators have been proved to depend on the level of inventory management practices (Lwiki et al., 2013).

Inventory constitutes a major portion of current assets especially in manufacturing companies and retail/trading firms. In order to maintain inventory levels of such magnitude, huge financial resources are committed to them (Mittal, 2014). As such, inventory also constitutes a major component of working capital. To a large extent, the success or failure of a business depends upon its inventory management performances. Inventory management, therefore, should strike a balance between too much inventory and too little inventory. The efficient management and effective control of inventories help in achieving better operational results and reducing investment in working capital. It has a significant influence on the profitability of a concern thus inventory management should be a part of the overall strategic business plan in every organization (Gupta & Gupta, 2012).

Inventory management is recognized as a vital tool in improving asset productivity and inventory turns, targeting customers and positioning products in diverse markets, enhancing intra and inter-organizational networks, enriching technological capabilities to produce quality products thereby imparting effectiveness in inter-firm relationships. Proper inventory management even results in enhancing competitive ability and market share of small manufacturing units (Chalotra, 2013). Well managed inventories can give companies a competitive advantage and result in superior financial performance (Isaksson & Seifert, 2013). Management of inventory is also fundamental to the success and growth of organization as the entire profitability of an organization is tied to the volume of products sold which has a direct relationship with the quality of the product (Anichebe & Agu, 2013).

Nevertheless, the primary focus in this research will be on manufacturing oriented firms. Inventory control is pivotal in effective and efficient performance of a firm. It is necessary in the control of goods to be used for production, stored or exchanged for money. It also aids the firm to avoid holding too much or too little stock or to tie up capital, which in return have an adverse effect on performance of manufacturing firms. This guides against the incurring of cost such as storage, spoilage, pilferage and obsolescence and the desire to make items or goods available when necessary for the manufacturing firms to perform properly.

Thus, efficient inventory cost management is vital for the successful functioning of manufacturing and retailing organizations. Inventory consist of raw materials, work in progress, spare parts or consumables, goods in transit and finished goods. It is not necessary that an organization will have all these inventory classes, but whatever may be the inventory items, they need efficient management as, generally, substantial share of the company’s funds are invested in inventory(Lyndon & Paymaster, 2016). The inventory cost management of any organization represents an important decision making function at all stages of the product manufacturing, distribution and sales chain. Apart from being a major portion of total current assets of many organizations, inventory often represent as much as 40% of the capital of industrial organizations. Sawaya and Giauque (2006) also stated that inventory represents 33% of a company’s assets and as much as 90% of working capital. As inventory constitutes a major segment of a company’s assets, it is crucial that good inventory management practice is put in place to ensure the organization’s growth and profitability to sustain the business as a going concern. This means that the right materials are in stock in the right quantity, and are available at the required time. Proper and regular checks on stores inventory are conducted to avoid pilferage, wastage and loss of customers due to stock-outs. Making the right order for inventories (buying of stocks that are needed by customers) at all times would promote high turnover thereby improving the profit level of the organization.

Good inventory management in any manufacturing organization saves the organization from poor quality production, the displeasure of customers, loss of profit and good social responsibility which in turns have a direct effect in the performance of the firm (Temeng Eshun & Essey, 2010). This is done by ensuring timely delivery of raw materials to the factory and distribution of finished goods, in order of production to the warehouse. If inventory management is not adequately maintained, production cannot meet the aspirations of customers which is loss of revenue to the organization and makes the organization performance very low. Right from procurement to the time of processing, quality of raw material is the chief determinant of the productive efficiency of any manufacturing concern. It is against this backdrop that the study appraises the inventory management and control in manufacturing firms.

**1.2    Statement of the problem**

Inventory is the life blood of any organization. This is because inventory contributes directly to the profitability of an organization more so the growth of any organization depends largely on its ability to manage its inventory effectively and efficiently.

The real problem therefore has been in the determination of the best inventory control method that fits into an organization very well and also to get the best inventory level at which money invested in inventory will produce a rate of return higher than it if invested in some other areas of the business (Amoako-Gyampah & Gargeya, 2011). Manufacturing firms are finding it challenging as to determination of how much of the inventory is the ideal stock as to maintain. If inventory level is high, capital is unproductively tied up. If the level of inventory is low, production will be affected.

However, this study aim to carry out an investigation on the relationship between inventory management control technique and performance of manufacturing firm and also find the extent to which inventory control has effect on performance of a manufacturing firm.

**Poor inventory management** involves poor planning, executing and controlling a supply and utilization of chain network inventory that is critical to the success of the organization. **Inadequate control of inventory consist of** lack of managerial skills relevant to proper inventory management exposes many organizations to many problems like overstocking, damage, deterioration and others.

 Problem of deciding which item of inventory should be kept in stock and at what quantity lead to need for Economics Order Quantity (EOQ) in an organization. Some organization looses much due to their failure to keep with EOQ desirable for them, and this work throws more light to forestall this.

**The problem of not implementing the inventory management systems;** Many organizations do not keep abreast with inventory management systems due to poor or no knowledge about the inventory management and such organizations are bound to face several related problems that this work highlights on towards reducing them.

 Also, in some manufacturing firms, they find it difficult to determine how much of the inventory to order and when to order; in order to meet customers demand and smooth flow of production process without unnecessary stoppage, idle time due to unavailability of inventory.

**1.3    Objectives of the study**

The overall objective of this study is to appraise inventory management and control in manufacturing firms of some selected manufacturing firms. The specific objectives are to:

1. Examine the effectiveness of the various tools and techniques (Economic order quantity or Economic Batch Quantity) used by manufacturing firms in inventory management.
2. Ascertain the extents to which inventory control contribute to profitability in manufacturing firms.

**1.4    Research questions**

**The study will be guided by the following research questions:**

1. How effective are the various tools and techniques of inventory management in manufacturing firms?
2. To what extent has inventory contributed to profitability in manufacturing firms?

**1.5 Research hypothesis**

The under-stated hypotheses will be tested in the course of this study:

**Ho1:** Economic order quantity (EOQ) and Economic Batch Quantity (EBQ) techniques of inventory management adopted in manufacturing firms are not effective.

**HA**:Economic order quantity (EOQ) and Economic Batch Quantity (EBQ) techniques of inventory management adopted in manufacturing firms are effective.

**Ho2:** Inventory control has not contributed significantly to the net profit of manufacturing organization.

**HA:** Inventory control has contributed significantly to the net profit of manufacturing organization.

**1.6    Significance of the study**

 **Future investors**: This research work can be of great help to those who have a little or no knowledge in manufacturing business. It will be valuable to people who are interested in the manufacturing business and wish to make it their career.

**Manufacturing firms**: The research work can help the Manufacturing Company to improve in areas where it is needed in their inventory operations so as to boost their profitability and consequently increase their shareholders wealth, and to assist the organizations to maximize their profits and reduce their risk of liquidity.

**General** **public**: Indeed, this will in no little way have effects on the national growth and development of Nigeria manufacturing sector and economy at large. Customers’ goodwill towards the organization will be maintained as it enables delivery committed to be met all the time.

**Future** **researches**/ **Academia**: This work will be of immense benefit and use to the future researches as reference document and will provide a base for other research works that might be carried out on stock management in any other sector.

**1.7    Scope of the study**

The scope of this study considers appraisal of inventory management and control in manufacturing firms. Also, this study will consider inventory management systems, contributions of efficient inventory management towards profitability, material usage, cost minimization and economy of operation; and the effect of efficient inventory management for organizational growth and performance.

**1.8 Limitations of the study**

In conducting this research work, the researcher encountered some difficulties such as the following:

1. Hoarding of data: Manufacturing firms held tightly their methods and data generated from their operations because they argued that they operate in a competitive industry and would not want to release their secret to their competitors.
2. Paucity of Relevant Literatures: The researcher found it hard in obtaining relevant literatures while conducting this research. Nevertheless, the researcher was able to surmount the above hurdles and at the end put up a research work whose output is reliable, testable and verifiable at any standard.

**1.9 Definition of terms**

**Management:** Managementconsists of the interlocking functions of creating corporate policy and organizing, planning, controlling, and directing an organization's resources in order to achieve the objectives of that policy.

**Inventory:** Inventory is the [raw materials](https://www.investopedia.com/terms/r/rawmaterials.asp), work-in-process products and finished goods that are considered to be the portion of a business's assets that are ready or will be ready for sale. Inventory represents one of the most important assets of a business because the [turnover](https://www.investopedia.com/terms/t/turnover.asp) of inventory represents one of the primary sources of revenue generation and subsequent [earnings](https://www.investopedia.com/terms/e/earnings.asp) for the company's shareholders.

**Control:** Control is a systematic effort to set performance standards with planning objectives, to design information feedback systems, to compare actual performance with these predetermined standards, to determine whether there are any deviations and to measure their significance, and to take any action required to assure that all corporate resources are being used in the most effective and efficient way possible in achieving corporate objectives.

**Inventory Management:** Inventory management is the management of inventory and stock. As an element of supply chain management, inventory management includes aspects such as controlling and overseeing ordering inventory, storage of inventory, and controlling the amount of product for sale.

**Inventory control:** Inventory control, also known as stock control, involves regulating and maximizing your company’s inventory. The goal of inventory control is to maximize profits with minimum inventory investment, without impacting customer satisfaction levels. Inventory control is also about knowing where all your stock is and ensuring everything is accounted for at any given time.

**Manufacturing Organization:** This is organizationsthat primarily produce a tangible product and typically have low customer contact. They produce physical, tangible goods that can be stored in inventory before they are needed.

**Costing Techniques (Methods):** Costing techniques are methods for ascertaining cost-for-cost control and decision-making purposes. They can be applied to make-or-buy decisions, negotiation, price appraisal and assessing purchasing performance.

**Cost Centre:** A cost center is a department within an organization that does not directly add to profit but still costs the organization money to operate. Cost centers only contribute to a company's profitability indirectly, unlike a profit **c**enter, which contributes to profitability directly through its actions.

**Economics Order Quantity (EOQ):** The Economic Order Quantity (EOQ) is the number of units that a company should add to inventory with each order to minimize the total costs of inventory—such as holding costs, order costs, and shortage costs.

**Just-in-Time (JIT):** Just-in-time (JIT) is an inventory strategy companies employ to increase efficiency and decrease waste by receiving goods only as they are needed in the production process, thereby reducing inventory costs.

**Ordering Cost:** Ordering costs are the expenses incurred to create and process an order to a supplier. These costs are included in the determination of the economic order quantity for an inventory item.

**Stock-out Cost:** Stock-out Costs is the cost associated with the lost opportunity caused by the exhaustion of the inventory. The exhaustion of inventory could be a result of various factors. The most notable amongst them is defective shelf replenishment practices.

**CHAPTER TWO**

**REVIEW OF RELATED LITERATURE**

**2.1 CONCEPTUAL FRAMEWORK**

**2.1.1 Concept of Inventory Management and Control**

Anichebe and Agu, (2013) opined that inventories are vital to the successful functioning of manufacturing and retailing organizations. They may consist of raw materials, work-in-progress, spare parts/consumables, and finished goods. It is not necessary that an organization has all these inventory classes. But, whatever may be the inventory items, they need efficient management as, generally, a substantial share of its funds is invested in them. Different departments within the same organization adopt different attitude towards inventory. This is mainly because the particular functions performed by a department influence the department’s motivation. For example, the sales department might desire large stock in reserve to meet virtually every demand that comes. The production department similarly would ask for stocks of materials so that the production system runs uninterrupted. On the other hand, the finance department would always argue for a minimum investment in stocks so that the funds could be used elsewhere for other better purposes, (Anichebe & Agu, 2013 citing Vohra, 2008:427).

Inventory refers to the value or quantity of raw materials, supplies, work in progress (WIP) and finished stock that are kept or stored for use as need arises (Kwadwo, 2015). Raw materials are commodities such as steel and lumber that go into the final product. Supplies include items such as Maintenance, Repair and Operating (MRO) inventory that do not go into the final product. Work in progress is materials that have been partly fabricated but are not yet completed. Finished goods are completed items ready for shipment. Inventory management is the art and science of maintaining stock levels of a given group of items incurring the least cost consistent with other relevant targets and objectives set by management (Kwadwo, 2015). Inventory is the availability of any stock or resources used in an organization. An inventory system is the set of policies that controls and monitors inventory level and determine what level should be maintained, how large orders should be made and when stock should be replenished. Inventory control is the supervision of the storage, supply and accessibility of items to ensure an adequate supply without excessive oversupply (Miller, 2010).

Inventories are basically stocks of resources held for the purpose of future production and/or sales. Inventories may be viewed as an idle resource which has an economic value. Better management of inventories would release capital for use elsewhere productively, (Ghosh & kumar, 2003). Hence inventory control implies the coordination of materials accessibility, controlling, utilization and procuring of material. The direction of activity with the purpose of getting the right inventory in the right place at the right time and in the right quantity is inventory control and it is directly linked to production function of any organization. This implies that profitability of any organization directly and indirectly is affected by the inventory management system operated (Miller, 2010). Inventory of goods has many reasons why organization should maintain it. It is economically unsound and physical impossible to have goods arrive in a system exactly when demands for them occur. Without stock at hand customers would have to wait for long period before their orders are fulfilled.

Inventory management is the control of materials used and stored in a company with the objective of providing exactly what is required where and when it is required employing a minimum of residual stock and thus incurring the least possible cost (Agha, 2010). Inventory management is primarily about specifying the size and placement of stocked goods. Inventory management is required at different locations within a facility or within multiple locations of a supply network to protect the regular and planned course of production against the random disturbance of running out of materials or goods. The scope of inventory management also concerns the fine lines between replenishment lead time, carrying costs of inventory, asset management, inventory forecasting, inventory valuation, inventory visibility, future inventory price forecasting, physical inventory, available physical space for inventory, quality management, replenishment, returns and defective goods and demand forecasting. Balancing these competing requirements leads to optimal inventory levels, which is an on-going process as the business needs shift and react to the wider environment (Ghosh & Kumar, 2003 in Ogbo & Wilfred, 2014).

Ogbo (2011) posits that the major objective of inventory management and control is to inform managers how much of a good to re-order, when to reorder the good, how frequently orders should be placed and what the appropriate safety stock is, for minimizing stock-outs. Thus, the overall goal on inventory is to have what is needed, and to minimize the number of times one is out of stock. According to Anichebe and Agu (2013) the cardinal objective of inventory management is the maintenance of an optimum level of inventory necessary to support the production system at any time and at the least cost possible. The attainment of this objective entails taking decisions with respect to the determination of an appropriate order quantity, when to place the order and how much inventory to carry per unit of time. These various decision variables will, at any time, dictate the behavior of any inventory system. Inventory ordering systems reflect part of the strategies available to an organization in meeting its inventory management objectives. Basically, there are three major inventory ordering systems, the fixed – order quantity system, the fixed-order interval system and the ABC inventory analysis system.

Inventory control is the supply of goods and services at the right time with the right quality and quantity. It is a reliable means in which businesses are been managed to ensure customers are satisfied and organization remains in operations via minimization of losses. Inventory management has been a problem to many business organizations in Nigeria. Inventories provide a significant link between production and sales of product, and constitute a large percentage of the cost of production. It is one of the most expensive and important assets of many manufacturing companies representing a considerable percentage of the total invested capital. At any level of a firm, inventory is among the largest investment made and therefore logically deserves to be treated as a major policy variable, highly responsive to the plans and style of top management. However, to date in most organization, both analysts and managers have been relatively unsuccessful in convincing top management to give this area the due consideration that it logically deserves (Ogbo, 2011). Inventory control means availability of materials whenever and wherever required by stocking adequate number and kind of stocks. The sum total of those related activities essential for the procurement, storage, sales, disposal or use of material can be referred to as inventory management. Inventory managers have to stock-up when required and utilize available storage space resourcefully, so that available storage space is not exceeded (Ogbo and Wilfred, 2014).

From the above analysis of the meaning of inventory management, it could be seen that managing inventory is encumbered with problems of cost reduction, the right time to order for inventory, the right quantity to order, how to maximize profits, satisfy the customers and produce at maximum capacity, among others. In this review, the following sub-topic is considered.

1. Evaluation of the kinds of inventories and methods of checking/supervising inventories for efficient inventory operations.

Quick Response Manufacture (QRM) involves application of computer to aid manufacture. In this case, computer is used to re-engineer the whole production process, reduce the waiting time, movement time, production process time, set-up time and avoiding rework and inspection that will not add direct values to the products produced.

So, in Nigeria where the above requirements of Just-In-Time are still finding their grounds, its full utilization involves using the concept (JIT) along side with other models like economic lot size.

The Quick Response Manufacture is a good inventory management and control innovation but still requires more aggressive pursuits of the development of Nigerian’s technology for its full maximization and this is why the companies apply it jointly with other models to achieve their desired goals.

Lastly, as Nigeria is trying to keep abreast of the other developed countries of the world, the manufacturing concerns operating in Nigeria are also following the pace set by their counterparts in the industrialized countries of the world.

**2.1.2 Evaluation of kinds of inventories and methods of checking inventories**

IAS 2 prescribes the accounting treatment on inventories, especially on measurement and recognition of inventories.

According to IAS 2, Inventory is an assets held for sale in the ordinary course of business. It also includes asset in the process of production for such sale (WIP) or asset in the form of materials pr supplies to be consumed in the production process or in the rendering of services (raw materials).

**Examples of Inventories**

* Goods purchased and held for resale
* Finished goods produced.
* Work in progress being produced raw materials

According to IAS 2, inventory should be measured at the lower of cost and net realizable value. That is, the cost value of inventory should be compared with the net amount that would be realized from the sales of the inventory, and the lower value should represent the value of the inventory. This is to ensure that inventory must value at cost or below cost if net realizable value is less than cost.

**Factors or reasons why net realizable value may be lower than cost value**

* A physical deterioration in the condition of inventory.
* An increase in costs or a fall in selling price.
* Obsolescence of products.
* A decision as part of the company’s marketing strategy to manufacture and sell products at a loss.
* Errors in production or purchasing

According to Idekwulim (2014) IAS 2 states that an entity should use the same method in measuring all its inventories having similar nature and use to the entity. For inventories with different nature or use, different valuation method may be justified. A difference in geographical location of inventories (and in the respective tax rules), by itself, is not justify the use of different valuation methods.

Some of these methods used to check inventories are the perpetual inventory control, actual counting method look it over method, re-order level and periodic review methods, among others. Lucey (2009) states that the basic prerequisite is that stock movements (issue and receipts) are accurately recorded, and the most frequently used methods are bin cards, Stock record cards and perpetual inventory system. According to Nweze (2000), the two systems of stock taking are generally in use namely: Perpetual and Periodic.

Perpetual inventory checking method is that in which complete data recorder are kept on each item of inventory and additions and subtractions are made with order or transaction. Here, there is an inventory balance plus a receipt of sale minus the actual sale to reflect the quantity at hand. Actual counting method is used to check inventories. It is used to actually count inventory, item by item.

Looking it over method is such in which the items of inventories are not properly and actually counted from time to time and is always full of errors because it is hard to pinpoint the inventory levels, the item that need to be ordered, and that which the firm is overstocking.

**2.1.3 Re-Order Level System**

The re-order level system which is also called the two BIN systems is such in which a predetermined re-orders level of stock is set for each item of inventory. When the stock level falls to the re-order level, a replenishment order is issued. The replenishment re-order quantity is at times economic lot size (Economic Order Quantity) (Agha, 2010). It should be noted that this method of checking inventory is also called two BIN systems because the stock is segregated into two bins. Stock initially drawn from the first bin and a replenishment order issued when it becomes empty from the second bin. Most of the organizations operate the re-order level which triggers off the required replenishment order. The mathematical illustration bellows can help to show how re-order level system is used. An efficient organization uses the following data on a Particular inventory to check its inventory levels by using it, the maximum and minimum levels of inventory, the re-order level are determined.

Normal usage -220 units per day Minimum anticipated usage -100 units per day Maximum usage -280 units per day

Lead time 50-60 days EOQ (Economic Order Quantity)

(Previously calculated) -10,000 units

This is computed as follow:

*Reorder level = Maximum usage × Maximum Reorder Period or Maximum usage ×Maximum Lead Time*= 280 x 60 units = 16,800 units

This method of checking inventory has its merit which is the ability of being responsive to changes in demand and generates automatically replenishment order at the appropriate time by comparing inventory levels against re-order level.

However, where many different types of stock are used jointly for production different items may reach re-order level at the same time thereby overloading the re-order system.

**2.1.4 Periodic Review System**

Periodic inventory review system is just like physical counting method in which stocks are cross-checked and updated from time to time.

Ama (2001), states that periodic review system is such in which stock level for all parts are reviewed at fixed intervals, for instance, every week, month or year. Where necessary a replenishment order quantity which is variable quantities ordered at fixed intervals and the EOQ is not previously calculated but is based on demand, the present inventory level and the lead-time.

Periodic inventory review system as a method of checking inventories has the following merits;

•All inventory items are reviewed periodically so that there is more chance of outdated items to be eliminated

•Because orders will always be in the same sequence, there may be production economy due to more efficient production planning being possible and lower set up cost.

•Large quantity discounts may be obtained when a range of inventory items are ordered at the same time from a supplier.

Nevertheless, this method of checking inventory is less responsive to change in consumption, if the rate of usage changes shortly after review, stock out may occur before the next review.

Unless, demands are reasonably consistent, it is somewhat difficult to set appropriate periods for review.

Lastly, manufacturing concerns use these methods to check and supervise the levels of their stock in order to avoid over-stocking or running out of stock as all these could tell much on the performance of the organization.

**2.1.5 Inventory Model: The Economic Order Quantity(EOQ) Model**

Undoubtedly, the best-known and most fundamental inventory decision model is Economic Order Quantity Model. Its origin dated back to the early 1900s. The EOQ has been previously defined by Ogbo (2011) as the ordering quantities which minimizes the balance of cost between inventory holding costs and re-order costs. Ogbo (2011) stressed further that to be able to calculate a basic EOQ, certain assumptions are necessary:

• That there is a known, constant, stock holding costs;

• That there is a known, constant ordering costs;

• That the rate of demand are known

• That there is a known constant price per unit

• That replenishment is made instantaneously, that is, the whole batch is delivered at once.

• No stock-outs are allowed

It would be apparent that the above assumptions are somewhat sweeping and that they are a good reason for treating an EOQ calculation with caution. Also, the rationale of EOQ ignores buffer stocks, which are maintained to cater for variations in lead-time and demand. The above assumptions are wide ranging and it is unlikely that all could be observed in practice.

**2.1.6 Basic Types of Inventory and Management Techniques in Manufacturing Concerns**

The aim of a manufacturing concern to the manager and its inventories are as follows:

•To establish and maintain an adequate inventory level at a minimum cost

•To reduce the cost of managing inventory

•To ensure the production is not interrupted due to lack of inventory and that inventories are not used through excess stock by fixing re-order and stock levels.

•To minimize overstocking and under-stocking.

In order to achieve the objective of inventory management, the organizations determine the optimum level.

The ordering costs on the order hand are the cost of placing for replenishment stocks or inventories. It is believed that when bulk quantities of stock are ordered, the ordering cost will reduce but holding cost will also increase.

According to Akinsulire, (2014), ordering cost means the amount spent in procuring the materials up to the point it is stored in the warehouse. Examples are:-

1. Transport cost
2. Administrative and clerical cost involved in procuring the materials

Ordering costs are the following:

* Receiving cost (e.g. unloading and inspection)
* Clerical costs of preparing purchase orders
* Transportation costs
* Sum spent finding suppliers and expediting order

However, the holding costs include:

* Deterioration, theft spoilage or obsolescence costs of storage space (e.g. warehouse)
* Forgone interest on working capital tied up in inventory
* Security Shortage costs includes:
* Loss of quantity discounts on purchase
* Disrupted production when raw materials are unavailable
* Lost sales resulting from dissatisfied customers
* Idle worker, extra machinery setups.

Ama (2001), enumerated inventory out-costs as follows:

(a). Labour frustration over stoppages

(b) extra costs associated with urgent and often small quantity replenishment purchases.

(c) lost contribution through the lost sale.

(d) cost of production stoppages caused by inventory out of work-in-progress of raw materials.

(e) loss of customers’ goodwill

(f) loss of future sales because of customers going elsewhere.

Therefore, when all the above cost elements are considered, the question will be how will inventory management method minimize them in order for the organization to thrive?

The answer is by using the order quantity of inventory that minimizes the cost of procuring and holding inventory. This stock order is called economic order quantity, EOQ or economic lot size (ELS).

**2.1.7 Profit Maximization through Efficient Inventory Management**

Organizations have limited resources and these always pose problems to the extent of result normally achieved. According to Nweze (2000) common organizational goals include: maximization of profit or achieving satisfactory levels of performance (profit satisfaction), achieving contained growth or ensuring the survival of the organization among others. To maintain profitability, the most important requirements are preventing wastage of time and raw materials, not leaving the machine capacity idle and under utilization of labour force. Specifically, the major asset in the enterprise which affects efficiency of operations is inventory. Both excess of inventory and its shortage affect the productive activity and the profitability of an organization (Ogbo, Onekanma & Ukpere, 2014).

In order to maximize profit, manufacturing concerns always try to reduce both holding costs and ordering costs by using optimum order quantities called economic order quantity or lot size. The holding costs such as interest on capital invested in inventories, insurance cost, obsolescence, wastage resulting from storing inventories, and costs attributed to not holding the inventories such as re-ordering cost, lost sales cost, lost production cost, orders not executed, customers dissatisfaction and threat to lose the market share, burden of fixed costs and wage payment to idle workforce and underutilized machine capacity have the capacity to reduce profit of a manufacturing concern when not handled properly. When inventory management is applied, costs are drastically reduced and the rate of turnover is increased due to attention to production and customers satisfaction (Agha, 2010). Thus, economic order quantity or lot order size of inventories is suggested to reduce the costs associated with acquiring and carrying the inventories (Egberi, & Egberi, (2011). The size of the order should be such which ensures the desired level of inventory at minimum acquisition and carrying costs.

However, costs reduction due to application of sound inventory management principles resulted in very significant increase in net income (profit). This is achieved as stated earlier by using optimum stock quantity that gives more turnovers to keep sales on as customers demand. Inventory management is also about balancing the two opposing cost factors for optimum profitability.

**2.1.8 Customers’ Satisfaction Due To the Use of Inventory Management**

Manufacturing concerns produce for the public who consumes their products. These products are in some cases purchased directly from them or through middlemen. However, what keeps the manufacturing concerns in sound business base is the level of their sales. The sales made are high when the customers’ needs are attended to as and when due. The manufacturing sector is key contributor to the growth of every economy especially developing economies. For instance, the federal government of Nigeria earned 179.5 billion revenue from non oil sector in the first quarter of 2013, this receipt was driven mainly from the industrial and manufacturing sub-sector which amount to 66.9 % (Wachukwu, 2013). To achieve a vibrant and stable economy, manufacturing firms must be well positioned to make profits which will invariably lead to their growth and survival. Manufacturing concerns do everything possible to keep in stock the kinds of products needed by their customers at all time. Therefore, the issue of out-of-stock is not there and production stoppages do not come in.

Hence, the pillar behind the success and excellent services cum satisfaction to the customers is the ability of the concerns to apply the techniques of inventory management very well in their organizations are always ordered and used at reduced cost, so as to sell at affordable prices to the customers.

Lucey (2009) states that firms are integrating their manufacturing activities more closely with purchasing and sales thus dramatically reducing or even eliminating excessive stock-holdings. In achieving all these, Just-In-Time (JIT), and Manufacturing Requirement Planning (MRP) methods are used.

Microsoft Business Solution (2003), states that customers are more important than ever, and they expect better services and more competitive prices than ever before. To survive, manufacturing concerns need to keep customers satisfied. Firms cannot afford to miss an order because an item is no in stock. When customers know that the organization is geared towards serving their needs, such organization becomes more than just today’s supplier of goods but becomes a long term partner. This is achieved by reduction in excessive inventory and encouraging optimum production.

Therefore, inventory management plays much role in determining that manufacturing concerns produce at reduced costs by helping them to reduce the holding costs and ordering costs so as to sell to the customers at reduced prices and regularly as the customers demand, due to hitch-free production.

**2.1.9 Possibility of Hitch -Free Production Due To Application of Inventory Management by Manufacturing Concerns**

Production is the act of transforming raw materials and work in progress into finished goods for the satisfaction of human wants (Amogu, 2005). Production is changing the form of things, changing raw materials into finished goods, changing substance by chemical actions, assembling many parts to make something such as a watch or a motorcar and the distribution of the products to the final consumers. Organizations at times do not control their inventory holding, resulting in under stocking and causing the organizations to stay off production, thereby resulting to organizational ineffectiveness. The essence of inventory according to Nwandu (2006) is, “to have the right goods quality and quantity, at the right place and time”. This process is needed as a part of supply chain network to protect production system against any kind of disturbance.

The above definition shows that raw materials, work-in-progress, materials are used for the production of finished goods. When these raw materials are not available, production is stopped or disrupted. The disruption hinders not only production but the level of sales that determines the profit of the organization. Also, when production suffers, the customers are lost to the competitors. When excessive inventories are stocked, capital is not only tied to the organization. And so, it is only through the process of efficient inventory management can enable the economic order lot sizes to be obtained that allows efficient production to be achieved. Ama (2001) posits that inventory management is a veritable key to hitch -free production in manufacturing concerns that ensures:

* Uninterrupted supply to the customers.
* Provides a buffer between production processes
* Ensures production processes that flow smoothly and efficiently
* Prevent loss of customers goodwill
* Prevent loss of future sales

• Prevents labour frustration over stoppages.

**2.1.10 Liquidity Control through Efficient Inventory Management**

Organizations in the course of their business operations apply all or some of their capital resources to acquire assets to be held for capital appreciation, income generation or production activities to secure trading advantages geared towards profit. Inventory constitutes one of the largest and most tangible investments of any retailer or manufacturing organization. Investment refers to economic activities designed to increase, improve or maintain the production quality of the existing stock capital (Miller, 2010). Sometimes, manufacturing concerns over invest in stock in order to maintain production, avoid stock-outs and satisfy their customers. But when this investment is done without regards to efficient inventory management, a lot of capital resources of the concerns are large holding costs. At that point, liquidity which is the ability of an organization to meet its repayment demand as they fall due will be affected.

The most liquid asset is cash, and is short term investments (bills). Debtors are fairly liquid assets and they can pay their bills in near future. Stocks are the least liquid current assets because they must first be sold (perhaps on credit) and the customers given credit period before they can be converted in to cash. Efficient inventory management directs the economic order quality that should be ordered at any time to reduce the capital that is tied down in stock. Therefore, in as much as manufacturing firms cannot do without investment that will avoid disrupted production, minimize costs, increase customers satisfaction, high profit and balanced liquidity position in order to maintain the integrity of the firms in the eyes of their creditors.

Finally, the essence of liquidity control cannot be overemphasized as pointed by Loyd and Rosenfield (1979) a company may be high profitable, yet be on the verge of bankruptcy because of shortage of liquid assets such as cash and accounts receivables.

**2.1.11 Vendor Managed Inventory Control and Performance**

Vendor managed inventory is a type of inventory control method whereby the supplier is given the obligation of handing the client’s inventory. The vendor is given access to its client’s inventory record account and request information for the reasons behind watching over the customer’s inventory level. Vendor managed inventory involves partnership among suppliers and their customers (e.g, distributor, retailer or product end user) which deviate from the usual traditional ordering process. Usually, sending of purchase orders is replaced with customer electronically sending daily demand of information to the supplier. The supplier generates replacement orders for the customer based on the demand information. The process is guided by conjointly agreed upon intentions for the customer’s inventory levels, fill rates and transaction costs. Irungu & Wanjau debated that vendor managed inventory systems could be used to gain competitive advantage by depending on inventory supplier reliability and solid buyer/supplier dealings to produce income and lessen risk. Their results propose that vendor managed inventory has been operational in retail supermarkets by refining inventory management, cash flow and risk controlling. Weele & Raaij affirmed in their studies that application of the Vendor-managed inventory system results to enhancement in service levels rather than cost reductions. Vendors and clients have linked copter systems often using Electronic Data Interchange (EDI).

**Just in time inventory control and performance:** Just in time actually is a well –developed philosophy for managing inventories. A Just-in-Time (JIT) inventory system places great emphasis on reducing inventory levels to a bare minimum, and so providing the items just in time as they are needed. This philosophy was first developed in Japan, beginning with the Toyota Company in the late 1950’s and is given part of the credit for the remarkable gains in Japanese productivity through much of the late 20th century.

**2.1.12 Purposes For Holding Inventory**

According to Banjoko (2004), manufacturing organizations carry inventories for a variety of reasons.

Inventories perform significant functions in the total production system and since “it is physically impossible and economically impracticable for each stock of item to arrive exactly where and when it is needed”, there is need to keep some amount of inventory at any point in time. Banjoko (2004) outlined seven reasons for holding inventories, which include;

1. To enhance uninterrupted flow of production

2. To meet variations in product demand.

3. To allow flexibility in production scheduling

4. To decouple successive stages of operations

5. To level production activities

6. To provide a means of hedging against future prices and delivery uncertainties

7. To provide a means of obtaining economic lot size and gaining quantity discounts.

On their own part, Chase and Aquilano (1995) enumerated five reasons for holding inventories. They are,

1. To maintain independence of operations

2. To meet variations in product demand

3. To allow flexibility in production scheduling

4. To provide a safeguard for variation in raw material delivery time

5. To take advantage of economic purchase order size.

**Reasons for holding Inventory**

Brag (2005) established that there are three motives for holding inventories, which are transaction, precautionary and speculative motives.

Transaction motive: The transaction motive occurs when there is a need to hold stock to meet production and sales requirements.

Precautionary motive: A firm might also decide to hold additional amount of stock to cover the possibility that it may have under estimated its future production and sales requirements. This represents a precautionary motive, which applies only when future demand is uncertain.

Speculative motive: The speculative motive for holding inventory might entice a firm to purchase a larger quantity of materials than normal in anticipation of making abnormal profits. Advance purchase of raw materials in inflationary times is one form of speculative.

**Brief history of the companies**

**Nigerian Breweries Plc**

Nigerian Breweries Plc (NBPLC) is the country's pioneer brewery. Incorporated in 1946, it commenced production in 1949. It started as a joint venture between the United African Company (WAC) International, UK and Heineken of Holland. Thus, at inception, it was 100 per cent foreign owned. By the early 1950s, when it began operating fully, some indigenous traders already involved with its products were invited to become shareholders. Under the indigenization policy of the early 1970s the foreign shareholders were forced to sell a significant proportion of their holdings. Today, the company is 60 per cent Nigerian owned and 40 per cent foreign owned. The 60 per cent Nigerian stake is held by company employees and members of the public, while the 40 per cent foreign ownership is split almost equally between CWA Holdings Limited (for Unilever) and Heineken Brouwerijen BV.

Its first bottle of beer, STAR Lager, rolled off the bottling lines of its Lagos Brewery in June 1949. Other breweries were subsequently commissioned by the company, including Aba Brewery in 1957, Kaduna Brewery in 1963, and Ibadan Brewery in 1982. In September 1993, the company acquired its fifth brewery in Enugu state, and in October 2003, its sixth brewery, sited at Ama in Enugu. Ama Brewery is the largest brewery in Nigeria and one of the most modern worldwide. Operations at Enugu brewery were discontinued in 2004, leaving the company with five operational breweries.

The company has a portfolio of high-quality brands, including Star Lager Beer (launched in 1949); Gulder Lager Beer (1970); Maltina (1976), which now has three varieties, namely Maltina Classic, Maltina Strawberry, and Maltina with Pineapple; Maltina Sip-it (2005), which was packaged in Tetrapaks; Legend Extra Stout (1992); and Amstel Malta (1994). The company also re-launched Heineken Lager into the Nigerian market in June 1998.

Nigerian Breweries is the most capitalized quoted company on the Nigerian Stock Exchange (NSE), it is also the first company in any sector to declare N12 billion in PBT and the first company in Nigerian history to declare dividend of N8 billion (Vanguard, 2003).

Nigerian Breweries operates many related companies, including beverage-related manufacturing companies making corks, labels, bottles, packing crates; and a logistics network, including transport companies, warehousing companies and retail sales management.

**Unilever plc**

Unilever Nigeria Plc was incorporated as lever Brothers Nigeria on the 11th of April, 1923 under the name, Lever Brothers West Africa Ltd. In 1924, the name was changed to the West African Soap Co Ltd, a deliberate attempt by its parent company, Unilever (Common wealth Holdings) Ltd to reflect the formers major product and identify its name with its local market – the British colonies of West Africa. The name was later changed to Lever Brothers (Nig.) Ltd on 5th December, 1955. The present name, Unilever Nigeria Plc came into being on 31st May 1973.

The company started with a share capital of ~~N~~40, 000 wholly owned and managed by Unilever (Common wealth Holdings) Ltd. In compliance with Nigeria Enterprises promotion Decree (1972), the company became a public company on 12th September, 1973 and had its shares listed on the Nigeria Stock Exchange Market for 40 percent of its shares to Nigerians. The share structure then became 60 percent to Unilever (Commoncealth Holdings) Limited and 40 per cent to Nigeria investors. A total of 2,720,000 of its ordinary share were sold to Nigerians. further implementation of the Nigeria enterprises promotion decrees of 1977 saw the company offering 10,200,000 ordinary shares representing 20 percent of the company’s then equity capital to Nigeria investors, This changed the company’s share structure to 60 percent for Nigeria investors and 40 percent to Unilever (common wealth holdings) Ltd.

The share capital of the company has risen from ~~N~~17 million to ~~N~~100 million at present. The Company was initially established to serves as the sole distributor of Unilever soap in the West African Sub-region. While serving this rule, the company was able to identify a large untapped market capable of sustaining a plant of economic size, as well as the availability of cheap and abundant raw material and labour. This offered the advantages of low production cost and enjoyment of economies of scale through high volume sales. Hence, the Company established its first factory at Dockyard Road Apapa, Lagos.

**2.2 THEORETICAL FRAMEWORK**

**2.2.1 Theory of Economic Order Quantity (Wilson EOQ):**

**i. Economic Order Quantity**: Economic order quantity is the level of inventory that minimizes the total inventory holding costs and ordering costs. It is one of the oldest classical production scheduling models. The framework used to determine this order quantity is also known as

***Wilson EOQ Model*** or ***Wilson Formula***. The model was developed by Harris in 1913. But still Wilson, a consultant who applied it extensively, is given credit for his early in-depth analysis of the model.

Assume that the demand for a product is constant over the year and that each new order is delivered in full when the inventory reaches zero. There is a fixed cost charged for each order placed, regardless of the number of units ordered. There is also a holding or storage cost for each unit held in storage (*sometimes expressed as apercentage of the purchase cost of the item*).

An organization wants to determine the optimal number of units of the product to order so that it minimize the total cost associated with the purchase, delivery and storage of the product

The required parameters to the solution are the total demand for the year, the purchase cost for each item, the fixed cost to place the order and the storage cost for each item per year. It is worth notable that the number of times an order is placed will also affect the total cost; however, this number can be determined from the other parameters-

* The ordering cost is constant.
* The rate of demand is constant
* The lead time is fixed
* The purchase price of the item is constant i.e. no discount is available
* The replenishment is made instantaneously; the whole batch is delivered at once.

EOQ is the quantity to order, so that ordering cost + carrying cost finds its minimum. (*A common misunderstanding is that formula tries to find when these are equal.*)

Inventory models for calculating optimal order quantities and reorder points have been in existence long before the arrival of the computer. When the first Model T Fords were rolling off the assembly line, manufacturers were already reaping the financial benefits of inventory management by determining the most cost effective answers to the questions of when? And how much? Yes long before JIT, TQM, TOC, and MRP, companies were using these same (then unnamed) concepts in managing their production and inventory.

Corporate goals and strategies may sometimes conflict with EOQ. Measuring performance solely by inventory turns is one of the most prolific mistakes made in the name of inventory management. Many companies have achieved aggressive goals in increasing inventory turns only to find their bottom line has shrunk due to increased operational costs.

EOQ is essentially an accounting formula that determines the point at which the combination of order costs and inventory carrying costs are the least. The result is the most cost effective quantity to order. In purchasing this is known as the *order quantity*, in manufacturing it is known as the *production lot size*.

While EOQ may not apply to every inventory situation, most organizations will find it beneficial in at least some aspect of their operation. Anytime firm has repetitive purchasing or planning of an item, EOQ should be considered. Obvious applications for EOQ are purchase-to-stock distributors and make-to-stock manufacturers, however, make-to-order manufacturers should also consider EOQ when they have multiple orders or release dates for the same items and when planning components and sub-assemblies. Repetitive buy maintenance, repair, and operating (MRO) inventory is also a good application for EOQ. Though EOQ is generally recommended in operations where demand is relatively steady, items with demand variability such as seasonality can still use the model by going to shorter time periods for the EOQ calculation. Just make sure their usage and carrying costs are based on the same time period.

The basic Economic Order Quantity (EOQ) formula is as follows:

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**THE INPUTS**

While the calculation itself is fairly simple the task of determining the correct data inputs to accurately represent your inventory and operation is a bit of a project.

Exaggerated order costs and carrying costs are common mistakes made in EOQ calculations. Using all costs associated with your purchasing and receiving departments to calculate order cost or using all costs associated with storage and material handling to calculate carrying cost will give firm highly inflated costs resulting in inaccurate results from its EOQ calculation. Often these references trace back to studies performed by advocacy agencies working for business that directly benefit from these exaggerated (my opinion) costs used in ROI calculations for their products or services. It is relevant to keep in mind that even though accuracy is crucial, small variances in the data inputs generally have very little effect on the outputs. The following breaks down the data inputs in more detail and gives insight into the aspects of each.

**Annual Usage**

Expressed in units, this is generally the easiest part of the equation. Firm can simply use its forecasted annual usage data for computational purposes.

**Order Cost**

Also known as purchase cost or set up cost, this is the sum of the fixed costs that are incurred each time an item is ordered. These costs are not associated with the quantity ordered but primarily with physical activities required to process the order.

For purchased items, these would include the cost to enter the purchase order and/or requisition, any approval steps, the cost to process the receipt, incoming inspection, invoice processing and vendor payment, and in some cases a portion of the inbound freight may also be included in order cost. It is important to understand that these are costs associated with the frequency of the orders and not the quantities ordered. For example, in firm’s receiving department the time spent checking in the receipt, entering the receipt, and doing any other related paperwork would be included, while the time spent repacking materials, unloading trucks, and delivery to other departments would likely not be included. If firm has inbound quality inspection where it inspects a percentage of the quantity received it would include the time to get the specs and process the paperwork and not include time spent actually inspecting, however if it inspects a fixed quantity per receipt it would then include the entire time including inspecting, repacking, etc. In the purchasing department it would include all time associated with creating the purchase order, approval steps, contacting the vendor, expediting, and reviewing order reports, it would not include time spent reviewing forecasts, sourcing, getting quotes (unless it gets quotes each time it order), and setting up new items. All time spent dealing with vendor invoices would be included in order cost.

Associating actual costs to the activities associated with order cost is where many an EOQ formula runs a foul. Do not make a list of all of the activities and then ask the people performing the activities "how long does it take you to do this?" The results of this type of measurement are rarely even close to accurate. It has been found it to be more effective to determine the percentage of time within the department consumed performing the specific activities and multiplying this by the total labor costs for a certain time period (usually a month) and then dividing by the line items processed during that same period.

It is extremely difficult to associate inbound freight costs with order costs in an automated EOQ program and it is suggested it only if the inbound freight cost has a significant effect on unit cost and its effect on unit cost varies significantly based upon the order quantity.

In manufacturing, the order cost would include the time to initiate the work order, time associated with picking and issuing components excluding time associated with counting and handling specific quantities, all production scheduling time, machine set up time, and inspection time.

Production scrap directly associated with the machine setup should also be included in order cost as would be any tooling that is discarded after each production run. There may be times when firm wants to artificially inflate or deflate set-up costs. If it lacks the capacity to meet the production schedule using the EOQ, it may want to artificially increase set-up costs to increase lot sizes and reduce overall set up time. If firm has excess capacity it may want to artificially decrease set up costs, this will increase overall set up time and reduce inventory investment. The idea being that if it is paying for the labor and machine overhead, anyway it would make sense to take advantage of the savings in the reduced inventories.

For the most part, order cost is primarily the labor associated with processing the order; however, it can include the other costs such as the costs of phone calls, faxes, postage, envelopes, etc.

**Carrying Cost**

Also called *Holding Cost*, carrying cost is the cost associated with having inventory on hand. It is primarily made up of the costs associated with the inventory investment and storage cost. For the purpose of the EOQ calculation, if the cost does not change based upon the quantity of inventory on hand it should not be included in carrying cost. In the EOQ formula, carrying cost is represented as the annual cost per average on hand inventory unit. Below are the primary components of carrying cost.

**Interest**: If firm had to borrow money to pay for its inventory, the interest rate would be part of the carrying cost. If it did not borrow on the inventory, but have loans on other capital items, it can use the interest rate on those loans since a reduction in inventory would free up money that could be used to pay these loans. If by some miracle firms are debt free, they would need to determine how much they could make if the money was invested.

**Insurance**: Since insurance costs are directly related to the total value of the inventory, firm would include this as part of carrying cost.

**Taxes**: If firms are required to pay any taxes on the value of their inventory they would also be included.

**Storage Costs**: Mistakes in calculating storage costs are common in EOQ implementations. Generally companies take all costs associated with the warehouse and divide it by the average inventory to determine a storage cost percentage for the EOQ calculation. This tends to include costs that are not directly affected by the inventory levels and does not compensate for storage characteristics. Carrying costs for the purpose of the EOQ calculation should only include costs that are variable based upon inventory levels.

If firms are running a pick/pack operation where they have fixed picking locations assigned to each item where the locations are sized for picking efficiency and are not designed to hold the entire inventory, this portion of the warehouse should not be included in carrying cost since changes to inventory levels do not effect costs here. Their overflow storage areas would be included in carrying cost.

Operations that use purely random storage for their product would include the entire storage area in the calculation. Areas such as shipping/receiving and staging areas are usually not included in the storage calculations. However, if they have to add an additional warehouse just for overflow inventory then they would include all areas of the second warehouse as well as freight and labor costs associated with moving the material between the warehouses.

Since storage costs are generally applied as a percentage of the inventory value you may need to classify your inventory based upon a ratio of storage space requirements to value in order to assess storage costs accurately.

There are situations where firm may not want to include any storage costs in its EOQ calculation. If firm’s operation has excess storage space of which it has no other uses it may decide not to include storage costs since reducing your inventory does not provide any actual savings in storage costs. As firm’s operation grows near a point at which it would need to expand its physical operations it may then start including storage in the calculation.

A portion of the time spent on cycle counting should also be included in carrying cost, remember to apply costs which change based upon changes to the average inventory level. So with cycle counting, it would include the time spent physically counting and not the time spent filling out paperwork, data entry, and travel time between locations.

Other costs that can be included in carrying cost are risk factors associated with obsolescence, damage and theft.

**2.3 EMPIRICAL FRAMEWORK**

Ogbo, Onekanma and Wilfred (2014) examined the impact of effective inventory control management on organizational performance: a Study of 7up Bottling Company Nile Mile Enugu, Nigeria. The researchers were motivated to embark on this study, in order to bring to fore the importance of effective inventory control system on organizational performance as it relates to the bottling company. A total of eighty-three respondent constitute the sample for the study. Four research questions and Four hypotheses were generated and tested at 10% (that is 0.10) significant level using descriptive statistics and non-parametric test (chi-square). The result of the analysis showed that flexibility in inventory control management is an important approach to achieving organizational performance. It was found that organizations benefits from inventory control management 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 management 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 management is recognized as one of the areas management of any organization should acquire capability. It is recommended that organizations should adopt the inventory keeping method that best suit their operations.

Anichebe and Agu (2013) examined the effect of inventory management on organizational effectiveness in selected organizations in Enugu Nigeria. Using a descriptive research and a sample size of two hundred and forty eight (248) respondents, they established that there is significant relationship between good inventory management and organizational effectiveness. Inventory management was found to have a significant effect on organizational productivity. There was a high positive correlation between good inventory management and organizational profitability. They concluded that Inventory Management is very vital to the success and growth of organizations. The entire profitability of an organization is tied to the volume of products sold which has a direct relationship with the quality of the product. The study recommended that Organizations should diversify their inventory system to suit specific needs of production, and that management should closely monitor and manipulate their inventory system to maintain production consistency for organizational profitability and effectiveness.

Kwadwo (2015) carried out a study on the impact of efficient inventory management on profitability: evidence from selected manufacturing firms in Ghana. A cross sectional data from 2004 to 2014 was gathered for the analysis from the annual reports of four manufacturing firms listed on the Ghana Stock Exchange. Measures of profitability were examined and related to proxies for efficient inventory management by manufacturers. The Ordinary Least Squares (OLS) stated in the form of a multiple regression model was applied in the analysis. The study revealed that the main variable raw materials inventory management designed to capture the effect of efficient management of raw material inventory by a company on its profitability is significantly strong and positive and impacts on the profitability of the manufacturing firms in Ghana. Therefore, efficient management of raw material inventory is a major factor to be considered by Ghanaian manufacturers in enhancing or boosting their profitability.

Nsikan, John and Tommy (2015) examined inventory management practices and operational performance of flour milling firms in Lagos, Nigeria and their effects on operational performance. Five flour manufacturing firms with aggregate staff population of 2569 constituted the unit of study. From the population space, 150 respondents were randomly selected. Structured questionnaire was the major instrument for the collection of relevant primary data while mean and standard deviation was used to analyze descriptive data. Results showed that exception of the large manufacturing companies, most of the medium-sized flour milling firms adopts different inventory management strategies from the scientific models. Their inventory management strategies and policies were rather based on factors such as changing level of customer demand, prevailing industry practices, forecast estimates and guesses, and available production capacity. Findings also revealed significant differences between effective management of inventory and optimal operating performance. the study recommended the need for flour manufacturing firms to implement scientific inventory management models to adequately handle material shortages, product stock outs, and component pile upwith consequent penalties.

Stephen (2014) investigated optimization of effective inventory control and management in manufacturing industries: case study of Flour Mills Company Calabar, Nigeria. The key source of information gathering which the research employed was the used of primary data through a well structured questionnaires and personal interviews. The data so obtain was analyse through qualitative technique, using descriptive statistics method by quantifying the level of frequency and determining the percentages of respondents and weighted mean scores. This method was considered more appropriate and convenient by the author because it helps to establish the objectives of the research. The results has help to proffer solution to the problem of lead time of delivery or delay in supply of goods or material, the interruption in production and stock out of goods or materials during production and problem of when to order and how much to order as it affects manufacturing industries in Nigeria. Conclusions were drawn and recommendations was made for the best practices that will ensure effective inventory control of stock and customers satisfaction and retention in both public and private industries in Nigeria.

Edwin and Memba (2015) studied the effect of inventory management on profitability of Cement Manufacturing Companies in Kenya: A Case Study of Listed Cement Manufacturing Companies in Kenya. A cross sectional data from 1999 to 2014 was gathered for the analysis of the annual reports for the three sampled firms listed at Nairobi Securities Exchange (NSE). The ordinary least squares (OLS) stated in the form of a multiple regression model was applied in the data analysis to establish the relationship between inventory management and firm’s profitability. The results provide a negative relationship between inventory turnover, inventory conversion period and storage cost with profitability of the company. In addition, inventory level was found to be directly related to firm’s size and storage cost. The study recommends that the Cement-manufacturing firms in Kenya should strive to ensure that the right stock is kept in their warehouses to hedge against excessive holding cost and stock-outs.

Lyndon and Paymaster (2016) examined the effect of inventory cost management on the profitability of listed brewery companies in Nigeria. Inventory cost management proxy by raw materials cost, work in progress cost and finished goods cost was regressed against profitability proxy by gross profit margin. Secondary time series data was collected from the annual reports and accounts of selected brewery companies from the Nigeria Stock Exchange from 2005 to 2014. A multiple regression technique using the computer software statistical package Windows SPSS 20 version to analyze the data obtained from NSE. The study revealed that efficient inventory cost management has positive influence on the profitability of brewery companies in Nigeria. Based on the findings, the study recommended that brewery companies should adopt effective and efficient inventory cost management practices; deploy appropriate modern technology for effective inventory cost management; and employ capable and qualified staff who should be trained regularly on proper and efficient inventory cost management.

Eneje, Nweze, & Udeh (2012) investigated the effects of raw materials inventory management on the profitability of brewery firms in Nigeria using a cross sectional data from 1989 to 2008 which was gathered for the analysis from the annual reports of the sampled brewery firms. Measures of profitability were examined and related to proxies for raw materials inventory management by brewers. The Ordinary Least Squares (OLS) stated in the form of a multiple regression model was applied in the analysis. The study revealed that the local variable raw materials inventory management designed to capture the effect of efficient management of raw material inventory by a company on its profitability is significantly strong and positive and influences the profitability of the brewery firms in Nigeria. They concluded that efficient management of raw material inventory is a major factor to be contained with by Nigerian brewers in enhancing or boosting their profitability.

**2.4 GAP IN LITERATURE**

In the past, inventory control management was not seen to be necessary. In fact excess inventories were considered as indication of wealth. Management by then considered over stocking beneficial. But, today firms have started to embrace effective inventory management due to its strategic role. Inventory constitutes the major part of a Nigeria manufacturing firm’s current assets due to the big size of inventories kept by firm’s most part of an organization’s fund is being invested into it. The objectives of most business include survival and growth, fulfillment of social responsibilities and realization of satisfactory profit. This level of returns enables one company to take advantage of business opportunities, undertake research and inventions which further makes for growth and survival on the long run; discharge its social responsibilities and its obligations to the owners. In order to maintain this status quo, it become important that positive effort be made to reduce operational costs of the business, increase production and boost the sales of their products. Efficient inventory control and cost management is vital for the successful functioning of manufacturing and retailing organizations.Inventory Management is a system used in a firm to control the firm's investment in stock. This includes; the recording and monitoring of stock levels, forecasting future demands and deciding when and how many to order.

Inventory management is the method of ensuring that the right quantity and quality of the relevant stock is available at the right time and at the right place. Thus, the gap that this current study will fill is to provide information for managers of manufacturing companies as it will help them to set trade-off balance between inventory management and liquidity position of their firms, in order to know that at what extend they manage their inventories will affect their liquidity.

Nevertheless, the literature reviewed showed that not much research work has been conducted to determine the extent of the inventory management and control in manufacturing firms in the light of profit maximization in Nigeria manufacturing industry. This shows a gap in literature hence, justifying the conduct of this study.

**CHAPTER THREE**

 **METHODOLOGY**

 **3.1 Research Design**

This study adopted the ex-post factor and descriptive research design. This is because the study seeks to investigate the inventory management and control in manufacturing firms in Nigeria. The data for this study were obtained mainly from both primary and secondary sources which were collected from the audited annual reports and accounts of the selected manufacturing company in Nigeria. The justification for the adoption of this research design lies on the un-manipulability of data (Osuala, 2005).

**3.2 Area of the study**

The area of the study is manufacturing firms. Due to time and financial constraints two manufacturing firms were selected for this study i.e. Nigeria Breweries and Unilever plc. The study focuses on the appraisal of inventory management and control in manufacturing firms.

**3.3 Population of the Study**

Population in research statistics can be described as the entire number of people, objective, events and things that all have one or more characteristics of interest of a study. It is the target of the study for collection of data (Olakunori, 2000). The population of the study consists of the top management staff, middle Management staff and lower level management staff of the organization of the Nigeria Breweries and Unilever plc and some selected members of the public basically individual that patronize the firm. Population of eighty (80) respondents was used for the study.

**3.4** **Sampling Method**

The sampling means the portion of the entire population so as to ensure conclusion about the population in an attempt to bring out accurate information concerning the research work (Olakunle, 2000). The study covers annual report of the selected firms in Nigeria. As such, data for the study will be sourced from the Nigeria Breweries and Unilever plc statement of account. This is considered averagely sufficient to produce robust results. The researcher also used judgmental sampling techniques for the study. Judgmental sampling is a non-probability sampling technique where the researcher selects units to be sampled based on their knowledge and professional judgment.

**Table 1**

|  |  |  |  |
| --- | --- | --- | --- |
|  Firm(s)  | Management level  | Population  | TOTAL  |
| Nigeria Breweries | Senior/ top mgt Middle mgtLow level mgt | 15205 | 40 |
| Unilever plc | Senior/ top mgt Middle mgtLow level mgt | 102010 | 40 |
| **Total Population Studies** | 80 |

**Source:** Field Survey 2018

* 1. **Research Instrumentation**

The research instrument for the study is the questionnaire and annual report of Nigeria Breweries plc and Unilever plc. These were designed to elicit vital information and filling in the spaces provided. The questionnaires were distributed respondents. In designing them, careful effort was made to exclude offensive questions. A number of questions were kept to a minimum by asking only clear and relevant questions. The researcher collected the completed questionnaires after giving the respondents some days to answer the questions while data for the study were through statement of accounts of selected companies.

**3.6** **Validity and reliability of research Instrument**

Validity referred here is the degree or extent to which an instrument actually measures what is intended to measure. An instrument is valid to the extent that is tailored to achieve the research objectives. The researcher constructed the questionnaire and data from annual report of Nigeria Breweries plc and Unilever Plc for the study and submitted to the project supervisor who used her intellectual knowledge to critically, analytically and logically examine the instruments relevance of the contents and statements and then made the instrument valid for the study.

To maximize the reliability of the instrument used for the research ensured that question were not ambiguous in presenting it to respondents as to give them the impression of different meaning or constructed in a manner likely to communicate different meaning that could generate inaccurate and inconsistent responses when instrument is repeatedly objectivity with no leading question as to answer desired. Also, the instruments are reliable because secondary data instrument is highly reliable because it helps to provide more facts about the relevance of inventory management in Nigeria Breweries plc and Unilever plc.

**3.7 Method of data collection**

It is because of the nature of the research works, to get all the necessary and authentic result, instruments used were from 2 (two) main sources and these are:

1. Primary data and
2. Secondary data

Both were significant and complementary in the execution of this project work.

**Primary data:** The primary data was obtained using oral interview and properly structured questionnaire administered to the respondent on face distribution method.

The questionnaire contained multi –choice and scaling question so that the respondents can answer without much difficulty, and to as certain opinions, ideas and experiences of the respondents.

**Secondary data:** The secondary data for the study were obtained mainly from textbooks, journals and internet articles.

**3.8 Method of data analysis**

Under this arrangement, a simple percentage approach will be employed to analyze the questionnaire for the purpose of simplicity. The table and percentage method data analysis is used to analyze the questionnaires, the formular for it is:

 A% = a x 100

 n 1

Where n = total number of response to a question

 a = number of respondents ticking a particular Answer

 A% = “a” expressed as a percentage of N

Analysis and interpretation were done using 5 likert scale have followed respectively in the tables below: SA= Strongly Agreed, A= Agreed, U=Undecided, D= Disagree, SD= Strongly Disagree.

The hypothesis would be tested using Regression Analysis at 5% level of significance. The analysis would perform using the Statistical Package for Social Sciences (SPSS) Version 20. Also, the simple regression technique was adopted because of its simplicity as well as minimizes the squares of the residuals.

**3.5 Model Specification**

A model is a simplified view of reality designed to enable us describe the essence and interrelationships within the system or phenomenon it depicts (Ezeja, 2007). The model of this research work is a simple regression models. Three models were formulated to answers the research questions. Thus, based on the above theoretical underpinnings, the general model is specified. According to (Isiwu, 2004): Y= f(X)

 Hence, Y = βo + β1X

**Model 1**

EMT= a + bInvm +μ ………………………………… (2)

**Where:**

EMT = Effective management tool at time t, (Dependent variable).

Invm = Inventory management at time t, (Independent variable)

a and b is constant indicating the intercept and the slope respectively

μ = Error term.

**Model 2**

Prof = a + bInvm+μ ………………………………… (1)

**Where:**

Pr = Profitability of a firm proxies profit after tax at time t, (Dependent variable)

Invm = Inventory management proxies inventories at time t, (Independent variable)

**CHAPTER FOUR**

**DATA PRESENTATION AND ANALYSIS AND INTERPRETATION**

**4.1 Introduction**

This chapter involves data analysis and interpretation. From the sample size of the study above, a total of 80 questionnaire was distributed to entire respondents and only 72 were returned representing 90% returns.

**Table 2: Sample return table**

|  |  |  |  |
| --- | --- | --- | --- |
| Firm(s)  | response option  | total  | TOTAL returned |
| Nigeria Breweries | Returned not returned | 38 2 | 38 |
| Unilever plc | Returned Not returned | 34 6 | 34 |
| **Total Sample return** | 72 |

Source: field survey, 2018

From the above out of 80 questionnaire distributed, 72 were returned. Therefore, the analysis is based on 72 returned questionnaire.

**4.2 Data Presentation, Analysis, Interpretation/Descriptive Statistics**

**Respondents Bio-Data**

**Table 3:** Educational background/ qualification of the respondents

|  |  |  |
| --- | --- | --- |
| Response option  | Number of response  | Percentage (%)  |
| WAEC/GCE/SSCE |  - | - |
| OND  | 10 | 13.9 |
| HND/B.SC  | 30 | 41.6 |
| MBA/M.SC  | 20 | 27.8  |
| OTHER /ACCA/ACA  | 12 | 16.7  |
| Total  | 72 | 100 |

Source: field survey, 2018

The above analysis of data on academic qualification of respondent shows that there were no WASSCE holder, OND were 10 represented 13.9% and HND/B.SC were 30 representing 41.6% while MBA/M.SC were 20 representing 27.8 and ACCA/ACA were 12 represented 16.7%.

**Table 4:** Length of work experience

|  |  |  |
| --- | --- | --- |
| Response option  | Number of response  | Percentage  |
| under 5 years  | 10 | 13.9 |
| 5-10 years  | 18 | 25.0 |
| 11-15 years  | 17 | 23.6 |
| 16-20 years  | 22 | 30.6 |
| above 20 years  | 5 | 6.9  |
| Total  | 72 | 100  |

Source: field survey, 2018

The age categories distributed as really show that the ranges from under 5 years are 10 representing 13.9%, 5-10 years are fully completed and returned questionnaires with number of 18 representing 25.0%, 11-15 years returned 27 representing 23.6% and 16-20 years returned 22 representing 30.6%, above 20 years returned 5 representing 6.9%.

**Table 5:** Level of management of the respondents

|  |  |  |
| --- | --- | --- |
| Response option  | Number of response  | Percentage (%)  |
| Top level | 23 | 31.9  |
| Middle level | 36 | 50.0 |
| Lower level | 13 | 18.1 |
| Total  | 72 | 100  |

Source: field survey, 2018

The Level of management of the respondents distributed show that the top management are 23 representing 31.9%, 36 are middle level representing 50%, 13 respondents are representing 18.1%.

**Respondents’ questions**

The research carefully selected some particular vital question in relations to the objectives of the research response from respondents have been represented by use of table and single percentage.

The formula for it is

A% = a x 100

 n r

Where

 n = total number of response to a question

 a = number of respondents ticking a particular answer option to the question

 A% = ‘a’ expressed as a percentage of N.

In the tables below: SA= Strongly Agreed, A= Agreed, U=Undecided, D= Disagree, SD= Strongly Disagree.

**Table 6:** Responses on effective of the various tools and techniques (Economic order quantity and Economic Batch Quantity) of inventory management in manufacturing firms

|  |  |  |
| --- | --- | --- |
| S/N | Statement  | No. of Respondents/ Percentage (%) |
| **SA** | **A** | **U** | **D** | **SD** |
| 1 | they help in maintaining adequate inventory level  | 36(50%) | 24(33.3%) | 6(8.3%) | 3(4.2%) | 3(4.2%) |
| 2 | they assist to reduce cost of managing inventory | 30(41.7%) | 27(37.5%) | 6(8.3%) | 6(8.3%) | 3(4.2%) |
| 3 | they are effective in ensuring that production is not interrupted | 33(45.8%) | 18(25%) | 3(4.2%) | 12(16.7%) | 6(8.3%) |
| 4 | they are used to monitor and maintain operating standards  | 39(54.2%) | 18(25%) | 6(8.3%) | 6(8.3%) | 3(4.2%) |
| 5 | They ensure that stock is neither overstocking nor under-stocking. | 30(41.7%) | 21(29.2%) | 3(4.2%) | 12(16.6%) | 6(8.3%) |

**Source**: Field Survey, 2018

The table 6 above shows that response on effective of the various tools and techniques (Economic order quantity and Economic Batch Quantity) of inventory management in manufacturing firms that 50% strongly agreed that they help in maintaining adequate inventory level, 33.3% agreed, 8.3% undecided, 4.2% disagreed and another 4.2% strongly disagreed; they assist to reduce cost of managing inventory 41.7% strongly agreed, 37.5% agreed, 8.3% undecided, 8.3% disagreed and 4.2% strongly disagreed; they are effective in ensuring that production is not interrupted 45.8% strongly agreed, 25% agreed, 4.2% undecided, 16.7% disagreed and 8.3% strongly agreed; they are used to monitor and maintain operating standards 54.2% strongly agreed, 25% agreed, 8.3% undecided , 8.3% disagreed and 4.2% strongly disagreed; They ensure that stock is neither overstocking nor under-stocking 41.7% strongly agreed, 29.2% agreed, 4.2% undecided, 16.6% disagreed and 8.3% strongly disagreed.

**Table 7:** Responses on consequences of ineffective inventory management on the productivity of manufacturing firms

|  |  |  |
| --- | --- | --- |
| S/N | Statement  | No. of Respondents/ Percentage (%) |
| **SA** | **A** | **U** | **D** | **SD** |
| 6 | organization loses customers | 39(54.2%) | 24(33.3%) | 6(8.3%) | 3(4.2%) | - |
| 7 | they will lack the supply of inventory when demand | 36(50%) | 21(29.2%) | 6(8.3%) | 6(8.3%) | 3(4.2%) |
| 8 | sales will decline  | 33(45.8%) | 18(25%) | 3(4.2%) | 12(16.7%) | 6(8.3%) |
| 9 | Adversely affects the procurement performance | 39(54.2%) | 18(25%) | 6(8.3%) | 6(8.3%) | 3(4.2%) |
| 10 | stock out, the decline in productivity and profitability and customer dissatisfaction | 30(41.7%) | 21(29.2%) | 3(4.2%) | 12(16.6%) | 6(8.3%) |

The table 7 above shows that response on consequences of ineffective inventory management on the productivity of manufacturing firms that 54.2% strongly agreed that organization loses customers 33.3% agreed and 8.3% undecided while 4.2% Disagree and strongly disagreed were none; they will lack the supply of inventory when demand 50% strongly agreed , 29.2% agreed, 8.2% undecided, 8.2% disagree and another 4.2% strongly disagreed; sales will decline 45.8% strongly agreed, 25% agreed, 4.2% undecided, 16.7% disagree and 8.3% strongly disagreed; Adversely affects the procurement performance 54.2% strongly agreed, 25% agreed, 8.3% undecided and 8.3% disagree and 4.2% strongly disagreed; stock out, the decline in productivity and profitability and customer dissatisfaction 41.7% very large extent, 29.2% large extent, 4.2% some extent, 16.6% no extent, and 8.3% undecided.

**Table 8:** response on inventory has contributed to profitability in manufacturing firms

|  |  |  |
| --- | --- | --- |
| S/N | Statement  | No. of Respondents/ Percentage (%) |
| **SA** | **A** | **U** | **D** | **SD** |
| **11** | Inventory contributed significantly to the growth and survival of an organization | 42(58.3%) | 18(25%) | 6(8.3%) | 3(4.2%) | 3(4.2%) |
| **12** | Inventory are critical to an organization's success in today’s competitive and dynamic market | 30(41.7%) | 27(37.5%) | 6(8.3%) | 6(8.3%) | 3(4.2%) |
| **13** | inventory ensures successful running and survival of a business firm | 27(37.5%) | 24(33.3%) | 3(4.2%) | 12(16.7%) | 6(8.3%) |
| **14** | Inventory contributes to achieve a balance between the low inventory and high return on investment | 36(50%) | 21(29.2%) | 6(8.3%) | 6(8.3%) | 3(4.2%) |
| **15** | inventory system maintained consistency will lead to organizational profitability and effectiveness. | 33(45.8%) | 24(33.3%) | 3(4.2%) | 12(16.7%) | - |

**Source:** Filed Survey, 2018

The table 8 above shows response on inventory has contributed to profitability in manufacturing firms and indicates that 58.3% strongly agreed that Inventory contributed significantly to the growth and survival of an organization 25% agreed and 8.3% undecided while 4.2% disagree and strongly disagreed were 4.2%; Inventory are critical to an organization's success in today’s competitive and dynamic market 41.7% strongly agreed, 37.5% agreed, 8.3% undecided, 8.3% disagree and 4.2% strongly disagreed; inventory ensures successful running and survival of a business firm 37.5% strongly agreed, 33.3% agreed, 4.2% undecided, 16.7% disagree and 8.3% strongly disagreed; Inventory contributes to achieve a balance between the low inventory and high return on investment 50% strongly agreed, 29.2% agreed, 8.3% undecided and 8.3% disagree and 4.2% strongly disagreed; inventory system maintained consistency will lead to organizational profitability and effectiveness 45.8% strongly agreed, 33.3% agreed, 4.2% undecided, 16.6% disagree and none were strongly disagreed.

**Table 9 Comparative Analysis of Performance**

Table showing inventory and profitability of Nigeria Breweries plc and Unilever plc

|  |  |  |
| --- | --- | --- |
| year  | Inventory | Profitability  |
|  | Nigeria breweries(N‘000) | Unilever plc (N‘000) | Nigeria breweries(N‘000) | Unilever plc (N‘000) |
| 2007 | 16,156,788 | 4,032,180 | 18,942,856 | 1,296,533 |
| 2008 | 20,741,461 | 4,632,184 | 25,700,593 | 2,596,533 |
| 2009 | 22,064,847 | 4,927,265 | 27,910,091 | 4,093,822 |
| 2010 | 21,231,097 | 6,286,744 | 30,332,118 | 4,180,076 |
| 2011 | 96,618,541 | 16,123,418 | 38,434,033 | 5,515,213 |
| 2012 | 42,348,420 | 21,719,351 | 38,042,714 | 5,597,613 |
| 2013 | 153,366,133 | 25,352,787 | 43,080,349 | 4,724,429 |
| 2014 | 193, 569,624 | 27,165,096 | 42,520,253 | 2,412,343 |
| 2015 | 197,108,847 | 29,164,670 | 38,049,518 | 1,192,366 |
| 2016 | 31,244,703 | 9,878,499 | 28,396,777 | 3,071,885 |

Source: Annual reports of Nigeria Breweries plc and Unilever plc for various years.

From the table above, the inventory of Nigeria Brewery is higher when compare to that of Unilever plc from the period under review that is from 2007 to 2016 with 16,156,788; 20,741,461; 22,064,847; 21,231,097; 96,618,541; 42,348,420; 153,366,133; 193, 569,624; 197,108,847; 31,244,703 & 4,032,180; 4,632,184; 4,927,265; 6,286,744; 16,123,418; 21,719,351; 25,352,787 ; 27,165,096; 29,164,670 & 9,878,499 respectively. This means that the portion of a business's assets of Nigeria breweries that is ready or will be ready for sale is higher than Unilever plc.

Relating to the profitability, Nigeria Brewery also recorded higher profit when compare to that of Unilever plc, from the period under review that is between 2007 and 2016 with 18,942,856; 25,700,593; 27,910,091; 30,332,118; 38,434,033; 38,042,714; 43,080,349; 42,520,253; 38,049,518; 28,396,777 & 1,296,533; 2,596,533; 4,093,822; 4,180,076; 5,515,213; 5,597,613; 4,724,429; 2,412,343; 1,192,366; 3,071,885 respectively. We also conclude that performance of Nigeria Breweries is better of that of Unilever plc.

**4.3 Testing of Hypotheses**

In this section, the data collection are used to test the hypotheses, which were formulated earlier in chapter one. In practice, there are several statistical techniques available for testing hypothesis. However, for the purpose of this research work, the researcher used the Statistical Package for Social Sciences (SPSS) Version 20 in testing the hypotheses. Also, the simple regression technique was adopted because of its simplicity as well as minimizes the squares of the residuals.

**Restatement of Hypotheses**

**Ho1:** Economic order quantity (EOQ) and Economic Batch Quantity (EBQ) techniques of inventory management adopted in manufacturing firms are not effective.

**HA**:Economic order quantity (EOQ) and Economic Batch Quantity (EBQ) techniques of inventory management adopted in manufacturing firms are effective.

**Ho2:** Inventory control has not contributed significantly to the net profit of manufacturing organization.

**HA:** Inventory control has contributed significantly to the net profit of manufacturing organization.

**Table10 Results of hypotheses tested (see appendices)**

|  |  |  |
| --- | --- | --- |
| **Statistic**  | **Hypothesis one**  |  **Hypothesis two** |
|  |  | **Nigeria Breweries**  | **Unilever plc** |
| R | 0.885 | 0.800 | 0.047 |
| R2 | 0.783 | 0.640 | 0.002 |
| AR2 | 0.710 | 0.595 | -0.123 |
| error estimate | 2.983 | 5097301.487 | 1698418.753 |
| R. sum of square | 96.100 | 3.697E+14 | 51194243502 |
| residual sum of squares | 26.700 | 2.079E+14 | 2.308E+12 |
| DW | 1.455 | 0.728 | 0.752 |
| C | -4.500 | 26340429.41 | 3357534.360 |
| Coeff. | 3.100 | 0.086 | 0.007 |
| P-value  | 0.046 | 0.005 | 0.897 |

Source: Compiled by researcher from the results of SSPS software, V. 20.

**Table 11 Analysis and Discussions of findings of regression**

|  |  |
| --- | --- |
| **Statistic**  | **Hypothesis one**  |
|  |  |
| R | 0.885 |
| R2 | 0.783 |
| AR2 | 0.710 |
| error estimate | 2.983 |
| R. sum of square | 96.100 |
| residual sum of squares | 26.700 |
| DW | 1.455 |
| C | -4.500 |
| Coeff. | 3.100 |
| P-value  | 0.046 |

Source: Compiled by researcher from the results of SSPS software, V. 20.

 The result of **Hypothesis One** tested shows that the R correlation coefficient is 0.885 signified that there is a very strong relationship between Inventory management (INVM) and Effective management tool (EMT). The degree to which the independent variables explain the dependent variables called coefficient of determination which is represented by R2 shows that 78.3% of the variation in INVM can be explained by EMT. Hence, the Adjusted R2 is 71.0%. This explains that the independent variables specified in the model can explain only about 71.0% of the variations in the dependent variable. With the linear regression model, the error of estimate is low with a value of about 2.983. The regression sum of square 96.100 is more than the residual sum of squares 26.700, which means that more of the variation in the dependent variable is explained by the model; hence variation explained that the model is not due to chance.

It is said that auto-correlation assumption is that a succeeding values of the random variable (u) are temporary independent; Auto-correlation usually indicated that an important part of the variation of the dependent variable has not been explained and it is usually dictated by Durbin Watson (DW) statistics. The acceptable value for the Durbin Watson Statistic is 2 but it permits a range of 0.2. The Durbin-Watson Statistic is 1.455 and since it falls within the acceptable range, the model is free from autocorrelation and is reliable. We conclude that the model shows positive serial autocorrelation. Thus, the constant or intercept is -4.500. This implies that when all the model parameters are zero, there will still be an effect of -4.500 on the EMT. This is accounted for by other factors not specified in the model. Based on above information that the estimated regression model is represented as follows: EMT = -4.500 + 3.100 INVM + *μ*

However, the significance value (p-value) of 0.046 is less than 0.05, the model is significant. Therefore, the null hypothesis is rejected and the alternative hypothesis is accepted. We therefore conclude that Economic order quantity (EOQ) and Economic Batch Quantity (EBQ) techniques of inventory management adopted in manufacturing firms are not effective.

**Hypothesis Two**

**Table 12 For Nigeria Breweries**

|  |
| --- |
| **Statistic**  |
|  | **Nigeria Breweries**  |
| R | 0.800 |
| R2 | 0.640 |
| AR2 | 0.595 |
| error estimate | 5097301.487 |
| R. sum of square | 3.697E+14 |
| residual sum of squares | 2.079E+14 |
| DW | 0.728 |
| C | 26340429.41 |
| Coeff. | 0.086 |
| P-value  | 0.005 |

Source: Compiled by researcher from the results of SSPS software, V. 20.

The R correlation coefficient is 0.853 signified that there is a very strong relationship between Profitability (Pr) and Inventory management (INVM). The degree to which the independent variables explain the dependent variables called coefficient of determination which is represented by R2 shows that 80.0% of the variation in INVM can be explained by Pr. Hence, the Adjusted R2 is 64.0%. This explains that the independent variables specified in the model can explain only about 59.5% of the variations in the dependent variable. With the linear regression model, the error of estimate is low with a value of about 5097301.487. The regression sum of square 3.697E+14 is more than the residual sum of squares 2.079E+14, which means that more of the variation in the dependent variable is explained by the model; hence variation explained that the model is not due to chance.

The auto-correlation dictated by Durbin Watson (DW) statistics is 0.728 and since it falls within the acceptable range, the model is free from autocorrelation and is reliable. We conclude that the model shows positive serial autocorrelation. Thus, the constant or intercept is 26340429.41. This implies that when all the model parameters are zero, there will still be an effect of 26340429.41 on the Pr. This is accounted for by other factors not specified in the model. Based on above information that the estimated regression model is represented as follows:

Pr= 26340429.41+ 0.086 INVM+ *μ*

However, the significance value (p-value) of 0.005 is less than 0.05, the model is significant. Therefore, the null hypothesis is rejected and the alternative hypothesis is accepted. We therefore conclude that inventory control has contributed significantly to the net profit of manufacturing organization(Nigeria Breweries plc).

**Table 13 For Unilever plc**

|  |
| --- |
| **Statistic**  |
|  | **Unilever plc** |
| R | 0.047 |
| R2 | 0.002 |
| AR2 | -0.123 |
| error estimate | 1698418.753 |
| R. sum of square | 51194243502 |
| residual sum of squares | 2.308E+12 |
| DW | 0.752 |
| C | 3357534.360 |
| Coeff. | 0.007 |
| P-value  | 0.897 |

The R correlation coefficient is 0.047 signified that there is a wek relationship between Profitability (Pr) and Inventory management (INVM). The degree to which the independent variables explain the dependent variables called coefficient of determination which is represented by R2 shows that 2.0% of the variation in INVM can be explained by Pr. Hence, the Adjusted R2 is -12.3%. This explains that the independent variables specified in the model can explain only about -12.3% of the variations in the dependent variable. With the linear regression model, the error of estimate is low with a value of about 1698418.753. The regression sum of square 51194243502 is more than the residual sum of squares 2.308E+12, which means that more of the variation in the dependent variable is explained by the model; hence variation explained that the model is not due to chance.

The auto-correlation dictated by Durbin Watson (DW) statistics is 0.752 and since it falls within the acceptable range, the model is free from autocorrelation and is reliable. We conclude that the model shows positive serial autocorrelation. Thus, the constant or intercept is 3357534.360. This implies that when all the model parameters are zero, there will still be an effect of 0.007 on the Pr. This is accounted for by other factors not specified in the model. Based on above information that the estimated regression model is represented as follows:

Pr= 3357534.360+ 0.007 INVM+ *μ*

However, the significance value (p-value) of 0.897 is more than 0.05, the model is not significant. Therefore, the null hypothesis is accepted and the alternative hypothesis is rejected. We therefore conclude that inventory control has not contributed significantly to the net profit of manufacturing organization(Unilever plc).

**Results of z-test for Nigeria Breweries plc**

**Table 14** z-test analysis of inventory control has not contributed significantly to the net profit of manufacturing organization.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Variable** | **N** | **X** | **SD** | **z. test**  | **Crit. z** | **Dec.** |
| INVM | 10 | 33140930.20 | 8011134.065 | 3.772 | 3.842 | don’t reject  |

Table 14 shows that the z-test is 3.772 while crit. z is 3.842. Since the z-test cal. is less than the Crit. z, the null hypothesis is not upheld. Therefore, inventory control has contributed significantly to the net profit of manufacturing organizationof Nigeria Breweries.

**Results of z-test for Unilever plc**

**Table 15:** z-test analysis of inventory control has not contributed significantly to the net profit of manufacturing organization.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Variable** | **N** | **X** | **SD** | **z. test**  | **Crit. z** | **Dec** |
| INVM | 10 | 14928219.40 | 10184755.133 | 3.397 | 3.842 | reject  |

Table 15 shows that the z-test is 3.397 while crit. z is 3.842. Since the z-test cal. is less than the Crit. z, the alternative hypothesis is not upheld. Therefore, inventory control has not contributed significantly to the net profit of manufacturing organization(Unilever plc).

**CHAPTER FIVE**

**SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS**

* 1. **Summary of findings**

Based on the above finding, the study empirically came out with the followings:

1. That the various tools and techniques of inventory management adopted in manufacturing firms are effective since the significance value (p-value) of 0.046 < 0.05, meaning that the model is significant.
2. That inventory control has contributed significantly to the net profit of manufacturing organization(Nigeria Breweries plc) since the significance value (p-value) of 0.005 is less than 0.05 meaning that the model is significant.
3. That inventory control has not contributed significantly to the net profit of manufacturing organization(Unilever Nigeria plc) since the significance value (p-value) of 0.897 is more 0.05 meaning that the model is not significant.

Other findings of the study are:

That some of the reasons why organization evolve inventory control management system include the need to smoothening operational requirements; maintain accountability and transparency, the need to optimize resources and meeting up operational requirement.

The study also found out that flexibility in inventory control management is an important approach to achieving organizational performance. Flexible inventory services are associated with minimizing stock holding cost, minimizing waste and encouraging high inventory utilization.

In addition, it was found that organizations benefits from inventory control management by way of easy storage and retrieval of material, improved sales effectiveness and reduced operational cost.

**5.2 Conclusion**

Inventory Management is very vital to the success and growth of manufacturing firms. The entire profitability of manufacturing firms is tied to the volume of products sold which has a direct relationship with the quality of the product. Management does a lot to present a good organization to the public in terms of quality production. Good inventory management in any manufacturing organization saves the organization from poor quality production, disappointment of seasoned customers, loss of profit and good social responsibility. This is done by ensuring timely delivery of raw materials to the factory and distribution of finished goods, in order of production to the warehouse.

Thus, if inventory management is not adequately maintained, production cannot meet the aspirations of customers which are loss of revenue to the organization. Right from procurement to the time of processing, quality of raw material is the chief determinant of the productive efficiency of any manufacturing concern. This varies from organization to organization. This study concludes that the various tools and techniques of inventory management adopted in manufacturing firms are effective and inventory management has significant impact on manufacturing company.

**5.3 Recommendations**

Based on the findings of the study, the researcher made the following recommendations:

1. The manufacturing firms should diversify their inventory system to suit specific needs of production and at the same time ensure that maximum attention is paid to inventory management so as to avoid or reduce the amount of loss that would be gotten from damaged goods in inventory
2. Inventory management should maximize space and timely delivery to avoid staying off production and closely monitor and manipulate their inventory system to maintain production consistency for organizational profitability and effectiveness.
3. Nigeria manufacturing firms should not take the issues of inventory management lightly because it has the power to make or mar the future of the organization liquidity position.
	1. **Contribution to knowledge**

The study has contributed to body of literature by providing empirical evidence on appraisal of inventory management and control in manufacturing firms using the following variables Effective management tool, Inventory management, Profitability and Productivity. In line with this, it has to a very large extent achieved the following objectives: effectiveness of the various tools and techniques used by manufacturing firms in inventory management; significant consequences of inefficient inventory management on the productivity of manufacturing firms in Nigeria and extents to which inventory control contribute to profitability in manufacturing firms.

**5.5 Suggestion(s) for Further Studies**

The study established the fact that inventory management and control is essential for smooth and effective running of manufacturing firms in Nigeria. The implication is that it is a vital tool in improving asset productivity and inventory turns, targeting customers and positioning products in diverse markets, enhancing intra and inter-organizational networks, enriching technological capabilities to produce quality products thereby imparting effectiveness in inter-firm relationships. Proper inventory management even results in enhancing competitive ability and market share of small manufacturing units. It is based on this that this study suggest that other research should take up the responsibility to broaden the scope of this study by looking at the effect of inventory valuation management on manufacturing firm performance which this study is limited to as the findings in this study might not be generalized to other firms. Other sub variables such as risk management, tax written off and cost of borrowing (Inventory valuation management) and profitability, productivity and sales (firm performance).

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**APPENDIX 1: QUESTIONNAIRE**

**SECTION A: DEMOGRAPHIC INFORMATION**

Instruction: Please give the following information about yourself.

1. Educational Qualification:
2. WAEC/GCE/SSCE [ ]
3. OND/NCE [ ]
4. HND/BSC [ ]
5. MBA/MSC [ ]
6. Others [ ]
7. Length of work experience:
8. Under 5 years [ ]
9. 5-10 [ ]
10. 11-15 [ ]
11. 16-20 [ ]
12. above 20 years [ ]
13. Level of management:
14. Top level [ ]
15. Middle level [ ]
16. Lower level [ ]
17. Department please specify: …………………………………………

**SECTION B:**

1. How effective are the various tools and techniques of inventory management in manufacturing firms?

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **S/N** | **STATEMENT** | **SA** | **A** | **U** | **D** | **SD** |
| **1** | they help in maintaining adequate inventory level  |  |  |  |  |  |
| **2** | they assist to reduce cost of managing inventory |  |  |  |  |  |
| **3** | they are effective in ensuring that production is not interrupted |  |  |  |  |  |
| **4** | they are used to monitor and maintain operating standards  |  |  |  |  |  |
| **5** | They ensure that stock is neither overstocking nor under-stocking. |  |  |  |  |  |

1. What are the significant consequences of ineffective inventory management on the productivity of manufacturing firms?

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **S/N** | **STATEMENT** | **SA** | **A** | **U** | **D** | **SD** |
| **6** | organization loses customers |  |  |  |  |  |
| **7** | they will lack the supply of inventory when demand |  |  |  |  |  |
| **8** | sales will decline  |  |  |  |  |  |
| **9** | Adversely affects the procurement performance |  |  |  |  |  |
| **10** | stock out, the decline in productivity and profitability and customer dissatisfaction |  |  |  |  |  |

1. To what extent has inventory contributed to profitability in manufacturing firms?

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **S/N** | **STATEMENT** | **SA** | **A** | **U** | **D** | **SD** |
| **11** | Inventory contributed significantly to the growth and survival of an organization |  |  |  |  |  |
| **12** | Inventory are critical to an organization's success in today’s competitive and dynamic market |  |  |  |  |  |
| **13** | inventory ensures successful running and survival of a business firm |  |  |  |  |  |
| **14** | Inventory contributes to achieve a balance between the low inventory and high return on investment |  |  |  |  |  |
| **15** | inventory system maintained consistency will lead to organizational profitability and effectiveness. |  |  |  |  |  |

**APPENDIX 2: REGRESSION RESULTS**

**Model 1**

EMT= f (INVM)

|  |
| --- |
| **Descriptive Statistics** |
|  | Mean | Std. Deviation | N |
| EMT | 4.80 | 5.541 | 5 |
| INVM | 3.00 | 1.581 | 5 |

|  |
| --- |
| **Correlations** |
|  | EMT | INVM |
| Pearson Correlation | EMT | 1.000 | .885 |
| ACC | .885 | 1.000 |
| Sig. (1-tailed) | EMT | . | .023 |
| ACC | .023 | . |
| N | EMT | 5 | 5 |
| ACC | 5 | 5 |

|  |
| --- |
| **Model Summaryb** |
| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | Change Statistics | Durbin-Watson |
| R Square Change | F Change | df1 | df2 | Sig. F Change |
| 1 | .885a | .783 | .710 | 2.983 | .783 | 10.798 | 1 | 3 | .046 | 1.455 |
| a. Predictors: (Constant), INVM |
| b. Dependent Variable: EMT |
| **ANOVAa** |
| Model | Sum of Squares | df | Mean Square | F | Sig. |
| 1 | Regression | 96.100 | 1 | 96.100 | 10.798 | .046b |
| Residual | 26.700 | 3 | 8.900 |  |  |
| Total | 122.800 | 4 |  |  |  |
| a. Dependent Variable: EMT |
| b. Predictors: (Constant), INVM |
| **Coefficientsa** |
| Model | Unstandardized Coefficients | Standardized Coefficients | t | Sig. | 95.0% Confidence Interval for B |
| B | Std. Error | Beta | Lower Bound | Upper Bound |
| 1 | (Constant) | -4.500 | 3.129 |  | -1.438 | .246 | -14.458 | 5.458 |
| INVM | 3.100 | .943 | .885 | 3.286 | .046 | .098 | 6.102 |
| a. Dependent Variable: EMT |
| **Residuals Statisticsa** |
|  | Minimum | Maximum | Mean | Std. Deviation | N |
| Predicted Value | -1.40 | 11.00 | 4.80 | 4.902 | 5 |
| Residual | -2.800 | 3.000 | .000 | 2.584 | 5 |
| Std. Predicted Value | -1.265 | 1.265 | .000 | 1.000 | 5 |
| Std. Residual | -.939 | 1.006 | .000 | .866 | 5 |
| a. Dependent Variable: EMT |

**Model 2**

**For Nigeria Breweries**

|  |
| --- |
| **Descriptive Statistics** |
|  | Mean | Std. Deviation | N |
| Pr | 33140930.20 | 8011134.065 | 10 |
| INVM | 79445046.10 | 74878229.826 | 10 |

|  |
| --- |
| **Correlations** |
|  | Pr | INVM |
| Pearson Correlation | Pr | 1.000 | .800 |
| INVM | .800 | 1.000 |
| Sig. (1-tailed) | Pr | . | .003 |
| INVM | .003 | . |
| N | Pr | 10 | 10 |
| INVM | 10 | 10 |

|  |
| --- |
| **Model Summaryb** |
| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | Change Statistics | Durbin-Watson |
| R Square Change | F Change | df1 | df2 | Sig. F Change |
| 1 | .800a | .640 | .595 | 5097301.487 | .640 | 14.231 | 1 | 8 | .005 | .728 |
| a. Predictors: (Constant), INVM |
| b. Dependent Variable: Pr |
| **ANOVAa** |
| Model | Sum of Squares | df | Mean Square | F | Sig. |
| 1 | Regression | 369744561443618.000 | 1 | 369744561443618.000 | 14.231 | .005b |
| Residual | 207859859622999.620 | 8 | 25982482452874.953 |  |  |
| Total | 577604421066617.600 | 9 |  |  |  |
| a. Dependent Variable: Pr |
| b. Predictors: (Constant), INVM |

|  |
| --- |
| **Coefficientsa** |
| Model | Unstandardized Coefficients | Standardized Coefficients | T | Sig. | 95.0% Confidence Interval for B |
| B | Std. Error | Beta | Lower Bound | Upper Bound |
| 1 | (Constant) | 26340429.413 | 2418280.010 |  | 10.892 | .000 | 20763865.710 | 31916993.117 |
| INVM | .086 | .023 | .800 | 3.772 | .005 | .033 | .138 |
| a. Dependent Variable: Pr |

|  |
| --- |
| **Residuals Statisticsa** |
|  | Minimum | Maximum | Mean | Std. Deviation | N |
| Predicted Value | 27723452.00 | 43212960.00 | 33140930.20 | 6409581.035 | 10 |
| Residual | -8780595.000 | 8077257.500 | .000 | 4805781.930 | 10 |
| Std. Predicted Value | -.845 | 1.571 | .000 | 1.000 | 10 |
| Std. Residual | -1.723 | 1.585 | .000 | .943 | 10 |
| a. Dependent Variable: Pr |

**For Unilever plc**

|  |
| --- |
| **Descriptive Statistics** |
|  | Mean | Std. Deviation | N |
| Pr | 3468081.30 | 1603059.725 | 10 |
| INVM | 14928219.40 | 10184755.133 | 10 |

|  |
| --- |
| **Correlations** |
|  | Pr | INVM |
| Pearson Correlation | Pr | 1.000 | .047 |
| INVM | .047 | 1.000 |
| Sig. (1-tailed) | Pr | . | .449 |
| INVM | .449 | . |
| N | Pr | 10 | 10 |
| INVM | 10 | 10 |

|  |
| --- |
| **Model Summaryb** |
| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | Change Statistics | Durbin-Watson |
| R Square Change | F Change | df1 | df2 | Sig. F Change |
| 1 | .047a | .002 | -.123 | 1698418.753 | .002 | .018 | 1 | 8 | .897 | .752 |
| a. Predictors: (Constant), INVM |
| b. Dependent Variable: Pr |
| **ANOVAa** |
| Model | Sum of Squares | df | Mean Square | F | Sig. |
| 1 | Regression | 51194243502.113 | 1 | 51194243502.113 | .018 | .897b |
| Residual | 23077010086047.996 | 8 | 2884626260756.000 |  |  |
| Total | 23128204329550.110 | 9 |  |  |  |
| a. Dependent Variable: Pr |
| 1. Predictors: (Constant), INVM
 |
| **Coefficientsa** |
| Model | Unstandardized Coefficients | Standardized Coefficients | T | Sig. | 95.0% Confidence Interval for B |
| B | Std. Error | Beta | Lower Bound | Upper Bound |
| 1 | (Constant) | 3357534.360 | 988460.660 |  | 3.397 | .009 | 1078139.991 | 5636928.728 |
| INVM | .007 | .056 | .047 | .133 | .897 | -.121 | .136 |
| a. Dependent Variable: Pr |

|  |
| --- |
| **Residuals Statisticsa** |
|  | Minimum | Maximum | Mean | Std. Deviation | N |
| Predicted Value | 3387393.50 | 3573505.50 | 3468081.30 | 75420.483 | 10 |
| Residual | -2381139.500 | 2079241.750 | .000 | 1601284.557 | 10 |
| Std. Predicted Value | -1.070 | 1.398 | .000 | 1.000 | 10 |
| Std. Residual | -1.402 | 1.224 | .000 | .943 | 10 |
| a. Dependent Variable: Pr |