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The Strategic JOURNAL of Business & Change MANAGEMENT
ISSN: 2312-9492 www.strategicjournals.com
Vol. 12, Iss.2, pp 798 – 824, May 20, 2025. www.strategicjournals.com, © Strategic Journals

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Accepted: April 28, 2025

DOI: http://dx.doi.org/10.61426/sjbcm.v12i2.3271

ABSTRACT

This study examined the influence of MIS capabilities on the performance of level 4 and 5, public and private hospitals in Mombasa County, Kenya. A descriptive research design was adopted, targeting 318 technical ICT specialists working in 31 level 4 and 5, private and public hospitals in Mombasa County. A sample size of 96 respondents participated in the study, representing 30% of the target population and selected using stratified random sampling technique. Primary data was collected using a semi-structured questionnaire. A pilot study was conducted to test the instrument's reliability, measured using Cronbach's Alpha, while expert view was utilized to achieve content validity. Questionnaire distribution was through drop and pick method and using Kobo Toolbox Data Collection Tool link where necessary. Data collected was subjected to descriptive, relational, and inferential analysis, and the findings presented using tables, charts, and graphs. The study revealed that service delivery automation, system management, data security and information quality had a positive significant influence on the performance of hospitals in Mombasa County. The study concludes that service delivery automation enhances the patient flow because automated appointment scheduling as a sub-system can reduce the time patients spend waiting for consultations and treatments. Effective system management ensures optimal resource allocation within hospitals and can help hospitals prioritize the use of medical supplies, equipment, and human resources. Patients are more likely to seek medical care and share sensitive information when they trust that their data is secure. High-quality information ensures that patient records are accurate and up-to-date, which is crucial for effective diagnosis and treatment. The study recommends that the hospitals should transition from paper-based records to comprehensive electronic health records systems. Transitioning to comprehensive EHR systems can streamline patient data management, improve communication among healthcare providers, and enhance patient care coordination. The hospitals should perform thorough assessments of existing data security measures to identify vulnerabilities and areas for improvement. The hospitals should establish standardized performance indicators that all hospitals must report on, such as patient wait times, readmission rates, infection rates, and patient satisfaction scores.

Key Words: *Service Delivery Automation, System Management, Data Security, Information Quality*

CITATION: Masika, I. W., & Kyalo, J. (2025). Management information system capabilities and performance of hospitals in Mombasa County, Kenya. *The Strategic Journal of Business & Change Management,* 12 (2), 798 – 824. http://dx.doi.org/10.61426/sjbcm.v12i2.3271

INTRODUCTION

Effective and efficient healthcare provision is among the primary goals of any responsible government. It is through this provision that a healthy population is achieved; one that is adequately positioned to spearhead the realization of a country's socio-economic development goals. A healthcare system that is well-functioning is crucial for the public and often times, health positively correlates with income pa capita (Salte, 2014). In this quest, healthcare providers are opting for evolutionary improvement through the adoption of modern information and communication technologies, including MIS, in driving innovativeness towards efficient service delivery. According to Ndawa and Wamitu (2019), modern technology adoption is equivalent to the choice to acquire and utilize innovation or new ideas. An MIS in the hospital setting, is a comprehensive system that integrates information requirements permitting the collection, storage, retrieval, and analysis of clinical, patient, and financial data. According to Onyando and Kandiri (2018), data in a hospital setting takes varying categories; part of it is relevant to the patient's well-being and care, while the other part entails administration. The quality of service and patient care, as argued by Yaseen A. Hayajneh et. al. (2014), is pegged upon how the hospital administration approaches and manages these data.

Information and Communication Technology (ICT) has permeated the global health industry to depth. With unending need for healthcare services amid a growing population, management of patient information right from admission, treatment, discharge, and the accomplishment of administrative roles, has become complex for a manual approach (Karitis et al., 2021). Across continents, human and naturally induced epidemiological changes have contributed to a myriad of emerging health challenges. This condition has necessitated digitalization of healthcare systems to handle the high demand for medical services. A European Region Digital Health Survey conducted by the World Health Organization in 2022 revealed tremendous progress in the implementation of digital health. Digital technologies such as Big Data, Artificial Intelligence (AI), Internet of Things (IoT), Wearable Technologies, Telemedicine, Hospital Management Information Systems, and Health Information Systems, were reportedly a feature of the European Union health sector. In 2022, the region adopted a digital health work plan with the acknowledgement that digital solutions are important in delivering people-centric healthcare. The Regional Committee who spearheaded the action planning cited digital health as indispensable, but at the same time identified inter-country integration of digital solutions such as health information systems as a major challenge (World Health Organization, 2022). With extensive adoption of MIS for hospitals, the committee fronted users' digital literacy as a key aspect of successful transition to digital healthcare. In order for the digital tools to be meaningful, it also requires proper legislation, functional governance, good policies, and more importantly, training and support to the health workers as the enabler of effective use and end-user satisfaction (WHO, 2022).

Markazi-Moghaddam et. al (2016) defined hospital performance as the achievement of goals in two perspectives; managerial and medical. A hospital that provides cost effective, easily accessible, and high-quality health services satisfactory to the expectations of the patients is a high performing institution. Viewing a hospital in the context of an organization, various scholars have defined organizational performance in different ways. According to Kim Jean Lee and Yu (2004), organizational performance refers to increase in market share, sales revenue growth, and financial growth. The market performance in comparison with competitors in a free market, financial stability, and shareholder value are important elements in this context. Combs et. al (2005) considered organizational performance as the effectiveness at which an organization's goals and

objectives are achieved. This encompasses financial health, operational efficiency and effectiveness, productivity, customer satisfaction, quality of services or products, and the overall success in the achievement of strategic objectives.

An MIS in a hospital setting, is an abstract computer-based comprehensive system that integrates data by allowing automated administrative, clinical, and financial operations. According to Farzandipour et. al., (2017), the user's functional requirements including data management, data sharing, processing and storage are supported. The World Health Organization (WHO) interprets MIS for hospitals as an integrated attempt to collect, process, report and utilize health related information and health knowledge for influencing program action, policy making, and research. MIS utilizes computer software and hardware, linked up by a communication network, to enable healthcare facilities to capture, store, analyze, retrieve and manage patient and hospital data with the aim of enabling informed decision making, and streamlining hospital processes for efficiency and improved patient care. In a simplistic view, a hospital can adopt a simple MIS in the form of a Transaction Processing System (TPS), e.g., a billing system, as well as run a complex system that comprises several modules.

The Mombasa County healthcare ecosystem comprises both public, private-for-profit, and private-not-for-profit hospitals; all being important pillars in the provision of healthcare services in the county. These are categorized in a hierarchical system as stipulated by the Kenya Medical Practitioners and Dentists Council (KMPDC) as follows; Level 1- Community Health Centers, Level 2- Dispensaries and Clinics, Level 3- Sub-county hospitals, Level 4- County hospitals, Level 5- Regional Referral Hospitals managed by County Governments, Level 6- National Referral Hospitals managed by the National Government. Considering all the above six tiers, Mombasa County has a single Level 5 hospital, the Coast General and Referral Hospital, being the only referral facility serving the coastal region in entirety. According to a statement by Swabah Ahmed, a Health Executive in the County Government of Mombasa, 47 hospitals that comprise the public health sector are limited in their capacity to serve the medical needs of the entire population in the county. 70 per cent of the healthcare needs in the county are catered for by private health facilities (Otieno, 2024).

In Mombasa County, hospitals encounter high patient volumes given a rapidly growing population and the prevalence of the region to vector-borne diseases (WHO, 2018). Disease outbreaks such as Chikungunya and Dengue Fever are unique to Mombasa and the coastal region in general, a situation that has increased the number of patients seeking medical attention in public and private hospitals within the county. Part six of the Mombasa County Health Act 2018 requires all health facilities to establish, utilize and maintain a health information system, a requirement that hospitals have complied with, to improve on operational efficiency and positive patient outcomes.

Statement of the Problem

Uneven progress in the development and adoption of e-health systems across hospitals in the 47 counties in Kenya has substantially affected their performance (Orrell, 2020). According to the Kenya Health Informatics Association, KeHIA (2020), time lags have been recorded in the submission of reports on key health metrics; fueled by a documentation gap with hospitals holding partially digitized records and paper-based records. In addition, health facilities are experiencing poor tracking of commodities due to improper tracking systems; this often leads to unforeseen cyclic stock-outs (MoH, 2020). With routine data captured using hospital management information systems not leveraged to inform timely decision making, patients are compelled to purchase expensive drug prescriptions outside the facilities (Karijo, Otieno, & Mogere, 2021), coupled with occasional long waiting times (Mwang'ombe et. al., 2019) in accessing medical attention.

Data captured in a digital way is fundamental in the identification of problems and existing needs in healthcare service delivery for prioritization. According to Odanga & Wachiuri (2022), MIS allows health facilities to cut down on operational costs through efficient inventory management that reduces incidences of stock-out for prime medical resources. Utilization of data through data analytics and reporting allows for consistency in patient management and low running costs due to reduced recurrence of diseases, (Karijo et. al., 2021). A study by Odanga and Wachiuri (2022) on the determinants of Inventory Management in Public Hospitals in Mombasa County, Kenya, concluded that information technology significantly improves the performance of inventory flow in public hospitals. Abdihakim and Tumuti (2022) examined how information security affects the performance of public hospitals in Garissa County, Kenya, indicating a gap in existing information security measures at the facilities. The study recommended sufficient adherence to IS security protocols besides the general capability of the system to allow data collection, comparison of expected versus actual performance standards, and communication with patients, electronically. Oreni et. al. (2021) studied how technological factors at Kenyatta National Hospital influence data quality. In their findings, they determined that technological concerns such as network issues posed a problem to MIS utilization and thus data quality, recommending the hospital's management to keep up to date with the latest information security measures and innovative technological trends. Orang'i et. al. (2019) looked at the effects of information systems on service delivery in private hospitals in Nairobi, exploring system integration and interoperability policies that can improve healthcare service dispensation. They noted that there is an existing Electronic Data Interchange application that allows collaboration and sharing, but they went ahead to recommend that all medical records should be computerized to permit seamless sharing and reporting by the private facilities under study.

The studies reviewed point at a conceptual gap, with limited conceptualization of the capabilities that a hospital management information system offers. While the studies have addressed issues to do with service delivery in hospitals, focus is on information security, data quality and interoperability policy issues. Undertaking the study in Mombasa County with focus on service delivery automation, system management, data security, and information quality as the capabilities fills this conceptual gap. Mombasa County is additionally yet to be surveyed to comprehend how the identified concepts influence the performance of public and private hospitals; creating a contextual gap. This study, therefore, sought to employ a descriptive research design to survey technical ICT staff in both private and public level 4 and 5 hospitals in Mombasa County and how they perceived the influence of service delivery automation, system management, data security, and information quality on hospital performance.

Objectives of the Study

The study examined the influence of management information system capabilities on the performance of hospitals in Mombasa County, Kenya. The following specific objectives guided the study:

- Establish the influence of service delivery automation on the performance of hospitals in Mombasa County
- Examine the effect of system management on the performance of hospitals in Mombasa County
- Determine the influence of data security on the performance of hospitals in Mombasa County
- Assess the effect of information quality on the performance of hospitals in Mombasa County

LITERATURE REVIEW

Theoretical Review

Systems Theory

In his philosophical view on holism, Aristotle argued that the properties of the whole are more than the sum of the properties of its parts. It is upon this premise that the systems theory was formulated as

a framework for comprehending phenomena in a holistic approach by Bertalanffy (1968). As propounded, systems theory considers a system as a composition of interconnected and interrelated parts all functioning towards the achievement of a common goal (Teece, 2018). Focus is on the integration, complementarities, and the outcomes resulting from the interactions among the elements of the system. Generally, systems are networked and nested. There are clearly existing boundaries within the system and the output of one sub system is an input for another. The sub-systems are unique in their own capacity and have dynamic capabilities, for instance, an organization in the form of a hospital comprises different sub-units such as the outpatient, emergency, maternity and neonatal, pharmacy, laboratory, and administration departments. Each is connected to others internally and externally where applicable. While still considering a holistic view as the premise of the systems theory, the individual elements that comprise the system are not to be neglected. They need to be comprehended and appreciated. A feedback loop is also a required element in systems theory. The loop comprises external changes' information that flow into the system for the components to adjust accordingly to the environment, at the same time keeping intact the interdependent internal parts in alignment to existing plans (Teece, 2018).

Technology Acceptance Model

Technology Acceptance Model is a brainchild of Davis (1986). Under this theory, Davis explains the driving force behind end users of an information system accepting usage of technology (Durodou, 2016). Two factors are highlighted by the model, as the contributors to information systems acceptance; perceived ease of use and perceived usefulness. Perceived usefulness is considered as the extent to which an individual is convinced that his performance will improve in reality if they make the decision to use the system. For perceived ease of use, Davis (1989) defines it as the level at which the user is convinced that the information system will eventually ease their physical and mental effort. According to Zhang, Aikman, & Sun (2008), perceived ease of use motivates and captures the users to take up and use the system. The two views create an attitude which translates into a behavior intention that then culminates in their usage of the system at hand. The complexity of the system notwithstanding, if the user perceives it to have the capability of improving on their work performance, they will own it up. For the complex of systems proposed and introduced, the users are likely to accept so long as the system meets the threshold of the perception of a positive impact on the work.

Unified Theory of Acceptance and Use of Technology

Developed by Venkatesh et. al., (2003), the Unified Theory of Acceptance and Use of Technology proposes that the use of technology is influenced by behavioral intention. The theory suggests that technology is likely to be successfully adopted depending on the effect of the following key issues; performance expectancy, effort expectancy, social influence, and facilitating conditions (Venkatesh et. al., 2003). These predictors are moderated by experience, gender, age, and voluntariness of using the technology.

Performance expectancy is about the belief that the system helps an individual achieve gains in their work performance. For instance, financial investments are initiated with an ultimate goal; the gains that an investor in an organizational setting expects to achieve. Effort expectancy is the extent of ease an individual has in the use of a system; the mental and physical effort needed to make use of the system. On another hand, social influence entails the extent to which a person develops the perception that other important people hold the view that they need to use the system. The use of this factor is important where technology use is a mandatory (Venkatesh et. al., 2003). The author considered facilitating conditions as the extent of believe by the user that the respective organization's technical infrastructure, expertise

and related capabilities are available to help in the system usage.

Resource Based View Theory

Posited by Penrose (1959), Resource Based View Theory focuses on an organization's internal resources as the main determinant of its performance and source of competitive advantage. Competition is not limited to the non-health industry organizations, hospitals need to have concerted effort in attracting more patients, the best staff, and modern technologies through building a strong brand of quality patient care. Penrose (1959) suggests that for an organization to remain relevant and perform as desired, the resources in their possession need to be firstly valuable, show rarity, be inimitable, and non-substitutable. The resources and capabilities under consideration are better off if they have features of immobility and heterogeneity, for instance, availability of tacit knowledge which the organization is in full control (Bharadwaj, A. S., 2000). Systems are an important and critical resource which organizations can leverage for gaining a competitive advantage comparable to other organizations that have lagged behind in the adoption of technology as an enabler of quality service delivery.

Empirical Review

Wandie and Muathe (2022) argued that organizational efficiency in the healthcare industry is a necessity for it ensures quality of service, which directly affects consumer satisfaction. It is prudent that patients receive the service they seek. Patient-centered healthcare service delivery incorporates the patient's medical experiences and adequate attention to their welfare. Service delivery in a hospital setting entails a series of administrative activities that are mandatory for the dissemination of clinical treatment. The patient's initial journey at a hospital starts with submission of their demographic data at the registration desk; a step that paves way for transition to the waiting bay as they await consultation with the doctor. The process involves filling out forms, manual or digital, as designed by the hospital management to keep record of the patient data for informing the patient's journey within the facility.

Hospitals generate a lot of data in the course of providing medical care to patients. While this data informs the type and level of medical attention to be dispensed to patients, leveraging it enables the management to develop insights which are fundamental in making decisions related to healthcare service delivery improvement. Holding heterogenous data in data silos poses an operational challenge and as Jayaratne et. al. (2020) suggested in his study on data integration for patient-centered e-healthcare, clinicians are limited in their efforts to build a comprehensive picture of the patient's medical history, and patient's having a holistic awareness of their health condition.

In their study on EHR and how IS researchers can contribute to healthcare transformation, Kohli and Tan (2016) considered privacy of health-related data as the main concern of patients, being the direct recipients of healthcare services. They further categorized stakeholders into two levels; primary and secondary stakeholders. Primary stakeholders are the ones who generate and have the privilege to directly access patient data in the EHR, including healthcare providers, patients, and purveyors. On the other hand, secondary stakeholders have indirect access to patient data, this includes insurance agencies, researchers in the health industry, local and state agencies, technology vendors, etc. Patient data revolves around the personal life of individuals thus the need for privacy. While some data sets have no harm being publicly available, other types have differing privacy levels. Patient data is considerably among the highly sensitive, required to be accessed by authorized users only (Al-Muhtadi et. al., 2019).

Rumisha et. al. (2020) asserted that effective planning towards healthcare dispensation for positive patient outcomes requires correctly captured, analyzed, and timely data presented for interpretation into information. Reliable and safe

healthcare delivery requires high quality data which the WHO recommends it has the dimensions of timeliness, completeness, reliability, accessibility, validity, accuracy, legibility, confidentiality, and usefulness (Endriyas et. al., 2019). The system's ability to integrate data collection for processing and reporting facilitates decision making for improved healthcare service. However, the researchers advocated that information needs to be of good quality in terms of accuracy, timeliness, completeness, and consistency. Information that is satisfactory in all the above aspects is substantial in monitoring, evaluation, and prioritization of interventions for healthcare service improvement (Rumisha et. al., 2020). One of the factors that compromise the quality of information is the presence of system users with a limited understanding of MIS functionalities due to inadequate skills. This category of users is prone to errors while entering data in the system. However, the system provides features that ensure data captured, stored, and retrieved in the system for use is of the desired quality. In a study conducted by Overrange et. al. (2019), the researchers opined that transition from paper-based systems to an electronic system contributed to improvements in data quality for reporting, monitoring and evaluation purposes in the Health Management Information System data in Ethiopia. With high quality information, Ouedraogo et. al. highlighted that areas highly burdened with disease and high mortality rates among children and women benefited a lot from high quality information especially in Jimma Zone in Ethiopia.

Conceptual Framework

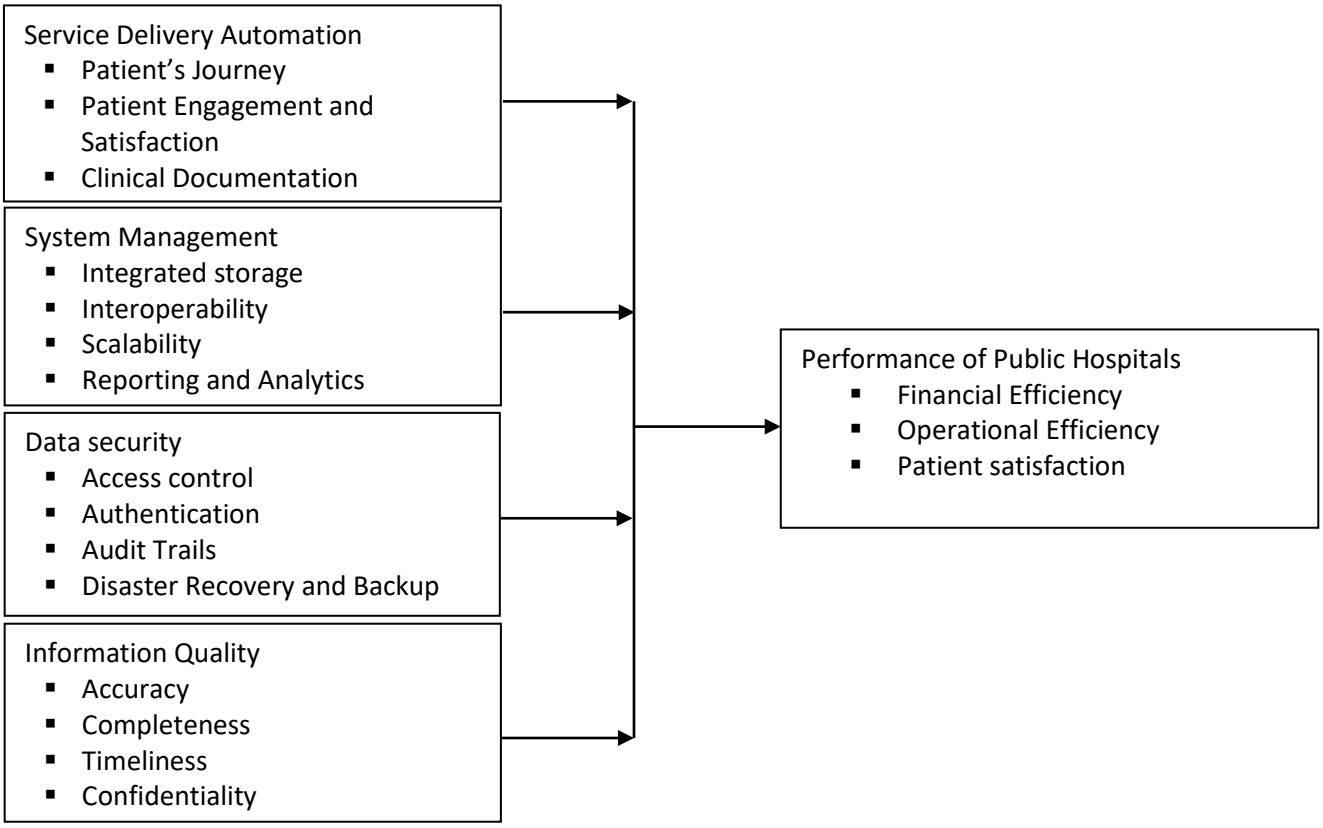

Figure 1: Conceptual Framework

Source: Author (2024)

METHODOLOGY

A cross sectional descriptive research design was adopted by the researcher in this study. The target population was ICT staff obtained from thirty-one level 4 and 5, private and public hospitals in Mombasa County comprising of five (5) public and twenty-six (26) privately-owned hospitals as per the MoH Master Health Facility List. The scope was limited to Level 4 and 5 hospitals because they utilize MIS in their operations. Moreover, the required level of operations for level 4 and 5 hospitals as per the KMPDC requirements warrants a sturdy hospital information system. According to the 2019 Health Facilities Inspection Checklist by KMPDC, Level 4 and 5 hospitals are required to have a minimum of 10 and 12 ICT officers respectively; including health records information management officers, the ICT manager, and other relevant categories of technical personnel. With twenty-seven level 4 and four level 5 hospitals in Mombasa County, a total of 318 ICT specialists, who have the responsibility of supporting the implementation and use of MIS in the hospitals formed the target population. Stratified random sampling technique was utilized to obtain representation from the varying categories of ICT Technical staff in the hospitals.

The researcher utilized a semi-structured questionnaire to collect data from the respondents. Besides consistency of the questions and simplicity in administration, the semi-structured questionnaire was comfortable for respondents who might have shied from interviews with the fear of the management.

In this study, qualitative and quantitative data collected were compiled, sorted, and coded accordingly. Quantitative data was analyzed using SPSS version 27, while thematic analysis was utilized in analyzing qualitative data regarding the open-ended questions in the instrument. Both descriptive, relational, and inferential analysis was computed. Means, percentages, and standard deviations were computed in the context of descriptive analysis. Karl Pearson's correlation coefficient was computed to measure the direction and strength of the linear relationships between each independent variable and the dependent variable. In order to examine the relationship between each of the independent variables and the dependent variable, the researcher used multiple linear regression, generating the beta coefficients to inform this. The empirical model below was used to understand how the dependent variable is affected by changes in the predictor variables;

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon$$

Where;

Y= Performance of hospitals

B_0 = Y-intercept/ Constant

$B_{(1-4)}$ = Beta Coefficients

X_1= Service delivery automation

X_2= System management

X_3= Data security

X_4= Information quality

ε= Error term (captures unexplained variations in the empirical model)

Prior to conducting regression, the researcher ran a diagnostic test using Variance Inflation Factor (VIF) to test for the level of multicollinearity among the independent variables. A VIF value between 1 and 5 was acceptable. Results from this analysis were presented in tabular form, bar graphs, and pie chart form, for easy understandability.

FINDINGS AND DISCUSSIONS

Response Rate

The questionnaires were administered to 96 respondents drawn from various hospitals in Mombasa County, Kenya. The research indicated that the returned questionnaires constituted 93.8%, while those that were not returned represented 6.3%. Baruch and Holtom (2014) suggested that a response rate of 80% or higher is sufficient for data analysis. Therefore, the study's response rate of 93.8% was deemed adequate for this purpose. This high response rate contributed to the acceptance and credibility of the research findings.

Descriptive Statistics Results

The research employed descriptive statistics, specifically Mean (M) and Standard Deviation (SD), to illustrate the findings derived from the quantitative data analyzed using the Statistical Package for Social Sciences (SPSS). The subsequent section presents these results.

Service Delivery Automation

The study sought to establish the influence of service delivery automation on the performance of hospitals in Mombasa County. The respondents were given a list of statements to indicate their level of agreement on each based on a Likert scale. The results are presented in terms of percentages, mean and standard deviations in Table 1.

Table 1: Service Delivery Automation

Statements	SD (%)	D (%)	N (%)	A (%)	SA (%)	M	SD
The system effectively supports the patient's smooth navigation through the required stages of their healthcare journey	3.3	2.2	0	51.1	43.3	4.58	0.42
MIS adequately facilitates timely assistance and support for patients during their hospital visit	6.6	12.2	0	42.2	38.9	4.05	0.95
ICT system enables seamless provision of clear information to the patients concerning their treatment plans	2.2	2.2	0.5	50	42.2	4.30	0.70
MIS enables comprehensive documentation of the patient's data; treatment procedures and medical histories	0	0	6.7	57.7	35.6	4.50	0.50
MIS ensures effective communication of patient's concerns and preferences for address by healthcare providers	11.1	3.3	1.1	44.4	40	3.63	1.37
The ICT system enables active engagement of patient's, through applications and digital platforms, in the decision-making processes regarding their health	7.8	4.4	2.2	40	45.6	3.94	1.06
The MIS significantly contributes to enhancing patient satisfaction relative to their service experience	3.3	0	0	51.1	45.6	4.75	0.25
Aggregate mean score						**4.25**	**0.75**

Source: Survey Data (2024)

Table 1 revealed strong support for the healthcare system among participants, with 94.4% agreeing it effectively assists patients through their healthcare journeys. Only 5.5% disagreed, indicating widespread perceived benefits. Additionally, 81.1% of respondents found the Management Information System (MIS) effective in providing timely support during hospital visits, while 18.8% disagreed, suggesting some users may not fully recognize its benefits. Furthermore, 92.2% affirmed that the Information and Communication Technology (ICT) system effectively communicates treatment plans, highlighting its role in patient understanding. Only 4.4% disagreed, indicating broad approval of the ICT system's value. Finally, 93.3% agreed that the MIS facilitates comprehensive documentation of patient data, essential for continuity of care, though 6.7% remained unconvinced.

A significant 84.4% of respondents agreed that the Management Information System (MIS) greatly improves communication of patients' concerns to healthcare providers, indicating strong support for its effectiveness. Only 14.4% disagreed. Additionally, 85.6% recognized the Information and Communication Technology (ICT) system's role in promoting active patient engagement, highlighting

its importance for patient autonomy and satisfaction. Furthermore, 96.7% affirmed that the MIS enhances patient satisfaction with their service experience, with only 3.3% dissenting.

A substantial majority of the respondents, amounting to 84.4%, expressed agreement that the Management Information System (MIS) significantly enhances the communication of patients' concerns and preferences to healthcare providers. This indicates a strong belief in the system's ability to bridge the gap between patients and providers, ensuring that important information is effectively relayed and considered in the care process. In contrast, only a small fraction, 4.4%, voiced disagreement, highlighting a general consensus on the MIS's effectiveness in this area. Moreover, the findings reveal that 85.6% of participants recognized the role of the Information and Communication Technology (ICT) system in fostering active patient engagement. This engagement is facilitated through a variety of applications and digital platforms, which empower patients to take an active role in their healthcare decisions. The ability to participate in decision-making processes is crucial for patient autonomy and satisfaction, and the high percentage of acknowledgment suggests that respondents value the opportunities provided by ICT for the patients' involvement in their health management. In addition to these points, an impressive 96.7% of respondents affirmed that the MIS is instrumental in enhancing patient satisfaction regarding their service experience. This overwhelming support indicates that the system not only improves communication and engagement but also contributes significantly to the overall satisfaction of patients with the healthcare services they receive. Only 3.3% of respondents disagreed, further underscoring the positive perception of the MIS's impact on patient experiences.

The overall mean score of 4.25, accompanied by a standard deviation of 0.75, reflects a strong consensus among respondents about the beneficial effects of service delivery automation on hospital performance in Mombasa County. This statistical data suggests that the majority of participants believe that the implementation of automated systems, such as the MIS, leads to improved service delivery, ultimately enhancing the quality of care provided to patients. The findings highlight the importance of these technological advancements in the healthcare sector, particularly in promoting effective communication, patient engagement, and satisfaction.

The finding agrees with the findings of a study by Mwaniki (2018) who found that hospitals are opting for incorporation of ICT in capturing health data considering the shortcomings presented by a manual system of capturing and transmitting data during the patient's journey at a hospital. The finding also agrees with the findings of a study by Perdana and Mokhtar (2023) on leveraging digital technologies for information technology-enabled healthcare transformation in Singapore, the researchers acknowledged that operations such as medication ordering and medical appointments can be tedious in a large public health organization.

System Management

The study sought to examine the influence of system management on the performance of hospitals in Mombasa County. The respondents were given a list of statements to indicate their level of agreement on each based on a Likert scale. The results are presented in terms of percentages, mean and standard deviations in Table 2.

Table 2: System Management

Statements	SD (%)	D (%)	N (%)	A (%)	SA (%)	M	SD
The MIS enables efficient integrated data storage for all necessary functions in the hospital	16.7	11.1	6.7	31.1	34.4	4.65	0.35
The data captured and stored by the system is easily accessible, in lesser time, when needed	0	0	0	52.2	47.8	3.58	1.42
Data can be easily shared between different users within and across departments	7.8	7.8	2.2	35.6	45.6	4.05	0.95
When necessary, there is seamless data exchange with external partners and healthcare systems	10	3.3	0	42.2	44.4	4.28	0.72
As the hospital expands, data storage is efficiently scalable, the system allows scaling up to accommodate increasing data demands	23.3	12.2	8.9	26.7	28.9	4.12	0.88
The MIS maintains performance and remains reliable even when the volume of data increases	11.1	22.2	1.1	32.2	33.3	4.55	0.45
The MIS provides adequate customized reporting and analytical tools that aid in decision making	5.6	5.6	0	44.4	44.4	4.52	0.48
Analytics availed by the system are fundamental in improving patient outcomes and hospital performance	6.7	14.4	4.4	22.2	52.2	3.99	1.01
Aggregate mean score						**4.22**	**0.783**

Source: Survey Data (2024)

The results in Table 2 indicate that the respondents agreed that the MIS enables efficient integrated data storage for all necessary functions in the hospital as presented by majority (65.5%) of the respondents, 27.8% disagreed and 6.7% were neutral. All the respondents agreed that the data captured and stored by the system is easily accessible, in lesser time, when needed. Most (81.2%) of the respondents agreed that data can be easily shared between different users within and across departments, 15.6% disagreed and 2.2% were neutral. The study revealed that majority (86.6%) of the respondents agreed that when necessary, there is seamless data exchange with external partners and healthcare systems while 13.3% disagreed.

The statement that as the hospital expands, data storage is efficiently scalable, the system allows scaling up to accommodate increasing data demands was agreed by majority (55.6%) of the respondents. 35.5% disagreed and 8.9% indicated neutral. Majority (65.5%) of the respondents agreed that the MIS maintains performance and remains reliable even when the volume of data increases with 33.3% and 1.1% disagreeing and indicating neutral respectively. 88.8% of the respondents agreed that the MIS provides adequate customized reporting and analytical tools that aid in decision making and 11.2% disagreed. The statement that analytics availed by the system are fundamental in improving patient outcomes and hospital performance was agreed by majority

(74.4%) of the respondents while 21.1% disagreed and 4.4% were neutral.

The aggregate mean and standard deviation of 4.22 and 0.783 respectively indicate that the respondents agreed on all the statements examining the influence of system management on the performance of hospitals in Mombasa County based on the Likert scale.

These findings concur with Munjal and Bhatia (2022) who pointed out the concept of cloud computing in their research as safer, unlimited, and economically feasible alternative for storage of health data. 'Cloud' is used symbolically to denote the Internet, whereby users upload data to a secure online server that offers unlimited storage space for vast amounts of data. The finding also agrees with Tahir et. al. (2020) who found that storage solution offers a scalable option amid the growing amounts of data. Through a system with a cloud-based database, patient records are stored, encrypted to make it accessible and interpretable to the service providers and authorized users, and made available for processing.

Data Security

The study sought to determine the influence of data security on the performance of hospitals in Mombasa County. The respondents were given a list of statements to indicate their level of agreement on each based on a Likert scale. The results are presented in terms of percentages, mean and standard deviations in Table 3.

Table 3: Data Security

Statements	SD (%)	D (%)	N (%)	A (%)	SA (%)	M	SD
The MIS ensures that only authorized users can view and modify data	0.0	0.0	0.0	41.5	58.5	4.51	0.487
Access to sensitive patient data is effectively controlled based on user roles	6.6	12.2	0	42.2	38.9	4.05	0.95
Only verified users gain access to the system, considering there is authentication	7.8	7.8	2.2	35.6	45.6	4.05	0.95
Potential data breaches and unauthorized access are adequately handled by MIS	1.5	7.3	3.8	48.5	42.4	3.67	1.33
Audit trails of data access, modifications, and other user activities are comprehensively captured	0.0	0.0	0.9	48.3	50.8	4.36	0.64
The MIS facilitates traceability and accountability of user actions within the system	0.0	0.0	0.7	39.2	60.1	4.66	0.34
Disaster recovery protocols are in place for timely data restoration in case of system failure	0.0	0.0	2.1	47.6	48.3	4.78	0.22
The system's disaster recovery mechanisms ensure continuity of hospital operations by preventing data loss during unforeseen events	0.0	2.4	0.0	41.6	52.4	4.56	0.44
Patient data is regularly backed up to secure off-site locations to mitigate effects of system failure	0.0	5.7	0.0	56.8	43.1	4.28	0.72
All MIS hardware are securely managed with antivirus installed for protection against malware	1.5	7.3	3.8	48.5	42.4	3.67	1.33
Few incidences of data security breach in the MIS have been reported	8.6	10.5	2.5	35.8	42.6	4.32	0.68
Aggregate Score						**4.26**	**0.736**

Source: Survey Data (2024)

Table 3 presents strong evidence of participants' perceptions regarding the Management Information System (MIS) and its effectiveness in ensuring data integrity and security. A significant

81.1% of participants believe the MIS restricts access to authorized users, highlighting confidence in its role-based access control. However, 18.8% disagreed, indicating a need for further investigation into their concerns. Additionally, 81.2% of respondents feel that access is limited to authenticated users, suggesting robust authentication measures, though 15.6% opposed this view and 2.2% remained neutral, indicating varying awareness of these processes. Furthermore, 90.9% of participants trust the MIS's ability to mitigate risks of data breaches and unauthorized access, reflecting high confidence in its security measures. Conversely, 8.8% disagreed, and 3.8% were neutral, suggesting differing experiences or perceptions.

The survey results show strong agreement among participants on the effectiveness of the Management Information System (MIS) in maintaining audit trails and enhancing accountability. An impressive 99.1% noted that audit trails for data access and modifications are well-documented, highlighting the importance of transparency in data management. Only 0.9% expressed neutrality, indicating near-universal recognition of the need for thorough documentation. Regarding traceability and accountability, 99.3% affirmed that the MIS significantly aids in tracking user actions, reflecting high confidence in its capabilities for operational efficiency and regulatory compliance. Just 0.7% remained neutral. Additionally, 90.9% acknowledged the MIS's positive impact on traceability and accountability, while 5.9% disagreed, suggesting some concerns that may need further exploration. On data security breaches, 78.9% agreed that incidents are rare, indicating a general sense of security in the system, 19.1% disagreed while 2.5% remained neutral, suggesting some respondents may have had negative experiences.

The mean score of 4.26 indicates strong agreement among respondents about the positive impact of data security on hospital performance in Mombasa County. This high score suggests that most participants view data security as a crucial factor. The standard deviation of 0.736 shows low variability in responses, indicating a consensus on the importance of data security in hospital operations. These findings emphasize the need for healthcare stakeholders to prioritize data security to enhance performance and maintain patient trust.

These findings are in line with Williams and Mahncke (2006), whose research observed that username and password form of authentication is to an extend insecure, compelling health facilities to opt for biometric technologies and smart cards as viable options. Advanced MIS systems prioritize biometric verification ranging from retina scans, gait recognition, facial recognition, finger print scanning, or iris scanning. Given that it is based on unique physical characteristics, biometric authentication has become the most sought-after method for verifying the user's identity. Two-factor authentication is another alternative preferable to single-level username-password approach. As suggested by Al-Muhtadi et. al. (2019), the method allows for addition of an extra security layer, for instance, using a one-time-password (OTP) that is send to a submitted contact address e.g., email or phone, to further verify the user's identity

Information Quality

The study sought to examine the effect of information quality on the performance of hospitals in Mombasa County. The respondents were given a list of statements to indicate their level of agreement on each based on a Likert scale. The results are presented in terms of percentages, means and standard deviations in Table 4.

Table 4: Information Quality

Statements	SD (%)	D (%)	N (%)	A (%)	SA (%)	M	SD
Information provided by the MIS is consistently accurate and error free	16.7	2.2	4.4	52.2	24.4	4.05	0.95
The captured patient information contains all relevant data elements during retrieval, for a holistic view of patient's health	3.3	4.4	0	58.9	33.3	4.11	0.89
The MIS avails information in a timely manner, allowing the users to access up-to-date patient data	0	5.6	0	60	34.4	3.67	1.33
MIS enables prompt updates on patients' records for up-to-date interventions	6.7	2.2	1.1	57.8	32.2	4.33	0.67
Confidentiality of sensitive patients' medical information is maintained by the MIS	10	7.8	0	32.2	50	3.57	1.43
Secure encryption of patient data in MIS preserves its confidentiality by ensuring authorized access	27.8	18.9	11.1	16.7	25.6	4.09	0.91
There are a few incidences of inaccurate information being provided by the MIS	12.2	0	6.7	27.8	53.3	4.26	0.74
Aggregate Score						**4.01**	**0.99**

Source: Survey Data (2024)

Table 4 reveals participants' perceptions of the Management Information System (MIS) in patient data management. A significant 76.6% agreed that the MIS consistently provides accurate information, indicating confidence in its data integrity, essential for informed healthcare decisions. However, 18.9% disagreed, suggesting concerns about inaccuracies, while 4.4% remained neutral. Regarding the comprehensiveness of patient information, 92.2% affirmed that the MIS captures all relevant data for understanding a patient's health, though 7.7% disagreed, indicating potential gaps in data collection. Timeliness is also a strength, with 94.4% agreeing that the MIS delivers information promptly, crucial for quick decision-making in patient care. Nonetheless, 5.6% disagreed, pointing to possible delays in information retrieval.

A substantial majority of the participants, specifically 90.0%, indicated their agreement with the statement that the Management Information System (MIS) plays a crucial role in facilitating timely updates to patient records. This capability is essential as it directly supports ongoing medical interventions and ensures that healthcare providers have access to the most current information when making decisions about patient care. In contrast, a smaller portion of the participants, 8.9%, expressed disagreement with this assertion, while a minimal 1.1% chose to remain neutral, suggesting that the overwhelming consensus is in favor of the MIS's effectiveness in this area.

In terms of data security, 82.2% of respondents concurred that the MIS is effective in safeguarding the confidentiality of sensitive medical information. This high level of agreement underscores the importance of data protection in healthcare settings, where the privacy of patient information is paramount. Conversely, 17.8% of participants disagreed with this statement, indicating some concerns about the system's ability to maintain confidentiality. When it comes to the specific feature of secure encryption within the MIS, which is designed to ensure that only authorized personnel can access patient data, the responses were more divided. Only 42.3% of respondents agreed that the encryption measures effectively guarantee confidentiality, while a significant 46.7% disagreed, suggesting skepticism about the robustness of these security measures. Additionally, 11.1% of participants remained neutral on this issue, reflecting uncertainty or ambivalence regarding the effectiveness of encryption in

protecting sensitive information. Lastly, the reliability of the MIS in presenting accurate information was also assessed. A notable 81.1% of respondents acknowledged that instances of inaccurate information being displayed by the MIS are infrequent, which points to a general confidence in the system's accuracy. However, 12.2% disagreed with this assessment, indicating that there are concerns about the potential for errors, while 6.7% of participants chose to remain neutral, suggesting that some may not have enough experience with the system to form a definitive opinion.

The mean score of 4.01 with a standard deviation of 0.99 indicates strong agreement among participants on the positive impact of information quality on hospital performance in Mombasa County. This score, above the midpoint of the Likert scale, suggests that respondents generally view high-quality information as beneficial. The low standard deviation shows that responses were closely aligned, reflecting a consensus on the importance of information quality. This collective belief highlights the need for hospital administrators and policymakers to prioritize information quality in their strategic planning, potentially improving service delivery and patient outcomes

The finding is in line with Stacek and Kovac (2019) who considered information completeness as the adequacy of user data in terms of structure, relations, and attributes. For completeness, the captured data needs to be all inclusive, leaving no gap in the patient's administrative data, medical history, progress notes, and treatment plans to allow informed decision making. The finding also is in line with Kawu et. al. (2023) who highlighted that complete and detailed data enables provision of effective and safe patient-centered service. With a hospital management information system, the researchers pointed out that a longitudinal tracking of the patient, recording of patient generated and related health data and its integration into a central database allows access to a complete set of data for relevant action.

Performance of Hospitals

The study sought to examine the performance of hospitals in Mombasa County. The respondents were given a list of statements to indicate their level of agreement on each based on a Likert scale. The results are presented in terms of percentages, means and standard deviations in Table 5.

Table 5: Performance of Hospitals

Statements	SD (%)	D (%)	N (%)	A (%)	SA (%)	M	SD
MIS has enabled effective management of financial resources to ensure profitability and sustainability	50	25.6	2.2	11.1	11.1	3.01	1.09
MIS has enabled efficient allocation of resources across departments to maximize operational effectiveness	41.1	45.6	0	5.6	7.8	2.98	2.02
MIS has streamlined and optimized hospital operational processes for efficiency	30	40	5.6	10	14.4	3.43	1.57
Utilization of technology through service automation has enhanced operational efficiency	16.7	35.6	11.1	13.3	23.3	2.77	2.03
Patients seeking medical care experience minimal waiting times and delays during their visits	24.4	48.9	2.2	4.4	20	3.07	1.93
MIS has enabled hospital staff to demonstrate high competency levels in their roles	45.6	22.2	10	2.2	20	3.01	1.99
Patients feel satisfied and well-cared for in the access of healthcare services at the hospital	28.9	37.8	5.6	6.7	21.1	2.22	2.78
The MIS enables active seeking of feedback from patients for continuous improvement of service	40	27.8	2.2	7.8	22.2	3.11	1.89
Aggregate Score						**2.95**	**1.91**

Source: Survey Data (2024)

Table 5 summarizes participants' views on the effectiveness of Management Information Systems (MIS) in financial and operational management. Notably, 75.6% disagreed that MIS significantly aids in effective management of financial resources, indicating skepticism about its positive impact on profitability and financial sustainability. Only 22.2% agreed, with 2.2% neutral, suggesting most do not see MIS as valuable in this area. Similarly, 86.7% disagreed that MIS facilitates efficient resource allocation across departments, highlighting a belief that current systems fail to enhance operational effectiveness. Only 13.4% agreed, reinforcing the disconnect between MIS's intended benefits and user experiences. Regarding hospital operations, 70.0% disagreed that MIS optimizes processes for improved efficiency, suggesting it is not viewed as a transformative tool. While 24.4% agreed and 5.6% were neutral, the overall sentiment leans towards skepticism. Finally, 52.3% of respondents disagreed with the effectiveness of MIS in other areas

The survey results indicate significant concerns among respondents about healthcare services at the hospital. A substantial 73.3% disagreed that patients experience minimal waiting times, suggesting widespread issues with patient flow and delays. Only 2.2% were neutral, while 24.4% agreed, indicating that the majority face significant delays. Regarding the Management Information System (MIS), 67.8% of respondents disagreed that it empowers staff to demonstrate high competency, highlighting doubts about its effectiveness in supporting staff development. Only 22.2% agreed, with 10.0% neutral, reflecting a divide in perceptions. On patient satisfaction, 66.7% disagreed that patients feel satisfied and well-cared for, raising concerns about care quality. In contrast, 27.8% agreed, and 5.6% were neutral, suggesting that positive experiences are not representative of the majority.

The mean score of 2.95, near the midpoint of the Likert scale, indicates that respondents generally held a neutral view on the performance of hospitals in Mombasa County, with no strong agreement or disagreement on service quality. The standard deviation of 1.91 suggests moderate variability in responses, indicating that while some had positive or negative views, most clustered around the mean, reflecting a lack of consensus. This variability points to differing individual experiences and perceptions of hospital performance.

The finding is in contrary to Kim Jean Lee and Yu (2004) research observation that organizational performance is the increase in market share, sales revenue growth, and financial growth, partially contributed to by automation of operations. The market performance in comparison with competitors in a free market, financial stability, and shareholder value are important elements in this context. The finding is also in contrary to Combs et. al (2005) who considered organizational performance as the effectiveness at which an organization’s goals and objectives are achieved. This encompasses financial health, operational efficiency and effectiveness, productivity, customer satisfaction, quality of services or products, and the overall success in the achievement of strategic objectives; factors whose achievement is partially attributable to management information systems.

Multiple Regression Analysis Results

The analysis utilizing multiple regression techniques was performed to examine the relationships between several independent variables and a dependent variable. The results are presented as follows;

Table 6: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.894	0.799	0.756	0.0245

Source: Survey Data (2024)

The model's summary results reveal key statistical indicators for assessing hospital performance in Mombasa County. The R value of 0.894 indicates a strong positive correlation between independent variables; service delivery automation, system management, data security, and information quality and hospital performance. This suggests that improvements in these areas can enhance hospital performance. The R square value of 0.799 shows that about 79.9% of the variance in hospital performance is explained by the model, highlighting the relevance of the studied factors. The adjusted R square value of 0.756 indicates that a significant portion of the variance (75.6%) remains explained even after accounting for the number of predictors. The remaining 24.4% of the unexplained variance is attributed to other factors not included in this study's model. Additionally, the standard error of 0.0245 suggests high precision in the model's predictions, as lower values indicate that predicted values closely align with actual values.

Table 7: Analysis of Variance

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	258.236	4	64.559	88.657	0.002
	Residual	61.896	85	0.728		
	Total	320.132	89			

Source: Survey Data (2024)

The ANOVA results indicate significant factors influencing hospital performance in Mombasa County. The F value of 88.657 shows a substantial variance between groups compared to within groups, suggesting that performance differences are not due to chance but reflect the impact of the independent variables studied. The mean square value of 64.559 indicates greater variability among group means, supporting the idea that factors like service delivery automation, system management, data security, and information quality contribute to performance differences. With a significance level of 0.002, well below the 0.05 threshold, the results are statistically significant, indicating a strong likelihood that these effects are genuine. This suggests that effective service delivery automation, robust system management, stringent data security, and high information quality are positively linked to improved hospital performance.

Table 8: Coefficients

		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	t	Sig.
1	(Constant)	0.645	0.254		2.53937	0.003
	Service delivery automation	0.715	0.335	0.0674	2.134328	0.002
	System management	0.811	0.291	0.1097	2.786942	0.001
	Data security	0.796	0.306	0.0229	2.601307	0.004
	Information quality	0.764	0.227	0.0511	3.365639	0.003

Source: Survey Data (2024)

Table 8 shows that service delivery automation has a beta value of 0.0674 and a significance value of 0.003, indicating a positive impact on hospital performance in Mombasa County. The beta value indicates that each unit increase in automation correlates with improved performance metrics, supported by the low p-value of 0.002, which confirms the reliability of the findings. This aligns

with Wandie and Muathe (2022) research suggesting that automated systems enhance operational efficiency, patient outcomes, and satisfaction for both patients and providers.

The study finds that system management significantly influences hospital performance in Mombasa County, with a beta value of 0.1097 indicating a positive relationship between effective management practices and improved performance metrics. This suggests that utilizing enhanced system management capabilities leads to better hospital outcomes. The significance value of 0.001 confirms that this relationship is statistically significant, emphasizing the critical role of robust management systems in healthcare. These results align with Aldwairi *et al* (2023) research, which highlighted the correlation between effective system scalability, a system management practice, and improved performance in healthcare institutions, underscoring the need to prioritize data management strategies, especially in challenging regions with an ever growing patient population, thus patient data, like Mombasa County.

The study finds that data security significantly impacts the operational performance of hospitals in Mombasa County, with a beta value of 0.0229 indicating a positive relationship. As data security improves, so does operational performance, supported by a significance value of 0.004, which confirms that this effect is statistically significant. These results emphasize the need for hospitals to prioritize data security, as it can lead to better patient's privacy and operational efficiency in service delivery. Consistent with Al-Muhtadi et. al. (2019) research, the findings highlight that effective data security is both a regulatory necessity and a strategic imperative for healthcare organizations.

The study finds that information quality significantly impacts hospital performance in Mombasa County, with a beta value of 0.0511 indicating a positive relationship. The significance value of 0.003 confirms that this relationship is statistically significant. The findings suggest that enhancing information quality is essential for hospitals aiming to improve performance and service delivery. These results align with Overrange *et al.* (2019), whose study emphasized the importance of accurate and timely information in healthcare reporting, monitoring, and evaluation, which leads to better decision-making and improved patient outcomes.

Qualitative Data Analysis Results

The qualitative data was collected from the open-ended questions and analyzed thematically as per the research objectives. The following are the results;

Service Delivery Automation

The respondents were asked to indicate their opinion whether there were any improvement areas regarding service delivery automation as facilitated by MIS within the hospital. The responses given are presented as follows;

'Implementing standardized protocols and APIs to ensure seamless data exchange between systems can enhance the flow of information, reduce errors, and improve patient care. Staff may not be fully trained on how to utilize MIS effectively, leading to underutilization of available features. Many MIS systems provide data retrospectively rather than in real-time, which can hinder timely decision-making. Developing and integrating patient engagement tools (e.g., mobile apps for appointment scheduling, telehealth services, and patient portals) can enhance the patient experience and streamline service delivery.'

System Management

The respondents were asked to indicate their opinion whether the current state of system integration/ management is capable of improving the hospital's performance. The responses given are presented as follows;

'Effective system integration allows for seamless access to patient data across various departments. Integrated management systems can streamline hospital operations by automating routine tasks, such as scheduling, billing, and inventory management. System integration fosters better

communication among healthcare teams. Advanced integrated systems often come equipped with analytics tools that can provide insights into patient care trends, operational efficiency, and resource allocation. Integrated systems can enhance patient engagement through portals that allow patients to access their health information, schedule appointments, and communicate with their healthcare providers.'

Data Security

The respondents were asked to indicate whether there were adequate data security measures in their organization to improve on performance. The responses given are presented as follows;

'Strong security measures help ensure that sensitive data, such as customer information, financial records, and intellectual property, is protected from unauthorized access and breaches. By employing advanced security protocols, organizations can significantly reduce their vulnerability to cyberattacks, such as phishing, ransomware, and data breaches. Implementing data security measures often involves the adoption of new technologies and processes that can streamline operations. Customers are more likely to engage with organizations that demonstrate a commitment to data security.'

Information Quality

The respondents were asked to indicate whether the impact of information quality in the aspects of accuracy, timeliness, confidentiality, and completeness has improved effectiveness of the hospital's operations. The responses given are presented as follows;

'Accuracy is paramount in healthcare settings. When information is precise and reliable, it allows healthcare professionals to make informed decisions regarding patient care. Timely access to information can be a matter of life and death. Rapid retrieval of patient data, test results, and medical histories enables healthcare teams to respond swiftly to changing patient conditions. Confidentiality is essential in maintaining patient trust and complying with legal and ethical standards. Enhanced information quality ensures that sensitive patient data is protected from unauthorized access and breaches. Completeness of information is equally important. Comprehensive patient records that include all relevant medical history, treatment plans, and follow-up care instructions enable healthcare providers to have a holistic view of a patient's health.'

CONCLUSIONS AND RECOMMENDATIONS

The study concluded that service delivery automation enhances the patient flow because automated appointment scheduling systems can reduce the time patients spend waiting for consultations and treatments. Automation facilitates the digitization of patient records, making it easier for healthcare providers to access and share information. Automated billing systems can ensure accurate invoicing and faster payment processing, which is essential for the financial sustainability of hospitals. Service delivery automation enhances communication among healthcare teams and between providers and patients through tools such as patient portals, messaging systems, and telehealth platforms which facilitate better interaction, allowing for timely follow-ups and consultations.

The study concluded that effective system management ensures optimal resource allocation within hospitals and can help hospitals prioritize the use of medical supplies, equipment, and human resources. Implementing robust inventory management systems can reduce waste and ensure that essential supplies are available when needed. This is particularly important in emergency situations where timely access to resources can save lives. System management also involves financial oversight, which is critical for maintaining operational efficiency. The quality of patient care is directly influenced by the efficiency of hospital operations.

The study concluded that patients are more likely to seek medical care and share sensitive

information when they trust that their data is secure. Hospitals that prioritize data security can enhance patient satisfaction and loyalty. A breach in data security can lead to negative publicity, damaging a hospital's reputation. Maintaining robust data security measures helps hospitals build a positive image in the community. Hospitals with strong data security measures are less likely to experience downtime, ensuring that patient care is not interrupted. Investing in data security can lead to long-term cost savings by preventing data breaches that require expensive remediation efforts.

The study concluded that high-quality information ensures that patient records are accurate and up-to-date, which is crucial for effective diagnosis and treatment. Inaccurate or incomplete information can lead to medical errors, adversely affecting patient safety. Quality information allows for the development of tailored treatment plans based on individual patient histories and needs, enhancing the effectiveness of care provided. High-quality information supports evidence-based decision-making, enabling healthcare professionals to apply the best available research to clinical practice. This can lead to improved treatment protocols and patient outcomes.

The study recommended that the hospitals should transition from paper-based records to comprehensive electronic health records systems. Implement online booking systems that allow patients to schedule, reschedule, or cancel appointments autonomously. Utilize software solutions to monitor and manage patient flow through various departments in the hospital. Develop Apps that allow patients to access health information, medication reminders, and educational resources. Implement automated inventory tracking systems to manage medical supplies and pharmaceuticals. Utilize data analytics to monitor performance metrics, patient outcomes, and operational workflows.

The study recommended that transitioning to comprehensive EHR systems can streamline patient data management, improve communication among healthcare providers, and enhance patient care coordination. Regular training sessions for healthcare professionals on the latest medical practices, technology use, and patient management can enhance service delivery. Implementing lean methodologies can help identify waste in processes, streamline operations, and improve patient flow within hospitals. Establishing systems for collecting and analyzing patient feedback can help hospitals understand patient needs and improve service quality.

The study recommended that the hospitals should perform thorough assessments of existing data security measures to identify vulnerabilities and areas for improvement. Analyze potential threats specific to the hospital environment, including cyberattacks, insider threats, and natural disasters. Use strong encryption protocols for data at rest and in transit to protect patient information from unauthorized access. Conduct ongoing training sessions for staff on data security best practices, including recognizing phishing attempts and handling sensitive information. Create a comprehensive incident response plan that outlines procedures for responding to data breaches or security incidents.

The study recommended that the Hospitals should establish standardized performance indicators that all hospitals must report on, such as patient wait times, readmission rates, infection rates, and patient satisfaction scores. Encourage the adoption of EHR systems that facilitate real-time data entry and retrieval, improving the accuracy and accessibility of patient information. Provide training for hospital staff on data collection methods to ensure consistency and accuracy in reporting. Implement regular patient satisfaction surveys to gather feedback on their experiences and perceptions of care quality.

Suggestions for Further Studies

From the results in regression analysis, the study concluded that there is a remaining 24.4% that

could account for other variables not studied. Therefore, this study suggests that further studies should be carried out focusing on other variables not studied to address this conceptual gap. In addition, the study focused on hospitals in Mombasa County. Therefore, there is need for similar studies that focus on hospitals in other Counties.

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