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INVENTORY MANAGEMENT TECHNIQUES AND FINANCIAL PERFORMANCE OF LISTED OIL AND GAS COMPANIES IN NIGERIA

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ABSTRACT

More often than not, Oil and gas companies, like every other companies' are faced with the issue of inventory management techniques and financial performance. As a result of oil drop, inadequate maintains of pipelines and tank installation and coupled with COVID-19 pandemic has affected the production capacity of oil and gas production and exploration. To that end, this study investigated the relationship between inventory management techniques and financial performance of listed Oil and Gas Companies in Nigeria. The specific objectives were to: ascertain the relationship between inventory turnover and profit after tax; evaluate the relationship between operating cycle and profit after tax; determine the relationship between inventory conversion period and profit after tax; evaluate the moderating relationship between firm size on inventory management techniques and financial performance, and finally, evaluate the moderating relationship between operational efficiency on inventory management techniques and financial performance of listed Oil and Gas Companies in Nigeria. Five research questions and five hypotheses guided the study. The study conceptual framework guided the review of related literature. The Researcher used ex-post facto research design. Targeted population comprised of ten listed Oil and Gas Companies in Nigeria which were sampled to eight (8) using purposive (Judgmental) sampling technique. Secondary data were used and it was sourced from annual reports and statement of accounts of the selected companies between 2013 and 2020. Descriptive statistics, correlation analysis and ordinary least Square regression were employed with the aid of Microsoft Excel, SPSS 25 and E-View 10. The result of the study showed that there is a negative and insignificant relationship between inventory turnover and profit after tax; there is a negative and insignificant relationship between operating cycle and profit after tax; there is a negative and insignificant between inventory conversion period and profit after tax; firm size has negative and significant relationship between with inventory management techniques but has positive and significant relationship with financial performance; and finally, operational efficiency has positive and significant relationship between with inventory management techniques and financial performance. The study generally concluded that, there is a negative and insignificant relationship between inventory management techniques and financial performance of listed Oil and Gas Companies in Nigeria under the period of study between 2013 and 2020. It was recommended amongst others that Firms should evaluate operating cycle when planning to sell and replacing inventories because this study result revealed that it has negative and insignificant relationship with profit after tax.

Keyword: Inventory turnover, Operating cycle, Inventory Conversion Period and Operational Efficiency

INTRODUCTION

Firms all over the world recognized inventory management as techniques used to determine the right quantity of an inventory item at the right time and place. Inventories are current assets that form a significant part of the assets of a firm which has a resale value that earn profit to the firm after cost expenses (Rodrigo et al, 2020). Obara (2014) posited that the cost of the inventory becomes an expense when business earns revenue by selling it to the customers. Therefore, proper management of this inventory will show financial stronghold and less-performing financial

transactions. Okpara and Ifurueze (2020) opined that financial performance shows both the financial strongholds and less-performing areas of a firm by expressing associations between the statement of financial position items and the income statement items. Therefore, there is a significant task to an inventory manager to decide the right quantity of inventory to keep and estimate the appropriate time to reorder those inventories to eliminate issues such as financial stronghold, losses and stock outs of inventories. It is important that managers should have in mind about the aim of satisfying customers need and keeping inventory costs at a minimum level. Similarly, Ngugi et al (2019) suggested that Inventory management techniques play a vital role in minimizing costs and maximizing profits. Financial manager should meet-up customers demand and make sure that there is enough stock at the right quantity, quality and available at the right time and the right place. Recent evidences proved that failure to manage inventory has almost caused the demise of some companies (Rodrigo et al, 2020; Ajayi et al, 2021). Torky (2020) stated that failure to manage inventories may affect the financial performance as it leads to insignificant increase in amount of profit. Financial managers have to carefully monitor inventories and forecast the level of inventories needed for future production (Golas & Bieniasz, 2016). Orga amd Mbah (2017) opined that inventory management is vital to the successful functioning of any firm; it is the lifeblood and the heart beat of any organization. Torky (2020) stated that powerful inventory management technique help firms to have competitive edge (advantage) over other organizations. Similarly, Osadchy et al (2018) asserted that Inventories play important role in increasing shareholders fund and improvement in profitability. Ngugi et al (2019) stated that 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.

Oil and gas industry play important role in the Nigerian economy through revenue generation to the government, employment generation and being the major contributor to the growth of the Gross Domestic Product (Obara & Efeeloo, 2017). Oil and Gas Companies, like other entities, are required to apply inventory management techniques to determine their financial performance level in order to achieve their objectives. According to Ajibike and Aremu (2015), there are two objectives and they include objective to generate revenue and objective to maintain inventories in the organization. This means that inventory management techniques in the oil and gas firms are used to balance between the benefit of holding cash in the form of saving transaction cost and inventory premium (Edem, 2017).

Statement of the Problem

All over the world, especially amongst the developing nations, financial performance measures has been the major challenges in Oil and Gas companies and these has led to deficiency and sudden corporate collapse. The financial performance and operational capacity of Oil and Gas companies are capital intensive and challenging. Therefore, it require experts who understand inventory management techniques and operational risks to mange stock installation tank in the Oil and Gas companies (Amin et al., 2019). Waswa et al (2018) opined that financial performance largely depend on the ability of companies operating in whatever industry to have an adequate capital and working mechanism to ensure cost reduction across all levels of the operations of the company in order to maintain a sustainable machinery in place, meeting its profitability requirements and corporate objective set by the company. Scholars from developed countries had written on inventory management and financial performance of companies (Amahalu et al, 2018; Abdikani et al, 2018; Muchaendepi et al, 2019; Folajimi et al, 2020; Horsfall & Odage, 2021; Anisere-Hameed & Bodunde, 2021). Oil and gas companies have experienced huge financial losses due to poor inventory management techniques and financial performance as a result of oil drop and COVID-19 pandemic which adversely affected their capital structure and earnings. Hence, if inventory management techniques are not properly managed, it may lead to several consequences in the sector. In a situation where the oil prices drop below targeted price, the oil and gas firms is likely

to face inventory management deficiency. This is because the cash required to maintain pipelines and tank installation would be unavailable, and this may lead to borrowing funds from the international market and central bank or other oil and gas industries at a very high cost due to high interest charges. In Nigeria, not enough researches have been carried out by scholars on the relationship between inventory management techniques and financial performance of Oil and Gas Companies. Some Scholars looked at the effect of Waste Management Expenditure on the Profitability of Oil and Gas Companies in Nigeria. Others have looked at the effect of Security and Militancy Costs of the Performance of Oil and Gas Companies in Nigeria. To the best of researcher knowledge, it was only Joseph et al (2019) that studied the effect of inventory control management and revenue generating capabilities of oil and gas drilling firms in Nigeria. None have looked at the problem of how techniques employed by Oil and Gas Companies relate with their financial performance, particularly their profitability. In the light of the above, considering the importance of inventory management in relations to efficient management, avoidance of work stoppage (downtime) and profitability of firms, it becomes imperative to embark on this research study with particular reference to oil drilling firms in the oil and gas companies in Nigeria through scientific analysis of the generated hypotheses. This study is hereby to fill the gap by investigating the relationship between Inventory management techniques and financial performance of listed oil and gas companies in Nigeria. It employed inventory turnover, Operating Cycle and inventory conversion period as proxies for inventory management techniques. Return on assets (ROA) and Profit after tax as proxy for financial performance while firm size and operational efficiency was employed as moderating variables.

Conceptual Framework

A conceptual framework is a logical aid in form of a diagram that is utilized by a researcher to visually demonstrate comprehensively the interaction between indicators of the independent variables (which were studied) and the dependent variable (Appah, 2020). Conceptual framework helps the researcher in recognizing and establishing viewpoints on the phenomenon to be investigated and it clearly define the variables of the research topic (Ogusi & Ogbaeze, 2018). Conceptual framework of this study is presented below.

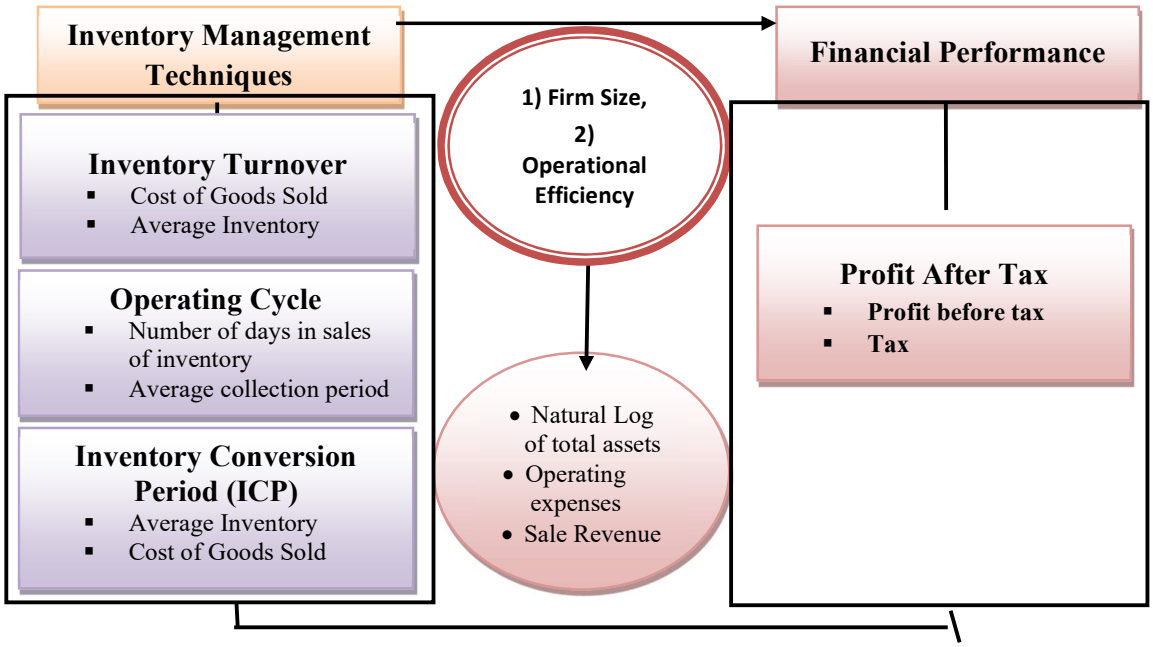

Figure 1.1 Conceptual framework showing the dimensions and measures of inventory management techniques and financial performance of listed Oil and Gas Companies in Nigeria

Source*:* Jean (2015); Amahalu et al (2018); Folajimi et al., (2020); Rodrigo et al (2020) and Researcher (2022)

Aim and Objectives of the Study

The aim of this study was to evaluate the relationship between inventory management techniques and financial performance of listed oil and Gas Companies in Nigeria. The Specific objective was to;

i. Ascertain the relationship between inventory turnover and profit after tax of listed Oil and Gas Companies in Nigeria,
ii. Evaluate the relationship between operating cycle and profit after tax of listed Oil and Gas Companies in Nigeria,
iii. Determine the relationship between inventory conversion period and profit after tax of listed Oil and Gas Companies in Nigeria,
iv. Evaluate the moderating effect of relationship between firm size on inventory management techniques and financial performance of listed Oil and Gas Companies in Nigeria,
v. Evaluate the moderating effect of relationship between operational efficiency on inventory management techniques and financial performance of listed Oil and Gas Companies in Nigeria.

Hypotheses

The following hypotheses were tested in order to answer the stated aim and objective.

H_{01}: There is no significant relationship between inventory turnover and profit after tax of listed oil and Gas Companies in Nigeria,

H_{02}: There is no significant relationship between operating cycle and profit after tax of listed Oil and Gas Companies in Nigeria,

H_{03}: There is no significant relationship between inventory conversion period and profit after tax of listed Oil and Gas Companies in Nigeria,

H_{04}: There is no significant moderating relationship between firm size on inventory management techniques and financial performance of listed Oil and Gas Companies in Nigeria.

H_{05}: There is no significant moderating relationship between operational efficiency on inventory management techniques and financial performance of listed Oil and Gas Companies in Nigeria.

REVIEW OF RELATED LITERATURE

CONCEPTUAL REVIEW

Inventory Management Techniques: Inventory management is a set of controls and guidelines that monitor inventory levels and determine the quantity of stock, when to replenish or stock up, and how much to order. According to Atnafu and Balda (2018), inventory management can be defined as framework used in firms by controlling its interest in inventory. It includes the recording and observant of stock level, estimating future request, and settling on when and how to arrange (Atnafu & Balda, 2018). Godana and Ngugi (2014) stated that inventory management refers to all or any action involved in developing and handling the inventory levels of raw materials, semi-finished materials and finished good so that sufficient supplies are available and the costs of over or under stocks are low. Deveshwar and Modi (2013) defined inventory management techniques as the process used by a company in organizing products, placing goods in a warehouse, and ensuring that the required goods are supplied while also minimizing costs as much as possible.

Dimensions of Inventory Management Techniques

The concept of inventory management techniques or practices has been of great interest and importance to various researchers in the past years. They have sought to offer different approaches to the understanding of the dimensionality of this construct. Some of them conceptualize inventory management techniques based on primary source of data collection while others conceptualize inventory management techniques based on secondary source of data collection. Akinlabi (2021) dimensionalize inventory management practices into the following sub-headings (Inventory Shrinkage, Inventory Investment, Inventory Control, Inventory Turnover, Inventory Record Accuracy, and Automated Inventory System). Ngugi et al (2019) measure the dimension of inventory management as Material Requirement Planning (MRP), Distribution Resource Planning (DRP), Vendor Managed Inventory (VMI) and Just in Time (JIT) System. Ugwu and Nwakoby (2020) employed ABC model techniques, Low, High (LH) Techniques and Economic Order Quantity EOQ model techniques. Gołaś (2020) employed days in inventory ratio as proxy for inventory management. Rodrigo et al (2020) used inventory conversion period and Inventory turnover as dimensions of inventory management techniques. However, considering the nature of scope, secondary source of data collection and Gap creation, this study employed inventory turnover, operating cycle and inventory conversion period as dimensions for inventory management technique.

a. Inventory Turnover: According to Rao and Rao (2009), inventory turnover has to do with the number of times that an inventory turns over or cycles through the firm in a year. It measures the speed goods moves through and replenished by the system (Tipparat & Sawat, 2013). Inventory turnover measures the speed at which inventories are moving through the warehouse of the company and measures the flow (liquidity) of a main part of its current assets (Marijan et al, 2015). Namagembe and Munene (2016) defined inventory turnover as the number of times inventory is converted into cash. It is a ratio showing how many times a company's inventory is sold and replaced over a one-year period. Furthermore, inventory turnover is the speed at which the trading company sells its inventories or how much turnover the average inventory generates in one year. Moridipour and Mousavi (2014) explained that proper inventory turnover is in maintaining optimum inventory and proper marketing to sell inventory and in time order.

b. Operating Cycle: Operating cycle is the average period of time spent by a company to obtain inventories and sell the inventories to its customers to get cash income (Douglas et al, 2020). Operating cycle is the total days needed to convert the inventory and accounts receivable into cash. Operating cycle depends on the company policy and these policy include; (a) inventory: how long it stays in storage. A longer time extends the cycle, (b) Sales: cash or credit. If a company sells in cash, it incurs no business debt. However, if the company sells on credit, it incurs accounts receivable. A long collection period of debt will extend the operating cycle and (c) Purchase: cash or credit. Credit purchase reduces the length of operating cycle (Douglas et al, 2020). In other words, operating cycle is a sequence of activities done by a company starting from the procurement of supplies to be sold to the customers to the collection of payment from the customers to the company as revenues. The company's earnings can be predicted from the operating cycle as it includes the selling factor which can be used to calculate earnings. According to Bhargav (2016), operating cycle is the time that elapses between purchases of raw material, its conversion into work-in process, work-in process converted into finished good, finished goods converted into receivables and receivables resulting into cash. Operating cycle is essential as it indicates the smoothness with which the business is run. Bhargav (2016) confirmed that the operating cycle influences the financial performance. A shorter period of operating cycle can ensure the company obtains payment faster and gets some revenues.

c. Inventory Conversion Period: Inventory conversion period reports about the average time to convert total inventory into sales (Ogbo et al, 2014). The inventory conversion period is the time required to obtain materials for a product, manufacture it, and sell it. The inventory conversion period is essentially the time period during which a company must invest cash while it converts material into a sale (Ogbodo et al, 2017). Cherutich and Anthony (2020) recognized inventory conversion period as a measuring tool that informs a firm the period taken in days from the date of acquiring new inventory through purchase or manufacturing, to the date when the product is sold to a customer. Sitienei and Memba (2015) believed that the capability of a firm to convert its inventory to sales within a short period enhances its financial performance. They further argued that optimum inventory level of a firm is achieved when there is growth in sales that result in an upward trend of profit. Inventory turnover ratio was utilized to measure inventory conversion period by dividing the firm's inventory on the statement of financial position sheet by the average sales of a given financial period.

Financial Performance

Financial performance is defined as the ability of a firm to minimize its cost of operations, efficiently use its assets and maximizes the value of shareholders (Ibrahim & Abdullahi, 2019). It shows the effectiveness and efficiency of management in the use of corporate resources. It is further defined as the attempt by a firm to meet established goals or effective productivity. Also, it is a measure of the firm's earnings and appreciation in its value which is disclosed in the market value of shares (Ibrahim & Abdullahi, 2019). Financial Performance is a subjective measure of how well a company can use assets from its primary business location and generate revenues. This term is also used as a general measure for a company's overall economic health over a given period and can be used to compare similar companies in the same industry or to compare industries or sectors in aggregation of financial performance (Ponnu, 2008).

Measure of Financial Performance

There are several measures of firm financial performance such as return on assets, return on equity, earning per share etc. Different indices can be uses to measure it at different times by different organizations, depending on the nature of the business' activity. Pferrferforn et al (2017) stated that financial performance measurement have attracted growing interest globally since the 1990s. The most suitable index of financial performance is profitability which is usually measured in financial terms. Frequently used measures of profitability include net profit, return on asset, return on equity current ratio, etc. According to Ugwu and Nwakoby (2020), there are 5 measures of absolute profitability, the use of which depends on the purpose for which such measure is computed viz. gross profit, operating profit, profit before interest and tax (PBIT), profit before tax (PBT) and profit after tax (PAT). Based on the above measures of financial performance in term of profitability, our study applied Profit After Tax (PAT) to evaluate financial performance ability in profit making according to total investments in assets and net profit return.

Profit After Tax (PAT): Profit after tax can be fully retained by a company to be used in the business or distributed as dividends, if declared and paid to the shareholders. The profit after-tax figure is considered the best measure of the ability of an entity to generate a return, since it incorporates both operating income and income from other sources, such as interest income. Profit after tax is a measure of how competent a company is with regards to converting its revenue into profits, it is also used in margin analysis to compare companies within the same industry. According to Ogbodo et al (2017), it help investors to determine how much a company actually earned and can also help determine whether a company needs to control its costs. Profit before tax (PBT) is a measure that looks at a company profit after tax. Company has to pay corporate income tax. It deducts all expenses from revenue including interest expenses and operating expenses except for income tax. Ajibolade (2013) stated that profit after tax combines all the company's continuing

operation and non-continuing operations and profit, before tax. Horngren et al (1994) noted that profit after tax exists because tax expense is constantly changing, and talking it out help give an investor a good idea of changes in a company's profit or earnings from year to year. The term is interchangeable used with earning after tax or post -tax profit.

Moderating Variables

Firm size: Firm size is perceived as an important element of performance in any firm. It has continuously been the purpose of firms to increase in size in order to have an advantage over their competitors. The positive correlation between size and performance is theoretically clarified by economies of scale (Oyelade, 2019; Omenyo & Muturi, 2019). Firm size is also another firm characteristic employed by previous studies to investigate firm size and financial performance of firms. A number of previous studies on firm size and corporate financial performance have produced mixed findings. Omenyo and Muturi (2019) study of firm size and financial performance of sugar companies in Kenya disclosed a significant positive association between firm size and return on assets and return on equity respectively. Similarly, Sritharan (2015) investigated firm size and financial performance of listed firms in Sri – Lankan. The findings of the study showed that firm's size has positive impact on the return on assets which was the measure of profitability. The study further revealed a negative association between total debt ratio and profitability. However some studies found a negative or weak negative association between size and firm performance.

Operational Efficiency: Kalluru and Bhat (2009) viewed operational efficiency as the capability of an organization to abridge the unwelcome and boosts asset capabilities so as to convey quality goods and services to clients. Operational efficiency is seen as the few methods and techniques used to achieve the essential goal of conveying quality products and services to clients within the most cost-effective and opportune way (Ohene-Asare et al, 2017). Asset utilization, production, dispersion and inventory management are the foremost common perspectives of operational efficiency. Operational efficiency is additionally clarified as the capability of an organization to diminish the unwelcomed and maximize asset capabilities so as to provide quality goods and services to clients (Ghosh & Sanyal, 2019). Operational efficiency represented by asset turnover, fixed asset turnover and working capital turnover had no vital effect on firms' profitability within the sector as measured by ROA and ROE as found by various studies.

Theoretical Framework

A theory is an integrated body of definitions, assumptions and general propositions that covers a given subject from which a comprehensive and consistent set of specific and tested principles can be deduced. It is logically maintained that a theory is a set of concepts, assumptions, principles and standards that governs a given professional practice. There are several theories that are utilized to explain the relationship between inventory management and financial performance of firms in prior empirical studies. Some of these theories are agency theory, stakeholder theory, lean theory, constraint theory, contingency theory, etc. However, this study were anchored on Lean inventory by Womack (1990).

Lean Inventory Theory: This theory was developed in Arsenal in Venice in the 1450s by Henry Ford as a result of his thoughts on integrated manufacturing process. Lean inventory theory was pioneered by Womack (1990) which was based on the principle of maintaining reduced inventories in organization. Lean inventory theory is an extension of Just-in-Time is an inventory control philosophy which emphasized that organizations should maintain minimum inventory in line with the requirement of production process (Eroglu & Hofer, 2011; Ajayi et al, 2021). Wangari (2015) noted that the theory proposes that inventory management act as a major component of any supply chain. The theory elaborates on how manufacturers gain flexibility in their ordering

decisions, reduce the stocks of inventory held on site and eliminate inventory carrying costs. Lean inventory theory focuses on cost minimization in organizational inventory system by taking decisions centered on manufacturing, warehousing and general supply chain (Troxell, 2015). The argument in favour of reduced or lean inventory system is that it leads to improvement in company's profitability owing to reduction in inventory carrying costs. According to Jolla (2014) the theory (Lean) tends to build on the postulation of Economic Order Quantity (EOQ) which seeks to optimize the quantity of inventories by determining the appropriate quantities of inventory to order per time. From the foregoing, the theory brings to the fore, the possibility of being dynamic in manufacturing and operating system used to monitor inventory level as well as various items of inventories that may require different treatment. In a highly competitive environment, lean inventory theory help firms to gain competitive advantage, capture larger market shares and make more profit since carrying excess inventories negatively affects firm's net cash flow (Nyabwanga, 2013).

The lean inventory theory is relevant to study because it gives theoretical explanations to the subject matter of this study. This choice is informed by the need to examine how inventory management influences financial performance thereby calling for a prudent approach to inventory management. The theory is also relevance to this study because, it helps organizations to improve the return on investment of a business through reduction in inventory held by firms which will reduce its associated carrying costs.

Empirical Review

S/N	*AUTHORS/YEAR*	*TOPIC*	*METHODILOGY USED*	*FINDINGS*	*CONCLUSION /RECOMMENDATION*	*INDIVIDUAL RESEARCH GAP*
1	Eze and Adamma (2021)	The effect of inventory management techniques of small and medium scale enterprises in Anambra state.	A descriptive survey research design was adopted. Data related to the research questions were analysed using mean and standard deviation while t-test was used to test the null hypotheses	The findings from the study revealed that Managers and Accountants of SMSEs in Anambra State utilize purchasing control inventory technique to a moderate extent, while economic order quantity technique was utilized to a lowly extent. The study also revealed that Managers and Accountants of SMSEs in Anambra significantly differ in their mean ratings on the extent of utilization of inventory management techniques.	The study concluded that Managers and Accountants of SMSEs do not adequately utilized inventory management techniques and this resulted in stunted growth and sluggish development of SMSEs.	The study was conducted in small and medium scale enterprises in Anambra state employing primary data while this study is conducted in Oil and Gas Companies in Nigeria employing secondary data

2	Ajayi et al (2021)	Effective inventory management practice and firms performance: Evidence from consumer goods firms in Nigeria	The study employed both field and empirical survey (ex-post facto) research design. Correlation coefficient and ordinary least square (OLS) regression method with the aid of STATA 13 statistical package was used to analyse the data	The findings revealed a significant positive relationship between return on capital employed, firm growth and effective inventory management practice; a positive and non-significant relationship between return on investment and effective inventory management practice.	The study recommended amongst others that consumable goods firms' management should emphasis on the proper effective inventory management practice techniques and measuring of efficiency deviations to identify weaknesses in the process of managing inventories.	The study was conducted in consumer goods firms in Nigeria while this study is conducted in Oil and Gas Companies in Nigeria moderating variable
3	Cranimar and John (2021)	The relationship between inventory management and private hospitals' financial performance in Western Uganda.	study adopted a positivist approach and a cross-sectional research design The study used a closed-ended questionnaire to collect data and simple linear regression for data analysis.	Result revealed inventory management as a significant predictor of private hospitals' financial performance in Western Uganda.	The study recommended that private hospitals adopt robust and scientific inventory management systems and models that aim to optimise stock levels and minimise costs if they are to achieve substantial financial performance.	The study was conducted in private hospitals' in Western Uganda employing primary data while this study is conducted in Oil and Gas Companies in Nigeria employing secondary data
4	Akinlabi and Sonko(2021)	The influence of inventory management on the sales growth of selected food and beverage companies in Nigeria	Cross-sectional survey research design was used. Hypotheses were tested using inferential statistics with the aid of SPSS V 25.0.	The findings revealed that inventory management had significant effect on sales growth of selected food and beverage manufacturing companies in Nigeria. There were significant influence of inventory turnover, information technology, and inventory reorder point on sales growth. However, inventory forecasting did not significantly influence sales growth of selected food and	The study concluded that inventory management significantly influence sales growth of selected food and beverage manufacturing companies in Nigeria.	The study was conducted in selected food and beverage companies in Nigeria employing primary data with the aid of SPSS while this study is conducted in Oil and Gas Companies in Nigeria employing secondary data with the aid of SPSS and E-view

				beverage manufacturing companies.		
4	Mustofa et al (2021)	implementation of inventory accounting information systems at pharmacy: Case study at Tirta pharmacy.	The study adopted theoretical Literature Review	The results of this study propose systems and procedures for cash receipts and disbursements, as well as suggestions for using information technology in carrying out company operational activities.	The study concluded that implementation of inventory management has significant impact on operational activities.	The study was conducted in pharmacy: Case study at Tirta pharmacy employing primary data while this study is conducted in Oil and Gas Companies in Nigeria employing secondary data
5	Akinlabi (2021)	Effect of inventory management practices on operational performance of selected flour mills companies in Nigeria. growth of selected food and beverage companies in Nigeria	Cross-sectional survey research design was used. The study adopted cross-sectional survey research design	Finding revealed that automated inventory system was found to be positively and significantly related to operational performance. Inventory shrinkage was found to be negatively and significantly related operational performance. Inventory investment was found to be positively and significantly related to operational performance. Inventory record accuracy and Inventory turnover was found to be positively and significantly related to operational performance.	The study concluded that inventory management practices significantly influenced operational performance of flour mills companies in Nigeria.	The study was conducted in selected flour mills companies in Nigeria. while this study is conducted in Oil and Gas Companies in Nigeria.
6	Mishra et al (2021)	The blood inventory management practices at the blood bank of an institute of national importance in India.	The study adopted theoretical Literature Review	Finding indicated that simple rule of thumb practices, the experience of staff, training, clear policy on stock keeping and allocation, daily stock review, record-keeping, monthly performance review, automation, adoption of information system, regular communications, and	The study concluded that blood bank follows simple procedures and relies on the experience of its staff to manage its inventory.	The study was conducted in bank in India adopted theoretical Literature Review while this study is conducted in Oil and Gas Companies in Nigeria adopting empirical method

				leadership emerged as factors contributing to inventory management.		
7	Obeidat (2021)	whether or not a relationship exists between inventory management of the listed pharmaceutical firms at Amman Stock Exchange, and the profitability of these firms, and whether or not inventory management affects firm profitability	The study adopted Pearson correlation and ordinary least square method	the study shows that inventory management has a positive significant effect on firm profitability. More studies regarding inventory management and firm profitability relationships.	The study recommended to be performed on other manufacturing industries than pharmaceutical firms.	The study was conducted in listed pharmaceutical firms at Amman Stock Exchange while this study is conducted in Oil and Gas Companies in Nigeria.

Source: *Researcher Compilation (2022)*

METHODOLOGY

Research Design: In line with the problem and objective of this study, the appropriate research design for this study is ex-post facto and correlational research design. Ex-post facto research design is used to cover investigations that are done retrospectively (after the effect has occurred) to identify possible cause-and-effect relations between the variables under investigation through observations of existing conditions and inquisitively searching back historically for the causal factors.

Population of the Study: The population of the study consisted of ten (10) Oil and Gas Companies listed on the floor of the Nigerian Exchange Group as at 31st December 2020.

Sample Size and Sampling Techniques: The sampling technique used in this study was purposive (Judgmental) sampling technique. As the name implies, it is a sample "chosen purely on the basis of convenience. Eight (8) listed Oil and Gas Companies were chosen simply because as at the time of this research work, two of the companies that are listed in Nigerian Exchange Group formally known as Nigeria Stock Exchange do not have data available. Hence, purposively, data of eight years period was chosen for the study which consists of 64 observational time period (2013-2020).

Sources and Method of Data Collection: The study used secondary data for the analysis. Secondary data was collected from published annual reports of the selected oil and gas companies in the Nigerian Exchange Group Fact Book.

Explanation of Variables: The variables that were adopted to measure the effect of inventory management and financial performance of listed oil and gas companies in Nigeria are presented in this section.

Variables	*Measures/ Abbreviations*	*Explanation*	*Mathematical Expression*
	Inventory Turnover (INVTUR)	Inventory turnover: is the amount of times your inventory is sold and replaced over a certain time period (like a year).	$\frac{\text{Cost of Goods Sold}}{\text{Average inventories}}$ X 365

Independent Variable	Operating Cycle (OC)	It enable organization to know how long it takes for you to sell your inventory each months or yearly. It shows how many days sales of inventory you have on hand at any given time	Inventory Period + Account Receivable Period.
	Inventory Conversion Period (ICP)	It enable organization to know how long it takes for you to sell your inventory each months or yearly. It shows how many days sales of inventory you have on hand at any given time	Average inventories / Cost of Goods Sold X 365
Dependent Variable	Profit After Tax (PAT)	This presupposes net profit earned by the company after deducting all expenses like interest, depreciation and tax.	PBT-Tax
Moderating Variable	Firm size	Firm size is a factor in determining company profitability in term of economies of scale that can be found in the traditional view of the company	Natural Log of Total Sale
	Operational efficiency	Is metric that measures the efficiency of profit earned as a function of operating cost.	Operating Expense / Net Income

Source: Complied by Researcher, 2022

Method of Data Analysis: This study adopted descriptive statistics, Pearson Product Moment Correlation Coefficient and Ordinary Least Square (OLS) multiple regression with the aid of Microsoft Excel, SPSS 25 and E-View 10. First, Microsoft Excel was employed to interpolate the raw data extracted based on the variables adopted for this study and the formula to be apply in calculating the measurement. Secondly, the data analysis was executed in three distinct stages. Firstly, a univariate (or descriptive) analysis was executed, followed by bivariate analysis and lastly, multivariate analysis.

Model Specification: In order to investigate the relationship between inventory management techniques and financial performance o listed oil and gas companies in Nigeria from (2013 to 2020), we develop the Multiple Linear Regression analysis using (Microsoft Excel, SPSS 25 and E-View 10). In line with the study objective and operational framework developed in chapter two, the required functional relationship to test the developed hypotheses is presented as follows:

Model 1: Profit After Tax (PAT) Model

$PAT = f(INVTUR, OC, ICP)$ 1

This can be written in Ordinary Least Square (OLS) form as:

$PAT_t = a_o + a_1INVTUR_t + a_2OC_t + a_3ICP_t + U_t$ 2

Model 2: Firm Size (FS) Model

$FS = f(IM, FP)$ 3

$FS_t = a_o + a_1IMT_t + a_2FP_t + U_t$ 4

$a_1>0$; $a_2>0$;

Model 3: Operational Efficiency (OE) Model

$OE = f(IM, FP)$ 5

$OE_t = a_o + a_1IMT_t + a_2FP_t + U_t$ 6

$a_1>0$; $a_2>0$;

Where: PAT = Profit after tax, as proxy for financial Performance
INVTUR = inventory turnover as proxy for Inventory Management Techniques
OC = Operating cycle as proxy for Inventory Management Techniques
ICP = inventory conversion period as proxy for Inventory Management Techniques

FS = Firm size as a Proxy for Moderating Variable
OE = Operational efficiency as a Proxy for Moderating Variable
t = time period under study
a_o = constant
a_1-a_3 = parameter or coefficient of explanatory variable
u = error term

Discussion Rule(s)

The relationship is assumed to be linear if the correlation coefficient ranges from -1.0 (perfect negative correlation) to +1.0 (perfect positive relationship). The correlation coefficient was calculated to determine the strength of the relationship between independent and dependent variables (Kothari, 2013). Finally, Ordinary Least Square (OLS) multiple regression technique was use to estimate the relationship between inventory management techniques variables and financial performance variables.

Accept Ho_1 to Ho_8 for If P (Greater than) > 0.05. Otherwise reject.

For the coefficient values, the following interpretation scheme applied was stated below, (a) No Relationship = 0, (b) Low/Weak Relationship = 0.1-0.2, (c) Moderate or Relatively Strong Relationship = 0.3-0.5, (d) High/Strong Relationship = 0.6-0.7, (e) Very High/Very Strong Relationship = 0.8-0.9, (f) Perfect Relationship = 1

Other tests of significance which was used in the study were:

R^2 – coefficient of determination was use to test the explanatory power of the independent variable;

T-test was use to test for the significance of the coefficient of the variables;

F-Ratio was use to test for the significance of the overall models;

Durbin-Watson (DW) test was use to test whether auto-correlation exist or not in error term (u);

RESULT ANALYSIS

Table 1: Output of Stationarity Test for Unit Root

Variables	Method	Statistic	5% Prob.**	Cross-sections	Stage
INVTUR	ADF Levin, Lin & Chu t*	-3.96014	0.0000	8	Level
OC	ADF Levin, Lin & Chu t*	-7.86944	0.0000	8	1ST difference
ICP	ADF Levin, Lin & Chu t*	-7.86908	0.0000	8	Level
PAT	ADF Levin, Lin & Chu t*	-3.03223	0.0012	8	Level
FS	ADF Levin, Lin & Chu t*	-23.7239	0.0000	8	1ST difference
OE	ADF Levin, Lin & Chu t*	-6.07925	0.0000	8	Level

Source: E-view Output for Stationarity of Data

The table above show the unit root test for variables conducted under the condition of an included intercept but no trend, the result reveals that the value of the augmented DickeyFuller (ADF) of -3.96014, -7.86944, -7.86908, -3.03223, -23.7239,and-6.07925 were generated with a P-values of 0.000, 0.0000, 0.0000, 0.0012, 0.0000 and 0.0000 less than 0.05 respectively. The result also indicated that INVTUR, ICP, PAT and OE passed the stationarity test at level while OC and FS are the only variables that passed the unit root stationarity at first difference means that they do not passed the test at level which required the researcher to difference it at the second time. Therefore,

all the selection criterion were appropriately low as expected confirming that there is no reason to doubt the stationarity of the variables in question which implied that th null hypotheses of non-stationarity of the variables in the model is rejected at level and after 1st differencing at 5 percent level of significance.

Table 2 Correlation Matrix of the Variables

	INVTUR	OC	ICP	PAT	FS	OE
INVTUR	1	-0.276	-0.2777	-0.0559	-0.3423	0.2956
OC	-0.2769	1	0.9999	-0.1129	-0.3310	-0.2312
ICP	-0.277	0.9999	1	-0.1121	-0.3280	-0.2314
PAT	-0.0559	-0.1129	-0.1121	1	0.2607	0.2381
FS	-0.3423	-0.3310	-0.3280	0.2607	1	-0.1230
OE	0.2956	-0.2312	-0.2314	0.2381	-0.1230	1

Source: E-view Output for Correlation of Data

The results in table 2 revealed a correlation coefficient of R-value (-0.0559) which illustrated negative relationship between inventory turnover (INVTUR) and profit after tax (PAT). Correlation coefficient of R-value -0.1129) illustrated a negative correlation between operation cycle (OC) and profit after tax (PAT). And, a correlation coefficient of R-value (-0.1121) which illustrated negative relationship between inventory conversion period (ICP) and profit after tax ((PAT).

Finally, the results in table 2 revealed a correlation coefficient of R-values (-0.3423, -0.3310, -0.3280, -0.0699 and 0.2607) which illustrated that firm size has negative relationship with inventory turnover (INVTUR), operating cycle (OC), inventory conversion period (ICP) but has positive relationship with profit after tax (PAT). Furthermore, a correlation coefficient of R-values (0.2956, -0.2312, -0.2314, -0.1345 and 0.2381) which illustrated that operational efficiency (OE) has positive relationship with inventory turnover (INVTUR) and profit after tax (PAT).

Table 3 Regression Analysis of Model One

Dependent Variable: PAT
Method: Panel Least Squares
Date: 03/13/22 Time: 19:05
Sample: 2013 2020
Periods included: 8
Cross-sections included: 8
Total panel (balanced) observations: 64

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3954192.	1129301.	3.501452	0.0009
INVTUR	-18.49659	31.41777	-0.588730	0.5583
OC	-8.57E+08	9.45E+08	-0.906635	0.3682
ICP	2337651.	2598877.	0.899485	0.3720

R-squared	0.034020	Mean dependent var	3093908.
Adjusted R-squared	-0.014279	S.D. dependent var	6028401.
S.E. of regression	6071288.	Akaike info criterion	34.13650
Sum squared resid	2.21E+15	Schwarz criterion	34.27143
Log likelihood	-1088.368	Hannan-Quinn criter.	34.18966
F-statistic	0.704364	Durbin-Watson stat	1.603134
Prob(F-statistic)	0.553154		

Source: Author computation using e-view

In table 3, a panel least square regression analysis was conducted to test the significant relationship between profit after tax (PAT) and inventory turnover (INVTUR), operating cycle (OC) and inventory conversion period (ICP). Adjusted R-squared is coefficient of determination which explained the variation in the dependent variable due to changes in the independent variables. From the findings in the table 3, the value of adjusted R-squared was 0.034020, an indication that there was variation of 3.3402% on profit after tax (PAT) due to changes in inventory turnover (INVTUR), operating cycle (OC) and inventory conversion period (ICP), while 96.598% was explained by unknown variables that were not included in the model. The F – statistic, 0.704364 with a Prob(F-statistic) value of 0.553154 showed that the model did not satisfies the overall goodness-of-fit statistical test. The Durbin-Watson Statistic of 1.603134 suggests that the model does not contain serial correlation.

Test of Hypotheses
Statement of Hypotheses

Ho_1: There is no significant relationship between inventory turnover and profit after tax of listed Oil and Gas Companies in Nigeria.

Ho_2: There is no significant relationship between operating cycle and profit after tax of listed Oil and Gas Companies in Nigeria.

Ho_3: There is no significant relationship between inventory convention period and profit after tax of listed Oil and Gas Companies in Nigeria.

Decision Rule: Accept Ho for P > 0.05. Otherwise reject
Decision: Results in Table 3 shown the probability value 0.5583 > 0.05 (greater than) alpha level. Therefore, we accepted the null hypothesis one and rejected the alternate one, implied that there is no significant relationship between inventory turnover and profit after tax of listed Oil and Gas Companies in Nigeria.

Results in Table 3 also shown the probability value 0.3682 > 0.05 (greater than) alpha level. Therefore, we accepted the null hypothesis two and rejected the alternate two, implied that there is no significant relationship between operating cycle and profit after tax of listed Oil and Gas Companies in Nigeria.

Results in Table 3 finally, shown the probability value 0.3720 > 0.05 (greater than) alpha level. Therefore, we accepted the null hypothesis three and rejected the alternate three, implied that there is no significant relationship between inventory convention period and profit after tax of listed Oil and Gas Companies in Nigeria.

Table 4 Regression Analysis of Model Three

Dependent Variable: FS
Method: Panel Least Squares
Date: 03/13/22 Time: 19:07
Sample: 2013 2020
Periods included: 8
Cross-sections included: 8
Total panel (balanced) observations: 64

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	7.327919	0.112680	65.03311	0.0000
IMT	-3.06E-05	1.08E-05	-2.830445	0.0063
FP	6.35E-08	3.05E-08	2.081652	0.0416

R-squared	0.176206	Mean dependent var	7.301845
Adjusted R-squared	0.149197	S.D. dependent var	0.790367
S.E. of regression	0.729026	Akaike info criterion	2.251527
Sum squared resid	32.42025	Schwarz criterion	2.352725
Log likelihood	-69.04887	Hannan-Quinn criter.	2.291394
F-statistic	6.523840	Durbin-Watson stat	0.396598
Prob(F-statistic)	0.002707		

Source: Author computation using e-view

In table 4, a panel least square regression analysis was conducted to test the significant mode3rating relationship of firm size (FS) on inventory management techniques (IMT) and financial performance (PF). Adjusted R-squared is coefficient of determination which explained the variation in the dependent variable due to changes in the independent variables. From the findings in the table 4, the value of adjusted R-squared was 0.176206, an indication that there was variation of 17.6206% on firm size (FS) due to changes in inventory management techniques (IMT) and financial performance (PF), while 82.3794% was explained by unknown variables that were not included in the model. The F – statistic, 6.523840 with a Prob(F-statistic) value of 0.002707 showed that the model satisfies the overall goodness-of-fit statistical test. The Durbin-Watson Statistic of 0.396598 suggests that the model does not contain serial correlation.

Test of Hypothesis

Statement of Hypotheses

Ho_4: There is no significant moderating relationship between firm size on inventory management techniques and financial performance of listed Oil and Gas Companies in Nigeria.

Decision Rule: Accept Ho for P > 0.05. Otherwise reject

Decision: Results in Table 4 shown the probability values 0.0063 < 0.05 (less than) alpha level and 0.0416 <.05 (less than) alpha level. Therefore, we rejected the null hypothesis four and accepted the alternate four, implied that firm size has a significant moderating relationship with inventory management techniques and financial performance of listed Oil and Gas Companies in Nigeria.

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Table 5 Regression Analysis of Model Three

Dependent Variable: OE
Method: Panel Least Squares
Date: 03/13/22 Time: 19:08
Sample: 2013 2020
Periods included: 8
Cross-sections included: 8
Total panel (balanced) observations: 64

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.250685	1.196938	1.044904	0.3002
IMT	0.000301	0.000115	2.623011	0.0110
FP	7.02E-07	3.24E-07	2.164783	0.0343

R-squared	0.152345	Mean dependent var	3.560524
Adjusted R-squared	0.124553	S.D. dependent var	8.276636
S.E. of regression	7.744062	Akaike info criterion	6.977470
Sum squared resid	3658.200	Schwarz criterion	7.078668
Log likelihood	-220.2791	Hannan-Quinn criter.	7.017337
F-statistic	5.481617	Durbin-Watson stat	1.307887
Prob(F-statistic)	0.006467		

Source: Author computation using e-view

In table 5, a panel least square regression analysis was conducted to test the significant moderating relationship of operational efficiency (OE) on inventory management techniques (IMT) and financial performance (PF). Adjusted R-squared is coefficient of determination which explained the variation in the dependent variable due to changes in the independent variables. From the findings in the table 4.13, the value of adjusted R-squared was 0.152345, an indication that there was variation of 15.2345% on operational efficiency (OE) due to changes in inventory management techniques (IMT) and financial performance (PF), while 84.7655% was explained by unknown variables that were not included in the model. The F – statistic, 5.481617 with a Prob(F-statistic) value of 0.006467 showed that the model satisfies the overall goodness-of-fit statistical test. The Durbin-Watson Statistic of 1.307887 suggests that the model does not contain serial correlation.

Test of Hypothesis

Statement of Hypotheses

Ho_5: There is no significant moderating relationship between operational efficiency on inventory management techniques and financial performance of listed Oil and Gas Companies in Nigeria.

Decision Rule: Accept Ho for P > 0.05. Otherwise reject

Decision: Results in Table 5 shown the probability values 0.0110 < 0.05 (less than) alpha level and 0.0343 <.05 (less than) alpha level. Therefore, we rejected the null hypothesis five and accepted the alternate five, implied that operational efficiency has a significant moderating relationship with inventory management techniques and financial performance of listed Oil and Gas Companies in Nigeria.

Table 6 Result Summary of Hypotheses Analyzed

S/N	Statement of Hypotheses	R-Value	Decision	P-value	Sig At 0.05	Decision
Ho_1	There is no significant relationship between inventory turnover and profit after tax of listed Oil and Gas Companies in Nigeria.	-0.055	Negative	0.558	Accepted	Insignificant
Ho_2	There is no significant relationship between operating cycle and profit after tax of listed Oil and Gas Companies in Nigeria.	-0.112	Negative	0.368	Accepted	Insignificant
Ho_3	There is no significant and positive relationship between inventory convention period and profit after tax of listed Oil and Gas Companies in Nigeria.	-0.113	Negative	0.372	Accepted	Insignificant
Ho_4	There is no significant moderating relationship between firm size on inventory management techniques and financial performance of listed Oil and Gas Companies in Nigeria	-0.343 0.260	Negative Positive	0.006 0.041	Rejected Rejected	significant significant
Ho_5	There is no significant moderating relationship between operational efficiency on inventory management techniques and financial performance of listed Oil and Gas Companies in Nigeria	0.295 0.238	Positive Positive	0.011 0.034	Rejected Rejected	significant significant

Source: Complied by the Researcher (2022)

CONCLUSION AND RECOMMENDATION(S)

This study provided empirical evidence that investigated relationship between inventory management techniques and financial performance of listed Oil and Gas Companies in Nigeria. Based on data obtained from the listed Oil and Gas Companies in Nigeria, data analysis and of findings and summary of findings above, we concluded that;

1. Inventory turnover negatively influence profit after tax of listed Oil and Gas Companies in Nigeria,
2. Operating cycle negatively influence profit after tax of listed Oil and Gas Companies in Nigeria,
3. Inventory conversion period negatively influence profit after tax of listed Oil and Gas Companies in Nigeria
4. Firm size has negatively influence when moderating inventory management techniques but has positively influence when moderating financial performance of listed Oil and Gas Companies in Nigeria, and finally
5. Operational cycle has positively influence when moderating inventory management techniques and financial performance of listed Oil and Gas Companies in Nigeria.

Therefore, this study generally concluded that there is a negative and insignificant relationship between inventory management techniques and financial performance of listed Oil and Gas Companies in Nigeria under the period of study between 2013 and 2020.

Based on the conclusions above, the following recommendations were made:

1. Firms should evaluate operating cycle when planning to sell and replacing inventories because this study result revealed that it has negative and insignificant relationship with profit after tax.
2. Firms should monitor inventory conversion period because this study result revealed that it has negative and insignificant relationship with profit after tax.
3. Oil and Gas companies should reduce credit sales or average collection period so as to easily convert inventory to cash that would enable them to have enough cash to settle their obligations.
4. Specialized persons in the field of inventory management should be hire for expert advice on the inventory management techniques in the Nigerian Oil and Gas Companies.
5. Firm should implement operational efficiency policy because this study finding revealed operational efficiency has positive and significant relationship with financial performance.

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