

# Inventory Management Practices and Organizational Performance: The Moderating Effect Of Supplier's Efficiency in Public Hospitals

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## Abstract

*This study examined the organizational performance and inventory management practices used by public hospitals in Calabar, Cross River State. The goal of the study was to ascertain the moderating role that supplier efficiency played in the relationship between public hospitals organizational performance and inventory management techniques. Primary data were collected from 79 procurement and store/warehouse officers in the various public hospitals using a standardized questionnaire as part of a cross-sectional survey research methodology. In the Statistical Package for the Social Sciences (SPSS 23), process macro hierarchical regression was used to analyze the data. The study's results showed that the relationship between economic order quantity, material requirement planning, and the performance of public hospitals in Calabar metropolis is significantly influenced by the supplier's efficiency. The study also showed that the performance of public hospitals in Calabar Metropolis, Cross River State, is not significantly impacted by the supplier's efficiency in terms of the relationship between just in time, vendor manage inventory, and performance. Thus, the study concludes that the performance of public hospitals in Calabar metropolis, Cross River State, and various inventory management strategies (EOQ, MRP) are significantly influenced by the supplier's efficiency. The study also found that the performance of public hospitals in Calabar metropolis, Cross River State, and other inventory management strategies (JIT, VMI) are not significantly impacted by the supplier's efficiency. As a result, the study recommends hospitals to be careful about the number of things they order because doing so will lower the cost of both ordering and carrying. To avoid overspending on ordering and carrying costs, the hospital's administration and the procurement/store unit should work together to ensure that the proper quantity of goods is ordered. Furthermore, the*

*study suggested that public hospitals should manage material requirement planning and scheduling of materials delivery since material demand planning greatly affects the operation of the hospital.*

**Keywords:** Inventory management practices, Organizational performance, Public hospitals, Economic order quantity, Just-in-time, Material requirement planning, Vendor managed inventory, Suppliers efficiency.

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## **INTRODUCTION**

Around the world, hospitals are evolving innovative techniques and methods aimed at effectively managing medical supplies for improved service delivery (Atnafu & Balda, 2018). Indeed, it is inconceivable to achieve service delivery efficiency and overall hospital performance without an effective, proactive, and efficient inventory management system that ensures the steady availability of materials required for adequate medical services and operations at minimal costs (Garba, 2020). As part of aimed at enhancing the effectiveness and efficiency of inventory management systems, hospitals are designing smarter inventory management practices such as automated inventory management, which uses computer software and hardware to perform inventory management functions (Kuloba, 2016). Throughout the movement, warehousing, distribution, consumption, and disposal of medical items, inventory management entails the flow, safeguarding, preservation, and administration of medical supplies. Nevertheless, there are prevailing studies on inventory management practices such as; economic order quantity (Atnafu & Balda, 2018), vendor managed inventory (Khalid and Lim, 2018), just in time (Muhammad, et al., 2013), activity based costing (Gatwiri, 2018), material requirement planning (Esther, 2015), electronic data interchange and enterprise resource planning (Wanyoike, and Richu, 2014), and how they take their toll on the performance of different organizations. However, no previous study has considered the moderating role of supplier's efficiency on the relationship between inventory management practices and organizational performance.

Despite the glaring paucity of studies on supplier's efficiency and how it affects inventory management techniques and organizational performance, the effective management of supplier's and inventory is pivotal to the optimal performance of the hospital (Oballah et al., 2015). To optimize material quality and availability, diverse inventory management practices (IMPs) have been designed and applied by the hospitals, and these inventory management practices (IMPs) are excogitated to improve customer service, reduce inventory cost, shorten delivery time, and lower overall handling costs (Ramos, et al 2020; Orobias, et al 2020). They further submit that inventory management practices (IMPs) include economic order quantity, vendor-managed

inventory, material requirement planning, just-in-time method, activity-based costing, inventory control, material supply management, electronic data interchange and enterprise resource planning among others. Most the aforementioned inventory management methods are applied by hospitals, to ensure the availability of needed materials, replenish stock, prevent overstocking, and inventory stock-out (Rajendran and Ravindran2020; Lee, et al 2020).Hence, hospitals around the world are faced with an uphill task of reducing cost and better managing their activities while consistently ensuring that the demands of the people are met. A significant proportion of the hospital's resources are channelled toward medical inventory and proper management of these inventories will serve as a catalyst for leveraging cost and providing an efficient and effective medical service (Jawab, Frichi, & Boutahari, 2018).Inventory management practices (IMPs)engaged by hospitals are aimed at ensuring prompt delivery of medical services, reducing the waiting time of the patients, and timely flow of required materials required to fulfill healthcare's demand placed on the hospitals (Buntak, Kovacic & Martincevic, 2019). This will eradicate every seen and unforeseen bottleneck. Landry and Philippe (2004) contend that medical inventory management ensure routine maintenance, provision of medical aids and tools, and other assisting tasks involved in the provision of healthcare support. This ensures the hospitals keep track of their medical supplies, order and dispense prescription within the hospital at reasonable time to meet the need of desperate patients with urgent and emergency cases.

There will be no medical supplies without a good logistics system to enhance proper medical inventory safety and delivery.A proper equipped logistics structureincludes sound and secure storage facility, decent means of transportation, right quantification, and selection process, among others.Saviour (2018) affirmed that an adequate logistics control system will upscale the availability of medical inventory and further minimize the likelihood that some of these medical inventories will go waste or unavailable when needed. Medical inventory includes tools such medical equipment, medical devices, diagnostic tools, pharmaceutical and sterile products, stationaries, and office equipment (Buntak, et al 2019; Jawab, et al, 2018; Saviour, 2018).These resources are aimed at providing various hospital personnel with the required materials to function (Costin, 2010). Furthermore, the author asserts that medical inventory management is crucial in the treatment process because it allows the care unit to process and synchronize physical and informational flows to provide optimum care to the patients. Without the cohesion between the various units in the hospitals to communicate the needed information, there will be a serious communication breach, and this can result in an ineffective medical service.

The disjointed cohesion among the various units in African hospitals leads to inefficiency and poor service delivery (Jawab, et al, 2018). This is not in anywhere differentin

Nigeria, where the demand for medical services is overwhelmingly larger than the supply. Therefore, there is a need for effective communication mechanism and medical inventory management methods to ensure smooth delivery of health services (Aregbeshola, 2019; Tarurhor & Osazevbaru, 2021). Although different studies have shown the contributions of suppliers to the expeditious performance of the hospital, there are no studies investigating the effect of supplier's efficiency on the relationship between inventory management practices and organizational performance (Kamau & Sammy, 2017; Osei, 2015 and Ageron, Benzidia & Bourlakis, 2018). While the foregoing cited studies have limpid some correlation between supplier's efficiency and organizational performance, some burdening questions, especially as relate to these forerunners (supplier's efficiency and organizational performance) and inventory management practices (IMPs) may still need to be answered. For instance, to what extent does inventory management practices (IMPs) affect organizational performance? To what extent will supplier's efficiency affect the relationship between inventory management practices (IMPs) and organizational performance? It is worth mentioning that the afore-cited studies did not test the moderating role of suppliers' efficiency and how it affect the relationship between inventory management practices (IMPs) and the performance of hospitals. As a result, it is necessary to undertake an empirical study that statistically investigates the moderating influence of suppliers' efficiency on the relationship between inventory management practices (IMPs) and public hospital performance.

This study has two main objectives: to examine the effect of inventory management practices (IMPs) on organizational performance of public hospitals in Calabar metropolis, and to investigate the moderating effect of supplier's efficiency on the aforementioned relationship. For clarity purpose, the specific objectives of the study are as follow; to examine the effect of economic order quantity on organizational performance, to ascertain the effect of just in time on organizational performance, to determine the effect of material requirement planning on organizational performance, and to investigate the effect of vendor managed inventory on organizational performance. The next part of this research paper presents an overview of the literature around the theory of constraints and other relevant topical issues in the study. This closely accompanied with a detailed description of the study research methodology and data analysis results. The final part of this paper covers the discussion of findings, and the conclusion of the research.

## **LITERATURE REVIEW**

### **Hospital performance**

In recent decades, the idea of performance has become more and more popular, influencing practically every aspect of human activity (Elena-Iuliana & Maria, 2016). Hospital performance could be said to be the actual input of a hospital as measured against its intended output. Financial performance (profit, return on assets, return on investment, etc.), service delivery performance (sales volume, market share, patient satisfaction, etc.), and shareholder return (total shareholder return, economic value added, etc.) are the three distinct categories into which hospital performance is categorized (Jawab, et al, 2018). The performance of the hospitals' service delivery is a major focus of this article. To accomplish the required level of performance, the management board needs to make informed decisions and initiate actions to scale-up their performance. Hospitals perform a variety of activities to achieve their organizational objectives. These activities are drugs prescriptions, different kinds of surgery, x-ray examination, treatments of all kinds, medical consultations among others. These activities are closely evaluated as their outcomes and feedbacks from patients aid the management to make informed decisions and take steps to improve performance (Jenatabadi, 2015). As a result, the hospital objectives and the concept of hospital performance can be considered to be inextricably linked. Based on the premise it can be said that hospital performance can be judged from different constituencies resulting in many different interpretations of the term "successful performance". The performance of the hospital has always had a substantial impact on their corporate image. One of such effect is the repeat and non-repeat purchase by their customers (patients) (Jenatabadi, 2015). Therefore, facing new conditions and organizational realities, the concept of performance measurement (PM) especially in the health sector with respect to the hospital, has been rapidly developing and evolving. Hence, performance is achieving organizational objectives, and this axiom criss-cross all disciplines (health sector, management control, general politics, and human resources management). In conclusion, performance depends on the objective/purpose.

### **Medical inventory management practices**

Medical inventory management is the planning, controlling, directing, and organizing of the activities that are related to the flow of medical materials in the hospitals with changes in variables like; demand, price, quality, and delivery schedule. Furthermore medical inventory management procedures are a system for organizing and keeping track of all the activities required to guarantee that the precise quality and quantity of medical products (drugs, gloves, needles, syringes, cotton wool, plasters, and cotton balls, for example) are specified correctly in a timely manner, purchased at a fair price, and, most importantly, always available at the point of use when required (Daniel 2019). The major activities covered under medical inventory management are the anticipation of the required medical supplies in the hospitals from time-to-time. It involves ordering and obtaining the needed medical materials from the suppliers, introducing these medical

supplies to the hospitals, and monitoring the rate of usage of these medical supplies (Siani, 2017). Medical inventory management does more to improve the hospital's corporate image, as the proper management of medical supplies enhances prompt and quality service delivery by the hospitals. It further assists the procurement team responsible for planning and controlling of these medical materials to know when there is need for a re-order (Arnold, Chapman, & Clive, 2008).

Rahman (2014) and Siani (2017) axiom that the appropriate resources are available at the appropriate time and location in the proper amount, quality, and cost, IMPs integrates the flow of medical supplies into hospitals. For a seamless flow of medical supplies within the hospital, Venkatesh (2020) contends that a proper synergy is required between the store/warehouse unit that handles the supply of medical materials and allied activities with the other units in the hospital. These officers' duties include purchasing, material handling and storage, inventory management, packing, transportation, and the use of related information systems throughout the hospital's supply chain, service delivery, and distribution (Rahman, 2014). They (store and procurement officers) further ensure the flow of medical supplies in line with the uniformity of service delivery requirement. With this, reduction and control of cost incurred by the hospitals which could accounts to about fifty percent on average is feasible, and the proper control of medical supplies within the hospital is achieved (Singh, 2019; Rahman, 2014). This study beams its search light on four out of the very many extant inventory management practices (IMPs), these practices are discussed in the next section of this paper.

### **Economic Order Quantity (EOQ) and organizational performance**

A well-managed inventory and an effective inventory system are essential for organizational performance when trying to cut costs. Identifying the best order with the lowest cost parameter is the main goal of EOQ (Aro-gordon & Gupte, 2016), as the EOQ model is a common component of a continuous review of the organization's inventory system. To lower inventory expenses which comprises of holding cost, carrying costs, shortfall costs, and ordering costs, hospitals use economic order quantities when making purchases (Tarver, 2020; Fernando, 2021), this enables these healthcare institutions to meet patient demand. Nevertheless, the EOQ model helps hospitals identify every item in the shop because they need to identify the ordering point and the best order quantity in terms of price (Charles et al, 2018). The EOQ model is used by hospitals as part of a continuous review inventory system, which continuously tracks the amount of inventory and places fixed quantity orders if the level hits a predetermined reorder point (Virginus et al, 2020). This enhance the quality of service delivered by the hospitals as relevant tools, equipment and drugs are readily available to be used in the hospitals. On the other hand, hospitals use EOQ which provide a great model to calculate the reorder point and optimal reorder point to acquire the appropriate quantity of goods required for service

delivery (Drake et al, 2014). Therefore, economic order quantity is a viable metric the hospitals use for sustainability as the ordering of excess materials may lead to high holding cost which may deprive other units of the hospitals resources to function optimally (Caldwell, 2021). Against the backdrop of the foregoing discussion, we hypothesis as follows:

*H<sub>1</sub>: Economic order quantity significantly affects organizational performance of public hospitals in Calabar metropolis.*

### **Just-In-Time (JIT) and organizational performance**

Studies (Rasit et al, 2018; Chen et al, 2013) have shown that just-in-time inventory management, aids organizations to retain the least amount of inventory on hand as is practical. Organizations such as the hospitals do not stash products in case they are needed, instead they simply reorder products to replace those that have already been used (Stevens, 2020). The JIT inventory management tool has proven to be the most essential strategy that has been so productive and useful in decreasing service delivery expenses in service operations, improving service quality, increasing efficiency, and eliminating waste to the bare minimum (Mazanai, 2012). Inventory-related costs like ordering costs, inventory cost, stock-out costs, and most especially carrying/holding costs are very expensive, these have made the hospitals ineffective and inefficient in their service delivery (Ganiyu et al, 2019). Therefore, the just-in-time (JIT) technique, according to Banton (2021), is an inventory management method in which commodities are acquired from suppliers just as they are required in the organization. Hospitals may not incur holding cost as the materials needed for a particular activity is supplied on time. Furthermore, hospitals that deploy JIT appropriately builds a reputable reputation and its always trusted by the patients (Canel et al, 2000). Hospitals that make use of JIT enjoys leanness and waste elimination as they deliver their services in line with the corresponding demand. Additionally, hospitals avoid building up medical stocks too much, which frees up capital and improves the performance of the hospital (Mulandi et al 2019). Against the backdrop of the foregoing discussion, we hypothesis as follows:

*H<sub>2</sub>: Just in time significantly affect organizational performance of public hospitals in Calabar metropolis.*

### **Vendor managed Inventory (VMI) and organizational performance**

Vendor-managed inventory is a process of integration where suppliers of medical inventory bought by hospitals manage as many elements of the supply chain as they can. The supplier of the medical inventory gives adequate information to the hospital, who

subsequently bears full responsibility for maintaining an agreed-upon inventory of the commodity, typically at the hospital (Murray, 2018). Vendor-managed inventory (VMI), which is used in supply chains, refers to inventory that is managed, optimized, and maintained by suppliers or vendors while it is under the client's control (Schulfer, 2021). Both the vendor and the buyer agree on what goals and criteria characterize their relationship's success, which are often in-stock performance, inventory turnover rate, and transaction cost (Scott, 2021). The vendor delivers goods to the hospital, analyses patients patronage patterns and inventory levels for their commodities there. Go further to calculates reordering and replacement based on demand forecasting and lead times, and then reviews the calculations and makes replenishment orders (Krisha, 2020). Hospitals that employ third party (suppliers) in their purchase and supplies of the materials needed do not border about carrying cost and they do not experience stockout (Ochieng, 2015). Synchronization of inventory and transportation decisions is relatively easy. Worthy of note is that VMI employs similar principles as JIT, however the responsibility of managing the inventory is placed with the vendor. The vendors with their industry experience and expertise anticipate demand and inventory need better than the hospitals (Ngugi, 2012). For a better inventory planning and controlling, an application that permits the vendors access to the hospital inventory data is required. Against this background of the foregoing discussion, we hypothesis as follows:

*H<sub>3</sub>: Vendor managed inventory significantly affect organizational performance of public hospitals in Calabar metropolis.*

### **Material requirement Planning (MRP) and organizational performance**

Hospitals and other organizations increase their productivity by using the computer-based inventory management technique known as material requirement planning (MRP). The hospital uses a material need planning system to forecast the required quantities of medical stocks and to schedule their supplies (Kenton, 2020). Material requirement planning's major goal is to keep inventory levels as low as possible in the organization. This is done by figuring out when medical supplies are needed and planning for them to arrive on time (Mokh, et al, 2017). When many of the components and subassemblies required for manufacturing and service delivery depend on the demands of goods that have external demands, material requirement planning is appropriate for both manufacturing and service-oriented companies. Application of this tool in the hospital aid to greatly reduce inventory level and improve quality of service delivery (Odunayo et al, 2021). The material requirement planning provides suitable information for inventory level, this ensure that the appropriate stocks are in place in the hospital for service delivery (Rouse, 2014). Hospitals inventory requirement are disintegrated into precise periods to maintain optimum inventory level to attain continuous service delivery (Oztemel et al, 2020). Material requirement planning is intended to address the questions of what, when, and how much is required. MRP assist the hospitals in managing

inventories to meet the service delivery requirement such as delivery speed, dependability and flexibility (Kallunki et al, 2011; Banerjee, 2018). In order to improve material flow, patient satisfaction, and product quality as well as reduce inventory obsolescence, stock outs, and surplus stock levels, MRP has been linked to operational performance (Oztemel et al, 2020; Musi et al, 2018; Katuu 2020). Against this background of the foregoing discussion, we hypothesize as follows:

*H<sub>4</sub>: Material requirement planning significantly affect organizational performance of public hospitals in Calabar metropolis.*

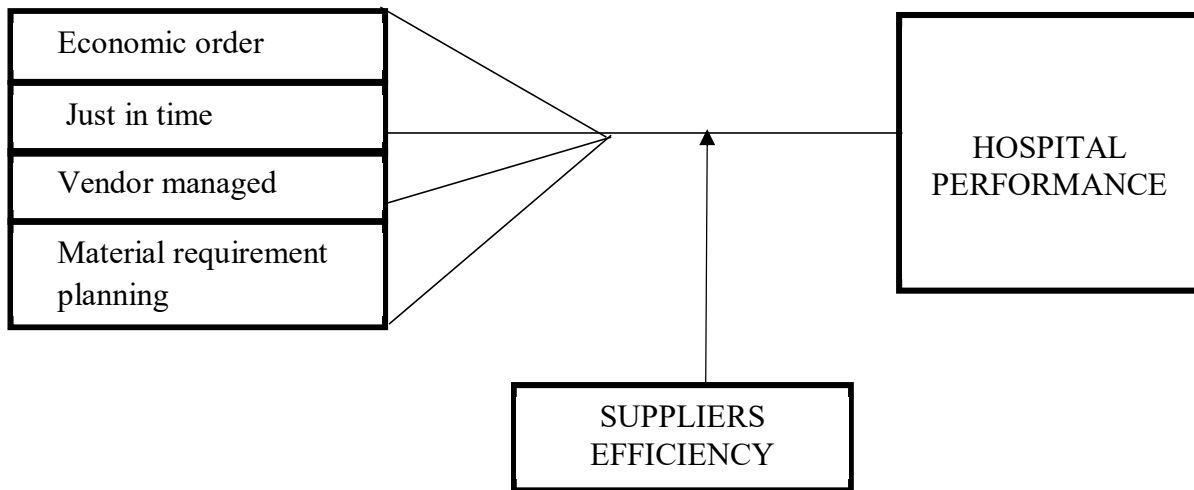
### **Inventory management practices, Suppliers' efficiency and organizational performance**

Efficiency is about making the best possible use of available resources, this connotes to avoiding wasting time, resources, money, energy, materials, and effort when doing an action or achieving a goal. From this standpoint, supplier's efficiency can be said to be the best possible way a supplier supplies materials to an organization with the lowest cost possible to aid enhance the production process of the organization, which brings about greater productivity and overall organizational performance. Some scholars choose to use the term suppliers' performance interchangeably with suppliers' efficiency (John, 2019; Fournier, 2020; & Thornton, 2021). Supplier performance management is a business approach that involves measuring, analyzing, and managing a supplier's efficiency and performance in order to save money, minimize hazards and promote ongoing development (Fournier, 2020). The main goal is to pinpoint prospective problems and their underlying causes so they can be fixed for the good of all parties involved as quickly as possible. Suppliers serve as a bridge between organizations and the inventory management practice they adopt. The optimum performance of an organization may be hinged on the inventory management practice deployed and the supplier's efficiency. An organization that deploys effective supplier's efficient management strategies, ensures that a supplier's efficiency and performance meet the expectation defined in the contract. This entails managing actual performance, identifying performance gaps, and agreeing on activities to meet the intended performance levels (Ryals et al, 2006). Hospitals that focus more on their core skills and outsource a higher percentage of work, their success becomes increasingly reliant on the suppliers' efficiency and effectiveness. Against this background of the foregoing discussion, we hypothesize as follows:

*H<sub>5</sub>: Suppliers efficiency significantly moderates the relationship between inventory management practices and organizational performance of public hospitals in Calabar metropolis.*

### **Conceptual model**

The model below has been developed to limn the effect of the moderating variable (supplier’s efficiency) on the relationship between the independent variable (inventory management practices), the dependent variable (Hospital performance), and as conceptualised by the researchers. As depict in the model below, the independent variable (Inventory management practices) is measured by; Economic order quantity (EOQ), Just-in-time (JIT), Material requirement planning (MRP), and Vendor managed inventory (VMI),with hospital performance as the dependent variable. The model therefore seeks to assert the moderating effectof suppliers efficiency on the relationship between inventory management practices and organizational performance of public hospitals in Calabar metropolis, Cross River State.



**Fig. 1:** Conceptual model of the study

**Source:** Researchers (2023)

### Theoretical framework

The study is anchored on the theory of constraint propounded by Goldratt (1984). Goldratt (1984) proposed the notion of constraints to identify the most critical constraining reasons that prevent an organization from achieving a defined gold standard and then systematically improve that restriction until it is no longer a major bottleneck. This theory's core premise is that every firm has at least one key restriction that limits its ability to produce (Pozo, Tachizawa, & Picchiai, 2009). This constraint can

be a resource constraint in the form of a person or a department, policy constraint, or even a dummy constraint (Blackstone, 2010). The resource constraint can be either internal or external, internal being a person or a department that is not meeting up to the standard of the organization's goals, and external can be a supplier whose activity is hampering the overall performance of the organization. The main aim of any organization be it manufacturing, or services oriented is to increase its profitability. Based on this viewpoint, anything that hampers the growth of an organization is considered a constraint (Simsit, Gunay & Vayvay, 2014). If the organization can handle or manage this constraint in their system, they will have a continuous improvement management system thereby achieving their set goals (i.e customers' satisfaction and higher profitability).

Regardless of the system, whether manufacturing, service, distribution, sales, or project management, the theory of constraint has five processes for detecting, exploiting, and controlling the system constraint. These steps are; Determine the constraint(s) on the system, Plan how to take advantage of the constraint(s), Everything else should be based on the aforementioned choice, Elevate the constraint, and if it has been broken in any of the steps above, return to Step 1.

Rahman (1998) in his study titled: theory of constraint; an overview of the philosophy and how it's applied explained this philosophy as follows;

Identify the system's constraint(s): Physical or managerial limits can exist in a company. Materials, machines, people, and demand level are the physical restrictions. A firm's physical restrictions are minor, but its managerial constraints, such as policies, processes, rules, and methods, are numerous.

Determine ways to take advantage of the constraint(s): If the restriction is physical, TOC aims to maximize the power of the restriction. Eliminating the managerial restriction is preferable to exploiting it in any way; instead, a strategy that supports increased throughput should be implemented.

Subjugate everything else to the above decision: To match the constraint's maximal efficacy, every non-constraint element in the system (firm) must be re-aligned. Because a firm's throughput is dictated by the constraint, aligning resources is the most efficient way to employ resources. Productive capacity (the ability to meet the constraint throughput) and idle capacity (the ability to withstand system interruptions and capacity not currently required) are examples of non-constraint resources.

Reassess the constraint: The performance of the system will improve if the current limitations are still the most crucial ones. When the performance of the constraints improves, the performance of the entire system also improves, allowing the potential of constraints resources to be more fully utilized. Eventually, the system will hit a new limit.

If the constraint has been breached in any of the preceding steps, return to step one: Allowing inertia to become the next limitation should be avoided. TOC is made continuous in the first half of this stage. The next segment is an alert that policy (or solution) is always appropriate (or correct) in every scenario or. The company must acknowledge that when the business environment evolves, the company's policies must alter to reflect those changes. Failure to enforce step five could spell doom for an organization.

Producing quality goods and services to meet the needs of customers with the clear intentions of making profit is the primary objective of every business organization be it a manufacturing or service-oriented firm. The theory of constraint enables the organizations to be able to know the one critical constrain that limit or slows their production capacity. The theory has a five-step model to help organizations identify, exploit, and manage the constraint in their system if the theory is adopted. Organizations stand a greater chance of enjoying their production while also basking in all-around performance if the five-step model of the theory is deployed. With the proper utilization of the theory, an organization can distinguish the constraint that is slowing down the advancement of the whole organization and if this constraint is internal or external, this information will aid the organization to maintain the structure for the continuous improvement management system. The theory of constraint (TOC) helps the organization to see additional capacity without further investment. The theory of constrain is not only effective in the manufacturing sector only, its benefits cut across other sectors like; banking, healthcare, and many others.

### **Empirical review**

Several academics have examined the various inventory management practices, their studies have contributed significantly to the robust literature and empirical findings available in the area of inventory management. In a study title “inventory management practices and operational performance of government hospitals in Kenya” conducted by Gatwiri (2018), four inventory management practices were studied by the researcher and these practices include; just in time (JIT), economic order quantity (EOQ), vendor managed inventory (VMI), and activity based costing (ABC). Forty-six government owned hospitals in Kenya constituted the population of the study, and their chief supply chain managers, assistant or the equivalent were the respondents for the survey. Descriptive statistic and regression analysis were used to analyzed the generated data. The result showed that inventory management practices studied by the researcher affected operational performance positively in government hospitals in Kenya.

Muhammad, Mehwish, Mansoor, Tauqeer and Khalid (2013) conducted a study on “Critical elements in implementations of just-in-time management: an empirical study of

cement industry in Pakistan”, 400 respondents being the operation managers in the cement industry were sampled, the researchers deployed the factor analysis, principal component analysis, and structural equation modeling to analyze the data. The study discovered that following the JIT philosophy's quality, product design, inventory management, supply chain, and production plans improves the cement industry's competitiveness in Pakistan. They also discovered that Implementing JIT reduces waste in the processes and wasteful production, which a big difficulty for businesses is attempting to maintain continuous flow processes. JIT also lowers inventory levels, operations, and prices.

Atnafu and Balda, (2018) carried out research on the small and medium scale enterprises in Ethiopia. In their study titled “The impact of inventory management practice on firms’ competitiveness and organizational performance: Empirical evidence from micro and small enterprises in Ethiopia”, the inventory management practices studied by the researchers were, economic order quantity (EOQ), just in time (JIT), vendor managed inventory (VMI) and activity based costing (ABC). Two hundred (200) small and medium scale enterprises were surveyed for this study using a structured questionnaire. The Structural equation-modeling tool (SEM) was used for data analysis and the study revealed that inventory management practice (EOQ, JIT, VMI, and ABC) potentially lead to a stronger competitive advantage and better business results. Furthermore, it was discovered that a company's ability to compete favorably affects its ability to succeed as an organization. Assessment of the role of materials management on organizational performance a case of new Kenya cooperative creameries limited, Eldoret Kenya was a study carried out by Keitany, Wanyoike, and Richu (2014). Eight (8) inventory management practices were studied by the researchers; just in time (JIT), lot for lot, buffer stock, material requirement planning (MRP), electronic data interchange (EDI), enterprise resource planning (ERP) ABC analysis and intelligence resource planning. Forty-nine (49) staff of Kenya cooperative creameries limited were surveyed for the study, Pearson product-moment correlation was engaged during data analysis. According to the study's findings, inventory control system involvement resulted in a considerable rise in organizational performance. They also discovered that procuring and distributing needed materials in the lowest amount of time was extremely important to organizational effectiveness.

Khalid and Lim (2018) carried out a study on Inventory Management towards Organizational Performance of Manufacturing Company in Melaka, Malaysia. The authors gave attention to material requirement planning (MRP), vendor managed inventory (VMI) and just in time (JIT). The respondents for the study were the inventory management manager of the target organization. The authors discovered that inventory management strategy and organizational performance have a positive link. Esther, (2015) in her study titled “the effect of inventory management practices on service delivery at

St. Martin’s Hospital, Agroyesum, Amansie-west”, the researcher surveyed 234 staff of the hospital and went on to use descriptive statistics to analyze the responses of the respondents. According to the result (MRP), the hospital ensures contracts with suppliers for short cycle deliveries (items that don't take a long time to supply), ensures precise forecasting of supplier delivery dates, and runs an MRP system.

**METHODOLOGY**

The study used a cross-sectional survey research methodology and purposive sample technique to gather 83 procurement and warehousing officials from the 17 public hospitals in Calabar Metropolis that made up the sampling frame to evaluate our hypothesized relationship. Primary data were collected first hand from the procurement and warehousing officers of the various public hospitals in Calabar Metropolis with the help of a 5-point Likert scale survey tool. The measures for this study was adapted from the study of Atnafu & Balda, (2018) where these variables were measured using the same measurement scale in a study on small and medium scale enterprise. The instrument was categorised into two categories, namely; category A (data on the population of the respondents) and section B (statements to drawn to measure the study variables). The Likert scale adopted was as follows: Strongly agree (SA=5), Agree (A=4), Undecided (U=3), Disagree (D=2) and Strongly disagree (SA=1). Principal component analysis was carried to ascertain to validity of the instrument while Cronbach alpha was to use to ascertain the reliability of the instrument. The survey instrument was subjected to Principal Component Analysis (PCA) technique in order to establish the content validity of the questionnaire constructs using a pilot survey of 20 respondents from private hospitals in Calabar metropolis, Cross River State (which shares same characteristics with but is not part of the study population).All the principal component analysis assumptions were met and this confirmed the validity of the instrument as seen in appendix two and three, while the holistic value of the Cronbach alpha (0.728) indicated that the instrument was reliable. Furthermore, the data generated from the respondents was analysed using descriptive statistics while the study hypotheses were tested using hierarchical regression with the aid of Process Macro in SPSS version 23.

Table 1: Cronbach’s Alpha Coefficient reliability estimate for the study instrument

S/N	Variables	No of items	Reliability
1.	Economic order quantity	3	0.768
2.	Just in time	3	0.742
3.	Material requirement planning	3	0.795
4.	Vendor manage inventory	3	0.765

5.	Supplier's efficiency	3	0.774
6.	Hospital performance	3	0.779

Source: Author's analysis using SPSS, 2022

**Model specification/Statistical Model**

The model specification for this study is as follows:

Model 1:  $Y_1 = a_1 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + u_1$

Model 2:  $Y_2 = a_2 + b_1X_1 * K_1 + B_2X_2 * K_1 + B_3X_3 * K_1 + B_4X_4 * K_1 + u_2$

Model 1: Where  $Y_1 = f(X_1, X_2, X_3, X_4)$

Model 2: Where  $Y_2 = f(X_1 * K_1, X_2 * K_1, X_3 * K_1, X_4 * K_1)$

Where:

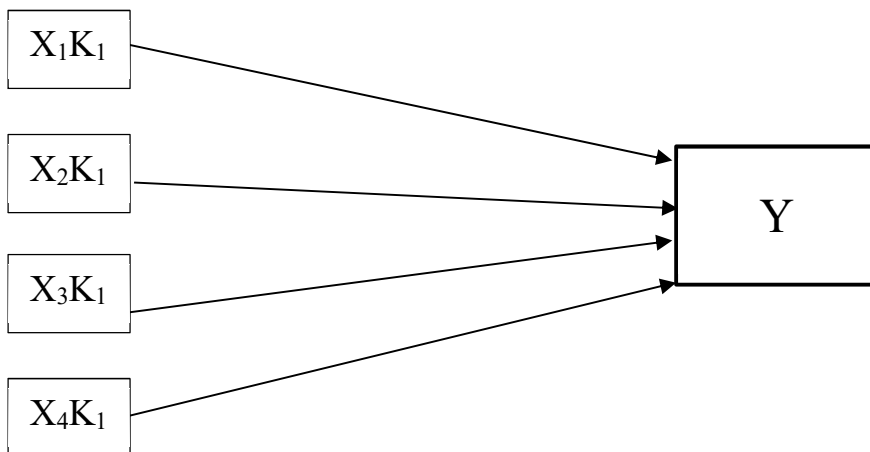
Y = Dependent variable (Hospital performance)

a = constant

b = slope coefficient

X = Independent variables (Economic Order Quantity; Just in Time; Material requirement Planning; Vendor Managed Inventory; Supplier's Efficiency).

K = Moderating variable (Suppliers efficiency)



**Fig. 2:** Statistical model of the study

**Source:** Researchers (2023)

## RESULTS AND DISCUSSIONS

### Demographic attributes of respondents

The table below shows the gender, age, marital status, educational qualification, years of service and position of the respondents. As seen from the table, there were more females than males accounted for by 42 (53.2 per cent) and 37 (46.8 per cent) respectively. The responses on the age range of the respondents shows that 9 (11.4 per cent) respondents were within the age range of 18 to 24 years, 10 (12.7 per cent) respondents were within the age range of 25 to 31 years, 21 (26.6 per cent) respondents were within the age range of 32 to 38 years, 28 (35.4 per cent) respondents were within the age range of 39 to 45 years while 11 (13.9 per cent) respondents were within the age range of 46 years and above. This suggests that most procurement and store officers of the public hospitals in Calabar metropolis are still vibrant as seen in their age. The table also shows the academic qualification of the respondents, 2 (2.5 per cent) respondents were holders of SSCE certificate, 8 (10.1 per cent) respondents were holders of the OND/NCE certificate, 55 (69.6 per cent) respondents were holders of B.Sc/HND certificate, while 14 (17.7 per cent) respondents were holders of M.Sc/Ph.D certificate as the time of this survey. 25 (31.6 per cent) respondents were single, 52 (65.8 per cent) respondents were married while 2 (2.5 per cent) respondents were divorced as the time of this survey. The table further shows the length of employment of the respondents in their various hospital. 6 (7.6 per cent) respondents were less than one year on the job, 11 (13.9 per cent) respondents have been working for at most three years, 10 (12.7 per cent) respondents have been working for at most six years while 52 (65.8 per cent) respondents have worked for seven years and more. Lastly, the table showed the various position occupied by the respondents in their various hospitals. 28 (35.4 per cent) respondents were procurement officers while 51 (64.6 per cent) respondents were store/warehouse officers as at the time of this survey.

Table 2: Demographic representation of the respondents

Demographic	Total	Percent (%)
<b>Gender</b>		
Male	37	46.8
Female	42	53.2
Total	79	100.0
<b>Age</b>		
18 - 24 years	9	11.4

<b>Demographic</b>	<b>Total</b>	<b>Percent (%)</b>
25 - 31 years	10	12.7
32 – 38 years	21	26.6
39 – 45 years	28	35.4
46 years and above	11	13.9
Total	79	100.0
<b>Academic qualification</b>		
WAEC/NECO	2	2.5
OND/NCE	8	10.1
B.Sc/HND	55	69.6
M.Sc/Ph.D	14	17.7
Total	79	100.0
<b>Marital status</b>		
Single	25	31.6
Married	52	65.8
Divorced	2	2.5
Total	79	100.0
Less than 1 year	6	7.6
1 - 3 years	11	13.6
4 – 6 years	10	12.7
7 years and above	52	65.8
Total	79	100.0
Procurement officer	28	35.4
Store/warehouse officers	51	64.6

Source: Fieldwork, 2023

### **Descriptive statistics of variables**

The table below shows descriptive statistics for replies to questions about inventory management techniques and hospital performance in Calabar, Cross River State. The report includes information from 79 people. Economic order quantity (EOQ), Just-in-time (JIT), Material requirement planning (MRP), Vendor managed inventory (VMI), and Suppliers efficiency, was used to measure procurement practices. Constructs designed to measure hospital performance included hitch free operational processes; discharge of many patients in recent times; and satisfied patients refer others to the hospital. All of the constructions had a mean of 3.84, indicating a good response to the questions. The standard deviation is less than one (1), indicating that up to 68 percent of the value dispersion is grouped around the mean. The variances show that the data spread is adequate.

Economic order quantity was measured through right quantity of product, optimal amount of inventory, and ordering and carrying cost is minimized. All of the constructions had a mean of 3.97, indicating a good response to the questions. The standard deviation is less than one, indicating that up to 68 percent of the variance is grouped around the mean. The variances show that the data spread is adequate.

Three constructs were designed as measures of just in time. They were; timely delivery of materials, prompt arrival of materials and materials are not stockpiled. All of the constructions had a mean of 4.15, indicating a good response to the questions. The standard deviation is less than one (1), indicating that up to 68 percent of the value dispersion is grouped around the mean. The variances show that the data spread is adequate.

Materials requirement planning was measured by the hospital estimates quantities of materials, inventory level is kept as low, as well as material planning helps the hospital to reduce cost. All of the constructions had a mean of 4.01, indicating a good response to the questions. The standard deviation is less than one, indicating that up to 68 percent of the variance is grouped around the mean. The variances, on the other hand, suggest that the data dispersion is adequate. Vendor managed inventory was measured by the hospital out-source its inventory procurement, the hospital use third party to manage its inventory, and the vendor handles inventory procurement and management while the hospital concentrate on delivery of services to patients. All of the constructions had a mean of 3.03, indicating a good response to the questions. The standard deviation is less than one, indicating that up to 68 percent of the variance is grouped around the mean. The variances show that the data spread is adequate.

Three constructs were designed as measures of supplier’s efficiency. They were accurate supply of materials, Safe arrival of materials and Prompt delivery of materials. All of the constructions had a mean greater than 4.54, indicating a good response to the questions. The standard deviation is less than one (1), indicating that up to 68 percent of the variance is grouped around the mean. The variances show that the data spread is adequate.

Table 3: Descriptive statistics of procurement practices and hospital performance

variables	N	Mean	Std. Deviation	Variance
Economic order quantity	79	3.97	.696	.485
Just-in-time	79	4.15	.660	.435
Materials requirement planning	79	4.01	.618	.382

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Vendor managed inventory	79	3.03	.852	.726
Supplier's efficiency	79	4.54	.529	.280
Hospital performance	79	3.84	.716	.512

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Source: Author's analysis using SPSS, 2023

### **Test of hypotheses**

Hypothesis one:

Ho: Economic order quantity (EOQ) significantly affect the performance of public hospitals in Calabar Metropolis.

Hypothesis two:

Ho: Just in time (JIT) significantly affect the performance of public hospitals in Calabar Metropolis.

Hypothesis three:

Ho: Material requirement planning (MRP) significantly affect the Performance of public hospitals in Calabar.

Hypothesis four:

Ho: Vendor managed inventory (VMI) significantly affect to the performance of public hospitals Calabar.

Hypothesis five:

Supplier efficiency moderates the relationship between inventory management practices and the performance of public hospital in Calabar Metropolis.

Independent variables: Economic order quantity, Just in time, Material requirement planning, Vendor managed inventory.

Moderating variable: Supplier efficiency

Dependent variable: Organizational performance

Test statistic: Hierarchical Regression (SPSS Process Macro)

Table 4: Hierarchical regression showing the effect of supplier’s efficiency on the relationship between inventory management practices and performance of public hospitals in Calabar Metropolis

Model 1	R	R-Square	F	P
X <sub>1</sub> K <sub>1</sub>	.58	.34	12.64	.07
X <sub>2</sub> K <sub>1</sub>	.51	.26	8.84	.75
X <sub>3</sub> K <sub>1</sub>	.59	.35	13.67	.01
X <sub>4</sub> K <sub>1</sub>	.46	.21	6.76	.48
Model 2	R2 change	Interaction	F	P
X1K1	.05	.02	5.64	.02
X2K1	.01	.46	.54	.46
X3K1	.08	.00	8.83	.00
X4K1	.01	.37	.80	.37

Source: Author’s analysis using SPSS Process Macro, 2023

**Interpretation**

The result in Table 4 shows process macro hierarchical regression model summary of effect of supplier’s efficiency on the relationship between inventory management practices and performance of public hospitals in Calabar Metropolis. The proportion of variation in the dependent variable accounted for by the economic order quantity in the model was 34 per cent. This implies that a change in the predictor variable affects the performance of hospital by 34 percent when other factors are held constant. The table limpid that economic order quantity without the interaction of the moderator (supplier’s efficiency) was not statistically significant, as the P value of model one (.07) is greater than .05. After the interaction, model two showed that there is a significant effect between the predictor (economic order quantity) and the moderator (Supplier’s efficiency) variables as the interaction is less than .05. The result of this interaction is seen in the new P-value (.00) of the predictor variable (economic order quantity) which is less than .05. This implies that supplier’s efficiency significantly moderates the relationship between economic order quantity and organizational performance of public hospitals in Calabar metropolis.

Furthermore, effect of supplier’s efficiency on the relationship between just in time and organizational performance of public hospitals was also examined. The proportion of variation in the dependent variable accounted for by the just in time in the model was 26 per cent. This implies that a change in the predictor variable affects the performance of hospital by 26 percent when other factors are held constant. The table revealed that just

in time without the interaction of the moderator (supplier's efficiency) was not statistically significant, as the P value in model one (.75) is greater than .05. After the interaction, model two showed that there was still no significant effect between the predictor (just in time) and the moderator (Supplier's efficiency) variables as the interaction is greater than .05. The result of this interaction is seen in the new P-value (.46) of the predictor variable (just in time) which is greater than .05. This connotes that supplier's efficiency does not significantly moderate the relationship between just in time and organizational performance of public hospitals in Calabar metropolis.

In addition, the table further showed the effect of supplier's efficiency on the relationship between material requirement planning and organizational performance of public hospitals in Calabar metropolis. The proportion of variation in the dependent variable accounted for by the material requirement planning in the model was 35 per cent. This implies that a change in the predictor variable affects the performance of hospital by 35 percent when other factors are held constant. The table also revealed that material requirement planning without the interaction of the moderator (supplier's efficiency) was statistically significant, as the P value in model one (.01) is less than .05. After the interaction, model two showed that there was significant effect between the predictor (material requirement planning) and the moderator (Supplier's efficiency) variables as the interaction is less than .05. The result of this interaction is seen in the new P-value (.00) of the predictor variable (material requirement planning) which is less than .05. This connotes that supplier's efficiency significantly moderate the relationship between material requirement planning and organizational performance of public hospitals in Calabar metropolis.

Finally, the effect of supplier's efficiency on the relationship between vendor managed inventory and organizational performance of public hospitals was also examine. The proportion of variation in the dependent variable accounted for by the just in time in the model was 21 per cent. This implies that a change in the predictor variable affects the performance of hospital by 21 percent when other factors are held constant. The table revealed that vendor managed inventory without the interaction of the moderator (supplier's efficiency) was not statistically significant, as the P value in model one (.48) is greater than .05. After the interaction, model two showed that there was still no significant effect between the predictor (vendor managed inventory) and the moderator (Supplier's efficiency) variables as the interaction is greater than .05. The result of this interaction is seen in the new P-value (.37) of the predictor variable (vendor managed inventory) which is greater than .05. This connotes that supplier's efficiency does not significantly moderate the relationship between vendor managed inventory and organizational performance of public hospitals in Calabar metropolis.

### **Discussion of Findings**

The result of hypothesis one revealed that economic order quantity does not significantly affect the performance of public hospitals in Calabar metropolis. The result of the analysis implies that the right quantity of product, optimal amount of inventory, ordering and carrying cost reduction does not improve the performance of public hospitals. This finding differs from the findings of Gatwiri (2018) who found out that economic order quantity significantly affected the operational performance of government hospitals in Kenya. In addition, in another study carried by Daniel and Balda (2018), the authors found out that economic order quantity enhanced competitive advantage and further improve organizational performance of small enterprises in Ethiopia. Similarly, Rashmi, Jyoti, Duryodhan and Goutam (2019) carried out their study in the land of India with economic order quantity as one their variable. The authors found out that economic order quantity has a strong relationship with production performance of organizations in India.

The result of hypothesis two showed that just in time does not significantly affect the performance of public hospital in Calabar metropolis. This finding must have been caused by different factors such as; adequate and well equipped storage facilities in these hospitals, and lack of differentiating the various hospital equipment like drugs, medical equipment, beds and beddings in the study. This result is not tandem with the study of Khalid and Lim (2014) that studied a combination of variables that included JIT. Using the multiply regression analysis, the authors discovered that a combination of variable like; material requirement planning, vendor managed inventory and just in time has a significant effect on the performance of the organization. In another study conducted by Kwadwo (2015), the author also used multiple regression to find out that the just in time variable have a significant effect on the performance of the organization when combined with other variables.

The result of hypothesis three revealed that material requirement planning significantly affects the performance of public hospitals in Calabar metropolis. This finding aligns with Mbah, Obiezekwem and Okuoyibo (2019), who study was on inventory management practices and the performance of manufacturing firms in south east Nigeria. The authors studied four inventory management practices (inventory cost, just in time, material requirement and strategic suppliers partnership) and Surveyed 538 respondents. Using simple regression analysis, the authors found out that material requirement planning had a significant effect on the performance of organization as against the finding of this study. The interaction between suppliers efficiency and material requirement planning further strength the effect of material requirement planning on performance of public hospitals in Calabar metropolis.

The result of hypothesis four revealed that, vendor managed inventory does not significantly. The interaction between suppliers efficiency and vendor manage inventory had no significant effect on hospital performance also. This result does not align with the

findings of Opoku, Fiati, Kaku and Ankomah (2020), who study was inventory management practices and operational performance of manufacturing firms in Ghana. The authors studied six inventory management practices, 152 respondents were surveyed for the study and the authors found out that vendor-managed inventory had a significant and positive effect on the operational performance of organization. In another study by Roselyne (2016) on inventory management practices and organizational productivity, the author studied four inventory management practices including vendor-managed inventory. 103 respondents were surveyed for the study and the multiple regression result showed that vendor managed inventory combined with other variables had significant effect on the organizational productivity.

The result of hypothesis five revealed that the interaction between supplier's efficiency and economic order quantity brought significant effect on the performance of public hospitals in Calabar Metropolis. The result further showed that the interaction between supplier's efficiency and material requirement planning does significantly affect the performance of public hospitals in Calabar metropolis. The result of the analysis implies that the right quantity of product, optimal amount of inventory, material planning, reduction in ordering and carrying cost and supplier's efficiency will help improve the performance of public hospitals. Lastly, the result revealed that the interaction between supplier's efficiency and just in time had no significant effect on the performance of public hospitals in Calabar Metropolis. In addition, the result further showed that the interaction between supplier's efficiency and vendor-managed inventory had no significant effect on the performance of public hospitals in Calabar Metropolis. This implies that prompt arrival of materials, timely delivery of materials and outsourcing inventory management does not significantly affect the performance of public hospitals in Calabar.

## **CONCLUSION AND RECOMMENDATIONS**

The study examined the effect of inventory management practices and the performance of public hospitals in Calabar Metropolis. This study is important because there is increase in demand in the health sector especially in this era of global pandemic, and inventory management practices have been identified as ways to help the hospital perform optimally. This study considered four inventory management practices- EOQ, JIT, MRP, VMI, and one moderating variable- supplier's efficiency. After the analysis was performed, it was revealed that one of the variables (material requirement planning) had significant effect on the performance of public hospitals in Calabar metropolis while the other three variables (economic order quantity, just in time and vendor manage

inventory) were not. The interaction between the moderating variable and the independent variables showed that there was a significant effect of this interaction on two independent variables (EOQ and MRP), and there was no significant effect of the interaction the other independent variables (JIT and VMI). This implies that public hospital should pay more attention to economic order and material requirement planning as these variables enhance the performance of the hospitals.

Based on the result of this research, the following recommendations are offered:

- Hospitals should also be mindful of the quantity of products they order as this will help reduce the ordering and carrying cost.
- Just in time, material requirement planning and vendor-managed inventory should be properly incorporated in the hospital as these inventory management practices can contribute significantly to the performance of the hospital if combined with other variables.
- The management of the hospitals with their procurement staff should create a more robust relationship with their suppliers as they play a very significant role in their optimal performance as an organization. In addition, the management of the hospitals should always contract the suppliers ahead of time so they can be more efficient.

### **Suggestion for further research**

This study examined how suppliers' efficiency effect the relationship between inventory management practices and organizational performance of public hospital, hence it could not explain how suppliers efficiency effect the relationship between inventory management practices and organizational performance of private hospitals. Hence, it is suggested that similar study should be replicated with private hospitals in Calabar metropolis. The study centered mainly on public hospitals in Calabar metropolis, comprising of Calabar Municipality and Calabar South Local Government Areas. Future research should widen the study area to cover other Local Government Areas in the state. The study concentrated on only four inventory management practices (EOQ, JIT, MRP and VMI), it is therefore suggested that a similar study should be conducted with other inventory management practices such as activity-based costing, inventory control, material supply management, among others on the performance of public hospitals. Lastly, studies that are more empirical should be carried out on inventory management practices in the service sector, in Cross River and Nigeria at large in order to clearly show empirical evidence on how inventory management practices could be applied in other sectors in the service industry.

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## **APPENDIX 1: QUESTIONNAIRE**

This questionnaire comprises two sections: Section A and Section B. Please fill the options to indicate your responses to the statements.

### **SECTION A [PERSONAL DATA]**

Please tick (✓) in the boxes provided below to show your responses:

- (1) Sex: (a) Male [ ] (b) Female [ ]
- (2) Age: (a) 18 – 24 years [ ] (b) 25 – 31 years [ ] (c) 32 – 38 years [ ] (d) 39 – 45 years [ ] (e) 46 years or above [ ]
- (3) Academic qualification: (a) WAEC/NECO [ ] (b) OND/NCE [ ] (c) B.Sc./HND [ ] (d) M.Sc./PhD [ ]

- (4) Marital Status: (a) Single [ ] (b) Married [ ] (c) Divorced [ ]
- (5) Length of employment: (a) Less than 1 year [ ] (b) 1 – 3 years [ ] (c) 4 - 6 years [ ] (d) 7 years and above [ ]
- (6) Position occupied in the hospital: (a) Procurement officer [ ] (b) Store/warehousing officer [ ]

**SECTION B [QUESTIONNAIRE STATEMENTS]**

Please kindly show your responses by ticking [√] the following alternatives below:

SA - Strongly Agree; A – Agree; U – Undecided; D – Disagree; and SD – Strongly Disagree.

S/N	RESEARCH VARIABLES	SA	A	U	D	SD
<b>ECONOMIC ORDER QUANTITY</b>						
1	The right quantity of product is ordered in the hospital.					
2	Optimal amount of inventory is purchased at the least possible cost in the hospital.					
3	Ordering and carrying cost is minimize during the procurement of materials in the hospital.					
<b>JUST IN TIME</b>						
4	This hospital places important on timely delivery of materials.					
5	Prompt arrival of materials in the hospital helps the medical staff to be efficient in their service delivery.					
6	Materials are not stockpiled in the hospital’s storeroom, they are supplied just when the need arises.					
<b>MATERIAL REQUIREMENT PLANNING</b>						
7	The hospital estimates quantities of materials and schedule their deliveries.					
8	Inventory level is kept as low as possible in the hospital.					
9	Material planning helps the hospital to reduce cost.					
<b>VENDOR MANAGED INVENTORY</b>						
10	The hospital out-source its inventory procurement.					
11	The hospital use third party to manage its inventory.					
12	The vendor handles inventory procurement and management while the hospital concentrate on delivery of services to patients.					
<b>SUPPLIER’S EFFICIENCY</b>						

S/N	RESEARCH VARIABLES	SA	A	U	D	SD
13	Accurate supply of materials improves service delivery in the hospital					
14	Safe arrival of materials enhance service delivery in the hospital					
15	Prompt delivery of materials at the right quantity and quality by our suppliers enhance hospital operational efficiency.					
<b>HOSPITAL PERFORMANCE</b>						
16	The hospital experiences hitch free operational processes.					
17	The hospital has discharge many patients in recent times.					
18	Satisfied patients refer others to the hospital.					

**APPENDIX 2: SPSS Raw Output for communalities result**

**Communalities**

	Initial	Extraction
Right quantity of product	1.000	.703
Opitmal amount of inventory	1.000	.762
Ordering and carrying cost	1.000	.706
Timely delivery of materials	1.000	.713
Prompt arrival of materials	1.000	.869
Materials are not stockplied	1.000	.737
Hospital estimate quantities	1.000	.749
Inventory level is kept low	1.000	.536
Material planning helps the hospital	1.000	.595

Hospital outsource its inventory procurement	1.000	.513
Hospital use third party to manage its inventory	1.000	.604
Vendor handles inventory procurement and management	1.000	.788
Accurate supply of materials	1.000	.742
Safe arrival of materials	1.000	.812
Prompt delivery of materials	1.000	.652

Extraction Method: Principal Component Analysis.

**APPENDIX 3: SPSS Raw Output for communalities result**

**Communalities**

	Initial	Extraction
Hospital experiences hitch free operational process	1.000	.905
Hospital has discharge many patients	1.000	.804
Satisfied patients refer others	1.000	.857

Extraction Method: Principal Component Analysis.