
**UNIVERSITY OF NAIROBI**

**SCHOOL OF BUSINESS**

# EFFECTS OF INVENTORY MANAGEMENT POLICY PRACTICES ON THE FINANCIAL PERFORMANCE OF GAS MANUFACTURING COMPANIES, AFRICA

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**NOVEMBER, 2021**

## DECLARATION

STUDENTS DECLARATION

This is my original research project and has not been submitted for the award of a degree or diploma at any other university.

Signature……  …. Date……11/11/2021…….

Linda Shilwatso Makong'o

D61/87349/2016

SUPERVISORS DECLARATION

This research project has been submitted for examination with my approval as the University supervisor.

Signature ……  … Date ……11/11/2021…….

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## DEDICATION

The research project is dedicated to my lovely husband Edwin Laleyo and my lovely daughters Melanie and Melissa for their prayers, support and encouragement that enabled this project to be a success. The study is also dedicated to my dear parents Mr. & Mrs. Makong'o who believed in me and have always taught me to do my best in everything that I do. May God bless you all.

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## LIST OF ABBREVIATIONS

ABC - Activity Based Costing

CES - Customer Engineering Services.

EOQ - Economic Order Quantity

ICT - Information Communications Technology

JIT - Just in Time

KCC - Kenya Cooperative Creameries

MRP - Materials Requirements Planning

WIP - Work in Progress

BOC - British Oxygen Company

## TABLE OF CONTENTS

## LIST OF TABLES

## LIST OF FIGURES

**ABSTRACT**

Inventory management is a major determinant of effective and efficient work for managers in gas manufacturing organization. This study looked at the effects of inventory management practices on the financial performance of gas manufacturing companies in Africa. The population of the study comprises of gas manufacturing companies in Africa whereas the sample of the study targeted both private and public gas manufacturing companies in the different countries. The scope of the study covered the period from 2010 to 2020. Descriptive statistics, regression analysis and Pearson correlation coefficient were used in analyzing data. The finding of the study shows that there is a positive significant relation between inventory management and the company's financial performance. The higher the levels of inventory that a firm keeps the lower the financial performance due to incurring high carrying costs. Based on the results, it was recommended that the companies should keep adequate inventories in their warehouse to avoid overstocking or understocking of inventory.

# CHAPTER ONE

# INTRODUCTION

## 1.1. Background of the Study

Inventory management is as a process that involves tracking the quantity of stocks in the warehouse store or shelf: raw materials (RM), work-in-progress (WIP) and finished goods (FG) relative to other retailers, resellers, and distributors. This makes it easier for one to create a suitable purchasing plan and/or provide a suitable allowance for variations and uncertainty in supply and demand – ensuring that materials are available to meet the demand, either in manufacturing lines or in commercial activities (Muhayimana, 2015). This safeguard, regrettably, comes with a high price and managers are keen on looking for ways to reduce their inventory costs without necessarily affecting the service (Salemi, 1997; Dobler, 2000). In recent years, this search has led to many innovations and alterations. Scientific inventory control has conventionary been the core of inventory management, especially in manufacturing environments but this has gradually been enhanced by practices such as materials requirements planning (MRP), economic order quantity (EOQ), and just in time (JIT), with e-commerce giving a fast and efficient flow of materials through an integrated supply chain (Wood, 2004; Walters, 2008).

The manner in which inventories are managed could have a great impact on the organization's financial performance and hence its market value as well as shareholder's wealth. Better management of inventories enhances profitability and reduces the storage and material handling costs (Lyson, 1996; Ghosh & Kumar, 2003). Having excess stock could lead to tying down of funds, increase in holding or carrying cost, obsolescence, material deterioration, and pilfering/theft (Muhayimana, 2015). On the other hand, shortage of materials could result in sales interruption, poor relations with customers as well as the underutilization of machines and equipment (Sprague & Wacker, 1996; Sakakibara, Schroeder, & Morris, 1997). Effective inventory management could, therefore, boost the company's overall performance. Further, it enhances the ability of a firm to generate more sales which directly affects its profitability as well as the financial performance. A slight increase or decrease of inventory may pose some risk to an organization (Duru, Oleka and Okpe, 2014; Swaleh and Were, 2014). Manufacturing companies will end up saving significantly from managing their inventory effectively by approximately 50% - 60% of the total costs. An

organization that has an effective inventory management system can easily achieve a 6% saving on the total cost (Chen, 2005).

Most manufacturing organizations in Kenya have not paid much attention towards the operational costs that are saved by strategic inventory management systems thus making inventory to be considered as essential and not as an asset that requires management. The resultant effect is that many of these organizations face many problems such as: fluctuating inventories, inaccurate forecasts, poor response to the needs of the customers and shortage of adequate ICT application systems –resulting in poor performance (Naliaka & Namusonge, 2015). These assertions are clarified by Ondiek and Odera (2012) in their findings that companies like New Kenya Cooperative Creameries (KCC) face challenges of inconsistent deliveries, reduction in consumer buying power and increased direct overheads as a result of poor strategies employed in managing the inventory. This often results in reduced profit levels and long-term performance. Similarly, Kagira (2012) notes that factories that were managed by the Kenya Tea Development Agency encountered challenges of fluctuating inventory levels, and poor management in demand and due to unavailability of proper strategic inventory management systems. Whether this also applies to gas manufacturing industry is a concept that calls for more research.

There exist several inventory management practices that can be put in place by the management to ensure adequate inventories are made available to facilitate smooth operations of a firm (Barrett, 2015). These includes JIT purchasing, Barcoding, Vendor Managed Inventory (VMI), Activity Based Costing (ABC), Economic Order Quantity, MRP, and Radio Frequency Identification (RFI). Such practices set the platform for superior performance through waste reduction together with related costs (Lewin, 2012). The practices attempt to elaborate on two key questions: when should one make an order and how much should be ordered? An attempt to answer these questions helps organizations to be more efficient and more productive than before; this therefore leads to efficient stock and quality control. Effectively, Bacchetti et al. (2010) suggest that an organized way of managing inventory will make it easier for managers to establish the ideal time to place an order and the required quantity should be ordered. To achieve this, firms should embrace EOQ as it enables them to plan on replenishing their inventory at a desired time that could either be monthly, quarterly, bi-annually, or annually.

Manufacturing firms form a vital component in driving the economic development contributing up to 10% of the Gross Domestic Product (GDP) (KAM, 2018). Currently, there are over 1000 firms in the manufacturing sector drawn from a wide array of industries: motor vehicle, consumables, and gas producing, amongst others. These companies are collectively tasked with ensuring they stay ahead of the global competition by becoming innovative, and forward thinking. To achieve this, various techniques are applied by these firms in managing their inventories. These practices tend to have a relevant effect on profitability, returns and sales' volume.

Most manufacturing companies tend to have a good performance as they put these practices into implementation. Gas manufacturing firms are encountering a challenge of inventory control and management leading to massive wastages: oil spillage and gas flaring which as a result led to significant challenges in managing waste along the supply chain whilst producing sufficient and quality products for the customers. This calls for managers to embrace a wholesome adoption of sound inventory management systems as an essential business initiative to enhance waste reduction and foster customer satisfaction.

### 1.1.1. Financial Performance

Financial performance could be defined as the optimum utilization of the assets of the firm from its core business activities to generate revenue (Maaka, 2013). As highlighted by First Rand Group (2006) proxies for the financial performance of companies include profitability ratios: return on equity (ROE), gross profit, earning per share, dividend ratio, return on asset (ROA) and Net Operating Profit (NOP). ROA is among the financial profitability measures that may be used to assess a company's financial performance. According to Jewell and Mankin (2012), ROA as a ratio shows the yield on the value of assets used in the firm. ROA is used to determine the overall efficiency of a firm's operations. The higher the ratio, the better, since the firm can more efficiently employ its assets to generate profits.

Good financial performance not only play a crucial role in increasing the market value of that specific company but also contributes towards wholesome industrial growth. This ultimately leads to the great success of the overall economy (Banafa, Muturi & Ngugi, 2015). Financial performance shows how managers of an organization have utilized its resources especially inventory to maximize or create value for shareholders (Epstein, Buhovac & Yuthas, 2015). Performance, on the other hand, is a measure of the quantity and quality of work completed, taking

into account resource usage. Individual, group, and organizational performance can all be quantified.

Financial goals measures include sales growth, profit, return on investment, organization effectiveness and business performance. On the other hand, the criteria for non-financial measures are innovativeness and resource planning, innovation performance and market share quality improvement, (Demirbag, 2006). According to Palepu et al. (2007) the general performance of the distinct components of inventory also assists to test the existence of any disparity on the production costs and operating expenses. Our study also aims to use these variables as proxied in the empirical and academic literature to assess the impact of inventory management systems on the financial performance of gas manufacturing companies, Africa.

### 1.1.2. Gas Manufacturing Companies

The process of producing medical and industrial gases is known as gas manufacture. Medical gases are gases utilized in medical treatments, whereas industrial gases are gaseous materials created for industrial usage (Dogan, 2021). Nitrogen, oxygen, carbon dioxide, argon, hydrogen, helium, and acetylene are just a few of the gases and mixes that can be found in gas cylinders. Gas manufacturing companies in Africa could attain a competitive advantage from practicing inventory effective management practices such as lean. Such practices provided firms with an opportunity to achieve superior by minimizing on their waste (Lewin, 2012).

This research focuses on the various gas manufacturing companies in Africa, but it specifically narrowed down to BOC Kenya Plc, Carbacid Investment, BOC Gases Nigeria, Tanzania Oxygen Limited (TOL Gases) and African Oxygen (AFROX) which are some of the gas manufacturing firms in Africa. BOC Kenya Plc, a gas producing firm, is a publicly traded corporation that is regarded as East Africa's top provider of medical and industrial gases. Medical gases include oxygen, nitrous oxide, medical air, entonox, and carbon dioxide; industrial gases include dissolved acetylene, oxygen, hydrogen, nitrogen, carbon dioxide, and noble gases like argon. Since 1947 it has largely been operating from the Nairobi office before opening various satellite offices in Kampala, Mwanza, Kisumu and Dar-es-Salaam.

The BOC organization traces its roots to the United Kingdom where it was originally incorporated 1886 and has been in existence for slightly over 130 years producing industrial gases. It is a member of the Linde Group Plc: a leading British multinational chemical company with

approximately 74,207 employees and a global presence in more than 120 countries as of December 2020. Since its acquisition by Linde Plc in 2002, BOC Holdings UK has been the majority shareholder of BOC Kenya Plc. The product portfolio of BOC Kenya includes a variety of gases, equipment, and the provision customer engineering services (CES). The client base of the organization cuts across an enormous range: public and private medical clinics, common and mechanical designing workers for hire, engine vehicle weightlifters, food processors, lodgings and cafés, the casual business area ("Jua Kali") just as little, and medium ventures.

Carbacid Investments plc is another gas manufacturing company in Kenya focused on carbon dioxide gas production processing. In Nigeria, BOC Gases manufactures and distributes gases for the industrial and medical sectors in Nigeria. Just like BOC Kenya Plc, the gases include Oxygen, argon, nitrogen and carbon dioxide. The Company also markets special gases, welding, and medical equipment. In Tanzania, Tanzania Oxygen Limited (TOL) gases on the other hand produces and distributes medical and industrial gases in Tanzania. In South Africa, African Oxygen Ltd. (AFROX) produces and sells gases, welding equipment, fluid handling systems, and specialized high-tech industrial items. The gases mentioned above are produced or manufactured differently, for instance nitrogen, oxygen and argon are obtained from air by fractional distillation.

### 1.1.3. Inventory Management Practices and the Financial Performance

According to Kotler (2002) management of inventory has been described as all activities that have been involved in inventory level development and management so that supplies are made available and the costs of under and over stocking are minimized. In a nutshell, the purpose of inventory management practices is to enable managers to maintain levels of inventory: not too much, nor too low, but optimal to minimize the costs whilst maximizing the profits as well as the shareholder's wealth (Hankinson and Persson, 2004). Extant inventory management literature confirms that a firms' profit is a function of two aspects: cost reduction and revenue maximization (Agus and Noor, 2006; Roumiantsev and Netessine, 2005; Eckert, 2007).

The duo find evidence to suggest that various practices employed to handle inventory have a relevant relationship with return on sales (ROS) and profitability. Eckert (2007) examine inventory management together with its role in enhancing better customer satisfaction. He finds a positive association between education and training of employees, customer satisfaction and supplier

partnerships, and technology. On the other hand, Roumiantsev and Netessine (2005) investigate how effective inventory management feeds into the financial as well as the overall performance of a company. They find no statistical relationship between the two, however they concluded that relatively lower levels of stock (which are well managed) could be attributed to enhanced levels of financial performance of a firm.

### 1.2. Statement of the Problem

Every organization should do all that it takes to keep inventory at the optimal level. Having excess or little inventory could have an adverse effect on the levels of profitability in an organization (Kolias et al., 2011). The significance of inventory management should not be taken lightly as it's the most problematic asset that must be managed and, in the end, it has significant effect on the supply chain as well as the performance of a company (Jeremy & Wagner, 2009). According to Choi (2012), the presence of an effective inventory management system is critical for the success of any business enterprise. The ability of maintaining the right quantity of inventory serves as a strategy employed by companies in meeting their customer's needs while mitigating the risk of unforeseen shortages. In cases of stock-out, a firm's production process is brought to a sudden halt.

Consequently, the absence of a product when the customer is in need of it, may lead to loss of customers. On the other hand, the presence of excessive inventories results in a situation where working capital is tied up while increasing the carrying costs (Rajeev, 2010). According to Dimitrios (2008), the presence of high inventory quantities is disadvantageous to a business since it results in usage of large physical space, the creation of financial burdens, and the high probability of spoiled and damaged inventories. In addition, the excess inventory covers for poor and ineffective management, suboptimal forecasts, erratic planning, and insufficient focus on details on procedures and processes. In order for a firm to be successful then there should be effective management of inventory flow along the supply chain. Balancing the supply inventory with demand is the main challenge in inventory management. For instance, Songet (2016) believes that most manufacturing firms have a significant proportion of their inventories as part of current assets. Therefore, effective inventory management is critical in a firms' profitability and ROA.

On the global arena, several studies have been conducted on the relation between the inventory management and the organization's overall performance. Some of these include Ogbo and

Onekanma (2014) who argue that organizations benefit from inventory control management through achieving reduced operational costs and improved sales effectiveness. Anichebe and Agu (2013) in their research showed how a good inventory management can lead to the organizational effectiveness in that there will be adequate inventory for production leading to the satisfaction of the customer as well as increasing the profitability of the organization.

In Kenya, Kamau and Kagiri (2015) conducted a study on inventory management and organization's competitiveness and found that profit maximization, customer satisfaction and inventory management is affected by inventory management practices and market share growth of a firm thereby affecting its competitiveness. Naliaka and Namusonge (2015) in their review on stock administration and the upper hand of modern firms showed that data innovation, stock administration practices and stock control frameworks are the fundamental variables influencing an assembling association's seriousness.

Gakinya (2013) in his study finds that management of inventory can affect the organization's supply chain performance through achieving customers' service delivery, gaining a competitive edge, and meeting forecast demands. None of these studies attempted to link inventory management practices with a firm's profitability. In gas firms inventory practices have been faced with cases of overstocking of goods, which eventually becomes obsolete and turns into dead stock, understocking, a lack of stock-taking, and chronic delays in material delivery which have all harmed the smooth operation and profitability of gas companies. It is therefore apparent that there is a loophole that needs to be addressed. In trying to dig into this problem, many other questions cross my mind that would also require my attention: could the lead time policy adopted; inventory handling costs; inventory size management; and automation systems and e-procurement be the sole elements that explain the variation in the financial performance of gas manufacturing firms in Africa?

### 1.3. General Objective

The study sought to establish the effect of inventory management policy practices on the financial performance of gas production companies in Africa.

#### 1.3.1. Specific Objectives

The objectives of the study were:

i. To establish whether the lead time (inventory placement and delivery period) policy adopted affects the financial performance of gas manufacturing companies in Africa.
ii. To examine the effect of inventory handling costs (storage costs of unsold inventory) on the financial performance of gas manufacturing companies in Africa.
iii. To find out how inventory automation and e-procurement systems affect the financial performance of gas manufacturing companies in Africa.
iv. To assess the effect inventory size management on the financial performance of gas manufacturing companies in Africa.

### 1.4. Significant of the Study

The research will add knowledge to the literature of inventory management. The study will also provide relevant information to gas manufacturing companies in order to improve on their inventory management. It will provide useful information that shall assist in comprehending various practices of managing inventory, how they are applied, the practical relevance to the organization as well as assist in providing a proper basis for making better and more informed decisions that revolve around inventory management.

The finding of this study would be beneficial for the academicians as they would be furnished with relevant information regarding the impact of inventory management practices on financial performance of gas manufacturing companies in Africa. The findings of this study would also be instrumental to the government in development of policy papers, making of policies regarding inventory management and other regulatory requirements of the country's gas manufacturing firms. In addition, the study would contribute to general knowledge and inform future research/studies.

# CHAPTER TWO

# LITERATURE REVIEW

## 2.1. Introduction

This chapter explored the significant literature on practices involving management of inventory that affects the performance of gas manufacturing firms in Africa. The review was undertaken to reveal the gaps in the existing empirical literature and set the foundation for this study.

## 2.2. Theoretical Literature Review

Several theories have been proposed to explain how inventory management methods affect the overall performance of gas-producing enterprises around the world. The important concerns on the link between inventory management and financial performance were constructed using the Lean theory, theory of Economic Order Quantity, Pecking Order Theory, and Agency Theory and Cash conversion cycle with a specific focus on gas manufacturing enterprises in Africa.

### 2.2.1. Lean Theory

Lean theory focuses on creating more value for customers with fewer resources. It mainly expounds on the ideas of just in time. The theory provides various tools that are used in analyzing process flow and delay times at each activity thus helps eliminate excess stock and reduce wastage in the production process (Green & Inman, 2005). The theory consists of three concepts: first, separation of value-added activities and non-value-added work, Second, movement of materials in the event where there are no bottlenecks as portrait by the theory of constraints, and thirdly, for the material to flow more evenly, it is important to narrow the variability associated with demand on the process. The leanness of inventory significantly impacts on the profitability of an organization and as a result, it is considered to be the best tool for the control of inventory (Schmenner & Swink, 1998).

Organizations that are leaner than industry average normally observe leanness attaining a positive return (Eroglu & Hofer, 2011). Lean theory further expounds on how flexibility is attained by manufacturers in their purchasing choices, reduce the levels of inventory that are kept by a company and eliminate the corresponding costs of ordering inventory. Numerous scholars point out that firms can effectively optimize inventory holding through practicing lean supply chains procedures enabling them to augment utilization of their assets and satisfying customers leading

to improved market share growth, profitability (Waller and Williams, 2008; Walters, 2008). One weakness that surrounds this theory is its limited range of applicability, as it can only be used where there is need for sharing information between a company and its trading partners as well as a close and long-term collaboration. This theory is relevant for my study as it helped in ensuring there was efficiency when it comes to production process in gas manufacturing companies in Africa.

### 2.2.2. The Theory of Economic Order Quantity (EOQ)

This is a model that was propagated by Harris ford in the year 2013 to keep track and determine the optimal inventory level. Although this model has been refined over time, it defines an optimal inventory level as the one which that can minimize both the cost of holding and ordering inventory (Lwiki et al., 2013). To determine the optimal ordering level, the model sets a criterion for minimizing the total ordering costs and carrying costs (Ziukov, 2015). The underlying weakness of this model stems from the assumptions it makes which, in reality, are generally unrealistic: constant demand, ordering and holding costs (Kumar, 2016).

The model considers keeping both ordering and carrying cost as low as possible in their strategic decisions to replenishing stock. To achieve this, inventory management personnel reduce, by a great proportion, the quantity of goods being ordered leading to a decrease in the costs of ordering but increase the costs of storage there by leading to a need for a larger storage space (Schwarz, 2008). Interestingly, some of the costs decline based upon the period of holding inventory while others increase, but ultimately, the curve for the total cost associated with inventory remains at the lowest level (Lwiki1 et al., 2013). For clarity, the ordering costs could be defined as expenses incurred when more a firm wants to buy more stock, carrying costs refer to the inventory holding expenses.

The point where these two costs intersect is the one, we call EOQ. This is the optimal point at which ordering and carrying costs are equal (Kumar, 2016). The theory is important for my study because it assisted in measuring carrying costs as my variable and it helped gas manufacturing companies to know the exact point at which they need to order stocks in order to avoid stock-out. Within the EOQ equation, according to Muckstadt et al. (2010), the first component represents inventory management system expenses, while the second component represents ordering costs. The entire holding and setup costs are reduced using EOQ.

### 2.2.3. Pecking Order Theory

Donaldson was the first to suggest this theory in 1961 which was later modified by Stewart, Myers and Malouf (1984). The theory argues that firms' priority is to use their internal finances as the first option since they are cheaper and then proceed to use external sources in the order of their cost. Internal sources are therefore utilized first, and companies only issue debt when such internal funds are depleted. The theory starts with asymmetric information since executives would have more information relating to the company's prospects and associated risks more than external investors. Such information influences the decisions on whether to use internal or external financing as well as whether to use debt or equity.

A pecking order therefore exists and would be very important in financing new or existing projects. In most cases, asymmetric information works in favor of debt financing over equity financing as debt financing depicts confidence that an investment would be profitable. On the other hand, issuance of equity signals a pessimistic view about the board of management and that they feel the share price is over-valued. Issuing more shares may therefore contribute to reduction in the price of the shares. Barry, Bierlen and Sotomayor (2000) tested the applicability of the partial adjustment theory and pecking order theory for firms. This theory is therefore relevant to the study as the gas companies would use it to determine whether to source funds in form of debt based on the pecking order of their companies. The theory would also be of great importance to the firms in determining the most appropriate and cost-effective source of financing to their projects.

### 2.2.4. Agency Theory

The agency theory was developed by Jensen and Meckling (1976). According to this theory, agents/managers are motivated by self-interest and will only engage in the investment process if it benefits them personally (Ghoss &Ruland, 1998). This goal does not always imply a higher return for Private Equity investors (Firth, 1980). The Agency theory supports Larcker's (1983) claim that agents are interested in making short-term judgments and attempting to optimize available company resources within a restricted time frame.

Shareholders, on the other hand, seek to maximize long-term returns above short-term gains, resulting in an agency dilemma. To mitigate this issue, investors provide performance incentives to its managers, such as stock options and the signing of a performance award system. Travlos and Waegele in (1987) suggested that companies with long term compensation plan perform better as

compared to those without one. In addition, Lewellen, loderer and Rosenfield (1985) states that Companies with managerial stock ownership plan normally have higher returns.

Inventory management leads to better financial decisions when they engage managers whose personal wealth is strongly connected to the worth of their companies. Managers can be compensated through performance-based compensation plans, as well as having close monitoring and, if necessary, intervention by shareholders, to boost investor returns and assure greater financial success for these organizations.

**2.2.5. The Cash Conversion Cycle Theory**

The cash conversion cycle model was established by Richards and Loughlin (1980) because it takes into account all important cash flows from activities. The time allotment between cash installments for unrefined substance buys and the assortment of receivables associated with the offer of completed merchandise is known as the money change cycle. The money change cycle, then again, essentially considers the period of time monetary streams are occupied with the cycle and overlooks the measure of cash put resources into an item as it advances through the cycle.

While the separation of stock into three parts of unrefined components, work in process, and completed things isn't accessible for outside specialists, the weighted cash conversion cycle is a complicated indicator of working capital management efficiency. Because of these restrictions, Shin and Soenen (1998) propose the net trade cycle as a working capital management solution. They contend that on the grounds that the denominators for the stock transformation time, the receivable assortment time frame, and the payable deferral time frames are for the most part unique, adding the money change cycle parts isn't actually valuable. They suggest that the denominators of the stock change, receivable assortment, and payable deferral periods be balanced.

The net exchange cycle is basically as old as money transformation cycle, then again, actually the three parts of the money change cycle (receivables, stock, and payables) are verbalized as a level of deals, making it more straightforward to ascertain and less perplexing than the money transformation cycle and the weighted money change cycle (Shin and Soenen, 1998). In contrast to the cash conversion cycle and the weighted money transformation cycle, Shin and Soenen (1998) argue that the net exchange cycle is a superior working capital proficiency measure because

it shows the number of day deals the organization requires to fund its functioning capital, and it is easily computed by the working capital administrator.

### 2.3. Empirical Literature Review

There is scarce information on the works of earlier researchers on practices involving management of inventory and its impact on the financial performance. This section focused on empirical studies relating to inventory management practices and its effect on the financial performance.

#### 2.3.1. Lead Time Policy and its Effect on the Financial Performance of the Firm

Etim, et al. (2014), recognize that practicing inventory management positively impacts an organization's operational performance. They argue that this can be achieved through the efficiency in utilizing capital, service delivery and reduced lead time as companies that practice effective inventory management are highly responsive to possible material shortages, product stock outs, obsolescence and piling of components. Koumanakos (2008) inspected the impact of stock administration on the presentation of 135 assembling firms in Greece from three pre-chosen enterprises: synthetic substances, food, and materials, all through the period 2000-2002. For instance, the connection between lean administration and monetary execution was investigated, and stock not really set in stone to have an opposite relationship with the pace of return.

#### 2.3.2. Carrying Costs and its Effect on the Financial Performance of the Firm.

Ndunge (2012) revealed that the applications meant for the management of inventory used by the edible oil firms enabled the firm to reduce on inventory wastage and reduce on costs. Inventory management implementation applications enabled the organization to record a positive increase in profits and more responsiveness to their customers and suppliers needs together with utilization of capacity. Wild (2004) indicates that there is need for proper supply warehousing for orders made on goods held to try to reduce the costs associated with holding them.

Munyao et al. (2015) employed surveys to collect data on inventory management and 45 manufacturing companies from the Kenyan coast. Their results showed that manufacturing firms use different techniques of managing inventory such as action level methods, EOQ periodic review method, and JIT. The study established that MRP was most successful practice in augmenting production departments' performance since action level methods were used by most organizations in the manufacturing industry.

### 2.3.3. Automation and e – procurement and their Effect on the Financial Performance of the Firm

Kitheka (2010) indicates that the automation of managing inventory positively creates an impact on the supermarkets' performance. This is because it reduces operations costs and augments customer service delivery levels. Ondiek and Odera (2012), in their study indicates that most manufacturing firms in Kenya face various difficulties which leads to their poor performance. This Includes: poor responsiveness to customers' needs, fluctuation of inventories, lack of proper ICT application systems, and inaccurate forecast.

### 2.3.4. Inventory size Management and its Effect on the financial performance of the Firm

Nwosu (2014) examined managing materials and its effect on profitability of Nigeria brewing companies. Using surveys and oral interviews, the study sampled 368 brewers. The study identified that the profitability of the brewing companies can significantly improve through material inventory as well as interdepartmental collaboration. This study observed that material management had a significant positive impact on the profits of brewing companies.

Kariuki (2013) in his study examined the various factors that impacts on controlling inventory at the State department of Internal Security, Kenya. The study identified various factors that led to the long bureaucratic procurement procedure. The factors included stock-outs, delay in procurement of goods, unpredictable changes in prices and untimely funds dispatch.

## 2.4. Research Gap

The empirical review has shown several knowledge gaps that needs to be filled with this study. First, majority of the studies on inventory management practices have taken place in the developed and emerging nations with very few studies done locally in Africa. Secondly, studies examining the influence of practicing management of inventory in organizations in Africa have tended to concentrate on factors like competitive advantage, customer satisfaction, and market share growth and so on with few studies examining the effect of lead time policy, carrying costs, automation, e-procurement systems and inventory size on the financial performance of gas manufacturing companies. This study focuses on the gas manufacturing companies as they have been experiencing challenges that have affected their operations. According to KAM (2013), the scenario in many gas manufacturing enterprises confirms this by demonstrating several issues such as insufficient inventory management system deployment resulting to decreased performance.

A large number of studies have looked at the impact of inventory management practices on business success and have found that effectively managing inventory has a major impact on a firm's performance. However, the studies have not been specific on gas manufacturing companies in Africa. The purpose of this research was to fill a knowledge gap in the literature by investigating the effects of inventory management on the financial performance of African gas producing enterprises, with a focus on the impact of lead time policy, carrying costs, automation and e-procurement systems, and inventory size.

### 2.5. Summary of the Reviewed Literature

The reviewed empirical literature shows that indeed, practices of managing inventory adopted by a firm has a great impact on the overall performance of a firm. It is also evident that effective and efficient inventory management system enhance firms' profitability. Both local and international studies have also indicated that the whole process of managing and controlling inventory is critical to any organization and an attempt of mismanaging the inventories jeopardizes the viability and going concern of a firm. One key observation from these studies is that they all focus more on practices of managing inventory and less on the link between these practices and the financial performance. To the best of our knowledge, none of the studies examine gas manufacturing companies in Africa, hence our study will be key to contribute knowledge in the field.

### 2.6. Conceptual Framework

A conceptual framework as alluded in most research texts is a model that attempts to illustrate the existent relationship between the predicted variable and the corresponding predictor variables (Leshem & Trafford, 2007). In our proposed study, our dependent variable was the financial performance of gas manufacturing companies, and the independent variables were lead time policy, carrying costs, automation & e-procurement systems and inventory size. The diagrammatic illustration of the variables is presented in figure 1.

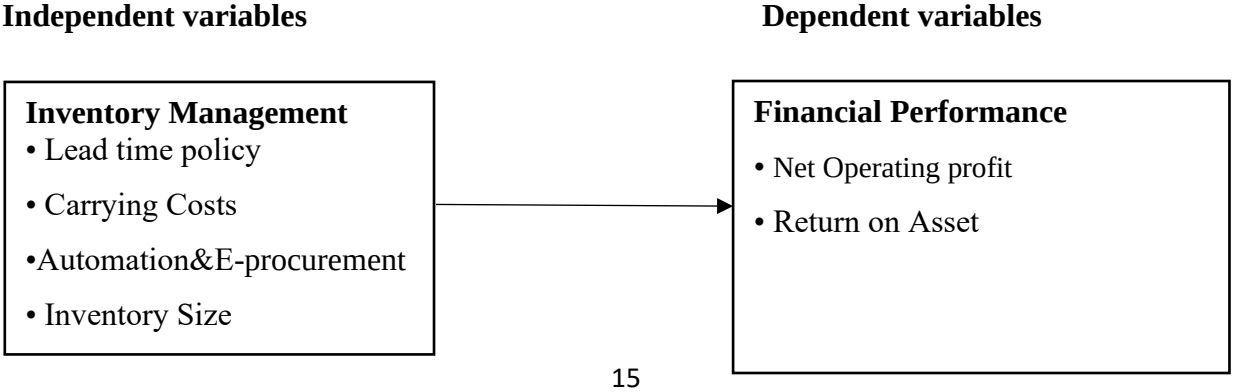

*Figure 2.1. Conceptual Framework*

### 2.6 .1. Lead Time Policy.

This is the period spanning from the time a customer places an order and the time a firm makes them available for either delivery or pick up or based upon the terms and conditions surrounding the sale. This varies from product to product or between customers. For instance, in manufacturing companies, lead time/period epitomizes the time (in days) taken to come up with a finished good, and have it delivered to the customer/end consumer. This process could be impeded by several factors: raw material shortage, natural disasters, labor shortages, breakdown of the means of transport, and human errors. All these have an adverse effect on the lead time policy and resultant company revenues. On the other hand, firms could improve their lead times by automating their systems and other augmented inventory management practices like JIT.

### 2.6.2. Carrying Costs.

These are the costs associated with holding inventory in stock. Examples of these costs are employee costs, taxes, warehouse storage fees, insurance, and opportunity costs. These costs are considered to have four different factors, and this includes costs incurred in the storage of the inventory, wages, salary of workers, maintenance and costs associated with utilities. Moreover, the carrying cost will mostly appear as a percentage number. It gives an idea on how long a company can hold inventory before losses start arising which makes it easier for the manager to know how much he needs to order.

### 2.6.3. Automation and e-pocurement systems

Automation is the technology by which a procedure is performed with minimal human assistance. An organisation that has an automated inventory management system can easily delete, add, edit, or transfer stock in real time. The software application allows the organisation to access inventories data from a central point using feeds that links onto the company's website. Electronic procurement are applications designed to facilitate the use of the internet by businesses to acquire the required goods and services. The main components of e-procurement systems include focusing on transactional improvement and the decision-making, asset management and having systems designed to maximize on a company's production operation. The applications are essential for business entities that aim to uphold the general idea of enhanced materials management. Lastly,

the wholesome process of automation will not escape out attention. To optimize the company's production process, automation is key: from material procurement through to the management of supplier contracts to production scheduling. When this process is up and running and is managed effectively, the results are easily seen in the organization's financial performance.

### 2.6.4. Inventory Size Management

This entails managing the size of inventory that an organization keeps at any particular time. This is important because an organization is able to have control over its inventory and it knows the quantities that are at the warehouses.

## 2.7. Hypothesis Formulation

### 2.7.1. Lead Time Policy and Financial Performance

With regards to seeking client orders, lead time is urgent. Chiefs of production network activities play a basic impact in an organization's prosperity. Most production network tasks supervisors, then again, come up short on an intensive comprehension of what lead times mean for monetary achievement (Stank et al., 2019). Besides, mirroring the connection between lead time and monetary execution is troublesome (Godinho and Veloso, 2013). To test for lead time, the research tested the hypothesis below:

H1: Shorter lead time improves financial performance

### 2.7.2. Inventory Carrying Costs and Financial Performance

Before merchandise is sold and sent to customers, a corporation incurs numerous expenditures for holding and storing it. These costs are calculated by businesses to determine how much profit they may expect from their current inventory. It can also be used to determine if a corporation should raise or decrease its output. A business may remain on top of spending and generate a consistent income stream by understanding its carrying costs. To test for carrying costs and its effect on financial performance, the following hypothesis was used.

H2: High inventory carrying costs leads to poor financial performance

### 2.7.3. Automation and Financial Performance

The research aims to check whether firms with high automation levels leads to higher financial performance. The research tested the hypothesis below.

H3. High automation levels leads to better financial performance

### 2.7.4. Inventory Size Management and Financial Performance

The issue in stock administration is to find some kind of harmony between stock market interest and the financial performance of the firm. In an ideal world, an organization would have sufficient stock to meet customer demands while keeping away from lost incomes because of stock-outs. Be that as it may, because of the great cost of conveying stock, the company would not like to keep an excess of stock close by. Stock choices impact an association's production network. Stock costs rise when slack assets are available. This was tested by the hypothesis below.

H4: Good inventory size management practices leads to good financial performance

# CHAPTER THREE

# RESEARCH METHODOLOGY

## 3.1. Introduction

The following key areas are focused on in this chapter: research design, population of the study, the process of collecting and analyzing data, analytical model, and statistical significance.

## 3.2. Research Design

The study was largely quantitative and utilized descriptive design as proposed by Bryman and Bell (2003) to enable us collect quantifiable information/data from various databases to be used in statistical analysis of our sample. The aim of using this design was to help us to effectively execute our research questions that are built around cause-and-effect relationship.

## 3.3. Population of The Study

The population of the study comprised of all Africa's gas manufacturing companies. This is because they contribute greatly to the gross domestic product (GDP) and decline in their performance results to the decline in the GDP. According to KNBS (2012), the GDP declined from 5% in 2010 to 3.08% in 2011, this was attributed to poor strategies in inventory management. The research targeted 9 gas manufacturing companies in Africa: BOC Kenya Plc, Carbacid investment Plc, BOC Nigeria Plc, Tanzania Oxygen Limited gases (TOL gases), African Oxygen Gases (AFROX), Chemigas Ltd, Gas Africa Ltd, Noble Gas Ltd and Synergy Gases. These 9 companies were selected based on their availability of financial statements, location and the fact that there is COVID 19 making movement to the various companies a little bit difficult.

## 3.4. Data Collection

Secondary data was used by the researcher to collect information. These was obtained from financial statement extracts and annual reports of gas manufacturing companies available from Orbis database and Bloomberg finance terminal, or DataStream. The data on control variables such as Kenya's inflation index was obtained from World Bank (GovData360).

## 3.5. Data Analysis

The researcher first presented the descriptive statistics such as standard deviation and mean obtained from Stata command. The researcher collated, tallied, and analysed the responses using the above-mentioned software. A regression between some predetermined variables was executed

and then presented in a tabular format using outreg2 command in the case of Stata package. Finally, the researcher described and interpreted the data in line with the research objectives.

### 3.5.1. Analytical Model

To establish whether there is a link between inventory management techniques and financial success of gas manufacturing companies, the researcher employed the ordinary least square (OLS) method, which has been used in previous empirical publications. Tobin's Q and ROA were utilized interchangeably as dependent variables and proxies of business performance by the researcher. Following Shan and (2007) and Hameri, and Weiss (2009) we model various inventory performance measures to enable us to test the relationship between firm performance and inventory management practices. For consistency purposes, we also scale our specific components of inventory with sales.

$$Tobin's\ Q_{it} = \beta_0 + \beta_1 \log FS_{it} + \beta_2 InvCsis_{it} + \beta_3 LT_{it} + \emptyset X_{it} + \varepsilon_{it}$$

$$ROA = \beta_0 + \beta_1 \log FS_{it} + \beta_2 InvCsis_{it} + \beta_3 LT_{it} + \beta_4 AP_{it} + \beta_5 IS_{it} + \emptyset X_{it} + \varepsilon_{it}$$

$\beta_0$ = Constant, that is, the value of y when x is equal to zero,

$\beta_1 \ldots B_3$ is the slope representing degree of change in independent variable by one-unit variable,

Log FS is a natural logarithm of total assets to proxy firm size.

InvCsis is a ratio between (raw material and sales, work in progress and sales, finished goods to sales).

LT is lead time (Cycle time X WIP).

AP = Automation and E-Procurement

IS = Inventory size

whereas $\Phi X_i$ is a control variable for inflation and ε is the error term.

Tobin's Q represents a ratio between the firms' market capitalization and the total assets. We use a natural logarithm to normalise our data distribution.

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### 3.6. Statistical Significance

For each of the hypotheses to be tested, p-values were used to interpret the results. The aim was to identify the coefficients that are significant and those that are insignificant. Where p-values are low (<0.05), the results were interpreted as significantly different from zero: not occurring due to pure chance. This led us to reject a null hypothesis at 5% level-two tailed test, and vice versa (see, e.g., Gibbons and Pratt, 1975).

# CHAPTER FOUR

# DATA ANALYSIS, RESULTS AND CONCLUSION

## 4.1. Introduction

This chapter presents empirical results on the effects of inventory management practices on the financial performance of gas manufacturing companies in Africa. The study utilized OLS approach using data collected from Bloomberg Finance terminal and World Bank database.

## 4.2. Descriptive Statistics

This study obtained financial data of all publicly listed gas manufacturing companies in Africa from Bloomberg where a unique ticker symbol was used to identify each of the firms.

***Table 1. Descriptive Statistics***

| Variable | Obs. | Mean | Median | SD | Max | Min | Skewness | Kurtosis |
|---|---|---|---|---|---|---|---|---|
| Tobin's Q | 73 | 1.536 | 1.362 | 0.7428 | 3.6500 | 0.0000 | 0.5198 | 3.8730 |
| Return on Assets | 73 | 8.475 | 8.277 | 8.2714 | 22.5524 | -22.3011 | -1.0537 | 6.6164 |
| Inventory Size | 73 | 8.326 | 8.075 | 0.8300 | 10.1838 | 7.2272 | 0.9323 | 2.9942 |
| Lead time | 73 | 91.035 | 105.00 | 34.1814 | 142.5543 | 26.0076 | -0.4305 | 2.0293 |
| Inflation rates | 72 | 8.108 | 6.589 | 3.6788 | 16.5235 | 3.2239 | 0.8642 | 2.5370 |

Table 1 shows the descriptive statistics for the gas manufacturing firms under study containing 73 observations. The average Tobin's q ratio for the companies is 1.54, while the standard deviation is 0.74, which is about half times the mean. The sample average of 1.54 reflects that the market/investors expect strong growth opportunities for gas producing companies over the sample period which is reasonable for the period before the Covid-19 crisis. This shows that the value of the firm is expected to go up and as a result the investors expects to maximize their wealth. The mean ratio of ROA for the companies is 8.47% which is quite high showing that the companies are more productive and there is efficient management in utilizing economic resources.

The data was checked for normality and most of the variables were found to be normally distributed and suitable for regression with skewness values ranging between -2.0 and +2.0 as shown in table 1 below. The results show that the companies are positively skewed. Kurtosis of the normal distribution occurs when the value is equal to 3. In this regard, the table shows a few values that are greater than 3 whereas others are less than 3 this shows that the data in table 1 below has heavier tails than for a normal distribution. The data was not homogeneous.

The average lead time of the various companies was 91.03, this shows that it takes 91 days from the time a customer places an order and the time a firm makes them available for either delivery or pick up or based upon the terms and conditions surrounding the sale. This means that it takes approximately 3 months to complete the whole process. This increase in lead time may be as a result of the companies under study waiting on shipments to arrive because most of them order via bulk shipping. Lead time can easily affect costs because it changes the value of in transit inventory. The lower the value or less time inventory spends in transit, the lower the costs and the better the performance of the organisation.

The ratio of finished goods in this study also assisted in determining the carrying costs involved and this was calculated at a percentage of 20-30 percent of the inventory value. The higher the finished goods the higher the carrying costs for the firms thus affecting the financial performance negatively. With the average standard deviation (SD) for each of the variables measured under the constructs of this research (H1, H2, H4), it shows that there is a strong positive significance relation between the dependent and independent variables as well as the observed variables and hence we could not reject any of the stated hypothesis.

### 4.2.1. Automation and E-Procurement System Analysis

A construct to measure the influence of automation and e-procurement was treated as observed variable and opted for nominal measures in this study. All the companies under study had a computerized system and all had various ERP systems in place. The ERP systems for the companies had inventory modules that helped the companies in tracking, lead-time, reorder level, usage and obsolescence. This module assisted in inventory control as the companies in study had

a complete control over complex inbound and outbound inventory transactions which assisted them in reducing carrying costs while delivering on-time orders, every time.

All the companies under study had an electronic procurement system meaning that the transaction between the organization, suppliers and other value chain partners had been centralized in order to improve on the speed and efficiency of procurement practice. They had a purchase module that facilitated the creating, maintenance and analysis of purchasing activities. The cost of the product for the companies was based on their weighted average. The e-procurement systems enabled the suppliers to receive purchase orders on a timely basis as well as enabling the users to receive the goods ordered on time without affecting the lead time. The manufacturing firms almost followed the same procurement process: purchase request, quotation analysis, purchase order generation and receipt of goods. The company showed that with the system in place they were able to manage their suppliers as well as procurement of goods and services. Below are the various ERP system that have been put in place by the various companies under study.

| *Ticker Symbol* | *Company* | *Type of ERP* |
|---|---|---|
| AFX SJ | African Oxygen Ltd (Johannesburg) | SAP |
| BOCGAS NL | BOC Gases PLC (Lagos) | SAGE |
| BOCK KN | BOC Kenya PLC (NSE) | SAGE |
| CBIL KN | Carbacid Investments Ltd (NSE) | SAP |
| TOL TZ | Tol Gases LTD (Dar Es Salaam SE) | SAP |

The financial performance of this companies that had the various ERP system was good as shown by the results that have been displayed in table 2 and 3 below and therefore, we could not reject the third hypothesis (H3. High automation levels leads to better financial performance).

### 4.3 Correlation Analysis

Correlation analysis assesses the inter-relationships and association between variables.

**Table 2. Correlation Matrix**

| Variables | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| (1) Tobin's Q | 1.000 | | | | | | | |
| (2) Return on Assets | 0.743*** | 1.000 | | | | | | |
| (3) Inventory Size | -0.103 | -0.352*** | 1.000 | | | | | |
| (7) Log of Lead time | 0.0573 | -0.0604 | 0.1729 | 0.329*** | 0.1122 | 0.6889*** | 1.000 | |
| (8) Inflation rates | -0.0757 | -0.0578 | -0.2305* | 0.179 | 0.2762** | -0.2663** | -0.2209** | 1.000 |

**** p<0.01, ** p<0.05, * p<0.1*

Table 2 provides some insights into collinearity aspect between independent variables, and how they are related to the dependent variables. The Pearson correlation coefficients were generated at various significance levels (1%, 5% and 10%). The results indicate that none of the independent variable have high correlations between themselves which according to Wooldridge (2015) indicates the absence of multicollinearity. Furthermore, inventory management strategies and financial success have a beneficial relationship. Because the correlation finding is more than 0.50, ROA (r=0.74) shows the strongest positive association between the variables.

The findings also likewise uncover that completed products have a huge negative relationship with monetary execution, while natural substances and work in progress have a positive relationship. Stock size has a negative considerable relationship with the association's monetary presentation. As per a review directed by Timothy, Patrick, et al. on the effect of stock administration systems on monetary execution. He found a connection between stock administration systems and monetary execution. As shown in the Table 2 above, there exists a strong positive correlation between the dependent and independent variables. With a p value of significantly less than 0.05 we concluded that the latent variable (Inventory size, lead time and carrying costs.) is significant to explain better financial performance. With this confidence level, we could therefore not reject any of the stated hypothesis.

### 4.3.1. Regression Analysis

The study made use of a multivariate regression analysis to analyze the inventory management techniques and operational performance. Two independent variables which were used interchangeably i.e., ROA and Tobin's Q to help determine the financial performance and the growth potential of the firm.

Table 3 presents the results of our regression together with the significant level. In model 1, only the coefficient of finished goods is negative and statistically significant. This implies that higher growing gas firms are negatively influenced by finished goods. In model 2, when inflation is not controlled, we can see that there is a negative significant relation between ROA and the inventory size. This is shown by the ratio -4.389. Also, we can see that in the same model, there is also a negative significant relation between ROA and finished goods. This is shown by the ratio -0.686.

***Table 3. Regression Results***

Model 1 and 2, there is no standard error clustering and controlling for inflation. From Model 3-6 we control for the country's inflation rate, and endogeneity by clustering standard errors by year. In model 5 and 6, we introduce an interaction term: lead time to WIP and FG scaled to sales. The standard errors are the parenthesis.

| Variable | (1) Q-ratio | (2) ROA | (3) Q-ratio | (4) ROA | (5) Q-ratio | (6) ROA |
|---|---|---|---|---|---|---|
| Inventory size | -0.0848 | -4.3887*** | -.3491** | -6.9527*** | -.3509** | -7.002*** |
| | (0.142) | (1.404) | (0.164) | (1.530) | (0.165) | (1.558) |
| RM-to-sales | 0.0148 | 0.4855 | 0.0817 | 1.0898** | 0.0811 | 1.0906** |
| | (0.047) | (0.466) | (0.053) | (0.496) | (0.054) | (0.507) |
| WIP-to-sales | .0437 | -.0925 | .0072 | -.1113 | | |
| | (.0467) | (.4634) | (.0519) | (.4854) | | |
| FG -to-sales | -.0402** | -.6857*** | -.0548*** | -.8498*** | | |
| | (.0178) | (.1765) | (.0185) | (.1733) | | |
| WIP-to-sales * LT | | | | | .0021 | -.0181 |
| | | | | | (.0114) | (.1075) |
| FG-to-sales * LT | | | | | -.0107*** | -.1685*** |
| | | | | | (.0038) | (.0362) |
| Inflation rate | | | -.0985*** | -1.137*** | -.0992*** | -1.1533*** |
| | | | (.0301) | (.2813) | (.0305) | (.2876) |
| Intercept | 2.3921** | 47.7684*** | 5.4974*** | 78.7974*** | 5.5012*** | 79.1215*** |
| | (1.1459) | (11.3586) | (1.4894) | (13.9354) | (1.502) | (14.1647) |
| Observations | 73 | 73 | 72 | 72 | 72 | 72 |
| R-squared | .1284 | .3094 | .3241 | .5234 | .3118 | .507 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Adj $R^2$ | .0771 | .2688 | .1275 | .3848 | .1117 | .3636 |
| Year Dummy | No | No | YES | YES | YES | YES |

*Standard errors are in parentheses *** p<.01, ** p<.05, * p<.1*

When we look at Model 4 and 6 respectively, where the study controls for inflation and conducts standard error clustering we can see that there is a negative significant relationship between ROA and the inventory size. This is shown by the ratio -6.952 and -7.002 respectively. The results indicate that the larger the inventory size of the firm the lower the profit and thus the lower the value of the shareholders wealth. There is also a positive significant relationship between ROA and raw materials when compared to sales with a ratio of 1.089 and 1.091 respectively. This means that the higher the raw materials when compared to sales the higher the profit as well as the shareholders' wealth. There is also a negative significant relationship between finished goods when compared to sales and the profit of the firm. This is shown by the ratio of -0.849 in model 4. From the results in the table below, it shows that work in progress was not significant.

In Model 1, which looks at Tobin's q, we find that there is a negative significance relation between finished goods when compared to sales and the growth of the firms. This is shown in the table below by the ratio – 0.0402. This means that the higher the number of finished goods in the company the lower the growth of the firm. Therefore, we could not reject the null hypothesis H2: High inventory carrying costs leads to poor financial performance. In Model 3 and 4 where inflation and lead time have been controlled respectively, we see that there is a negative significance relation between the inventory size and the growth of the firm. This has been shown by the ratios -0.3491 and -0.3509 respectively. There is also a negative significant relation between the finished goods in relation to sales and the growth of the firm. This is shown by the ratio -0.0548 in model 3. The higher the finished goods in an organization the lower the growth of the firm. This can be explained that it tends to incur a lot of carrying costs. As you control the dependent variables the model shows there is significant impact on the size of the firm.

As shown in the table 3 above, all the indicators regress on inventory management practices and there exists a strong positive correlation between the variables observed. With a p value of significantly less than 0.05 we concluded that the latent variable (Inventory size, lead time and Carrying costs) is significant to explain better financial performance. With this confidence level, we could therefore not reject any of the stated hypothesis.

### 4.4. Discussion of The Findings

Inventory management and financial performance were found to have a positive connection in the review. The discoveries of the review concur with those of Chapman et al. (2000), who tracked down that great inventory administration has turned into a critical issue for an organization's creation. Inventory administration is basic for each organization that needs to build creation productivity. Through different inventory administration methodologies, a few gas fabricating organizations have saved huge number of dollars in costs and decreased inventories while further developing efficiency and consumer loyalty. This is because of the way that inventory administration prompts the coordination of better assembling methodology to lessen expenses and waste.

The findings also support the findings of Kotler and Keller (2006), who found that inventory management is extremely significant in any important drive-in stock escalated gas fabricating firms in light of the fact that powerful inventory administration processes permit the firm to diminish stock expenses and stay away from episodes brought about by an absence of material assets. For gas manufacturing companies, inventories are critical components of current assets. Holding appropriate inventory assures ongoing operations; consequently, to achieve high productivity, gas production companies use various inventory management strategies to assess and maintain optimal levels of inventory investment that meet customer demands while lowering inventory costs.

# CHAPTER FIVE

# SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

## 5.1. Introduction

This chapter includes a summary of the research findings, conclusions and recommendations based on the research findings, study limitations, and suggestions for further research.

## 5.2. Summary

The study shows that the companies that had a good ERP system in place had a good financial performance as they were able to minimize on carrying costs and it was easier for them to track the lead time for the suppliers. Automation is very key in supporting good financial performance. The findings demonstrate that finished goods have a negative relationship with financial performance, whereas raw materials and work in progress have a favorable relationship. Having a high number of finished goods in the organization resulted in incurring a lot of carrying costs which leads to poor financial performance and thus affecting the shareholder's wealth. The study also shows that companies that had shorter lead times performed better than those that had longer lead times. From the study we can also see that good inventory size management practices leads to good financial performance.

## 5.3. Conclusion

The study concludes that inventory management played a vital role in financial management decisions and it is a continuous process. Financial success is influenced by a variety of elements such as inventory size, lead time, and carrying costs. The financial performance of gas manufacturing enterprises was influenced by different types of inventory: raw materials, work in progress, and finished goods, with finished goods having a negative significant association with financial performance. Work in progress was not significant in the study. It is therefore paramount that special care be given to inventory, and management should make sure that stocks are not held for long unnecessarily. Automation is important in ensuring that there is better performance in the organization. This is so because from the results, the organization that had automated its systems had better results.

## 5.4. Recommendations

The study recommends that the organization should ensure that they use the JIT system so that they don't incur a lot of carrying costs and obsolescence's. Companies should also focus on having

shorter lead times as they contribute to good financial performance. The companies should ensure that they fully automate their process as it enhances efficiency and minimizes on human errors and makes it easier for work in the organization to be tracked properly.

### 5.5. Limitation of The Study

The study did not look at the private gas manufacturing firms because the private companies were not willing to provide their financial information. Therefore, the study only targeted gas manufacturing companies that were listed in Africa because their data could be easily found on the different stock exchanges in the various countries.

### 5.6. Suggestion for Further Research

Based on the findings, the review recommends that further investigations should be directed on the effect of stock administration on the monetary exhibition of private gas producing organizations. The study likewise proposes that further investigations to be directed on a bigger example size that incorporates every one of the enlisted gas fabricating in Africa.

## REFERENCES


Agus, A., & Noor, Z. M. (2006). Supply chain management and performance. An Empirical Study (Vol. 1, No. 1, pp. 4-19). A working paper university of Malaysia.

American Companies between 1981 and 2000? Management Science 51(7), 1015–1031.

Banafa, A. S., Muturi, W., & Ngugi, K. (2015). The impact of leverage on financial performance of listed non-financial firm in Kenya. International Journal of Finance and Accounting 4 (7), 1, 20, 2009-2013.

Barnes, D. (2008). Operations Management. An International Perspective. United Kingdom: Thomson Learning.

Bell, E., Bryman, A., & Harley, B. (2018). Business research methods. Oxford university press.

BOC Kenya website. Available from http://www.boc.co.ke/en/index.html. (Accesses on 22.06.2020

Cannon, A. R. (2008). Inventory improvement and financial performance. International Journal of Production Economics, 115(2), 581-593. http://doi.org/10.1016/j. ijpe.2008.07.006

Capkun, V., Hameri, A.-P., & Weiss, L. A. (2009). On the Relationship between Inventory and Financial Performance in Manufacturing Companies. International Journal of Operations & Production Management, 29(8), 789-808. http://doi. org/10.1108/01443570910977698.

Chen, H., M.Z. Frank and Q.W. Wu (2005). What Actually Happened to the Inventories of

Choi, T. (2012). Handbook of EOQ inventory problems – Stochastic and deterministic models and applications. New York, Heidelberg, Dordrecht, London: Springer.

Demirbag, M., Koh, S. L., Tatoglu, E., & Zaim, S. (2006). TQM and market orientation's impact on SMEs' performance. Industrial Management & Data Systems.

Dobler and Burt (2000) Production and inventory control handbook, 3rd edition Pitman London

Eroglu, C., & Hofer, C. (2011a). Inventory types and firm performance: Vector autoregressive and vector error correction models. Journal of Business Logistics, 32(3), 227-239. http://doi.org/10.1111/ j.2158-1592.2011. 01019.x

Gall, M.D., Gall, J. P. & Borge, W. R. (2006). “Educational Research: An Introduction”. (8th Ed.). New York: Pearson

Gibbons, J.D. and Pratt, J.W., 1975. P-values: interpretation and methodology. The American Statistician, 29(1), pp.20-25.

https://databank.worldbank.org/source/doing-business# (accessed on April 29, 2021).

https://orbis4.bvdinfo.com/version-20201113/orbis/1/Companies/ListEdition (access will be given by a library staff at Aston University, UK)

Jewell, J., & Mankin, J. A. (2012). What is Your ROA? An Investigation of the Many Formulas for Calculating Return on Assets. Academy of Educational Leadership Journal., 15, 79–91.

John, N., Etim, J. and Ime, T., 2015. Inventory management practices and operational performance of flour milling firms in Lagos, Nigeria. International Journal of Supply and Operations Management, 1(4), pp.392-406.

Kamau, L. W., & Kagiri, A. W. (2015). Influence of inventory management practices on organizational competitiveness: A case of Safaricom Kenya Ltd. International Academic Journal of Procurement and Supply Chain Management, 1(5), 72-98.

Kolias, G. D., Dimelis, S. P., & Filios, V. P. (2011). An empirical analysis of inventory turnover behaviour in Greek retail sector: 20002005. International Journal of Production Economics, 133(1), 143-153. http:// doi.org/10.1016/j.ijpe.2010.04.026

Kolias, G. D., Dimelis, S. P., & Filios, V. P. (2011). An empirical analysis of inventory turnover behaviour in Greek retail sector: 2000–2005. International Journal of Production Economics, 133(1), 143-153.

Kotler P (2002). Marketing Management. 2nd Edition. The Millennium Edition. New Delhi: Prentice Hill of India

Koumanakos, D. P. (2008). The effect of inventory management on firm performance. International journal of productivity and performance management. 57(5), 355-369. http://doi. org/10.1108/17410400810881827

Kruger, G.A. (2005). A statistician looks at inventory management, Quality Progress, 38,2,36.

Kumar, R., 2016. Economic order quantity (EOQ) model. Global Journal of finance and economic management, 5(1), pp.1-5.

Lai, K. H., & Cheng, T. E. (2016). Just-in-time logistics. CRC Press

Leshem, S., & Trafford, V. (2007). Overlooking the conceptual framework. Innovations in education and Teaching International, 44(1), 93-105.

Lewin, S. (2012). Inventory planning & optimization: Extending the enterprise through the supply chain. whitepaper, Sourcetrix Corporation, 1-5.

Lwiki, T., Ojera, P. B., Mugend, N., & Wachira, V. (2013). The impact of inventory management practices on financial performance of sugar manufacturing.

Lyson K (1996). Purchasing and Chartered Institute of Purchasing and Supply, London: Pitman Publishing

Maduenyi, S., Oke, A. O., Fadeyi, O., & Ajagbe, A. M. (2015). Impact of Organisational Structure on Organisational Performance.

Mahidin, F., Saad, R., Mohd, N. M. &Yusoff, R. (2015). The Influence of Inventory Management Practices towards Inventory Management Performance in Malaysian Public Hospitals. International Academic Research Journal of Business and Technology, 1(2), 142-148

Milicevic, N., Davidovic, M. & Stefanovic, M. (2012). Financial Effects of Inventory Management in Trading Companies - EOQ Model. Economics and Organization, 9(4), 507 – 519

Muhayimana V. (2015). Inventory Management Techniques and Its Contribution on Better Management of Manufacturing Companies in Rwanda: Case Study: Sulfo Rwanda Ltd. European Journal of Academic Essays, 2(6), 49-58

Munyao, R. M., Omulo, V. O., Mwithiga, M. W., & Chepkulei, B. 'Role of Inventory Management Practices on Performance of Production Department'a Case of Manufacturing Firms.

Naliaka, V. W., & Namusonge, G. (2015). Role of Inventory Management on Competitive Advantage among Manufacturing Firms in Kenya: A Case Study of Unga Group Limited.

International Journal of Academic Research in Business and Social Sciences, 5(5). https://doi.org/10.6007/ijarbss/v5-i5/1595

Naliaka, V. W., & Namusonge, G. S. (2015). Role of inventory management on competitive advantage among manufacturing firms in Kenya: A case study of Unga Group Limited. International Journal of Academic Research in Business and Social Sciences, 5(5), 87-104.

Ogbo, A. I., &Ukpere, W. I. (2014). The impact of effective inventory control management on organizational performance: A study of 7up bottling company Nile mile Enugu, Nigeria. Mediterranean Journal of Social Sciences, 5(10), 109-109.

Ondiek, G. O., & Odera, O. (2012). Assessment of materials management in Kenyan manufacturing firms. Journal of business studies quarterly, 3(3), 40.

Rajeev, N. P. (2010). Inventory management performance in machine tool SMEs: What factors do influence them? Journal of Industrial Engineering and Management, 3(3). https://doi.org/10.3926/jiem.2010.v3n3.p542-560

Sakakibara, S., Flynn, B. B., Schroeder, R. G., & Morris, W. T. (1997). The impact of just-in-time manufacturing and its infrastructure on manufacturing performance. Management Science, 43(9), 1246-1257.

Spagnol, G. S., Min, L. L., & Newbold, D. (2013). Lean principles in Healthcare: an overview of challenges and improvements. IFAC Proceedings Volumes, 46(24), 229-234.

Sprague, L.G., & Wacker, J.G. (1996). Macroeconomic Analyses of Inventories: Learning from Practice. International Journal of Production Economics, 45, 231-237.

Timothy L, Patricka BO, Nebat GM, Virginia KW (2013) He Impact of Inventory Management Practices on Financial Performance of Sugar Manufacturing Firms in Kenya. Int J Bus Humanit Technol, 75-85.

Waters, D. (2008). Inventory control and management. John Wiley & Sons.

## APPENDICES

## APPENDIX I: LETTER OF DATA COLLECTION

**UNIVERSITY OF NAIROBI**

**COLLEGE OF HUMANITIES AND SOCIAL SCIENCES**
**SCHOOL OF BUSINESS**

Telephone: 020-8095398 Tel: 020 8095398

Telegrams: "Varsity", Nairobi Nairobi, Kenya

Telex: 22095 Varsities

Our Ref: **D61/87349/2016** **30th June,2021**

**TO WHOM IT MAY CONCERN**

The bearer of this letter, **Linda S. Makong'o** of Registration Number **D61/87349/2016** is a Master of Business Administration (MBA) student of the University of Nairobi.

She must present a research project report as part of her coursework evaluation. We would like the student to undertake her project on the financial performance of gas manufacturing enterprises in Africa as a result of financial inventory management methods. As a result, we would appreciate it if you could support her by enabling her to collect data for research purposes within your firm.

The results of the report will be used solely for academic purposes and a copy of the same will be availed to the interviewed organization on request.

Thank you.

Deans Office
University of Nairobi
School of Business
P. O. Box 30197 - 00100
Nairobi

**PHILIP NGIGI**

## APPENDIX II: GAS MANUFACTURING COMPANIES IN AFRICA

1. BOC Kenya Plc
2. Carbacid investment Plc
3. BOC Nigeria Plc
4. Tanzania Oxygen Limited gases (TOL gases)
5. African Oxygen Gases (AFROX)
6. Chemigas Ltd
7. Gas Africa Ltd
8. Noble Gas Ltd
9. Synergy Gases

## APPENIDIX III: FINANCIAL STATEMENTS OF THE VARIOUS GAS MANUFACTURING COMPANIES

## CARBACID INVESTMENTS PLC

Liabilities & equity

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Shareholders funds | 30,194 | 30,012 | 30,318 | 28,140 | 26,376 | 24,161 | 24,565 | 22,049 |
| ∟ Capital | 2,366 | 2,446 | 2,538 | 2,453 | 2,514 | 2,486 | 2,903 | 1,947 |
| ∟ Other shareholders funds | 27,828 | 27,566 | 27,780 | 25,688 | 23,862 | 21,675 | 21,662 | 20,102 |
| Non-current liabilities | 1,787 | 1,996 | 2,131 | 2,259 | 2,367 | 2,386 | 2,512 | 2,195 |
| ∟ Long term debt | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| ∟ Other non-current liabilities | 1,787 | 1,996 | 2,131 | 2,259 | 2,367 | 2,386 | 2,512 | 2,195 |
| Current liabilities | 1,702 | 1,612 | 1,125 | 1,426 | 1,653 | 2,410 | 1,774 | 1,013 |
| ∟ Loans | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| ∟ Creditors | 10 | 128 | 79 | 59 | 42 | 33 | 762 | 307 |
| ∟ Other current liabilities | 1,692 | 1,484 | 1,047 | 1,368 | 1,611 | 2,378 | 1,012 | 706 |
| **Total shareh. funds & liab.** | **33,682** | **33,620** | **33,575** | **31,825** | **30,396** | **28,957** | **28,850** | **25,257** |

Memo lines

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ∟ Working capital | 1,825 | 1,545 | 1,334 | 1,543 | 1,585 | 1,628 | 827 | 1,523 |
| ∟ Net current assets | 8,106 | 7,565 | 9,485 | 8,275 | 10,066 | 8,462 | 9,395 | 9,208 |
| ∟ Enterprise value | 18,636 | 19,162 | 27,182 | 31,836 | 36,823 | 41,726 | 79,870 | 53,875 |

## BOC KENYA LIMITED

Liabilities

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Total Current Liabilities | 4,341 | 5,395 | 6,110 | 5,980 | 5,131 | 5,931 | 6,112 | 6,303 |
| ∟ Trade Creditors | 871 | 1,362 | 1,074 | 733 | 855 | 1,638 | 1,205 | 821 |
| ∟ Other | 3,470 | 4,033 | 4,640 | 5,016 | 4,276 | 4,293 | 4,907 | 5,482 |
| ∟ Other Creditors | 736 | 371 | 578 | 995 | 620 | 712 | 876 | n.a. |
| ∟ Other Current Liabilities | 2,713 | 3,651 | 4,062 | 4,021 | 3,656 | 3,582 | 4,031 | 5,049 |
| Non Current Liabilities | 71 | 65 | 0 | 3 | 0 | 0 | 0 | 151 |
| Total Liabilities and Debt | 4,412 | 5,460 | 6,110 | 5,983 | 5,131 | 5,931 | 6,112 | 6,454 |
| Total Shareholders Equity | 14,725 | 14,204 | 14,920 | 15,606 | 16,485 | 16,754 | 19,306 | 24,054 |
| ∟ Share Capital | 894 | 963 | 959 | 946 | 953 | 954 | 1,079 | 1,131 |
| ∟ Common Stock / Shares | 894 | 963 | 959 | 946 | 953 | 954 | 1,079 | 1,131 |
| ∟ Other | 13,831 | 13,241 | 13,961 | 14,661 | 15,532 | 15,800 | 18,227 | 22,922 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ∟ Share Premiums | 23 | 25 | 25 | 25 | 25 | 25 | 28 | 30 |
| ∟ Revaluation Reserves | n.a. | 691 | 1,032 | 1,501 | 1,693 | 2,112 | 3,121 | -40 |
| ∟ Retained Earnings | 12,847 | 12,837 | 13,221 | 13,420 | 14,124 | 13,906 | 15,200 | 14,364 |
| ∟ Other Shareholders Reserves | 961 | -312 | -317 | -285 | -310 | -243 | -123 | 8,569 |
| Total Liabilities and Equity | 19,137 | 19,664 | 21,029 | 21,589 | 21,616 | 22,685 | 25,417 | 30,507 |
| Net Assets | 14,725 | 14,204 | 14,920 | 15,606 | 16,485 | 16,754 | 19,306 | 24,054 |
| Net Debt | -2,819 | -2,536 | -3,475 | -5,755 | -5,689 | -6,637 | -6,620 | -4,278 |
| Enterprise Value | 8,448 | 8,639 | 10,903 | 14,483 | 9,933 | 12,829 | 20,348 | 24,000 |

## BOC GASES NIGERIA PLC

Liabilities

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Total Current Liabilities | 5,351 | 5,505 | 4,231 | 4,640 | 3,546 | 3,816 | 5,448 | 5,043 |
| ∟ Trade Creditors | 778 | 501 | 607 | 427 | 788 | 659 | 654 | 812 |
| ∟ Other | 4,573 | 5,004 | 3,625 | 4,213 | 2,758 | 3,158 | 4,438 | 4,231 |
| ∟ Other Creditors | 915 | 1,067 | 489 | 1,392 | 1,265 | 2,397 | 4,068 | 3,016 |
| ∟ Dividends Payable | 1,005 | 1,133 | 667 | 433 | 377 | 522 | n.a. | 322 |
| ∟ Other Current Liabilities | 2,284 | 2,068 | 2,017 | 2,130 | 1,105 | 238 | 311 | 297 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Non Current Liabilities | 1,311 | 2,060 | 1,726 | 1,426 | 1,235 | 1,783 | 2,752 | 1,811 |
| ∟ Other Non-Current Liabilities | 1,311 | 1,722 | 1,726 | 1,426 | 1,235 | 1,783 | 2,033 | 1,811 |
| ∟ Deferred Taxes | 1,262 | 1,668 | 1,677 | 1,379 | 1,192 | 1,697 | 1,943 | 1,695 |
| Total Liabilities and Debt | 6,662 | 7,566 | 5,957 | 6,067 | 4,781 | 5,600 | 8,201 | 6,855 |
| Total Shareholders Equity | 7,558 | 8,834 | 8,673 | 7,818 | 7,124 | 10,717 | 11,947 | 11,749 |
| ∟ Share Capital | 546 | 678 | 678 | 680 | 682 | 1,056 | 1,227 | 1,341 |
| ∟ Common Stock / Shares | 546 | 678 | 678 | 680 | 682 | 1,056 | 1,227 | 1,341 |
| Total Liabilities and Equity | 14,220 | 16,399 | 14,629 | 13,884 | 11,905 | 16,317 | 20,147 | 18,604 |
| Net Assets | 7,558 | 8,834 | 8,673 | 7,818 | 7,124 | 10,717 | 11,947 | 11,749 |
| Net Debt | -4,313 | -4,161 | -4,987 | -4,271 | -2,144 | -1,291 | -1,369 | -4,653 |
| Enterprise Value | 6,142 | 3,296 | 721 | 1,959 | 2,660 | 6,717 | 12,074 | 13,209 |
| ∟ Number of employees | 82 | n.a. | 85 | 85 | 88 | 94 | 97 | 99 |

## TOL GASES LIMITED

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Total Current Liabilities | 2,672 | 2,796 | 3,485 | 4,184 | 5,614 | 5,201 | 4,488 | 3,266 |
| ∟ Loans | 635 | 682 | 1,299 | 2,217 | 2,068 | 1,864 | 1,769 | 1,453 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ∟ Current Portion of LT Debt | 272 | 189 | 690 | 698 | 639 | 513 | 721 | 362 |
| ∟ Current loans & overdrafts | 363 | 493 | 610 | 1,519 | 1,429 | 1,352 | 1,048 | 1,091 |
| ∟ Trade Creditors | 506 | 426 | 569 | 658 | 508 | 453 | 124 | 389 |
| ∟ Other | 1,531 | 1,688 | 1,617 | 1,309 | 3,037 | 2,883 | 2,596 | 1,424 |
| Total Liabilities and Debt | 3,778 | 4,494 | 7,359 | 8,852 | 8,009 | 6,586 | 6,230 | 5,885 |
| Total Shareholders Equity | 1,095 | 1,090 | 1,696 | 2,722 | 5,844 | 5,735 | 7,173 | 8,035 |
| ∟ Share Capital | 2,558 | 2,368 | 2,368 | 2,760 | 3,240 | 2,599 | 2,628 | 2,581 |
| ∟ Common Stock / Shares | 2,558 | 2,368 | 2,368 | 2,760 | 3,240 | 2,599 | 2,628 | 2,581 |
| ∟ Other | -1,463 | -1,278 | -673 | -37 | 2,603 | 3,136 | 4,545 | 5,454 |
| ∟ Share Premiums | 2,570 | 2,379 | 2,379 | 2,369 | 3,635 | 2,915 | 3,056 | 3,030 |

## AFRICAN OXYGEN LIMITED

Liabilities

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Total Current Liabilities | 90,633 | 106,283 | 86,522 | 84,207 | 116,571 | 114,206 | 223,029 | 186,543 |
| ∟ Loans | 1,461 | 3,486 | 1,608 | 1,801 | 2,504 | 24,119 | 116,337 | 63,000 |
| ∟ Current loans & overdrafts | 1,461 | 3,486 | 1,608 | 1,801 | 2,504 | 23,833 | 29,525 | 1,351 |
| ∟ Trade Creditors | 45,908 | 52,452 | 40,484 | 37,633 | 47,060 | 47,951 | 59,874 | 57,719 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ∟ Other | 43,265 | 50,345 | 44,430 | 44,773 | 67,007 | 42,136 | 46,817 | 65,824 |
| ∟ Other Short Term Debt | 0 | 0 | 0 | 4,889 | 4,231 | 3,623 | 3,529 | 1,474 |
| ∟ Other Creditors | 5,773 | 13,377 | 13,957 | 12,223 | 10,535 | 16,587 | 16,704 | 11,544 |
| ∟ Income Tax Payable | 2,852 | 3,810 | 3,946 | 2,380 | 6,217 | 6,006 | 7,646 | 4,667 |
| ∟ Social Expenditure Payable | 6,677 | 6,810 | 6,285 | 5,854 | 9,326 | 10,200 | 12,234 | 18,053 |