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RESEARCH ARTICLE

# Digitalization and supply chain management: impact assessment of healthcare technology implementation on service delivery in public hospitals, Lagos, Nigeria

**Busayo Qazeem, Ibikunle**

Department of Public Administration, Lagos State University, Ojo, Nigeria

Corresponding author: Busayo Qazeem Ibikunle. Email: busayo.ibikunle@lasu.edu.ng
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**Abstract**

The study examined digitalization and supply chain management: assessing healthcare technology implementation for service delivery in Lagos General Hospital, Nigeria. It employed both qualitative and quantitative techniques. It analysed 293 questionnaires using multiple-regression, and Pearson. It used thematic to analyse data from interview and focused group discussion. The results showed a value of 3.28, with a standard deviation of 1.46, indicating the effectiveness of healthcare technology in general hospital. The $H_2$ (R2 =.078, R = 278, F (2,290) = 12.19; p<.001) revealed digitalization-supply chain management have effect on Service-Delivery. The $H_3$ (t = 3.71; B =.234; p<.001) revealed SCM can have an effect on achieving Sustainable-Development-Goal3. $H_4$ (r =.070; p >.05) Revealed E-Medical Record does not have an effect on death rate in Lagos State, Nigeria. The study recommended, among other things, that all government and private healthcare facilities should harmonise EMR through SCM.

**Keywords:** Digitalization; Delivery; Healthcare; SCM; Service

## Introduction

In recent times, urgent concerns have captured the attention of policymakers worldwide regarding the need to maintain citizens' well-being. Sustainable Development Goal (SDG) 3 emphasises that substantial investment in the universal healthcare sector will enhance citizens' quality of life. Therefore, the government's active participation and monitoring of the citizens medical well-being is crucial for service delivery sustainability (Habib, Chowdhury, Sabah, & Debnath, 2022). Policymakers in industrialised states such as the United States of America (USA), the United Kingdom (UK), Canada, Germany, etc. are addressing the needs of technology and optimising the supply chain to deliver appropriate healthcare services while strategically minimising costs (Bialas, Bechtsis, Aivazidou, Achillas, Aidonis, 2023). Recently, Africa has fulfilled its responsibility by convening conferences and engaging specialists from various African countries to address the persistent health and environmental challenges faced by its citizens. These innovations and conferences have facilitated the implementation of supply chain inclusion in public services, with the aim of enhancing efficiency in service delivery. As a result, Lagos state, Nigeria, has partnered with international organisations, the health sector's supply chain, and other entities to provide technology as a substitute for manual healthcare services (Oluwadare, Akintayo, Babatunde, Olanrewaju, 2024).

Supply chain digitalization encompasses the essential competencies required to effectively manage diverse manufacturing capacities and integrate various technological systems. Supply chain digitalization refers to the deliberate use of technology to efficiently convey goods and services while maintaining long-term competitiveness. The approach involves a proactive, relational, and coordinated strategy for effectively using digital capabilities (Ikegwuru & Ihunwo, 2023). One of the objectives of supply chain management (SCM) is to facilitate the transfer of digitalized medical records, thereby replacing the traditional manual storage method. This transition allows for convenient and prompt retrieval of records when required. The SCM has facilitated the adoption and distribution of electronic medical record cards (EMR) to general hospitals in order to streamline the medical consultation process. This involves granting patients the ability to retain possession of their medical records in order to prevent the loss of their files (Ogbonna, Nduka, Ngwoke, Anetoh, and Adenola, 2022). Healthcare policy has also encouraged the adoption of telemedicine, which utilises information and communication technology (ICT) to enable patients to remotely consult with their preferred medical practitioners, eliminating the need for in-person meetings. This initiative intends to improve the delivery of healthcare services (Akwaowo, Sabi, Ekpenyong, Isiguzo, Andem, Maduka, Dan, Umoh, Ekpin, and Uzoka, 2022). Based on the foregoing, the study aims to investigate digitalization and supply chain management, evaluating the effects of healthcare technology implementation on service delivery in general hospitals in Lagos State, Nigeria. Located in the southwestern region of Nigeria, Lagos State boasts a population of over 21 million, positioning it as one of the most densely populated states in Nigeria, according to the 2006 national census. Lagos State serves as a prominent economic centre in Nigeria. With a total GDP of $267 billion (PPP), it would rank as the fifth largest economy in Africa if it were considered a country. Lagos State has the most elevated level of human development and serve as a home for those seeking for greener pasture. Nevertheless, Lagos faces healthcare challenges due to its high population and mortality rate. Over the years, the state government has formulated policies to effectively mitigate the challenge; unfortunately, the policies have failed to provide any significant impact. However, the onset of the COVID-19 pandemic exposed policymakers to developing technologies with the potential to supplant manual healthcare services. This invention has also facilitated the integration of a supply chain network into public service. The Lagos State Government has capitalised on innovation by partnering with private firms to facilitate the supply of electronic medical tools and data analytics in general hospitals. The belief was that the innovation would overcome health-related challenges. The policy has also necessitated the inclusion of supply chain management in public service to ensure the processing of goods, logistics, procurement, and management of e-medical cards and pharmacy products. Recent studies argued that the effectiveness of healthcare services in Lagos has been questionable, despite the implementation of a digitalization policy. In this context, scholars in the related field have engaged in a debate on the influence of healthcare technology on the delivery of health services. Researchers have also discovered several findings regarding the integration of supply chain management (SCM) in public service and its impact on the digital transformation process. Several studies, including those by Ogbonna, Nduka, Ngwoke, Anetoh, and Adenola (2022), Akwaowo, Sabi, Ekpenyong, Isiguzo, Andem, Maduka, Dan, Umoh, Ekpin, and Uzoka (2022), and Ikegwuru & Ihunwo (2023), have found that supply chain inclusivity has significantly improved healthcare service delivery in Nigeria. On the contrary, Oluwadare, Akintayo, Babatunde, Olanrewaju (2024), Ikegwuru, and Nwokah (2022) concentrated on the implementation of digitalization through supply chain management (SCM) for the oil industry. Given the continuous growth of technology, they stressed the importance of conducting dedicated research on the adoption of supply chain digitalization in Nigeria's oil and gas sector. The previous studies on supply chain management have received accolades for their unique viewpoints and findings. The empirical review of this study encompasses some studies on healthcare technology, which did not clearly assess the gaps in healthcare service delivery both before and after the introduction of technology. Also, only a few of the previous studies revealed findings on

patients' mortality, while other studies focused on telemedicine alone without evaluating the effectiveness and accessibility of e-medical cards. As a result, this study seeks to fill the knowledge gap by assessing the impact of healthcare technology on patients' satisfaction with the influence of digitalization and supply chain inclusion in service delivery. Again, the study fills the knowledge gap by evaluating the e-medical records and their influence on the reduction of mortality rates in Lagos State, which previous studies have failed to clarify. Furthermore, the study confirms the integration of supply chain management practices into public service and its role in achieving sustainable development in Lagos State, Nigeria. In this consonant, the following objectives were developed for the study based on the gaps it aims to fill:

The study's objectives are;

a. To assess the effective use of healthcare technology among government health facilities in Lagos State, Nigeria;
b. To evaluate the patients' satisfaction with the influence of the implementation of supply chain practices and digital healthcare services in Lagos State, Nigeria;
c. to evaluate how inclusive SCM practices is in delivering public services and achieving Sustainable Development Goal (3) in Lagos State, Nigeria,
d. to evaluate the extent to which the implemented EMR has significantly aided the reduction of mortality rates in public hospitals in Lagos State, Nigeria

We set out the following pertinent research questions in an effort to achieve the various objectives mentioned above:

a. How effective is the use of healthcare technology among government health facilities in Lagos State, Nigeria?
b. Is there any significant influence of the implementation of supply chain inclusion and digital healthcare services on patients' satisfaction in Lagos State, Nigeria?
c. To what extent has supply chain inclusion in healthcare services influence Lagos State general hospitals in attaining Sustainable Development Goal 3?;
d. To what extent has the implementation of EMR significantly aided the reduction of mortality rates in public hospitals in Lagos State, Nigeria?

To the researchers and students involved in the related field: This study serves as veritable material in the field of public healthcare and education among public health workers in Lagos State, Nigeria. Again, the study aids in the improvement of healthcare service delivery, which in turn drastically reduces the mortality rate in Lagos State, Nigeria. Furthermore, the study educates and exposes the importance of Sustainable Development Goal 3 (3) and how to attain it. It provides ready-made data and statistics about the effectiveness and pitfalls of the implemented EMR cards for adequate decision-making. It also gives significant importance to digitalization in SCM networks in aiding the improvement of service delivery in the public sector. And again, it helps inform Nigerian public health regulatory authorities of the need for sensitization and monitoring for proper service delivery.

## Literature Review

Globally, there has been an increasing trend towards digitalizing supply chain networks, and numerous organisations are now acknowledging the significance of digitizing their supply chains to maintain competitiveness in the market (Gautr, 2020). Digitization in supply chains offers advantages such as heightened efficiency, greater accuracy, and improved visibility. Organisations may optimise their supply chain processes, lower expenses, and enhance customer satisfaction by leveraging digital technologies like big data analytics,

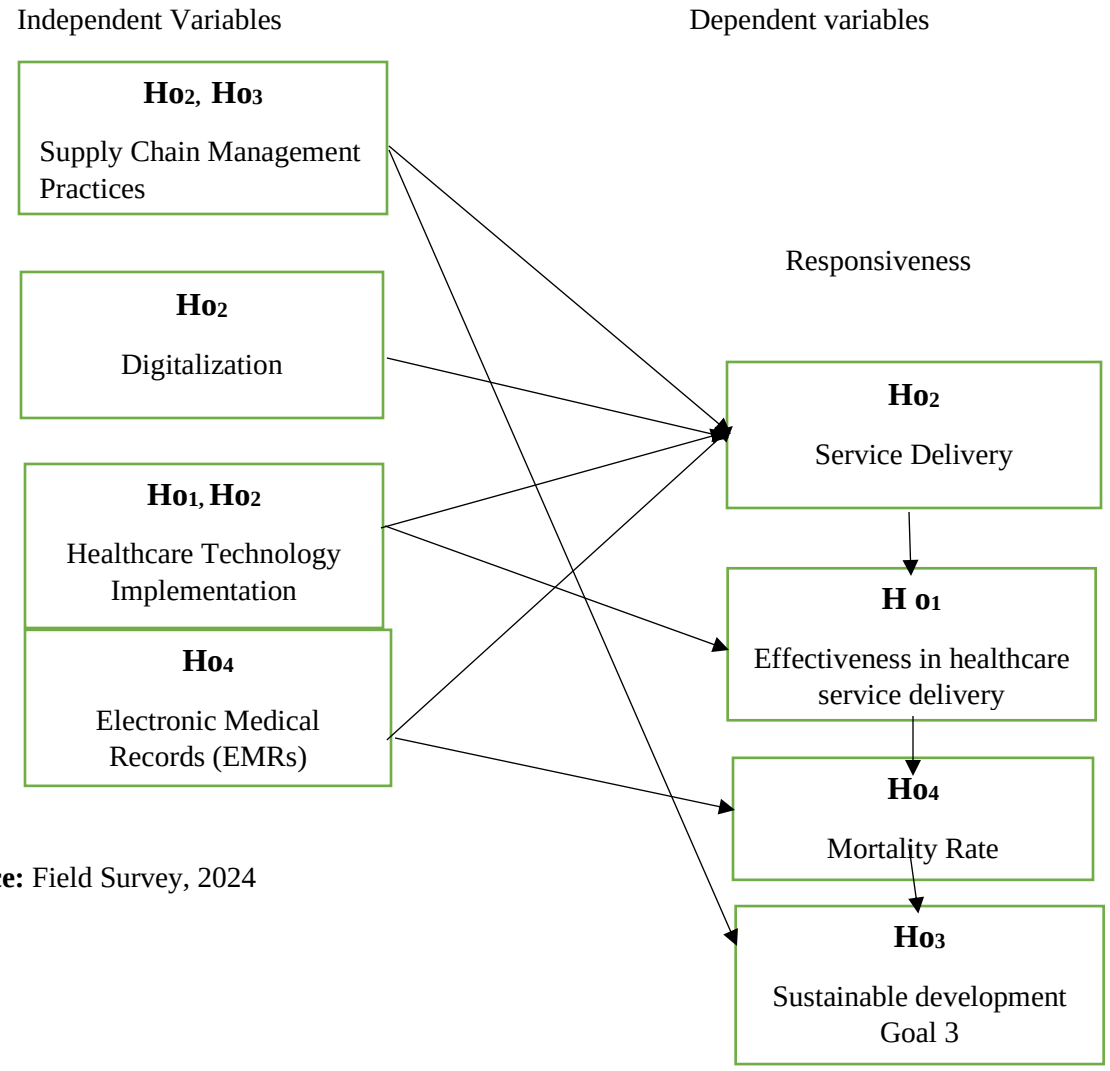
blockchain, and the Internet of Things (IoT). Nevertheless, the implementation of digitization in supply chains presents various obstacles, including the necessity for substantial investments in technology and infrastructure, the demand for specialised skills and experience, and the possibility of cybersecurity vulnerabilities (Liu & Chiu, 2021). Despite these obstacles, numerous organizations recognize the potential advantages of digitization in supply chains and are allocating resources to digital technology to enhance their operations. We anticipate that in the future, digitization will become more prevalent in supply chain management. Organisations that do not embrace digital technology may face a competitive disadvantage. According to Legner, Eymann, Hess, Matt, Böhmann, Drews, Mädche, Urbach, and Ahlemann (2017), digitalization as the process of transforming analogue signals into a digital format, along with the subsequent impacts of these technologies during their adoption and use. They additionally contended that digital technology not only improves data analytics but also enables streamlined processes that produce outcomes. Abdirad & Krishnan (2020) support the idea that organizations worldwide are increasingly acknowledging the substantial benefits of digitalization, which provides more advantages to many industries.

Sanders and Swink (2020) propose a comprehensive link between digitalization and the supply chain, asserting that digitalization in the supply chain entails the widespread use of digital technology for the purpose of planning and executing transactions, communications, and activities. These frequently involve the use of big data analytics (BDA) and advanced manufacturing technology. Sensors, intelligent agents' decentralized control, cutting-edge robotics, augmented reality, state-of-the-art tracking and tracing technologies, and additive manufacturing (3D printing) are all examples (Liu & Chiu, 2021). In general, the process of converting supply chains into digital form has the capacity to result in substantial enhancements in effectiveness, precision, and transparency. Organizations that allocate resources to digital technologies are likely to gain an advantage in the future. Researchers have formulated diverse conceptions of technology. Arnulf (2019) defines it as a combination of hardware and software, encompassing the understanding of how to create a product utilising both mechanical and electronic methods. We can also view technology as the practical application of knowledge within a specific field. Our offerings include engineering technology, health technology, and social technology, among other disciplines. Arnulf (2019) delineates two primary components of technology: the physical component, encompassing items such as products, tools, equipment, blueprints, techniques, and processes, and the information component, encompassing technical knowledge, skills, reliability, and quality control. Technology is defined as the combination of physical items or artefacts, the process of creating them, and the significance attributed to these physical objects. These researchers define technology as the integration of physical items and interconnected information processes aimed at providing humanity with a purposeful existence (Osakede, Igbokwe-Ibeto, & Nwalozie, 2023). The field of implementation science has witnessed significant growth, leading to the creation of several guidelines and recommendations by various organisations and researchers (World Health Organisation, 2019). These guidelines and recommendations aim to facilitate the deployment of digital health technologies in healthcare settings (Powell, Fernandez, Williams, Aarons, Beidas, Lewis, et al., 2019). Nevertheless, there remains a dearth of evidence about the application of digital health technologies at both the meso- and micro-levels, as well as the absence of guidelines for effectively integrating these technologies into specific clinical contexts. Successful and sustainable implementation in health care necessitates the adoption of a comprehensive approach and the use of effective tactics at all levels.

According to Balas and Chaman (2018), they have not thoroughly investigated the implementation processes of digital health tools in German ICUs, excluding the concept of tele-ICU. Tele-ICU involves enhancing local ICU capacity by leveraging external expertise through video consultation, remote monitoring, and web-based access to patient data management systems (Mosch, Poncette, Spies, Weber-Carstens, Schieler, Krampe, and Balzer, 2022). The healthcare supply chain is a complex system that oversees the movement of items, services, and

information to achieve healthcare service delivery (Callender & Grasman, 2010). According to Gartner (2022), supply chain expenditures account for 40 to 50% of a healthcare provider's total costs.

**Conceptual Model**




**Source:** Field Survey, 2024

Figure 1: a Model of multiple linear regression analysis study

This suggests that improving supply chain performance might greatly increase operational efficiency and save expenses (Pal, Baral, Mukherjee, Venkataiah, & Jana, 2022). While other industries implement many SCM strategies to reduce their supply chain expenses, the healthcare industry is evidently falling behind (Beaulieu & Bentahar, 2021).Digitalization, on the other hand, facilitates the generation and administration of electronic medical records (EMRs), which encompass patient data, medical background, and treatment strategies. Healthcare providers can exchange this information, which improves service continuity and supply chain management (Björkdahl, 2020). Digitization also offers immediate and constant access to information on supply chain processes, allowing healthcare providers to monitor the movement of medical supplies, equipment, and

pharmaceuticals from the manufacturer to the patient. Digitalization facilitates the implementation of automated inventory management systems in healthcare, ensuring the availability of necessary supplies and equipment while minimizing stockouts and overstocking, thus enhancing the efficiency of health services (Bialas et al., 2023).

Hypotheses Development

**$Ho_1$**: Healthcare Technology would not be effective in government healthcare facilities in Nigeria State, Nigeria

**$Ho_2$**: Implementation of supply chain practices and digital healthcare services will not jointly and independently influence service delivery in public hospitals in Lagos State, Nigeria.

**Ho3:** Inclusive SCM practices will not significantly influence the achievement of Sustainable Development Goal (3) in delivering public services in Lagos State

**$Ho_4$**: EMR will not significantly aid the reduction of mortality rates in public hospitals in Lagos State, Nigeria

The above-mentioned conceptual model connected the independent variables with the dependent variables using multiple linear regression analysis, linear regression, and the Pearson product moment correlation coefficient. The model presented four (4) hypotheses to see if one variable affected another. We compare and juxtapose the study's results with the theoretical evidence and empirical findings of previous studies.

**Empirical Review**

This topic has been the focus of several empirical studies. Akwaowo, Sabi, Ekpenyong, Isiguzo, Andem, Maduka, Dan, Umoh, Ekpin, and Uzoka's study, "Sustainable Supplier Selection Factors and Supply Chain Performance in the Nigerian Healthcare Industry," published in 2022, found that the main reasons for looking at a supplier were those that were good for the economy. In fact, three of the four dimensions of economic sustainability, namely contract (purchase) cost, delivery timeliness, and quality of product delivered, occupied the top three rankings of healthcare supplier selection criteria. Ogwel, Otieno, and Odhiambo-Otieno (2020), in their study titled "Cloud Computing Adoption by Public Hospitals in Kenya: A Technological, Organisational, and Behavioural Perspective," discovered that cloud computing has eight indicators that determine health records. In addition, Haskewa et al. (2015) did a study called "Implementation of a cloud-based electronic medical record for maternal and child health in rural Kenya." The study looked at how the cloud-based EMR was used and compared it to the paper record that was already in place. The cloud-based EMR model allows for real-time data sharing across multiple sites, potentially improving access to data at various care levels. However, Ogbonna, Nduka, Ngwoke, Anetoh, and Adenola (2022) took a different view by arguing that the problem with healthcare records in Nigeria goes beyond EMR. The inability to use the EMR in another government facility has led to challenges in supply chain management (SCM). As a result, it appears that there is a risk in the supply chain. Bialas et al. (2023) conducted a study to investigate the impact of adopting enterprise resource planning (ERP) systems in hospitals on the digitalization of the healthcare supply chain. The study focused on identifying the influencing factors and cost performance associated with this adoption. They implemented a framework to verify its accuracy using structural equation modelling (SEM), utilising data obtained from 107 Greek public hospitals. The findings indicate that factors such as technological and organisational readiness, hospital size, governmental legislation, and perceived benefits significantly influence the level of ERP system adoption. Additionally, they

establish a statistically significant correlation between the use of ERP systems and hospital supply chain expenses. Bialas et al. (2023) conducted a closely related study.

Nevertheless, the current emphasis lies on the economic efficiency of implementing a technologically advanced supply chain system in public hospitals for healthcare purposes. They evaluate the research model by analysing survey data obtained from Greek public hospitals using structural equation modeling. The study findings indicate that technology readiness, organisational readiness, perceived benefits, and hospital size significantly influence the adoption of these techniques in hospital supply chains. Additionally, they demonstrate a statistically significant correlation between the implementation of supply chain management methods and enhanced cost performance in hospitals. This indicates a larger need for hospitals to fully utilise these strategies. The researcher applauds the previous studies on the related topic for their various perspectives. However, when compared side-by-side with the empirical and theoretical evidence, this study presents unique information that previous studies have failed to consider. This study addresses a research gap by examining the use of digitalization by public policymakers in healthcare service delivery, its effectiveness in reducing the risk of death among mothers and children, its potential for use in other health facilities, and the resilience strategies employed by the actors to prevent service delivery from becoming ineffective in Lagos state general hospitals. Based on the empirical evidences cited above, this study also examined theoretical backings. Emphasising the TOE theory and its relevance to the study.

**Theoretical Framework**

The study not only establishes the practicability of the empirical findings, but it also introduces relevant theories related to the topic. Stakeholder theory, principal-agent theory, technological advancement theory, and technological organisation and environment theory (TOE) are just a few examples. For this purpose, the TOE is considered suitable. Between the 1950s and early 1960s, technological, organisational, and environmental (TOE) theory gained popularity, led by Harold and Albert. The Tavistock Institute carried out the experiment, which has since gained worldwide use (Fatile & Adejuwon, 2017). Fernando, Rozuar, and Mergeresa (2021) asserted that the theory encompasses extensive knowledge of an organisation's formation and operation. Scholars have recently grouped technological organisation and environmental (TOE) theories to evaluate empirical facts about the existence of technological innovation (Fatile & Adejuwon, 2018). DiPietro proposed the TOE theoretical framework in the 1990s, according to Oliveira and Martins (2011), and since then, people have used it to explain ICT innovation within the organisation and its environment. TOE asserts that we cannot overemphasise the use of technology in organisations and environments. Any organisation seeking efficiency and effectiveness must devote considerable attention to technology. The statement also reaffirmed that, without digital transformation, no environment can function or advance.

However, critics have pointed out that this theory fails to take into account human effort and ability. While it's true that every machine experiences malfunctions, it's important to remember that humans ultimately value their contributions. There was a debate on whether digitization was replacing human activities. Many contemporaries argued that the rise of digital technology would result in job losses. Nevertheless, the theorist clarified that the essence of TOE is not to replace humans; rather, it will aid the effectiveness of human effort. The study uses this theory to explain why technology is needed in the workplace and how important it is for smooth operations. Given the devastating impact of technology on the movement of process goods to end users, this theory analyses the smoothness of the healthcare information system in terms of service delivery. The study also establishes a connection between the use of digital records and the prolonged waiting times and mortality rates of patients in

general hospitals, while also acknowledging the crucial role of smooth logistics for these goods. Because of this importance, the study draws relevance from the current findings.

## Methodology

This study adopts a cross-sectional survey design. The study's involvement stemmed from its predictive capacity and ability to gather information about all sample cases. The study chose this design because it made the researchers more accessible by allowing them to question and discuss the issues with the participants. The data collection process employed a structured questionnaire. To improve questionnaire completion, the study coded the views of the respective participants on the intended understanding issues; the study also adopted a five-point Likert-type scale measurement: strongly agree, agree, undecided, disagree, and strongly disagree. The research ground for the collection of data was a Lagos State-Owned Secondary Health Facility (Alimosho General Hospital). Alimosho General Hospital's population includes registered patients (outpatients), staff, and management, for a total of 2037. The study generated a sample size of 335 using the Taro Yamane sample size determination formula and was further distributed in the following table:

**Table 1:** Distribution list

| Employee Category | Total Respondents | Male | Female |
|---|---|---|---|
| Medical Doctors | 49 | 27 | 22 |
| Admin staff | 56 | 3 | 53 |
| Laboratory Scientists | 24 | 11 | 13 |
| Logistics and procurement officers | 67 | 17 | 50 |
| Accounts and Records | 31 | 20 | 11 |
| Out-patients | 108 | 50 | 58 |
| Total | 335 | 128 | 207 |

From the table 1 above, the study employed both probability and non-probability sampling techniques. The study necessitated patient opinions and availability of the participants justified for the convenience sampling technique. Furthermore stratified sampling technique was used to strata the department for sampling. The researcher distributed 335 questionnaires, retrieving 293 of them. The study analysed the questionnaire results using the descriptive statistics, multiple linear regression and Pearson product moment correlation coefficient from the Statistical Package for Social Science (SPSS), and lastly, for the qualitative research, the study used thematic analysis to analyse informant interviews and focused group discussions data.

## Analysis and Interpretation of Findings

Hypothesis one

Table 2 above reveals that the descriptive statistics on healthcare technology in general hospitals indicate that all respondents hold similar opinions about the subject matter. The grand mean is 3.28, which indicates that, on average, the respondents agreed with most of the statements on a high scale in relation to healthcare technology. The overall standard deviation of 1.46 suggests a clustering of responses around the mean, as all statement standard deviations exceeded 1.

**Table 2.** Healthcare Technology and Effectiveness

| The use of healthcare technology in Lagos state general hospital | Level of Agreement (%) (n= 293) | | | | | Average | |
|---|---|---|---|---|---|---|---|
| | SA | A | U | D | SD | Mean | SD |
| The use of healthcare technology in your daily work is effective | 34.1 | 13.7 | 12.6 | 12.3 | 27.3 | 3.15 | 1.64 |
| Healthcare Technology is easy and insightful for individual use in Alimosho general hospital | 30.7 | 20.5 | 9.2 | 22.5 | 17.1 | 3.25 | 1.51 |
| The healthcare technology has not improve the patient care in Alimosho general hospital, Lagos state ] | 33.1 | 6.8 | 15.4 | 17.1 | 27.6 | 3.00 | 1.63 |
| You often experience technical issues as regards to healthcare technology in Alimosho general hospital, Lagos state | 41.0 | 23.9 | 3.4 | 27.3 | 4.4 | 3.69 | 1.36 |
| Grand Mean | | | | | | 3.28 | 1.46 |

Source: Field Survey Data (June, 2024)

Hypothesis Two

**Table 3** Supply Chain Practices and Service Delivery

| SCM & SD | Level of Agreement (%) (n=293) | | | | | Average | |
|---|---|---|---|---|---|---|---|
| | SA | A | U | D | SD | Mean | SD |
| You often experience stock outs or shortages of critical supplies in Alimosho general hospital, Lagos state | 45 | 35 | 13 | 80 | 120 | | |
| The current inventory management system in Alimosho general hospital is highly effective | 113 | 11 | 10 | 20 | 40 | | |
| You often satisfy with the timeliness of deliveries from your primary supplier to Alimosho general hospital | 80 | 120 | 13 | 50 | 30 | | |
| you have experienced several time, supply chain disruptions in the past year | 60 | 43 | 10 | 70 | 110 | | |
| Grand Mean | | | | | | | |

Source: Field Survey Data (June, 2024)

**Table: 3.1** Model Summary

| | | | | Std. Error | Change Statistics | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Model | R | R Square | Adjusted R Square | of the Estimate | R Square Change | F Change | df1 | df2 | Sig. F Change |
| 1 | .278[a] | .078 | .071 | 1.66087 | .078 | 12.191 | 2 | 290 | .000 |

a. Predictors: (Constant), Digital Healthcare Services, Supply Chain Management

It was seen in the multiple regression table 3.1 above that putting in place supply chain and digital services has an effect on service delivery in public hospitals in Lagos State, Nigeria (R2 =.078, R = 278, F (2,290) = 12.19; p<.001). In Lagos State, both supply chain implementation and digital healthcare services accounted for 7.8% of service delivery in public hospitals. Therefore, we reject the null hypothesis H0 and accept the alternate hypothesis (H1).

Hypothesis Three:

**Table 4**: Supply Chain Practices and SDGs

| SGD goal (3) | Level of Agreement (%) (n=293) | | | | | Average | |
|---|---|---|---|---|---|---|---|
| | SA | A | U | D | SD | Mean | SD |
| You often do not have access to a healthcare provider when needed in Alimosho general hospital, Lagos state | 69 | 70 | 30 | 78 | 46 | | |
| You are satisfied with the inventory management on healthcare system in Lagos state general hospital, Nigeria | 180 | 70 | 30 | 10 | 3 | | |
| You have confidence in the ability of your healthcare stock system to handle epidemics or pandemics | 100 | 69 | 20 | 78 | 26 | | |
| You often receive health promotion or education programmes in Alimosho general hospital | 29 | 39 | 10 | 89 | 126 | | |
| Grand Mean | | | | | | | |

**Table 4.1** Coefficients[a]

| Model | | Unstandardized Coefficients | | Standardized Coefficients | | |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | t | Sig. |
| 1 | (Constant) | 9.613 | .786 | | 12.226 | .000 |
| | Supply Chain Management | .234 | .063 | .212 | 3.705 | .000 |

a. Dependent Variable: SDG goal (3)

According to the linear regression table 4.1 above, inclusive supply chain management significantly influences the achievement of Sustainable Development Goal (3) in delivering public service in Lagos State hospitals (t = 3.71; B =.234; p<.001). In essence, this implies that we will reject the null hypothesis and accept the alternate hypothesis.

Hypothesis Four

**Table 5:** EMRs and Mortality Rate

| EMR cards | Level of Agreement (%) (n=148) | | | | | Average | |
|---|---|---|---|---|---|---|---|
| | SA | A | U | D | SD | Mean | SD |
| You are satisfied with the accuracy of patient data in the EMR cards in Alimosho general hospital, Lagos state. | 120 | 80 | 13 | 35 | 45 | | |
| There are often experience of technical issues with the EMR system in Alimosho general hospital | 40 | 20 | 10 | 110 | 113 | | |
| There are level of significant confidence in the security and privacy of patient data in the EMR | 30 | 50 | 13 | 120 | 80 | | |
| The EMR system is very easy to navigate in Alimosho general hospital | 60 | 43 | 10 | 70 | 110 | | |
| Grand Mean | | | | | | | |

**Table 5.1** Mortality Rate

| Mortality Rate | Level of Agreement (%) (n= 145) | | | | | Average | |
|---|---|---|---|---|---|---|---|
| | SA | A | U | D | SD | Mean | SD |
| There have been significant changes in mortality rate and quality of healthcare since EMR implementation | 36 | 40 | 27 | 100 | 60 | | |
| There are satisfaction in the EMR system's user interface and functionality | 90 | 40 | 37 | 46 | 50 | | |
| EMR system often impacted your clinical workflows and decision-making | 97 | 20 | 45 | 50 | 81 | | |
| Mortality rate is usually caused by the delay in manual filing system in Alimosho general hospital. | 120 | 70 | 10 | 80 | 13 | | |
| Grand Mean | | | | | | | |

The table 5.1 above reveals the hypothesis which stated that EMR will significantly aid the reduction of mortality rates in public hospitals in Lagos State, Nigeria was tested using Pearson Product Moment Correlation Analysis. The result is presented in the table below:

**Table 5.2** Correlations

| | | EMR | Mortality rate |
|---|---|---|---|
| EMR | Pearson Correlation | 1 | .070 |
| | Sig. (2-tailed) | | .235 |
| | N | 148 | 145 |
| Mortality rate | Pearson Correlation | .070 | 1 |
| | Sig. (2-tailed) | .235 | |
| | N | 148 | 145 |

The table 5.2 above reveals no significant relationship between EMR and mortality rate in public hospitals in Lagos State, Nigeria ($r = .070$; $p > .05$). This, in essence, means that EMR does not significantly reduce hospital mortality rates. Therefore, we will accept the H0 and reject the H1.

**Analysis of the Qualitative Data**

The study conducted focused group discussions (FGD) and key informant interviews (KII) to gather qualitative data. It also conducted an interview section with the head of procurement and head of administration at Alimosho general hospital in Lagos, and arranged a FGD with five department heads (pharmacist, records, laboratory, service delivery director, and public affairs office). The combination between the qualitative and quantitative analyses formed the study's findings (Adenugba, Fadoju, & Akhuetie, 2017). There are five ways to identify FGD: single focus group, two-way focus group, dual moderator focus group, duelling moderator focus group, and respondent moderator focus group. Depending on the size, one could consider FGD as a large or small group. Individual FGDs was conducted for this study. This type of FGD is a form of group interview that capitalises on communication between research participants and a facilitator (Nyunba, Wilson, Derrick, & Mukherjee, 2018).

**Key Informant Interview**

Theme one**:** The study's initial objective led to the formulation of two inquiries. The first question was, how effective is the use of healthcare technology in Alimosho General Hospital? The second question was, "is there any significant impact of supply chain digitalization on the effectiveness of healthcare technology?'

Response 1 Answer: Healthcare technology is very effective compared to previous operations where we ran healthcare administration on a manual basis. Everyone can attest to the effectiveness of the healthcare technology in its current form. It relieves us of some stress from attending to patients all day long.

Response 2 Answer: Supply chain management and digitalization have a significant impact on our healthcare providers' operations. The supply chain network, with the use of digitalization, has helped to track the logistics of healthcare goods from the manufacturer firm to the destination. It has also had an impact on the general hospital's supply of goods.

**Table 6:** Summary of responses on theme one

| Questions | Responses | Participants | Percentage |
|---|---|---|---|
| The nature of healthcare technology | • Effective<br>• Ineffective | • 2of2<br>• | • 100%<br>• 00% |
| Significant of supply chain digitalization | • Impactful<br>• Un-impactful | • 2of2<br>• 0 | • 100%<br>• 00% |

**Source:** Field Survey, May, 2024

In the table 6 above, we conducted an interview with the administrative head and procurement officer of Alimosho General Hospital, as indicated in the table above. They positively responded to all the questions posed, demonstrating 100% effectiveness and impact. The analysis focused on the 100% response.

Theme two: From the second objective of the study, two questions were drawn from. The second question is, 'What is your perception of patients' outcomes since the inclusion of the supply chain in public service?' And the second question is, 'Is there any significant difference in service delivery since the digital and supply chain inclusion in healthcare services?'

Response Answer 1: The outcome for the patients has been satisfying since we adopted digitalization and supply chain inclusion in healthcare services. Our service charter unit usually conducts surveys for inpatients and outpatients, and the results have been positive.

Response 2: Answer: Technology has improved our mode of service. Supply chain management, coupled with technology, has significantly assisted in the area of goods tracking and monitoring, invariably enhancing swift service in Alimosho General Hospital.

**Table 7**. Summary of responses on theme one

| Questions | Responses | Participants | Percentage |
|---|---|---|---|
| SCM and healthcare | • Positive<br>• Negative | • 2of2<br>• | • 100%<br>• 00% |
| SCM and Digitalization on healthcare service | • Impactful<br>• Un-impactful | • 2of2<br>• 0 | • 100%<br>• 00% |

Source: Field Survey, May, 2024

The table 7 above indicates that we conducted an interview with the administrative head and procurement officer of Alimosho General Hospital. Out of the questions posed, we found that the respondents gave 100% positive and impactful responses. The analysis focused on the 100% positive response.

Theme three**:** From the third objective of the study, two questions were drawn. The first question is, 'is there are significant effect of SCM on SDG3?' And the second question is, 'should SCM be a factor that determine the attainment of SDG3?'

Responses Answer 1: SCM is encompassing when it comes to SDG. The goal 3 emphasised on wellbeing and good health of the citizens. All these cannot be attained if logistics and procurement of the goods needed to meet up with the goal are not effectively managed, so SCM plays a vital role in SDG 3.

Response 2 Answer: like I said earlier, SCM importance cannot be overemphasised in attaining SDGs, adopting SCM in connection to SDGs would be helpful in attaining the goals.

**Table 8.** Summary of responses on theme one

| Questions | Responses | Participants | Percentage |
|---|---|---|---|
| SCM and SD | • Positive<br>• Negative | • 2of2<br>• | • 100%<br>• 00% |
| SCM factor for SDG3 attainable | • Impactful<br>• Un-impactful | • 2of2<br>• 0 | • 100%<br>• 00% |

Source: Field Survey, May, 2024

The table 8 above indicates that we conducted an interview with the administrative head and procurement officer of Alimosho General Hospital. Out of the questions posed, we found that the respondents gave 100% positive and impactful responses. The analysis focused on the 100% positive response.

Theme Four**:** From the fourth objective of the study, two questions were drawn. The first question is, 'is there significant connection between EMR and Mortality rate?' And the second question is, 'has the EMR been effective in consultation hour?'

Responses 1: Answer 1: EMR is a digital card to all the patients files are stored, it aids rapid response to patients demand rather that keeping them waiting while the records officers search for their files. It does not absolutely influence the reduction of mortality in the hospital, although it can be connected but not absolutely.

Response 2: Answer: EMR has made the consultation hour seamless. However, there are other unlinking factors that prolong the waiting out of patients one of them is lab test. Sometime, if the result from the lab is not ready, it can influence the waiting hour of patients.

**Table 9.** Summary of responses on theme one

| Questions | Responses | Participants | Percentage |
|---|---|---|---|
| EMR and Mortality | • Positive<br>• Negative | • 2of2<br>• | • 30%<br>• 70% |
| EMR and Wait Time | • Often<br>• Not-often | • 2of2<br>• 0 | • 50%<br>• 50% |

**Source:** Field Survey, May, 2024

The table 9 above indicates the conduction of interview with the administrative head and procurement officer of Alimosho General Hospital. Out of the questions posed, we found that the respondents gave from the first question, 30% positive and 70% negative. The implication is that EMR does not influence mortality rate in alimosho general hospital. Also from the second question we realised that EMR does not absolutely influence the reduction of patients waiting hour. The implication is that the often scored 50% while not-often scored 50%.

**Analysis from the focused group discussion (FGD)**

**Table 10.** Summary of the FGD conducted

| Questions | Responses | Participants | Percentage |
|---|---|---|---|
| Do you think the management of Alimosho General Hospital provide healthcare technology services to reduce the stress of workers | • Very often<br>• Not often<br>Undecided | • 4of5<br>•<br>• | • 80%<br>• 00%<br>• 20% |
| How effective is the supply of SCM Practices and digitalization tools for healthcare services in Alimosho General Hospital? | • Effective<br>• Ineffective<br>Undecided | • 5of5<br>• 0<br>• | • 100%<br>• 00% |
| How would you rate the procurement of healthcare goods in your hospital? | • High<br>• Low<br>Undecided | • 5of5<br>• 0<br>• | • 100%<br>• 00% |
| What is your perception on EMR and mortality in Alimosho General hospital | • Impactful<br>Un-impactful<br>Undecided | • 5of5<br>• 0<br>• | • 100%<br>• 00% |

Source: Field Survey, May, 2024

The table 10 above focused group discussion was organised in Alimosho general hospital with 5 man panel and one facilitator. It was realised that all responded. However, out of 100% response on the first question, one of the respondent decided to silent about the first question which gave 80% very often. The subsequent question were 100% responded. It was realised that all the respondents gave that EMR in not impactful of mortality rate in Alimosho general hospital.

**Discussions of findings**

Firstly, from the first hypothesis, which states “the effective use of healthcare technology in government facilities in Lagos State” the study used descriptive statistics to analyse the result. We discovered that the average score for respondents' agreement with healthcare technology was 3.28, indicating a high level of agreement with most statements. The overall standard deviation of 1.46 suggests a clustering of responses around the mean, as all

statement standard deviations exceeded 1. Additionally, the key informant interview supports the findings, demonstrating 100% effectiveness and significant impact. From the focus group discussion (FGD), we found that four out of the five respondents positively attested to the effectiveness of healthcare technology in Lagos State health facilities. This result contradicts the findings of Ogbonna et al. (2022), who argued that the inability to use the EMR in another government facility has led to challenges in supply chain management (SCM). However, this result aligns with the TOE's assertion that organisations that adopt technology have the potential to achieve success.

Also, the second hypothesis tested “the influence of SCM and digitalization of service delivery in Alimosho General Hospital." Multiple linear regression analysis was used, and the result was revealed ($R2 = .078$, $R = 278$, $F(2,290) = 12.19$; $p < .001$). The implication is that in Lagos State, both supply chain implementation and digital healthcare services accounted for 7.8% of service delivery in public hospitals. Therefore, we rejected the null hypothesis H0 and accepted the alternate hypothesis H1. From the qualitative data (both interviews and FGD), we discovered that the respondents attested that SCM and digitalization have a positive impact on service delivery in Alimosho General Hospital. The study supported the theory of TOE with findings that technology plays a crucial role in enhancing service delivery. This study is in agreement with the work of Bialas et al. (2023), whose findings indicated that factors such as technological and organisational readiness, hospital size, governmental legislation, and perceived benefits significantly influence the level of ERP system adoption. Furthermore, the third hypothesis tested “SCM and its influence on SDG3." According to the linear regression table, inclusive supply chain management significantly influences the achievement of Sustainable Development Goal (3) in delivering public service in Lagos State hospitals ($t = 3.71$; $B = .234$; $p < .001$). In essence, this implies that we will reject the null hypothesis and accept the alternate hypothesis. The qualitative data (both interviews and FGD) also showed that supply chain management can play a role in attaining SDG 3. According to Akwaowo, Sabi, Ekpenyong, Isiguzo, Andem, Maduka, Dan, Umoh, Ekpin, and Uzoka's study, "Sustainable Supplier Selection Factors and Supply Chain Performance in the Nigerian Healthcare Industry," published in 2022, the main reasons for looking for a supplier were those that were good for the economy. Their findings indicate that SCM is important for achieving sustainability in the healthcare sector. We used Pearson Product Moment Correlation Analysis to conclusively test the fourth hypothesis, "that EMR will significantly aid the reduction of mortality rates in public hospitals in Lagos State, Nigeria." The results revealed no significant relationship between EMR and mortality rate in public hospitals in Lagos State, Nigeria ($r = .070$; $p > .05$). This, in essence, means that EMR does not significantly reduce hospital mortality rates. Therefore, we will accept the H0 and reject the H1. This result is in agreement with the findings of Ogbonna et al. (2022), who argued that EMR has not achieved its purpose. The qualitative data also revealed a significant association between EMR and the mortality rate in Alimosho General Hospital, Lagos State, Nigeria.

## Conclusion and recommendations

The study concluded that if public hospitals do not provide proper resilience for EMR, the risk of mortality will continue to rise. The following are the recommendations: The government should strengthen its capacity to ensure that healthcare technology is absolutely beneficial to citizens. The lack of data analytics in other government healthcare facilities prevents access to the EMR card. The Lagos government should take a cue from Ghana and establish a health management information system that harmonizes the EMR card across all government and private healthcare facilities.

To ensure the effectiveness of public sector services, we must strengthen digital supply chain management and regulation. By creating a logistics management information system, SCM can track all goods and ensure they are effective.

The government should strengthen its collaboration with the private sector to enhance efficient service delivery; this will aid SDGs 3 and 17.

It is important to monitor and evaluate the implemented EMR to make sure it addresses record-keeping and mortality issues.

The study has contributed to knowledge in the following areas:

The study developed a multilinear regression model that connected all the variables, showing how technology in healthcare influences effective service delivery.

By confirming that other government facilities cannot access EMR cards, the study bridged a knowledge gap and suggested a health management information system and data analytics to enhance the relevance of EMRs.

Lastly, the study advanced knowledge by tying digitalization and SCM together to improve SD in the public sector, a connection that previous studies had missed.

Alimosho General Hospital, which is too small to generalize the findings of Nigerian healthcare services, was the sole focus of this study. The researchers are positive that, if research funding is available, it would be interesting to conduct comprehensive research.

## *Declaration*

This research was conducted in accordance with the principles of academic integrity and objectivity.

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**Ethics Approval/Declaration:** N/A

**Consent to Participate:** Informed consent was obtained from all participants prior to data collection.

**Consent for Publication:** The authors have obtained consent from participants for publication of this study's findings.

**Data Availability:** The datasets generated and/or analyzed during this study are available from the corresponding author upon reasonable request.

**Authors' Contributions:** Dr. B.Q. IBIKUNLE: Conceptualization, Methodology, Data collection, Data analysis, Writing - Original draft

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