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INVENTORY VISIBILITY AND PERFORMANCE OF LEVEL 4 PRIVATE HOSPITALS IN KENYA

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ABSTRACT

Healthcare system in Kenya is still a national challenge, five decades after independence. Accountability and transparency on the utilization of health resources is also a major issue and as a result, ministry of health is the second most corrupt ministry in Kenya and the health department in the county governments is the department most perceived to be prone to corruption. Therefore, the study sought to determine the effect of inventory visibility on performance of level 4 private hospitals in Kenya. The study also sought to establish the moderating effect of technology adoption on the relationship between inventory visibility and performance of level 4 private hospitals in Kenya. The study was anchored on Resource-Based View (RBV) theory and Technology Acceptance Model (TAM). The study adopted cross-sectional research design and positivist research paradigm. The unit of analysis was the 368 level 4 private hospitals in Kenya while the unit of observation was heads of procurement, quality assurance, finance, risk and compliance and audit. Therefore, the target population was 1840 heads of departments in level 4 private hospitals in Kenya. Krejcie and Morgan (1970) formula was adopted in calculating appropriate sample size. From the formula, the sample size for the study was 320 respondents. The sample was selected using stratified random sampling. The study used primary data collected using semi-structured questionnaires. The study collected both qualitative and quantitative data, Qualitative data was analysed using content analysis a presented in prose form. Quantitative data was analysed using SPSS version 28. Descriptive statistics including means, percentages, frequencies and standard deviations were used to analyse quantitative data. Inferential statistics using Pearson R correlation, simple regression and multiple regressions were also computed. The study concludes that inventory visibility positively and significantly influences with performance of private hospitals in Kenya. The study also concludes that technology adoption has significant moderating effect on the relationship between inventory visibility and performance of private hospitals in Kenya. Based on the findings, the study recommends private hospitals to invest in advanced inventory management software that allows real-time tracking and monitoring of medical supplies, medications, and equipment. This software should provide visibility into inventory levels, expiration dates, and usage patterns.

Key Words: Inventory Visibility, Technology Adoption, Level 4 Private Hospitals

Background of the Study

In the age of competition, no industry can survive without pondering much about reducing expenditures wherever possible (Shiau, Dwivedi, & Tsai, 2020). The same is true for health care industry, which is witnessing sharp rise in price in almost all its products and services. The alarmingly high pace of upward movement of cost is making the produce of the industry beyond the reach of the mass (Christopher, 2021). Supply chain in this industry being a significant driver of cost is therefore grabbing all the attention from industry stakeholders.

It is therefore substantial for health care industries to enforce and seek out new strategies regarding supply chain management to endure within the current competitive and capricious business climate which is critical (Paulraj, Chen, & Lado, 2019). A concept of visibility represents a beneficial role among business partners such as manufacturers, supplier, and customers. The categorization of several types for uncertainties in the supply chain such as demand, quality, broader variety, time, and customization of a product are related to the decision-maker. Management of uncertainties applicable with the help of sharing the information creates visibility among supply chain partners (Shi & Yu, 2020). Supply chain visibility therefore helps with equipping more accurate, precise, faithful, and rigorous real-time portrait of demand, quality, and price indications or information about supplier's inventory levels (Tan, 2021).

In recent years, the concept of supply chain visibility (SCV) has been gaining the attention of practitioners and researchers (Catalayud et al., 2019). Many sources draw on the definition of SCV by Barratt and Oke (2017) as "the extent to which actors within a supply chain have access to or share information which they consider as key or useful to their operations and which they consider will be of mutual benefit". An important part of full supply chain visibility is making sure the business data that is being tracked is available to all stakeholders in the chain, including the customer.

Events such as Covid-19 pandemic have revealed some vulnerabilities that companies face due to low visibility (Sharma et al., 2020). The visibility upstream toward suppliers and downstream toward customers has been limited. Beyond the visible range, companies have no choice but to accept what happens (Carter et al., 2019). Lower-tier suppliers are much less visible and may not even be known to the focal firms (Choi et al., 2021). Consequently, companies experience supply chain disruptions concerning material supply, deliveries, productivity, and revenue (Caridi et al., 2020; Yu & Goh, 2019; Swift et al., 2019). In addition to affecting business performance, low visibility causes restricted ability to achieve supply chain resilience (Bregman et al., 2019). Thus, the management of supply chain disruptions in a network of global suppliers, operations, and markets has increased attention to SCV in order to attain sustainable and competitive business performance (Suh and Lee, 2020). In fact, visibility has become one of the most highlighted concerns conveyed by health care companies (Sodhi & Tang, 2019).

Firms are increasingly held accountable for their suppliers' transgressions (Swift et al., 2019). Therefore, firms need to develop upstream visibility to exercise control over their supply chains (Somapa et al., 2020). Patterns and trends identified through the analysis of supply chain allow the company to make informed decisions about how to optimize operations (Calatayud et al., 2019). The insight gained from supply chain analytics enables the company to better understand the performance of each activity within the supply chain and identify processes that require improvement to create more value for business and customers (Swift et al., 2019).

Presently hospitals are looking for new sources of competitive advantage and cost cutting measures wherever possible. It is imperative to look into the supply chain management aspects and identify areas in which they can improve the quality of service for efficient patient care. Supply Chain Management in healthcare should ensure complete end to-end visibility of

information among suppliers, manufacturers, distributors and customers. This study therefore seeks to establish the influence of supply chain visibility on performance of level 4 private hospitals in Kenya.

Pakistan's Ministry of National Health Services, Regulation, and Coordination had limited insight into the performance of its supply chains, resulting in widely varied stock-availability reports and stock performance across geographies, commodities, service-delivery entities, and sub-functions (Clement, Tuma, & Walter, et al., 2020). Stock availability at service-delivery points (SDPs), for example, was as high as 95 percent and as low as 36 percent at aggregate provincial levels across the country. Such lack of visibility presents problems for donors and governments that have a different view of key performance metrics, such as current warehouse inventory of vaccines (Dicko, 2020).

Nigeria's health system previously consisted of nine distinct supply chains and about 20 data systems, making distribution and supply management difficult and preventing providers and governments from making informed decisions on when (and how much) to replenish health commodities (Lakovou et al., 2019). A shared end-to-end view of events at different points in the supply-chain system would allow donors and governments to make better-informed decisions about where to allocate resources (Pereira et al., 2020).

Over the last five years, the health sector in Kenya led by the MOH has formulated sectoral guidance on health information system, including the management information system for Health Products and Technologies (HPT) (Supply Chain Strategy 2020-2025). There is significant fragmentation in the information systems currently used to support the HPT supply chain system. Though Logistics Management Information System (LMIS) designs exist for some HPT, they are not integrated and do not function adequately. Besides the lack of interoperability and limited integration, data visibility is limited at all levels of the supply chain and incomplete reporting is experienced.

Private hospitals have been clearly distinguished from the public hospitals by their ability to admit and take care of the inpatients. A treating facility owned by a for-profit or a non for-profit organization and is privately funded through payment for medical or healthcare services by patients themselves, by insurers, or by foreign embassies is what is termed as a private hospital. The Private healthcare hospitals have grown by wide margin for the past years due to absence of quality health care systems in the public health sector and introduction of user fees in 1989 (Kimani et al., 2019).

Statement of the Problem

Healthcare system in Kenya is still a national challenge, five decades after independence. For instance, Kenya has very few doctors compared to developed countries. Kenya with a total population of 46 million citizens, currently has 0.2 physicians per 1000 population. Comparatively, Sweden with a population of only 8 6 million citizens, has a physician density of 3.93 physicians per 1000 population (CIA, 2019). Consequently, Kenya has high morbidity and mortality rates affecting the population of all ages, especially children under five years. The infant mortality rate is about 58.1 per 1,000 live births, maternal mortality rate is about 414 per 1,000 and the overall under five child mortality rate is about 121 per 1,000 live births, which are all double of the global average (ROK, 2020).

Accountability and transparency on the utilization of health resources is also a major issue in Kenya (Mohajan, 2019). Ministry of health is the second most corrupt ministry in Kenya and the health department in the county governments is the department most perceived to be prone to corruption (EACC, 2020). Lack of basic infrastructure, poor health care policies and prevalent misappropriation of public funds has compromised the quality of health care in public healthcare sectors (Kenyanya, 2021). The study postulates that improvements in hospital SCM

through application of supply chain visibility may directly improve performance of hospitals in Kenya. Since 45% of the hospital operating budget is allocated to supply chain, improvements and innovations in supply chain management may provide significant impact on cost and quality of heathcare (Chen, Preston, & Xia, 2019).

There has been limited academic interest in recent years in supply chain visibility. Aberdeen (2019) did a study on the effect of SCV on supply chain costs and service levels. The study found that SCV if implemented will have positive influence on operational performance of the firm. Gustarsson (2019) carried out on how SCV can be applied in a case of Pulp Company in Sweden. The study concluded that information sharing was well implemented at the firm leading to visibility. In Kenya little related research had been done and there is need to conduct a study to deepen understanding of the role of SCV. The study answered the following question; what is the effect of inventory visibility on performance of level 4 private hospitals in Kenya?

Specific Objectives

i. To determine the effect of inventory visibility on performance of level 4 private hospitals in Kenya
ii. To establish the moderating effect of technology adoption on the relationship between inventory visibility and performance of level 4 private hospitals in Kenya.

Theoretical review

Resource-Based View (RBV) theory

The Resource-Based View (RBV) theory founded by Barney (1991) is a strategic management framework that focuses on the internal resources and capabilities of a firm as sources of competitive advantage. At its core, RBV posits that a firm's unique bundle of resources and capabilities can enable it to achieve sustainable competitive advantage and superior performance in the marketplace. Unlike traditional strategic management approaches that primarily focus on external factors such as market dynamics and industry structure, RBV emphasizes the importance of internal factors in determining a firm's success. RBV theory entails identifying and leveraging a firm's distinctive resources and capabilities to create value and achieve strategic objectives (Mukhtar *et. al*., 2021). Resources can include tangible assets such as physical infrastructure, financial capital, and technology, as well as intangible assets such as human capital, intellectual property, organizational culture, and reputation. These resources are considered valuable if they enable the firm to exploit opportunities or neutralize threats in the external environment. Capabilities, on the other hand, refer to the firm's ability to effectively deploy and utilize its resources to perform specific activities and achieve desired outcomes (Otim, 2020).

The Resource-Based View (RBV) theory of strategic management is built upon several foundational assumptions that shape its approach to analyzing firm performance and competitive advantage. One key assumption of RBV is that firms are heterogeneous in terms of the resources and capabilities they possess. This means that each firm has a unique bundle of resources—both tangible and intangible—that is valuable, rare, difficult to imitate, and non-substitutable (VRIN). RBV posits that these distinctive resources and capabilities are the primary sources of sustained competitive advantage and superior performance. Another assumption of RBV is that firms are rational and profit-maximizing actors that seek to exploit their resources and capabilities to create value for stakeholders. RBV theory also assumes that resources are not static, but can be developed, accumulated, and leveraged over time to enhance a firm's competitive position. This implies that firms can invest in building and renewing their resource base, as well as developing dynamic capabilities that enable them to adapt and respond effectively to changes in the external environment. Additionally, RBV assumes that markets

are imperfect and that firms can earn economic rents by possessing unique resources and capabilities that are not fully captured by market prices. These rents can arise from factors such as brand reputation, customer loyalty, and proprietary technology (Atnafu & Assefa, 2021). .Resource-Based View (RBV) theory was used to establish the effect of inventory visibility on performance of level 4 private hospitals in Kenya.

Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM) is a theoretical framework that seeks to explain and predict how users come to accept and use technology. Developed by Davis (1989), TAM specifically addresses the factors that influence individuals' decisions to adopt new technologies, particularly information systems (Ferrer-Dávalos, 2023). The model posits that two primary factors—perceived ease of use and perceived usefulness—determine a user's intention to use a technology, which in turn affects actual usage behavior. Perceived ease of use refers to the degree to which a person believes that using a particular technology would be free from effort (Mukamanzi & Ndikubwimana, 2022). If users feel that a technology is easy to learn and operate, they are more likely to adopt it. This aspect emphasizes the importance of user-friendly design and intuitive interfaces in promoting technology acceptance. On the other hand, perceived usefulness reflects the extent to which a person believes that using a specific technology would enhance their job performance or provide benefits in a broader context (Kiprop & Mutuku, 2024). When users recognize the potential advantages of a technology, such as increased efficiency or improved outcomes, they are more likely to form a positive intention to use it. TAM has been widely applied across various fields, including education, healthcare, and business, making it a versatile tool for understanding technology adoption. Researchers often utilize the model to evaluate new systems, software, or applications, gathering insights into user attitudes and potential barriers to acceptance (Asser, Waiganjo & Njeru, 2023). This can inform the design and implementation of technologies to better meet user needs and enhance the likelihood of successful adoption. For instance, in educational settings, understanding students' perceptions of a learning management system can help institutions improve its features and usability (Mandala, Ayoyi & Kipketer, 2024). This theory was used to establish the moderating effect of technology adoption on the relationship between supply chain visibility and performance of level 4 private hospitals in Kenya.

Conceptual Framework

According to Yin (2019), a conceptual framework refers to a diagrammatical representation showing the relationship between dependent and independent variables. Figure 2.1 below shows the independent variable, inventory visibility and moderating variable which is technology adoption and dependent variable which is performance.

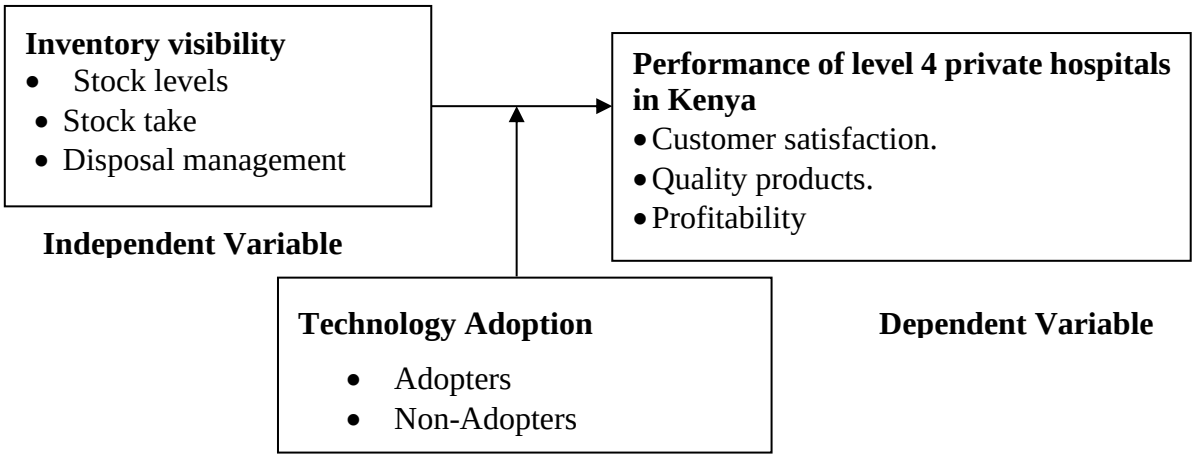

Figure 2. 1: Conceptual Framework

Source: Researcher (2022)

Inventory Visibility

Inventory visibility simply means knowing what inventory you have on hand, and where that inventory is located, at any given moment (Silver, Pyke, & Peterson, 2019). While inventory visibility has always been a critical part of any retail operation, it has become increasingly important as many operations have shifted to an omni-channel order fulfillment and distribution model. Today's order fulfillment operations may have inventory located in countless spots along the supply chain—in the warehouse, on trucks in transit, on the store shelves or in the backroom, etc.—and ensuring that all of that inventory is appropriately accounted for and reflected in the stock ledger is critical to running a successful operation (HolmstroÈm, 2020). For an ecommerce business to scale, it's crucial to have visibility into inventory levels at all times, along with the ability to gain insights into how to better manage inventory to meet customer expectations (Waller, Johnson & Davis, 2019).

Having full inventory visibility enables prepare for the unexpected and provides the data and analytics needed to make better business decisions, such as how to efficiently allocate inventory across distribution network to reduce shipping costs and speed up transit times (Cachon, & Fisher, 2022). Increasing inventory visibility can significantly improve your supply chain velocity, increase efficiency, meet customer demand, and more (Clark & Scarf, 2020). According to Disney and Towill (2021) unseen inventory affects almost everyone in your supply chain, causing delays in processes and often incurring additional delivery costs. It frustrates suppliers, weakens customer relationships, and, ultimately, it impacts your bottom line. This is why inventory management is so critical to any retailer's survival (Fransoo, Wouters & DeKok, 2019).

Technology adoption

Technology adoption refers to the process by which individuals, businesses, or institutions begin to use and integrate new technologies into their operations, routines, or lifestyles (Gustarsson, 2019). The process can vary depending on the complexity of the technology, the perceived benefits, cost, and the readiness of the users (Aberdeen, 2019). Technology adoption is not a one-size-fits-all experience—it is influenced by a myriad of factors including socio-economic conditions, organizational culture, user attitudes, and the availability of infrastructure. Within this framework, it is important to understand the dynamics of both adopters and non-adopters, as these two groups play crucial roles in shaping the pace and success of technological diffusion in a society or industry (Mandala, Ayoyi & Kipketer, 2024).

Adopters are individuals or entities that choose to embrace and implement new technologies (Asser, Waiganjo & Njeru, 2023). This group often sees the value and advantages associated with innovation, whether in terms of efficiency, cost-savings, competitive edge, or convenience. Adopters can be categorized into different groups based on Everett Rogers' Diffusion of Innovations theory—innovators, early adopters, early majority, late majority, and laggards (Kiprop & Mutuku, 2024). Innovators are risk-takers and the first to try out new technologies; early adopters follow, often influencing broader acceptance within a social system. The early and late majorities represent the bulk of adopters who join once a technology proves its value and becomes more accessible, while laggards adopt last, usually out of necessity rather than choice (Mukamanzi & Ndikubwimana, 2022). Non-adopters, on the other hand, are individuals or organizations that choose not to embrace new technologies. This decision can stem from various factors including financial constraints, lack of technical know-how, perceived irrelevance, fear of change, or cultural resistance (Ferrer-Dávalos, 2023).

Empirical Literature Review

Inventory Visibility

Otim (2020) researched on the effect of inventory visibility and cross-channel integration on online channel performance. This study focused on channel integration, which is defined as the degree to which a firm closely coordinates its virtual and physical channels. Due to the proliferation of channels through which firms can reach customers, the route to the market has become a key competitive battleground in many industries, with different players trying out different channels or channel combinations in an attempt to reduce costs and gain market advantage. While the practitioner literature conveys the value of strategic management of physical and virtual channels, this issue has received limited empirical examination by academic researchers. This study examined the effects of inventory data integration and cross-channel process integration on the performance of the online channel. Regarding all potential influences, only in-store returns of products purchased online has a significant effect on the performance of the online channels. Thus, firms interested in deriving value from channel integration strategy need to pay more attention to how they can streamline and coordinate cross-channel processes.

Atnafu and Assefa (2021) studied the impact of inventory management practice on firms' competitiveness and organizational performance: Empirical evidence from micro and small enterprises in Ethiopia. Data for the study were collected from 188 micro and small enterprises (MSEs) operating in the manufacturing sub-sector and the relationships and hypothesis proposed in the conceptual framework were tested using structural equation modeling (SEM). The results indicate that higher levels of inventory management practice can lead to an enhanced competitive advantage and improved organizational performance. Also, competitive advantage can have a direct, positive impact on organizational performance. Therefore, it is recommended that policy makers, universities, NGOs and any concerned party who are engaged in supporting of MSEs need to work on providing the necessary training and resource to promote the inventory management practice of MSEs which will result in increasing their competitiveness and organizational performance. That would enhance their contribution to the economic development of the country.

Makori (2019) conducted a study on retail supermarkets in Nairobi to understand the relationship between real time information processing and supply chain optimization. The study targeted a population of 105 supermarkets but based the research on 50 supermarkets in Nairobi. Data collection was done using questionnaires and was analysed using SPSS and Microsoft excel. Research findings revealed that real time information processing has a positive influence on inventory turnover. The study recommended employment of tech savvy staff and increased use of smart devices.

Technology Adoption

Ferrer-Dávalos (2023) conducted a study on the influence of technology adoption on organizational performance: evidence from Paraguayan microenterprises. Thirty-two microenterprise owners and managers were selected for this case study and participated in four phases of the action research method. The study found that the implementation has contributed to a significant improvement in administrative tasks and processes, making their overall work more efficient, more accurate and with greater speed. The study concluded that a correct implementation of information and communication technologies based on specific needs has a positive impact on the administrative performance of microenterprises.

Mukamanzi and Ndikubwimana (2022) assessed on the effects of technology adoption on Small and Medium sized enterprises in Rwanda: a case study of Kigali City. The study adopted a cross-sectional approach. Data was collected from 250 respondents with the help of a

questionnaire. The study found that technology adoption has a strong, significant relation to Small and Medium sized enterprises. The study concluded that technology adoption influence Small and Medium sized enterprises in Rwanda.

Kiprop and Mutuku (2024) examined on the influence of technology adoption on the adoption of enterprise resource planning at The Kenya Medical Research Institute in Nairobi City County, Kenya. A descriptive survey design was utilized in the study. Semi-structured questionnaires will be administered for the data-gathering process. A census approach was used to select 52 employees of Kenya Medical Research Institute. The study found a positive influence of technology adoption on the adoption of enterprise resource planning. The study concluded that technology adoption is essential for supporting the scalability requirements of an enterprise resource planning system.

Asser, Waiganjo and Njeru (2023) researched on the influence of technology adoption interventions on performance of selected commercial state corporations in Kenya. The target was 55 commercial state corporations and a total of 48 were studied. The study found a strong positive and significant relationship between technology adoption interventions and performance. The study concluded that technology adoption interventions influenced performance of commercial state corporations in Kenya.

RESEARCH METHODOLOGY

Research Design

The study adopted a cross-sectional research design. Cross sectional surveys are versatile in nature and therefore give accurate means of evaluating information while enabling the researcher to confirm whether there are significant causalities among the variables (Harlow, 2019). Research philosophy is the foundation of knowledge and the nature of that knowledge contains important assumptions about the way in which researchers view the world (Saunders, Lewis, & Thornhill, 2017). Research methods are influenced by philosophical orientations such as epistemology, which attempts to answer the basic question of what distinguishes true (adequate) knowledge from false (inadequate) knowledge. Epistemology is concerned with determining the nature of knowledge and the extent of human knowledge (Burrell & Morgan, 1979).

Target Population

According to National Hospital Insurance Fund (2022) there are 368 level 4 private hospitals in Kenya. The unit of analysis was therefore the 368 private hospitals in Kenya while the unit of observation was heads of procurement, quality assurance, finance, risk and compliance and audit. Therefore, the target population was 1,840 heads of departments in level 4 private hospitals in Kenya. The distribution of target population is presented in Table 3.1.

Table 3. 1: Target Population

Head of Department	Population
Procurement	368
Quality assurance	368
Finance	368
Risk and compliance	368
Audit	368
Total	**1,840**

The sample frame for this study was compiled from list of heads of procurement, quality assurance, finance, risk and compliance and audit. Therefore, the sampling frame was 1840 level 4 heads of departments in private hospitals in Kenya.

The overall sample size for this study was determined using a formula by Krejcie and Morgan (1970). The sample size for this study was determined as follows;

$$\text{Required sample size } \mathbf{(s)} = \frac{X^2NP\,(1\text{-}P)}{d^2\,(N\text{-}1) + X^2P\,(1\text{-}P)}$$

X^2=the table value of chi-square for 1 degree of freedom at the desired confidence level 1.96 x 1.96 = 3.8416. (for 0.05 confidence level)

N = the population size.

P = the Population proportion (assumed to be 0.50 since this would provide maximum sample size).

d = the degree of accuracy expressed as a proportion (0.05).

$$= \frac{3.8416*1840*0.5*0.5}{0.05^2(1840)+3.8416*0.5*0.5} = \frac{1767.136}{5.5604}$$

$$= 319.807$$

$$\approx 320$$

Therefore, using the Krejcie and Morgan formula, the sample size for the study was 320 respondents.

This study will employ stratified random sampling. Babbie (2019) posit that stratified random sampling is appropriate when the population is not homogeneous. Stratified sampling is regarded as the most efficient system of sampling as there is little possibility of any essential group of population being completely excluded (Gupta & Gupta, 2019).

The study then used simple random sampling in selecting a sample from each strata. The sample size for each department was as shown in Table 3.2

Table 3. 2: Sample size

Head of Department	**Population**	
Procurement	368	64
Quality assurance	368	64
Finance	368	64
Risk and compliance	368	64
Audit	368	64
Total	**1,840**	**320**

Data Collection Instruments

In this study, primary data was used and was collected using a semi structured questionnaire because they are cost effective and convenient to collect and summarise responses (Kothari, 2019).

This study used both closed-ended questions and open ended questions to collect the data. Closed-ended questions were used where respondents were restricted to direct their answers without further explanation while the open-ended questions sought respondent's views on variables being studied.

The questionnaire includes Likert scale psychometric constructs with a scale ranging from 1-5 where each respondent will be required to rate each and every statement given describing a given variable. The scale ranges from 5=Strongly Agree, 4=Agree, 3=No Opinion, 2= Disagree and 1=Strongly Disagree.

Data Analysis and Presentation

Data was analysed using the Statistical Package for Social Sciences (SPSS) version 28 software. The study performed descriptive analysis. Descriptive statistics enable the researcher to meaningfully describe a distribution of measurements and summarize data (Kothari, 2019; Mugenda & Mugenda, 2021).

Qualitative data collected (through the open ended section of the questionnaire) was coded, and repeated themes (responses) or concepts recorded until saturation is achieved (Jennings, 2019). Quantitative data was analysed using descriptive statistics including frequency, percentages and means, summary graphs, pie charts and frequency distribution tables were employed to portray the sets of categories formed from the data.

Pearson correlation coefficient was used for testing associations between the independent and the dependent variables.

This study also conducted inferential statistics through bivariate regression analysis and multiple regression analysis. Using SPSS software, the data was subjected to regression analysis. Simple linear regression analyses for (H_{01}, H_{02}, H_{03}, and H_{04}) and multiple regression analysis was used to establish the nature and the magnitude of the relationship between the dependent and the independent variables and to test the hypothesized relationships.

$$Y = \beta_0 + \beta_1 X_1 + \varepsilon$$

This study used multiple regressions analysis (stepwise method) to establish the moderating effect of technology adoption (M) on relationship between inventory visibility and performance of level 4 private hospitals in Kenya. The moderating regression model was formed on a three steps approach

$$Y = \beta_{30} + \beta_{31} X + \beta 32 Me + \varepsilon_3$$

Regress the dependent variable (Performance of level 4 private hospitals in Kenya) on both the mediator (technology adoption) and independent variable (inventory visibility).

RESEARCH FINDINGS AND DISCUSSIONS

Descriptive Analysis

The purpose of descriptive analysis is to give background to the study before carrying out analysis. In this section the study presents findings on Likert scale questions where respondents were asked to indicate their level of agreement with various statements to the establish the effect of inventory visibility integration on performance of level 4 private hospitals in Kenya and the moderating effect of technology adoption. They used a 5-point Likert scale where 1-strongly disagree, 2-disagree, 3-moderate, 4-agree, 5-strongly agree. The means and standard deviations were used to interpret the findings where a mean value of 1-1.4 was strongly disagree, 1.5-2.4 disagree, 2.5-3.4 neutral, 3.5-4.4 agree and 4.5-5 strongly agree. Frequencies and percentages were also used to describe the findings obtained.

Inventory Visibility and Performance of level 4 Private Hospitals

The first specific objective of the study was to determine the effect of inventory visibility on performance of level 4 private hospitals in Kenya. The respondents were requested to indicate their level of agreement on various statements relating to inventory visibility and performance of level 4 private hospitals in Kenya. A 5 point Likert scale was used where 1 symbolized strongly disagree, 2 symbolized disagree, 3 symbolized neutral, 4 symbolized agree and 5 symbolized strongly agree. The results were as presented in Table 1.

From the results, the respondents agreed that they maintain optimal stock levels and know the exact amount of inventory they have on hand. This is supported by a mean of 4.155 (std. dv =

0.850). In addition, as shown by a mean of 3.927 (std. dv = 0.658), the respondents agreed that their institution has a well-developed systems for disposal management. Further, the respondents agreed that most of their operations have shifted to an omni-channel order fulfillment and distribution model. This is shown by a mean of 3.917 (std. dv = 0.974). As shown in the results, the respondents agreed that order fulfillment operations in their institution have inventory located in countless spots along the supply chain. This is shown by a mean of 3.887 (std. dv = 0.928).

The respondents agreed that inventory in their company is appropriately accounted for and reflected in the stock ledger. This is supported by a mean of 3.843 (std. dv = 0.786). In addition, as shown by a mean of 3.812 (std. dv = 0.843), the respondents agreed that they always keep accurate information relating to stock and order monitoring and tracking. Further, the respondents agreed that inventory visibility enables prepare for the unexpected. This is shown by a mean of 3.786 (std. dv = 0.786). As shown in the results, the respondents agreed that inventory visibility has provided us with data and analytics needed to make better business decisions. This is shown by a mean of 3.743 (std. dv = 0.863). The respondents also agreed that unseen inventory causes delays in processes and often incurring additional delivery costs. This is shown by a mean of 3.721 (std. dv = 0.786).

Table 1: Inventory Visibility and Performance of level 4 Private Hospitals

	Mean	**Std. Deviation**
We maintain optimal stock levels and know the exact amount of inventory we have on hand	4.155	0.850
Our institution has a well-developed systems for disposal management	3.927	0.658
Most of our operations have shifted to an omni-channel order fulfillment and distribution model.	3.917	0.974
Order fulfillment operations in our institution have inventory located in countless spots along the supply chain	3.887	0.928
Inventory in our company is appropriately accounted for and reflected in the stock ledger	3.843	0.786
We always keep accurate information relating to stock and order monitoring and tracking	3.812	0.843
Inventory visibility enables prepare for the unexpected	3.786	0.786
Inventory visibility has provided us with data and analytics needed to make better business decisions	3.743	0.863
Unseen inventory causes delays in processes and often incurring additional delivery costs	3.721	0.786
Aggregate	**3.879**	**0.865**

The respondents were also requested to indicate how inventory visibility affected performance of level 4 private hospitals in Kenya. From the results, the respondents indicated that with real-time tracking and monitoring of medical supplies, pharmaceuticals, and equipment, hospitals can maintain optimal stock levels and prevent shortages or overstocking. Respondents emphasized that this has minimized delays in treatment caused by unavailable resources, ensuring uninterrupted patient care. Additionally, they noted that inventory visibility has streamlined procurement processes, enabling hospitals to anticipate demand accurately, negotiate better terms with suppliers, and reduce wastage from expired or unused items.

Moreover, respondents explained that inventory visibility has enhanced cost management within the hospitals. By having a clear picture of stock movement and consumption patterns, hospitals can identify inefficiencies and implement measures to control costs. Respondents also mentioned that inventory visibility has improved accountability, as it allows for tracking the

usage of high-value items, reducing instances of theft or mismanagement. Furthermore, it has facilitated data-driven decision-making, enabling management to allocate resources more effectively and plan for future needs.

Technology Adoption and Performance of level 4 Private Hospitals

The second specific objective of the study was to establish the moderating effect of technology adoption on the relationship between inventory visibility and performance of level 4 private hospitals in Kenya. The respondents were requested to indicate their level of agreement on statements relating to technology adoption and performance of level 4 private hospitals. A 5 point Likert scale was used where 1 symbolized strongly disagree, 2 symbolized disagree, 3 symbolized neutral, 4 symbolized agree and 5 symbolized strongly agree. The results were as presented in Table 2.

From the results, the respondents agreed that their organization implements automated systems to handle repetitive and manual tasks. This is supported by a mean of 3.968 (std. dv = 0.905). In addition, as shown by a mean of 3.959 (std. dv = 0.885), the respondents agreed that the use of process automation improves the overall efficiency of their business operations. Further, the respondents agreed that employees are trained and comfortable using automated systems to perform their tasks. This is shown by a mean of 3.920 (std. dv = 0.605).

With a mean of 3.855 (std. dv = 0.981), the respondents agreed that their current IT infrastructure is scalable and supports the growth of their business. Further, with a mean of 3.841 (std. dv = 0.873), the respondents agreed that they regularly invest in upgrading their infrastructure to ensure high system reliability and performance. The respondents also agreed that their infrastructure includes advanced security measures to protect against cyber threats. This is shown by a mean of 3.838 (std. dv = 0.786).

From the results, the respondents agreed that their organization employs skilled IT professionals who are well-versed in the latest technologies. This is supported by a mean of 3.812 (std. dv = 0.786). In addition, as shown by a mean of 3.796 (std. dv = 0.897), the respondents agreed that IT experts in their organization actively contribute to improving their technological capabilities. Further, the respondents agreed that IT experts are involved in decision-making processes for the adoption of new technologies in the organization. This is shown by a mean of 3.768 (std. dv = 0.934).

Table 2: Technology Adoption and Performance of level 4 Private Hospitals

	Mean	Std. Deviation
Our organization implements automated systems to handle repetitive and manual tasks.	3.968	0.905
The use of process automation improves the overall efficiency of our business operations.	3.959	0.885
Employees are trained and comfortable using automated systems to perform their tasks.	3.920	0.605
Our current IT infrastructure is scalable and supports the growth of our business.	3.855	0.981
We regularly invest in upgrading our infrastructure to ensure high system reliability and performance.	3.841	0.873
Our infrastructure includes advanced security measures to protect against cyber threats.	3.838	0.786
Our organization employs skilled IT professionals who are well-versed in the latest technologies.	3.812	0.786

IT experts in our organization actively contribute to improving our technological capabilities.	3.796	0.897
IT experts are involved in decision-making processes for the adoption of new technologies in the organization	3.768	0.934
Aggregate	**3.815**	**0.867**

The respondents were further requested to indicate how technology adoption affected performance of level 4 private hospitals in Kenya. From the results, the respondents highlighted that the integration of electronic health records (EHR) and hospital management systems has streamlined administrative tasks, reduced paperwork, and improved communication between departments. Additionally, the implementation of telemedicine services has increased access to healthcare, particularly for patients in remote areas, while also reducing the burden on physical infrastructure. These advancements have led to quicker diagnoses, more accurate treatment plans, and enhanced patient satisfaction, as medical staff are able to make more informed decisions with real-time data.

However, some respondents pointed out challenges related to technology adoption, particularly in terms of costs and training. The initial investment in hardware, software, and training staff to efficiently use these technologies can be prohibitive for some hospitals. Additionally, there are concerns about the reliability of some systems and the need for regular updates and maintenance. Despite these challenges, most respondents agreed that the benefits of technology adoption far outweigh the drawbacks, and there is a growing recognition of the need for ongoing investment in healthcare technology to maintain high standards of service delivery and ensure long-term sustainability.

Test for Hypothesis One

The first objective of the study was to establish the influence of inventory visibility on performance of level 4 private hospitals in Kenya. The corresponding hypothesis was inventory visibility has no statistically significant influence on performance of level 4 private hospitals in Kenya.

A univariate analysis was therefore conducted to test the null hypothesis. From the model summary findings in Table 3, the r-squared for the relationship between inventory visibility and performance of level 4 private hospitals in Kenya was 0.259; this is an indication that at 95% confidence interval, 25.9% variation in performance of level 4 private hospitals in Kenya can be attributed to changes in inventory visibility. Therefore, inventory visibility can be used to explain 25.9% change in performance of level 4 private hospitals in Kenya. However, the remaining 74.1% variation in performance of level 4 private hospitals in Kenya suggests that there are other factors other than inventory visibility that explain performance of level 4 private hospitals in Kenya.

Table 3: Model Summary for Inventory Visibility

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.509[a]	.259	.258	.68365

a. Predictors: (Constant), Inventory Visibility

The analysis of variance was used to determine whether the regression model is a good fit for the data. From the analysis of variance (ANOVA) findings in Table 4, the study found out that that Prob>$F_{1, 249}$= 0.000 was less than the selected 0.05 level of significance. This suggests that the model as constituted was fit to predict performance of level 4 private hospitals in Kenya. Further, the F-calculated, from the table (409.35) was greater than the F-critical, from f-

distribution tables (3.879) supporting the findings that board can be used to predict performance of level 4 private hospitals in Kenya.

Table 4: ANOVA for Inventory Visibility

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	51.169	1	51.169	558	.000[b]
	Residual	22.832	249	0.0917		
	Total	74.001	250			

a. Dependent Variable: Performance of level 4 private hospitals in Kenya
b. Predictors: (Constant), Inventory Visibility

From the results in table 5, the following regression model was fitted.

$$Y = 0.287 + 0.366\ X_2$$

(X_2 is Inventory Visibility)

The coefficient results showed that the constant had a coefficient of 0.287 suggesting that if Inventory Visibility was held constant at zero, performance of level 4 private hospitals in Kenya would be at 0.287 units. In addition, results showed that Inventory Visibility coefficient was 0.366 indicating that a unit increase in Inventory Visibility would result in a 0.366 increase in performance of level 4 private hospitals in Kenya. It was also noted that the P-value for board coefficient was 0.001 which is less than the set 0.05 significance level indicating that Inventory Visibility was significant. Based on these results, the study rejected the null hypothesis and accepted the alternative that Inventory Visibility has a positive and significant influence on performance of level 4 private hospitals in Kenya.

Table 5: Beta Coefficients for Inventory Visibility

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	0.287	.076		3.776	.000
	Inventory Visibility	0.366	0.098	0.365	3.735	0.001

a. Dependent Variable: Performance of level 4 private hospitals in Kenya.

Test for Hypothesis Two

The first objective of the study was to establish the moderating effect of technology adoption on the relationship between inventory visibility and performance of private hospitals in Kenya. Moderation happens when the relationship between the dependent variable and the independent variables is dependent on a third variable (moderating variable). The effect that this variable has is termed as interaction as it affects the direction or strength of the relationship between the dependent and independent variable. To achieve the first research objective, the study computed moderating effect regression analysis. This (moderating effect regression analysis) also guided the study in testing the first research hypothesis. Technology adoption (M) was introduced as the moderating variable.

Ho_5: Technology adoption has no moderating effect on the relationship between inventory visibility and performance of private hospitals in Kenya.

The study combined inventory visibility to form a new variable X. The study then used stepwise regression to establish the moderating effect of technology adoption (M) on the relationship between independent variable (X) and performance of private hospitals in Kenya (Y).

From the model summary findings in Table 6, the first model for which is the regression between inventory visibility (X) without moderator, technology adoption (M) and interaction, the value of R-squared was 0.336 which suggests that 33.6% change in performance of private hospitals in Kenya can be explained by changes in inventory visibility. The p-value for the first model (0.000) was less than the selected level of significance (0.05) suggesting that the model

was significant. The findings in the second model which constituted inventory visibility, technology adoption and performance of private hospitals in Kenya (X*M) as predictors, the r-squared was 0.568. This implies that the introduction of technology adoption in the second model led to a 0.232 increase in r-squared, showing that technology adoption positively moderates performance of private hospitals in Kenya.

Table 6: Model Summary for Moderation Effect

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.580[a]	.336	.334	.65170	.336	150.295	1	249	.000
2	.754[b]	.568	.564	.52727	.232	79.360	3	247	.000

a. Predictors: (Constant), inventory visibility

b. Predictors: (Constant), inventory visibility, technology adoption, Interaction (X*M)

From the model summary findings in Table 7, the F-calculated for the first model, was 733.70 and for the second model was 654.29. Since the F-calculated for the two models were more than the F-critical, 3.879 (first model) and 2.641 (second model), the two models were good fit for the data and hence they could be used in predicting the moderating effect of technology adoption on the performance of private hospitals in Kenya.

Table 7: ANOVA for Moderation Effect

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	63.832	1	63.832	733.70	.000[b]
	Residual	21.675	249	0.087		
	Total	85.507	250			
2	Regression	107.958	3	35.986	654.29	.000[c]
	Residual	13.622	247	0.055		
	Total	121.58	250			

a. Dependent Variable: performance of private hospitals in Kenya

b. Predictors: (Constant), inventory visibility

c. Predictors: (Constant), inventory visibility, technology adoption, Interaction

Further, by substituting the beta values as well as the constant term from the coefficient's findings for the first step regression modelling, the following regression model will be fitted:

$Y = 1.387 + 0.608 X$

Where X is inventory visibility

The findings show that when inventory visibility is held to a constant zero, performance of private hospitals in Kenya will be at a constant value of 1.387. The findings also show that inventory visibility has a statistically significant effect on performance of private hospitals in Kenya as shown by a regression coefficient of 0.608 (p-value= .000).

By substituting the beta values as well as the constant term from model 2 emanating from the second step in regression modeling the following regression model was fitted:

$$Y= 3.876 + 0.220 X + 0.325 M + 0.283 X*M$$

Where X is inventory visibility; M is technology adoption and X*M is the interaction term between inventory visibility and technology adoption.

The findings show that when inventory visibility, technology adoption, interaction (X*M) are held to a constant zero, performance of private hospitals in Kenya will be at a constant value of 3.876. The model also indicated that inventory visibility had a positive and statistically significant effect on performance of private hospitals in Kenya as shown by a regression coefficient of 0.220 (p-value= 0.002). It is also seen that technology adoption had a positive and significant effect on performance of private hospitals in Kenya as shown by a regression coefficient 0.325. On the other hand, interaction of inventory visibility and technology adoption (X*M) also had a positive and significant effect on performance of private hospitals in Kenya as shown by a regression coefficient of 0.283 (p-value= 0.000).

It is therefore seen that determinants of inventory visibility on its own has 22% effect on performance of private hospitals in Kenya. However, when interacted with technology adoption, it has an effect of 28.3%. This is a clear indication that introduction of technology adoption as moderating variable has positive influence on performance of private hospitals in Kenya. The study therefore rejects the null hypothesis and accepts the alternative that technology adoption has significant moderating effect on the relationship between inventory visibility and performance of private hospitals in Kenya.

Table 8: Beta Coefficients for Moderation Effect

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.387	.194		7.163	.000
	inventory visibility	.608	.050	.580	12.260	.000
2	(Constant)	3.876	1.009		3.841	.000
	inventory visibility	.220	.067	.782	3.284	.002
	technology adoption	.325	.048	.310	6.748	.000
	Interaction (X*M)	.283	.065	1.661	4.357	.000

a. Dependent Variable: Performance of private hospitals in Kenya.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

Inventory Visibility and Performance of Private Hospitals

The fourth null hypothesis test was ‘inventory visibility has no significant effect on performance of private hospitals in Kenya. The study found that inventory visibility is statistically significant in explaining performance of private hospitals in Kenya. The influence was found to be positive. This means that unit improvement in inventory visibility would lead to an increase in performance of private hospitals in Kenya’. Based on the findings, the study concluded that inventory visibility positively and significantly influences with performance of private hospitals in Kenya.

Technology Adoption and Performance of Private Hospitals

The fifth research hypothesis tested was that ‘Technology adoption has no significant moderating effect on the relationship between inventory visibility and performance of private hospitals in Kenya. The study revealed that technology adoption is statistically significant in explaining performance of private hospitals in Kenya. It was also found that the interaction between technology adoption and inventory visibility had positive, statistically significant effect on performance of private hospitals in Kenya. Based on the findings, the study concludes

that technology adoption has significant moderating effect on the relationship between inventory visibility and performance of private hospitals in Kenya.

Recommendations

Inventory Visibility

Invest in advanced inventory management software that allows real-time tracking and monitoring of medical supplies, medications, and equipment. This software should provide visibility into inventory levels, expiration dates, and usage patterns. Utilize barcoding and radio-frequency identification (RFID) technology to tag and track inventory items. These technologies enable hospitals to monitor the movement and usage of items efficiently, reducing the risk of stockouts or overstocking.

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