LEVEL OF AUTOMATION AND PERFORMANCE OF HOSPITALS IN NAIROBI COUNTY

BY

BEATRICE WANJIKU WAMBUGU

A RESEARCH PROJECT PRESENTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF MASTER OF BUSINESS ADMINISTRATION,

FACULTY OF BUSINESS AND MANAGEMENT

SCIENCE, UNIVERSITY OF NAIROBI

NOVEMBER, 2023

DECLARATION

This is my original research project and has not been handed to any other university or examination body.

Signature _____ Date __15/11/2023_____

Beatrice Wanjiku Wambugu

D61/9815/2018

This research project has been submitted for examination with my approval as university supervisor

Signature _____ Date ____16/11/23_____

Dr. Salome Richu

Lecturer,

Department of Management Science & Project Planning

Faculty of Business & Management Science

University of Nairobi

DEDICATION

This research project is lovingly dedicated to my family, a source of immeasurable inspiration. I deeply appreciate the countless sacrifices made, not only for my education but also for my overall success in life.

ACKNOWLEDGEMENT

I would like to convey my deepest appreciation to the Divine for the bestowal of life, well-being, and serenity of mind. I am also appreciative of my supervisor, Dr. Salome Richu, who has generously devoted her time and expertise to offer valuable input and constructive critique on this research. Her thorough assessment, perceptive remarks, and suggestions for enhancement have significantly bolstered the excellence and trustworthiness of this undertaking. Equally significant is the moderator, Mrs. Zipporah Kiruthu, her thorough review process has been instrumental in molding and enhancing the content, methodology, and interpretation of this study. Her proficiency in the domain and her dedication to upholding academic standards have been pivotal in assuring the precision, validity, and pertinence of the research findings.

I am genuinely thankful for the diligence and dedication exhibited by all the faculty members of the department of management science and project planning, in their comprehensive evaluation of this paper. Their exhaustive observations and recommendations have not only enriched the lucidity and consistency of the manuscript but have also stimulated additional contemplation and refinement of the research. Their unwavering commitment to preserving the rigor and integrity of the research process plays a crucial role in nurturing scholarly excellence and advancing the dissemination of high-caliber research results.

Much acknowledgement goes to the respondents of the study. The time, feedback and timely response made the data analysis possible. Further, I wish to appreciate my research assistant, for his integrity in the data collection session. To all my family members and everyone who contributed, directly or indirectly to the success of this project, MAY GOD BLESS YOU ALL.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABBREVIATION AND ACRONYMS

GDP   Gross Domestic Product

IAS   Intruder Alarm Systems

ICT   Information and communication Technology

IDS   Intruder Detection System

IFMIS   International Finance Security Management System

ISMS   Integrated Security Management System

IT   Information Technology

KNH   Kenyatta National Hospital

MTRH   Moi Teaching and Referral Hospital

SPSS   Statistical Package for the Social Sciences

ABSTRACT

The main objective of the study was to analyze the effect of level of automation on the performance of hospitals in Nairobi City County. The specific objectives of the study were to find out the level of automation of hospitals in Nairobi City County; to assess the effect of automation on performance of hospitals in Nairobi City County; and to evaluate the challenges experienced in the automation of hospitals in Nairobi City County. The study adopted a descriptive research design with the target population being the level 4 and 5 hospitals in Nairobi City County. Primary data was collected using semi-structured questionnaires from 72 respondents from the 18 listed hospitals. The response rate was 90.3%. Both descriptive and inferential statistics were used for data analysis. The independent variable, level of automation had 3 sub constructs namely: human resource management information system, patients' integrated system and integrated security system. The dependent variable, organizational performance was measured by patient satisfaction, quality of care, operational efficiency/effectiveness and financial performance as the measures. The regression results had the value of R-square at 0.482. This means that variations in the performance of the hospitals is can be explained by the 3 independent variables. From the findings, the study concludes that HRMIS, patients' integrated system and integrated security system had a favorable and substantial correlation with the performance of hospitals in Nairobi City County. The study recommends that the level 4 and level 5 hospitals in Nairobi County ought to fully adopt the HRMIS, to aid in addressing some of the human resource management challenges including but not limited to identifying ghost workers. The study also recommends that the hospitals ought to fully adopt the patients' integrated system, to monitor the progress of the patients keenly as well as efficiently keeping the patients' records. Finally, the study recommended that the City hospitals ought to fully adopt the integrated security system since the security of the patients and the hospital is paramount in the wake emerging dynamic security threats. The challenges experienced in the automation of hospitals were also outlined. The study highlighted areas of further study among them being a similar study in other industries and a longitudinal study noting the impact automation and innovations can have over a long period of time.

CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

Global integration and technological innovation have transformed the healthcare sector. Healthcare has received numerous benefits from computerization, biometric operation, information technology and the fast movement of information which translates to automation in the long-run. Adila (2012) opined that innovation is the cause of turnaround in health care. The efficiency and effectiveness of the hospital is measured by the adoption of productive technology. The automation of the operationalization of businesses, healthcare and enterprises among others have been prompted by the increased security concerns. The attempt to seal loopholes have been met with innovation that eases the operation and eliminates the wastages. Kassan (2021) indicated that integration of the security system eliminates frauds, inefficiency, delays and major predicaments associated with the manual operation. In a nutshell, it creates a roadmap for productivity and quality performance.

The study was grounded in three theories; diffusion innovation theory, resource dependency theory and modernization theory. Diffusion innovation theory is well indicated as innovation theory or innovation diffusion formulated by Rodgers (1962) to stipulate the importance of information technology, integrated systems, biometric machines, innovations and technological transformation that enhance efficiency and effectiveness. Some of these translate to the impacts of level of automation on performance of hospitals. Resource dependency theory was embedded by Salancik and Pfeffer (1978) to coin the importance of resources and the inter-relationship among firms. This creates avenues for business transformation, benchmarking while acting as a critical yardstick for prosperity. Modernization theory by Rostow Watt (1960) illustrated the economic and social transformation resulting from progressive transition to more effective methods and techniques of operations.

1

Globally, all sectors in the economy have undergone a pragmatic shift, transformation and turnaround for better methods of value addition, production and generation of quality products. Omachonu and Einsprunch (2010) opined that innovation has changed the approaches and techniques in the healthcare industry. The businesses, service industry and other sectors have witnessed paradigm shifts in their operation. The immense innovations in healthcare have caused major transformation. Additionally, the sector has gained numerous simple and secure ways of handling challenges. According to Kisame (2016), the computerization and technology were initiated to curb the security concerns emanating from frequent frauds, misappropriation of resources, delays, and inconveniences. However, the benefits reaped from automation have extended to reduction on the operational cost, increase profit, improve convenience and promote the business operation (Kassan, 2021).

1.1.1 Level of Automation

Automation replaces manual processes with information technology and computerization. It defines the extent of this shift and its impact (Mulumba, 2012). Adila (2012) highlighted computers' role in business enhancement. Healthcare innovation, as per Kassan (2021), eases procedures and enriches hospital operations. Automation encompasses records, analysis, diagnosis, prescriptions, and deviation recognition. Biometric recognition, stressed by Omachonu and Einsprunch (2010), curbs theft and mismanagement. Automation brings cost efficiency, safety, and operational excellence. It boosts efficiency, The influence of a Human Resource Management Information System (HRMIS) on hospital performance is profound. A functional HRMIS efficiently oversees various HR aspects, from recruitment to retention, streamlining operations (Singh, Chakkaravarthy & Das, 2023). By automating and centralizing data, administrative tasks are eased, reducing paperwork and enhancing precision (Singh, Chakkaravarthy & Das, 2023). This boosts productivity, ensures optimal staffing, and supports workforce planning. Insights on performance and training needs from the HRMIS, as

highlighted by Odero (2022), lead to targeted development efforts. Aligning HR strategies with organizational goals, the HRMIS enhances employee engagement and satisfaction (Odero, 2022). It ensures compliance with HR regulations, contributing to improved performance and patient care. In conclusion, an efficient HRMIS enhances human resource management, employee performance, and overall hospital outcomes.

The implementation of a patients' integrated system plays a supreme role in enhancing the performance of hospitals. According to Lan, Chandrasekaran, Goradia, and Walker (2022), integrating various aspects of patient management, such as electronic health records, appointment scheduling, billing and payment systems, and communication channels, hospitals can streamline their operations, improve efficiency, and enhance the overall patient experience. Burns, Nembhard and Shortell (2022) stated that a well-designed integrated system allows for seamless coordination and communication among healthcare providers, enabling them to access accurate and up-to-date patient information, make informed decisions, and provide personalized care. This not only improves the quality and safety of healthcare delivery but also contributes to increased patient satisfaction and loyalty. Furthermore, a patients' integrated system facilitates effective data management and analysis, allowing hospitals to identify trends, monitor outcomes, and continuously improve their services. By leveraging technology and implementing a comprehensive patients' integrated system, hospitals can optimize their performance, enhance patient outcomes, and establish themselves as leaders in delivering high-quality healthcare services.

Integrated security systems significantly boost hospital performance. By amalgamating security measures like surveillance, access control, alarms, and fire detection, hospitals ensure safety and assets protection (Jamal, Majid, Konev, Kosachenko & Shelupanov, 2023). These systems deter threats,

enabling rapid responses in emergencies (Harikrishnan, Sunilkumar, Joseph & Nair, 2023), creating a secure patient environment, engendering community trust, and safeguarding hospital reputation (Harikrishnan et al., 2023). Real-time monitoring enhances resource allocation, risk management, and overall hospital performance (Aldhyani & Alkahtani, 2023).

Dowling (2014) associated automation with quality and standard services. Wong and Sohal (2013) credited the automation in the provision of consistency and better service delivery. The automation of hospitals' process starts from the registration to the discharge from the hospital. The automation has heightened productivity, accessibility and implementation of strategic plans of the healthcare sector. Automation has been associated with productivity and efficiency. Too (2021) posit that emerging technological innovation improves the tactical plans in the organization. The implementation of projects and its performance has been measured using robustness and the user acceptance. Pato and Millet (2011) concluded that technical performance assisted in the delivery of accurate results in minimal time. Moreover, it gives chief latitude to speed and security. However, it has faced several challenges such as power outages and system failures in some cases. In a nutshell the automation has brought significant transformation to the hospital. The developed countries have rolled out automation in all sectors of their economy (Adila, 2012).

1.1.2 Organizational Performance

Performance in any organization is critical due to the nature and expectations of the operations. The clients, shareholders and the employees expect efficiency and effectiveness. The performance in hospitals has been associated with time taken to deliver, speed, efficiency and effectiveness. Consequently, effectiveness, efficiency in addition to environmental concerns built a great foundation for the operational efficiency (Hsieh & Lin, 2010). Moreover, the qualitative metrics for measuring the performance include the customer satisfaction and corporate social responsibility. Bakken and

Baker (2023) opined that performance is the major purpose of the healthcare sector. The performance is driven by strategy to accomplish the shareholders' objective. Martinho, Rijo and Nunes, (2015) indicated that alignments of business objectives, strategies and tactics helps the organization to accomplish the centralized objective. Davenport (2013) opined that China and America have portrayed increased performance resulting from intensive execution of computerization systems.

Organizational performance encompasses various aspects, including technical, operational, design, and financial outcomes. To gauge performance effectively, it is essential to employ measurable indicators that target strategies and operational tactics. According to Lee (2017), performance plays a vital role in boosting employee confidence and delivering high-quality services to clients. Evaluating hospital performance can be achieved through both qualitative and quantitative metrics. Qualitatively, the achievement of strategic objectives serves as a method to measure performance, as hospitals align their goals with market demands. Thota, Shajin and Rajesh (2020) emphasized the significance of key performance indicators, highlighting the importance of goal setting and striving for continuous improvement to achieve desired outcomes. Efficiency and effectiveness in fulfilling the organization's mandate are key factors in determining performance, while maintaining quality performance helps eliminate errors, deficiencies, and wastage, contributing to overall success.

1.1.3 Level Four and Five Hospitals in Nairobi County, Kenya

The service industry is the chief contributor to the economy. Its contribution is approximately 64% of Kenya GDP (Kungu, 2014). The service industry includes tourism, communication and the healthcare service. The immense chain of success has been recorded in the airline sector. The availability of high-quality, effective, and efficient healthcare services in hospitals serves as an indicator of their performance. In Nairobi, hospitals are classified into different levels, each catering to specific healthcare needs. Level 1 facilities are community-based and focus on treating minor illnesses. Level

2 comprises health dispensaries, while level 3 consists of well-equipped health centers. Furthermore, level 4 encompasses county hospitals that are strategically located within the region. Additionally, level 5 refers to county referral hospitals, and level 6 represents national referral hospitals, offering specialized and advanced healthcare services. The performance of hospitals indicates the healthcare fitness of a nation (Omolloh, Were, & Muchelule, Mwaniki, 2023). The industry has presented a holistic avenue to address the challenges in the nation. Quality hospital service translates to a better standard of living. Moreover, it reflects the life expectancy and productive age that translate to growth of the economy.

The vision 2030 indicated healthcare as one of the objectives that can transform Kenya economy (GOK, 2018). In addition, the GOK listed healthcare and hospital upgrades among the four key pillars of the economy (BIG Four). The strategic policies formulated by the ministry of health (GOK, 2020) illustrated the importance of a healthy nation in transforming the economy. The development of the country depends on the productive nation. Kungu (2014) opined that hospitals present good opportunities for development. The numerous pressing health problems can be handled by hospitals to achieve sustainable development goals. The health sector is fundamental for the nation. Besides increasing the healthy population, it enhances the competitiveness of a nation. The critical benchmarks, brainstorming and assemblage of critical health equipment has been successful in countries with quality healthcare (Mwaniki, 2017). A healthy population provides human capital and untapped knowledge for the productivity of a nation.

The automation of hospitals is vital for enhancing performance and service delivery by integrating technology and automated systems to streamline processes, improve efficiency, and enhance healthcare quality. Automating tasks such as patient registration, appointment scheduling, billing, inventory management, and medical records reduces errors, saves time, and increases staff

productivity (Kilincer, Ertam, Sengur, Tan, & Acharya, 2023). It promotes better communication and collaboration among different departments, improving coordination within the healthcare facility. Real-time monitoring of patient data enables faster and more accurate diagnoses, treatment decisions, and care delivery. Focusing on 18 level 4 and level 5 hospitals in this investigation provides a comprehensive understanding of how automation impacts performance and service delivery in advanced healthcare settings.

1.2 Research Problem

Automation and performance in the hospital setting are closely intertwined. The implementation of automation technology has led to increased efficiency and effectiveness in various operational processes. It has also significantly contributed to the delivery of high-quality services. Tonner (2012) emphasized the importance of automating systems across sectors to enhance cost management, improve accessibility to services, and enhance service quality. By incorporating automated systems, hospitals experience growth and improved service delivery. The introduction of automated systems, such as biometric employee clocking and computerized patient registration, has positively impacted hospital performance. Automation and organizational performance are intertwined because automation enables the provision of excellent services to clients (Panigrahi, Jena and Mishra, 2022). Furthermore, automation is tailored to address specific needs and requirements (Cupido, 2011). Porter and Tanner (2012) highlighted that automation and performance play significant roles in transforming the healthcare industry.

Globally, countries like the US and China have prioritized healthcare, allocating substantial budgets for two decades (World Bank, 2022). Their emphasis on quality services provides a competitive edge and reduces medical tourism. The World Bank (2020) underscores healthcare in sustainable development goals. Management systems, according to Mwarangu (2018), are transformative in

business. Prior research, for example Muheidat (2020) and Shehu and Dika (2011), links performance with biometrics and technology, yet yields varying findings. Computerization and biometrics expedite healthcare, as affirmed by Hans et al. (2016), Mwaniki (2017), and Fátima et al. (2015). Automation boosts loyalty, notes Muthee and Mang'ana (2021), enhances operations, medication, and employee support. It heightens customer satisfaction (Tonner, 2012), aligning with Kenya's constitution (GOK, 2010). Healthcare's contribution to the economy and its role in nurturing a productive population are evident (GOK, 2010).

Organizational performance is critical for the transformation and success within an entity. The studies conducted by Mulumba (2012) and Omobogo (2016) identified top management involvement and the utilization of modern technology as key factors associated with achieving excellent performance in organizations. Furthermore, Adewole (2014) emphasized the significance of performance as the core of an organization, while Kim, Eves, and Scarles (2013) asserted that organizational performance is a pivotal factor for the long-term sustainability of firms. Seethamraju (2012) highlighted the critical role of performance in enhancing cost-effectiveness and ensuring the continuous operation of businesses. Abanti (2010) concluded that the level of acceptance of biometric systems portrays the performance. Kassan (2021) indicated that an integrated security system protects hospitals from enormous challenges. Adila (2012) recommended the biometric authentication systems to promote the quality service, eliminate errors, and avoid delays. Kungu (2014) concluded that information technology transforms the health sector by enhancing service delivery and quality results. Moreover, the public sector can address the challenges faced by the citizens through automation of services (Kungu, 2014). Davenport (2013) concluded that a nation can earn the foreign exchange through quality hospitals in the country.

The hospital segment is a critical and highly important field that requires significant attention and focus from various stakeholders. The provision of healthcare services directly impacts the well-being and quality of life of individuals, making it essential to prioritize and invest in the development and improvement of hospitals. The sector plays a vital role in public health, diagnosing and treating illnesses, and ensuring the overall welfare of the population. Mwaniki (2017) posits that quality, timely and customer-oriented service increase client's loyalty in the hospitals. The increasing number of patients in the facility depends on the services offered and punctuality. Shawlo (2013) stated that productivity and punctuality in the healthcare sector is very important. Lu (2016) described the importance of hospitals in the provision of quality services and promoting drastic improvement to the economy. Hospitals enhance the customer to access service in time and on demand. The growth and prosperity of a nation is gauged using economic development and health care productivity.

Wang, Wang, Ma, Fang, and Yang (2019) demonstrate that public health advancement significantly shapes economic prosperity, signifying a direct link between population well-being and a nation's economic stability. Prioritizing public health through efficient strategies enhances individual well-being and workforce productivity. Investing in healthcare infrastructure, disease prevention, and services is vital for economic growth and societal vitality. Reza and Barua (2016) assert that healthcare quality propels economic development. Notably, while global research on automation exists, local studies remain limited, revealing a contextual gap. Regional research has largely focused on IT, leading to conceptual disparities in automation understanding across sectors. Local studies combine secondary and primary data, applying mixed methodologies. Yet, these varied approaches result in methodological and conceptual gaps necessitating further research.By bridging these gaps, a more comprehensive and holistic understanding of automation and its implications can be achieved.

Therefore, this study aims at answering the question on; what is the effect of automation on the performance of level 4 and 5 hospitals in Nairobi City County?

1.3 Research Objective

The overarching goal of this study was to examine the impact of the level of automation on the performance of hospitals in Nairobi City County.

The study was guided by the following specific objectives:

i.   To find out the level of automation of hospitals in Nairobi City County.

ii. To assess the effect of automation on performance of hospitals in Nairobi City County.

iii. To evaluate the challenges experienced in automation of hospitals in Nairobi City County

1.4 Value of the Study

The research significantly contributes to the existing body of knowledge and enhances our understanding of the subject matter. It serves as a valuable reference for scholars who can build upon the findings to conduct further studies. They provide valuable insights and recommendations for improving the performance and quality of healthcare in line with international standards. Scholars can gain valuable insights into the current technologies and advancements in the hospital setting through this research, enabling them to stay abreast of the latest developments and contribute to the transformation of Kenyan healthcare.

The research set is conspicuous and prerogative towards the research outcome. The research is vital in enhancing the transformation, boosting knowledge of policy makers, students, doctors and managers. In addition, the research updates the previous finding to suit the technology-based

environment, performance and automation of the hospitals. The management and employees can enhance their operation and discharge of duties to fit the tastes and preferences of the customers in the fast-paced technological environment.

The research shall have a significant impact on management practices, fostering creativity, imagination, and innovation within the hospital setting. By embracing technological innovations, the hospital can enhance its credibility and reputation among patients and stakeholders. Automation can streamline operations, leading to cost reductions in areas such as drug procurement and service delivery. This, in turn, shall result in more affordable and accessible healthcare services without compromising quality and timeliness.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This section presents a comprehensive literature review that pertains to as well as aligns with the aim of the current assessment. It addresses significant concept and practical considerations that are pertinent to understanding the influence of automation levels on organizational performance. The chapter aims to establish a robust theoretical foundation and empirical framework for the subsequent analysis and findings of study.

2.2 Theoretical Framework

The study was built on 3 theories namely, diffusion innovation theory, resource dependency theory and modernization theory.

2.2.1 Innovation Diffusion Theory

This theory was embedded by Rodgers (1962) attempting to expound on the level of assimilation of innovation, how it is done, where it is implemented, the rate of spreading ideas. The theory blueprints the speed of ideas, practices and the products. It gives deeper insight on technological advancement and seeks to justify the pattern of assimilation and utilization. Healthcare enhances the utilization of technology to increase efficiency. It is useful in the advancement of the operations in the health sector. The theory is the epicenter of relative advantage and observation. Moreover, it seeks to explain the consistency in the application of technology and automation in all the sectors of the economy (Wani & Ali, 2015).

The theory is relevant since it provides critical aspects in the relative advantage. The theory explains the consistent values, experiences and the demands by the potential users. The theory assembles the multiple problems facing the organizations and attempts to solve them through a single solution.

Therefore, it results in automation and easing the complex processes which are tedious and costly (Hidayat & Mukminin, 2022). It blueprints the alignment of the firm's policies, skills and knowhow. The advancement of the technological landscape lubricates automation in the hospitals. The complex issues, problematic procedures, lack of standardization and high degree of mismanagement can be avoided through automation. This is possible through mass assimilation of technological advancement and automation (Acikgoz, Elwalda, & De Oliveira, 2023)

2.2.2 Resource Dependency Theory

This concept was established to elaborate on the inter-dependency, alliance and common unity in the journey toward collective success. This theory was coined and embedded in 1978 by Pfeffer and Salancik. It states that an organization depends on different assets and services in a business environment. Dependence rate by organization is based on the dynamic business surrounding which alters this. The theory is a yardstick towards the achievement of common goals. Moreover, the theory illustrates the supremacy realized through a highly network of firms and scaling against all odds to accomplish the goals (Rixom, Jackson, & Rixom, 2023).

The resource-based logic looks at the companies within operation surroundings as a primary driver which can influence competitive merits for company. The RBT, assumes that a firm is made up of unique resources and capabilities as core for the company's strategy to compete favorably with other firms and make profit over its rivals. As by Hitt, Ireland and Hoskisson (2013), institution maximized assets at their disposal to improve accomplishment. For this to happen, the company has to carry out its activities in an integrated manner and differently from the other firms. Automation is the most valuable resource in hospitals   that would help in cutting cost of expenses as well as improving efficiency of services offered in the hospital in Nairobi County.

2.2.3 Modernization Theory

Proposed by Rostow Watt in 1960, this theory outlines societal modernization, delineating the transition from traditional to contemporary practices. Modernization entails shifting from established to current methodologies. The theory emphasizes economic and social growth, elucidating the continuous integration of novel approaches. It advocates for well-connected businesses that align with the rapid pace of commerce, highlighting the significance of optimizing business processes. In the healthcare sector, particularly hospitals, precision, efficiency, speed, accuracy, and timeliness are paramount. Hospitals serve as vital gateways to healthcare sector advancement, facilitating the transition toward modern development (Amlung, Huth, Cullen, & Sequist, 2020).

Relevant to the contemporary highly interconnected society, this theory transcends national boundaries, disrupting self-sufficiency and fostering global connections. This interconnectedness underscores the interdependence of society and economics (Acemoglu & Robinson, 2022; Charles, 2022). Networks accelerate globalization and international interaction. This theory holds importance in studying the relationship between ATMs and hospital bill payments, as well as the evolution of automated hospital services. These advancements enhance efficiency and the healthcare sector, prioritizing service quality over revenue generation. The evaluation focal point was on influence of hospital automation on service delivery plus performance, shedding light on the modernization of hospitals and its implications.

2.3 Level of Automation

The determinants of performance in the hospital include the use of Human Resource Integrated System, Patients' Integrated System and the Integrated Security System. The Human Resource Integrated system is useful for proper management of employees, preparation of payroll and proper

monitoring as well as evaluation. The Integrated Security System reinforces the operation of business without security threats. This is possible through a proper system for surveillance and security checks.

According to Kilincer, Ertam, Sengur, Tan, and Acharya (2023), level of automation in a hospital encompasses several key aspects that significantly impact the delivery of healthcare services. It includes digital maturity, which reflects the hospital's readiness to adopt advanced technologies. Hospitals with high digital maturity often employ electronic health records (EHRs), telemedicine, and data analytics, improving patient care and decision-making. Integration of information systems ensures seamless data flow between systems, enhancing efficiency. EHR adoption and telemedicine services reflect automation levels, increasing accessibility and patient care quality. Automated administrative processes, like scheduling and billing, streamline operations. Data analytics extracts valuable insights from healthcare data. Some advanced hospitals use automation in clinical procedures, such as robotic surgery and clinical decision support, to enhance precision and patient outcomes. Automation is pivotal in modern healthcare.

2.3.1 Human Resource Integrated System

The human resource Integrated system is critical in safeguarding the confidential information about the employees. It assists in management of clocking and time out. Kisame (2016) indicated that biometric systems are important for business operation. The automation blueprints adoption of electronic employee's systems. The system helps in efficient attendance management of employees, payroll preparation and standardization. Moreover, the system provides efficient and effective techniques for the operation of the hospital. The activities, undertakings, leaves and bonus are handled through automated systems. Ononiwu and Okorafor, (2012) concluded that effective systems increase productivity among the employees and offer guidance on the working hours. The actions provide a framework for efficient business operation.

2.3.2 Patients' Integrated System

The patients' integrated system plays an important part in from patients' registration to the discharge. The system is designed to answer questions raised by the patients and relay them to the doctors for more actions. The automated excel can enhance the management of massive data. Currently, there are powerful tools to improve the patients' outcomes. Automation upgrades the accuracy of the results, improves speed and reduces room for medical errors. Kassan (2021) opined that delivery of quality service relies on the quality systems to address the predicaments facing the patients. The automation of healthcare enhances better therapeutic options.

2.3.3 Integrated Security System

The security integrated system, known as integrated security or security system is critical for the safety of both employees and the patients. The security systems entail the promotion of safety of information and ensuring adherence to well-stipulated policies that promote the hospital operation. The system protects the employees and patients' confidential information from the cyber-attacks (Bartholomeusz, 2023). Moreover, the majority of the hospital has additional security information of perimeter walls, doors and barriers. Likewise, the integrated system prevents virtual and intrusion motivated in degrading the credibility of security, confidentiality, accountability, integrity and availability of the data. The presence of biometrics systems, CCTV and Sensor among other security measures. Moreover, the system detects intruders and relays warning information for responses.

2.4 Empirical Reviews

In a recent study conducted in Kilincer, Ertam, Sengur, Tan and Acharya (2023), researchers focused on the auto detection of cybersecurity threats in healthcare systems. The study was prompted by the proliferation of interlinked healthcare devices, software, operating networks, and networks in IoMT,

which has great security threat as a result of lack of robust protection against internet attacks in most IoMT devices. To sort this setback, assessors built a model for detecting cyber-attacks as well as anomalies, maximizing RFE in combination with MLP optimization. The RFE technique employed LR together with XGBRegressor kernel approach to select the high optimal attributes. Additionally, the researchers fine-tuned the parameters of the MLP model using a hyperparameter optimization technique, and performance evaluations were conducted through a 10-fold cross-validation approach. They postulated a technique illustrate the ability to efficiently counter attack threats in health systems. The analysis was based on the healthcare in different ways, however, it did not analyze the key products for hospitality such as automation thereby leaving conceptual gaps.

In their research conducted in 2023, Mashar, Chawla, Chen, Lubwama, Patel, Kelshiker, and Peters (2023) examined the optimization of Artificial Intelligence (AI) algorithms in healthcare and addressed the regulatory challenges associated with their executions. The progressive adoption of machine learning techniques in healthcare was the driving force behind the study, as it aimed to nail the persistent issues that have hindered performance in the field. Machine learning has become pivotal in transforming and adapting to continuous changes in the healthcare environment, utilizing its distinctive adaptive characteristic of learning from real-world feedback. However, the study emphasized the need for strict regulations to ensure patient safety and mitigate challenges at a systemic level, given that machine learning algorithms frequently support or even substitute the role of medical professionals. To address this, the study advocated for the establishment of a novel control away, akin to the regulation of medical professionals, that covers the entire life cycle of an algorithm—from its inception and development to its clinical application and continuous adaptation in hospital practice. However, this examination focused on the global perspective while the current study delves into the local context.

Owino, Senaji, Eng and Ntara (2017) analyzed consequences of modernization in regards to the sourcing of revenue. The study was undertaken in Nairobi City County. The research utilized descriptive surveys. Moreover, the population was composed of 102, 41 and 13 lower level, middle and upper-level managers. The stratified proportionate but random sampling was maximized in the evaluation. Semi-structured questionnaire WAS optimized to garner data from the respondents. The finding coined that online billing procedure promoted the performance. However, the study did not analyze the automation of hospitals in Nairobi County.

Tetteh (2012) Scrutinized Automation System steps. The research pivotal region was Ghana Revenue Authority. The research concentrated on the efficiency of income collection. The efficient employment of the system promoted tax administration and automation. Additionally, the study concluded that automation provided a crucial framework for the elimination of costly processes. In addition, there was a dramatic increment in cash receipts that effectively sustained the utility while generating the acceptable return on investment. The research was undertaken in Ghana. Moreover, it concentrated on revenue collection. Nonetheless, the investigation done in a distinct setting using different methods thus current fills the gaps.

Porter and Thomas (2013) assessed the association amid the hospitality quality and service quality. The study was driven by the desire to analyze a sample of 150 hospitals in the UK. The categories of the hospital scrutinized were the community hospitals. The study concluded on the strong correlation amid the patients' satisfaction and quality of hospitality products. The outcome also concluded that numerous health facilities have embarked on changing the environmental serenity to reflect hotels. Moreover, conducive and private rooms with self-service enhance the performance of the hospital. Even though the pivotal area of study was hospital, it did not dwell much on automation. In addition, it was undertaken in the UK hence a local study fills the contextual and conceptual loopholes.

Delnoij et al. (2010) analyzed the consumer quality index. The study was informed by the need to make quality choices on the hospital to visit. The comparative analysis was run on what informed the patients. The conclusion indicated that managers valued operational efficiency and productivity. Nonetheless, the patients made the decision on which hospital to obtain service based on the prices. However, manual hospitals were more procedural and costly than automated ones. They examined Dutch consumers and there is a need for local study. Additionally, the studies emphasized on the prices without addressing automation directly.

Njonde and Kimanzi (2014) assessed the unified financial governance information System. The researcher was motivated to scrutinize why the government rolled out IFMIS. The research pivotal region was the Nairobi County Government. The conclusion indicated that IFMIS played an immense part in finance, reporting, budgets, control mechanisms, monitoring and balance-checks. The assessment recommend that the use of IFMIs enhanced standardization, ease the process, elimination predicaments and enhanced the performance.

Midiwo (2015) examined the integral effect of Human Resource Information Systems. Contest of evaluation was electronic sourcing of employees for the Kenya Public Universities. The research prioritized descriptive research methods. The target respondents were HRMIS users and the service providers. The questionnaires were optimized to source the secondary data. Additionally, interviews enhance the research findings. The stratified sampling method was useful in the research. The finding summarized that HRMIS offered quality, standardized, accurate and effective results to the recruitment process. The study did not analyze the automation of the hospital in Nairobi County.

Twathe (2020) examined the strategic management and accomplishment of referral hospital in Kenya. Investigation utilized the case study to arrive at the conclusive results. Moreover, the content analysis was useful in the research. The descriptive techniques in addition to the presentation formats enhanced

the interpretation. Moreover, the presence of the 2010-2013 and 2013-2017 strategic plan was an eye-opener in the study. The automation was an integral plan for excellence performance, execution of changes, enhancement of medical information, and improvement of service deliveries. The study did not concentrate solely on the automation and performance hence needful for such research.

Kisame (2016) assessed the effect of computerized biometric systems. The research was informed by the need for a case study regarding Operational effectiveness of MTRH. The research employed a descriptive design for recommendations and the results. The target respondents were 2906 employees. Moreover, the descriptive and inferential analysis eased the explanation, conclusion and the interpretation. The study opined those computerizing biometric systems enhanced the efficiency and effectiveness. Nevertheless, the study was a case study analyzing biometric computerization without critical outlook of automation in the hospitals located in Nairobi County.

Kassan (2021) analyzed the essential component of the integrated security management system. versus the crime level. The study was motivated to illustrate the chief role of crime elimination. The data was generated through interviews as well as the questionnaires. The conclusion recommended for the technological absorption to eliminate risk in the hospital. The research focused on a case study of Kenyatta National Hospital, highlighting the necessity for analyzing hospitals in Nairobi County.

2.5 Summary of Literature Reviewed and Research Gaps

Kassa (2021) concluded that an integrated security system helped in the elimination of crimes and other bottlenecks. Kiseme (2016) opined that computerization and the biometric system enhance the performance while Twatte (2020) recommended for strategic plans to increase the adoption of prevailing technology to gain the competitive advantage. Delnoij et al. (2010) scrutinized the consumer index and concluded that the ability of business to adopt new ways in their operation

enhanced the performance. The study concentrated on Dutch Consumer hence a local study is paramount for in depth knowledge.

Porter and Thomas (2013) analyzed quality hospitality techniques in the hospital while Thomas (2013) examined the strategies utilized to realize holistic performance. From the analysis, the studies failed to address the automation thought it recommended for the adoption. In summary, the global studies have opened doors for contextual and methodological gaps. The regional studies widened the conceptual and methodology gaps. The local studies reviewed posted knowledge and concept gaps emanating from multiple ideas.

2.6 Conceptual Framework

This is the schematic representation portraying the association between the dependent and the independent variable. The independent variable, Level of automation was measured by human resource management system, patients' integrated system and integrated security system. The dependent variable, which is organizational performance, had patient satisfaction, quality of care, operational efficiency/effectiveness and financial performance, as the sub constructs.

Independent Variable

Level of Automation   **Dependent variable**
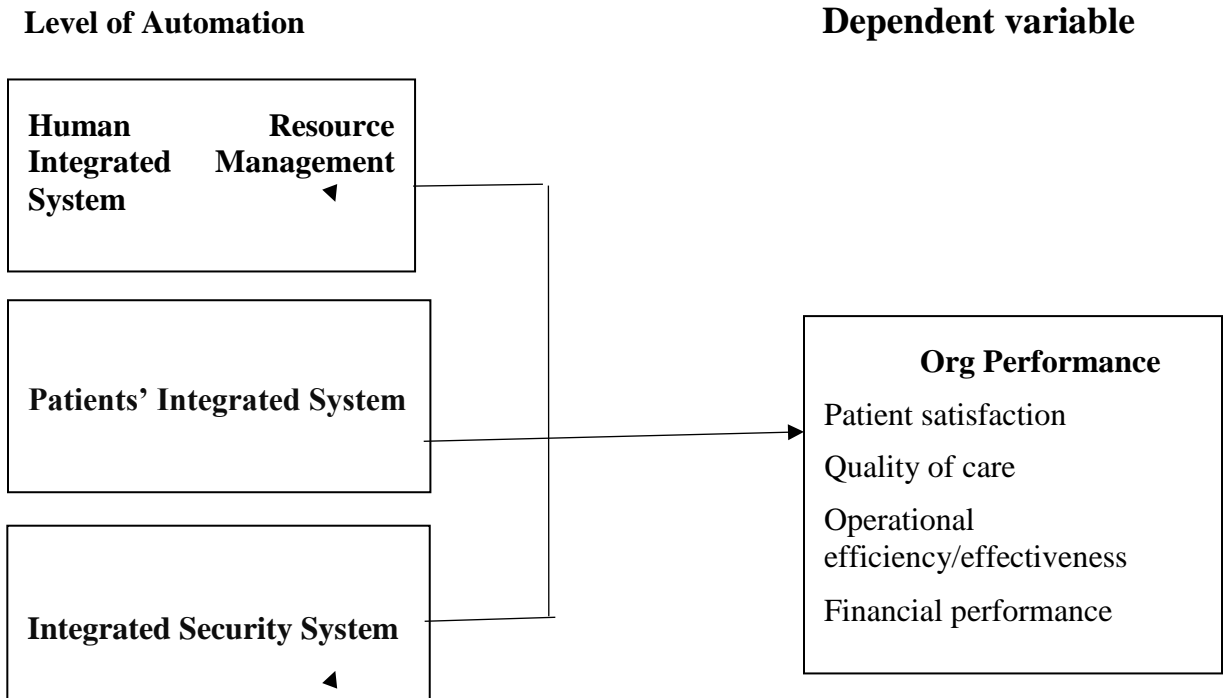
Figure 2.1 Conceptual framework

Source: Researcher, 2023

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

The part is the epicenter of research approach, which blueprints the guideline on how to undertake investigation. It pinpoints the adequate population to make a conclusive recommendation and generalization. It posts the data gathering techniques based on the nature and intention of the research. It also elaborates on the data analysis method that eases the interpretation, explanation, conclusion, and discussions.

3.2 Research Design

The research design is a framework and roadmap explaining how the assessment and analysis was undertaken. The research employed a descriptive research design to facilitate the assessment analysis and sourcing data. Cooper and Schindler (2014) argued that design is supreme in guiding the steps of data collection, analysis and the measurement. It uncovers the research problems while answering the evaluation questions.

3.3 Target Population

Target population is the cornerstone for the sourcing of the research information. It blueprints the clear direction for the research findings (Saunders, Lewis & Thornhill, 2016). The target population in the study were the level 4 and 5 hospitals in Nairobi County. There are eighteen (18) level 4 and 5 hospitals in Nairobi County (Appendix 11). As the target population was relatively small, a census was executed. Further, executing a census frequently leads to a sufficient number of respondents, ensuring a high level of statistical confidence in the survey results.

3.4 Data Collection

The assessment in this study involved the collection of primary data, which was obtained by the use of semi-structured questionnaires. The research specifically focused on the 18 level four and five hospitals in Nairobi City County, examining deeply into their operations and performance. The questionnaire was segmented into sections. Section A encompassed general data, collecting data on various aspects that provide a broad understanding of the hospitals under study. This section gathered information such as hospital demographics, size, and overall organizational structure. Section B focused on the independent variable, namely the level of automation within the hospitals.

Section C addressed specific issues related to the performance of the hospitals. It gathered data on key performance indicators, such as patient satisfaction, quality of care, operational efficiency, and financial performance. This section aims to examine association amid the level of automation and overall performance outcomes of hospitals. Finally, Section D had some open-ended questions, where the respondents can avail any information relevant to the study but not captured in the other sections.

The key respondents were chief officers in the four key departments in line with the study variables, namely, operations department, ICT department, finance department, and senior management. Therefore, the total respondents were 72 officers. Once the data was consolidated, it was reviewed, summarized, and then coded to facilitate the subsequent analysis. This approach enabled the researcher to draw meaningful insights and make informed conclusions based on the gathered data.

3.5 Data analysis

Data analysis is a crucial element of research, as it empowers researchers to extract meaningful insights and draw conclusions from the gathered data. Without proper data analysis, the information gathered may not be interpreted hence fail to contribute to the overall research objectives (Saunders, et al, 2016;

Kothari, 2005). It summarizes the data garnered, visualizes data, and strive to construct patterns, communicate and interpret the results. Data analysis allows researchers to draw more reliable and generalizable conclusions from their data (Salter, Mutlu & Frowd, 2023). The data scrutiny entails the systematic application of statistical ways, consistent techniques and sound judgment. Data analysis entails the application of logical techniques to elaborate, condense and evaluate the data (Resnik, 2023).

Consequently, the collected data from sections A, B, C and D were examined by SPSS. This examination delved into examining the link amid degree of automation and accomplishment of the 18 level 4 and 5 hospitals in Nairobi County. Through statistical techniques and tests, the study aims to uncover any significant correlations, patterns, or associations among the study variables, providing valuable insights into how automation impacts the performance of hospitals in the specified context.

The data collected was evaluated systematically while applying the statistical computations. The condensed and summarized data helps in the quantification before making inductive inferences. This study optimizes the multiple linear regression to elaborate on the correlation amidst elements. The assessment equation was of the form:

$$Y = \alpha_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_3 X_3 + \varepsilon$$

Whereby: Y = Performance of the hospital

α_0 = y intercept of the regression (constant attribute)

X_1 = Human Resource Management System

X_2 = Patients' Integrated System

X_3 = Integrated Security

ε = error term

CHAPTER FOUR: DATA ANALYSIS, RESULTS AND DISCUSSION

4.1 Introduction

The section outlines the analysis of the data collected, the interpretation of the key results and the discussion of the findings, which are integral aspects of the study. The study utilized primary data collected through structured questionnaires administered to the respondents. Subsequently, the collected data was cleaned and coded, preparing it for analysis. The results were analyzed using both inferential and descriptive statistics. The inferential statistics entail model summary, ANOVA as well as the regression coefficients. The descriptive statistics were outlined in form of means, standard deviation and frequencies.

4.2 Response Rate

The study employed a census approach due to the relatively small number of target respondents. The aimed population for the study comprised 72 respondents. Questionnaires were administered to the 72 respondents who were chief officers from the four key departments in relation to the study variables in the 18 level 4 and 5 hospitals in Nairobi City County. However, 65 surveys were properly completed and returned. The represents a rate of feedback of 90.3 percent, which is sufficient in a research study. Table 4.1 outlines these results.

Table 4.1: Response Rate

	Frequency	Percent
Response	65	90.3
Non Response	7	9.7
Total	**72**	**100**

4.3 Demographic Information

Demographic information involves the information that relates to the respondents as well as the hospitals under study. This study sought to analyses the gender of respondents, their educational attainment, the duration of their service in current positions, the number of years since the hospital upgraded to its present level, and the duration since the hospital adopted automation.

4.3.1 Gender

The assessment aimed to examine the gender of respondents. From the outcomes, 52.3 percent of the respondents contacted were female whereas 47.7 percent were male. This implies that the chief officer positions in the various departments in the hospitals under study were occupied by both male and female as outlined in Table 4.2.

Table 4.2: Gender of the Respondents

	Frequency	Percent
Male	31	47.7
Female	34	52.3
Total	**65**	**100**

4.3.2 Level of Education

The evaluation further aimed at evaluating degree of education of respondents. As observed from the analysis results, 56.9 percent of those contacted in the study had undergraduate qualification whereas 43.1 percent had postgraduate qualification. Table 4.3 outlines these outcomes.

Table 4.3: Level of Education

	Frequency	Percent
Undergraduate	37	56.9
Postgraduate	28	43.1
Total	**65**	**100**

4.3.3 Number of Years of Service at Current Position

The investigation also purposed to examine number of years the respondents had served in their present positions in the respective hospital under study. This was critical because it is instrumental in determining the level of experience as well as the quality of knowledge regarding the operations of the hospital. From the results, 30.8 percent of the respondents contacted had worked in their present positions for between 10 to 15 years, 24.6 percent for above 15 years, 23.1 percent between 5 to 10 years and finally 21.5 percent below 5 years. Table 4.4 outlines the outcomes.

Table 4.4: Years of Service at Current Position

Years	Frequency	Percent
Below 5	14	21.5
5- 10	15	23.1
10 -15	20	30.8
Above 15	16	24.6
Total	**65**	**100**

4.3.4 Level of Hospital

The analysis further centered on analyzing the levels of hospital under study. From the outcomes, 64.6 percent of the hospitals under review were level 5 hospitals whereas 35.4 percent were level 4. Table 4.5 current these outcomes

Table 4.5: Level of Hospital

	Frequency	Percent
Level 4	23	35.4
Level 5	42	64.6
Total	**65**	**100**

4.3.5 Number of Years since Hospital was Upgraded to Current Level

The assessment also sought to establish the number of years since the respective hospitals were upgraded to their current levels. It was observed that 56.9 percent of the hospitals upgraded 10 to 15 years ago, 26.2 percent more than 15 years ago and finally 16.9 percent between 5 to 10 years ago. Table 4.6 outlines these results.

Table 4.6: Years since Hospital was upgraded to Current Level

Years	Frequency	Percent
05- 10	11	16.9
10 -15	37	56.9
Above 15	17	26.2
Total	**65**	**100**

4.3.6 Number of Years since the Implementation of Automation

The examination finally target to analyze the number of years since the respective hospitals implemented automation in their different departments. As can be observed, 58.5 percent of the respondents indicated that their hospitals implemented automation between 10 to 15 years ago, 23.1 percent having implemented automation more than 15 years ago and finally 18.5 percent to the hospitals implemented automation between 5 to 10 years ago. Table 4.7 outlines the outcomes.

Table 4.7: Years since Implementation of Automation

Years	Frequency	Percent
05- 10	12	18.5
10 -15	38	58.5
Above 15	15	23.1
Total	**65**	**100**

4.4 Descriptive Statistics

Descriptive statistics are significant as they provide the explanations of the characteristics of the dataset. The descriptive statistics entailed the means, standard deviation as well as percentages. The study employed primary data, gathered predominantly through the use of questionnaires as the main data collection tool. A Likert scale was used to collect responses from closed ended questions. The values of the scale ranged from 1 to 5 with 1 representing Strongly Disagree (SD), 2 for Disagree (D), 3 for Neutral (N), 4 for Agree (A) and 5 for Strongly Agree (SA). In the interpretation of these responses, the study calculated the mean response of each of the statements. A mean of 1 implied that the responses were largely in strong disagreement, mean of 2 implying that the responses were largely in disagreement, mean of 3, responses were neither in agreement or disagreement, mean of 4, the responses were largely in agreement and finally mean of 5 implying that the responses were largely in strong agreement. The descriptive analysis was done according to the variables in the study.

4.4.1 Human Resource Management Information System (HRMIS)

The section outlines the descriptive results of human resource management information system in form of frequencies, mean and standard deviations. From the results, the question, automation has been incorporated in the hospital, received responses as follows; 43.1% of the responses were in strongly in tandem, 27.7% in agreement while 6.2% neutral with a mean of 3.8 and a corresponding SD of 1.3 implying that on average, the responses were in agreement. Furthermore, 26.2% of the respondents further agreed that automation assists in clocking in and clocking out by the employees, 7.7% taking a neutral stand and 38.5% strongly agreeing with a mean and SD of 3.6 and 1.4 in that order.

Regarding the question, the automation is useful in preparation of payroll for the employees, 43.1% of those contacted did strongly agree, 23.1%, agreeing whereas 9.2% did not take sides with a mean of 3.8 and an SD of 1.4. With an average of 3.7 and SD of 1.4, 24.6% of the responses were in agreement that automation enhances increase the standardization in the daily undertaking. Furthermore, 41.5% were strongly in tandem while 9.2% did not take sides. Finally, 29.2% of the responses were in strong agreement that automation has enhanced evaluation and monitoring of the employees. However, 32.3% were in agreement and 12.3% neutral with a mean of 3.6 and an SD of 1.3. The results are displayed in Table 4.8.

The results are displayed in Table 4.8.

	SD	D	N	A	SA		S
	%	%	%	%	%	M	Dev
Automation has been incorporated in the hospital.	6.2%	16.9%	6.2%	27.7%	43.1%	3.8	1.3
The automation assists in clocking in and clocking out by the employees.	12.3%	15.4%	7.7%	26.2%	38.5%	3.6	1.4
The automation is useful in preparation of payroll for the employees	7.7%	16.9%	9.2%	23.1%	43.1%	3.8	1.4
The automation enhances increase the standardization in the daily undertaking	9.2%	15.4%	9.2%	24.6%	41.5%	3.7	1.4
It has enhanced evaluation and monitoring of the employees	7.7%	18.5%	12.3%	32.3%	29.2%	3.6	1.3

4.4.2 Patients' Integrated System

The section outlines the descriptive results of the patients' integrated system in form of frequencies, mean and standard deviations. The statement, the patients are registered in the system when they get to the hospital recorded responses as follows. 44.6% of the responses were in strongly in agreement,

32.3% in tandem while 7.7% neutral with a mean of 4.0 and a corresponding SD of 1.2 implying that

on average, the responses were in agreement. 26.2% of the responses further agreed that the data can

be seen by other users in the respective departments without carrying manual files, 10.8% taking a

neutral stand and 36.9% strongly agreeing with a mean and SD of 4.0 and 1.1 respectively.

Regarding the question, the identification, admissions and discharge is done through biometric system,

47.7% of those contacted did strongly agreed, 29.2%, agreeing whereas 4.6% did not take sides with

a mean of 4.0 and an SD of 1.3. With an average of 4.0 and SD of 1.3, 27.7% of the responses were

in agreement that the patients' repeat visits do not require them to carry the previous results.

Furthermore, 47.7% were in strong concurrence while 7.7% did not take sides. Finally, 44.6% of the

responses were in strong agreement that the system had eased the queuing, doctor's time and increased

the number of patients seen. However, 29.2% were in agreement and 7.7% neutral with a mean of 3.9

and an SD of 1.3. The outcomes are displayed in Table 4.9.

Table 4.9: Descriptive Results for Patients' Integrated System

	SD	D	N	A	SA		
	%	%	%	%	%	M	S Dev
The patients are registered in the system when they get to the hospital	7.7%	7.7%	7.7%	32.3 %	44.6 %	4.0	1.2
The data can be seen by other users in the respective departments without carrying manual files	12.3 %	13.8 %	10.8 %	26.2 %	36.9 %	3.6	1.4
The identification, admissions and discharge is done through biometric system	9.2%	9.2%	4.6%	29.2 %	47.7 %	4.0	1.3
The patients' repeat visits do not require them to carry the previous results	6.2%	10.8 %	7.7%	27.7 %	47.7 %	4.0	1.3
The system has eased the queuing, doctor's time and increase the number of patients seen	6.2%	12.3 %	7.7%	29.2 %	44.6 %	3.9	1.3

4.4.3 Security Integrated System

The section outlines the descriptive results of the security integrated system in form of frequencies, mean and standard deviations. It can be noted from the results, the question, security system has eliminated fraud and mismanagement attracted responses as follows. 47.7% of the responses were in strongly in agreement, 29.2% in tandem while 7.7% neutral with a mean of 4.1 and a corresponding SD of 1.2 meaning that on average, the responses were in agreement. 26.2% of the responses further agreed that security system has enhanced surveillance and reduced violence, 12.3% taking a neutral stand and 49.2% strongly agreeing with a mean and SD of 4.1 and 1.2 respectively.

Regarding the question, CCTV cameras have been placed in strategic position to monitor activities, 58.5% of those contacted did strongly agree, 23.1%, agreeing whereas 15.4% did not take sides with a mean of 4.4 and an SD of 0.9. With an average of 4.1 and SD of 1.2, 23.1% of the responses were in agreement that there are electronic alarms that sense danger and alert the management and security personnel. Furthermore, 52.3% were in strong concurrence while 9.2% did not take sides. Additionally, 43.1% of the responses were in strong agreement that the entry and exit point have electronic checkpoints. However, 26.2% were in agreement and 13.8% neutral with a mean of 3.9 and an SD of 1.3. The results are displayed in Table 4.10.

Table 4.9: Descriptive Results for Security Integrated System

| | SD | D | N | A | SA | | |
	%	%	%	%	%	M	S Dev
Security system has eliminated fraud and mismanagement	3.1%	12.3%	7.7%	29.2%	47.7%	4.1	1.2
Security system has enhanced surveillance and reduced violence	4.6%	7.7%	12.3%	26.2%	49.2%	4.1	1.2
CCTV cameras have been placed in strategic position to monitor activities	1.5%	1.5%	15.4%	23.1%	58.5%	4.4	0.9
There are electronic alarms that sense danger and alert the management and security personnel	6.2%	9.2%	9.2%	23.1%	52.3%	4.1	1.2
The entry and exit point have electronic check-points	7.7%	9.2%	13.8%	26.2%	43.1%	3.9	1.3

4.4.4 Performance of Hospitals

The dependent attribute of the study was the performance of the level 4 and 5 hospitals in Nairobi County under study. The descriptive outcomes of the performance of hospitals entailed percentages, mean and standard deviation. It is worth noting from the results, the question, the performance has been increasing since the incorporation of the system received responses as follows. 46.2% of the responses were strongly in agreement, 29.2% in tandem while 15.4% neutral with a mean of 4.1 and a corresponding SD of 1.0 meaning that on average, the responses were in agreement. 23.1% of the responses further agreed that their patients have reported increased levels of satisfaction, 12.3% taking a neutral stand and 53.8% agreeing strongly with a mean and SD of 4.2 and 1.1 respectively.

Concerning the statement, the system has eliminated a lot of manual works, 41.5% of those contacted did strongly agreed, 33.8%, agreeing whereas 10.8% did not take sides with a mean of 4.0 and an SD of 1.0. With an average of 4.3 and SD of 1.1, 18.5% of the responses were in agreement that

stakeholders have expressed satisfaction with quality of care. Furthermore, 61.5% were in strong concurrence while 12.3% did not take sides. Furthermore, 52.3% of the responses were in strong agreement that it was fast, accurate and timely in comparison to previous states. However, 23.1% were in agreement and 12.3% neutral with a mean of 4.1 and an SD of 1.2.

It can also be noted from the outcomes, the question, the financial performance has increased drastically attracted responses as follows. 58.5% of the responses were in strongly in agreement, 20.0% in tandem while 10.8% neutral with a mean of 4.2 and a corresponding SD of 1.1 meaning that on average, the responses were in tandem. 27.7% of the responses further agreed that the system translates to the operational efficiency of the organization, 9.2% taking a neutral stand and 44.6% strongly agreeing with a mean and SD of 3.9 and 1.3 respectively. Regarding the question, there is better performance with the automated appointment scheduling, 60.0% of those contacted did strongly agree, 21.5%, agreeing whereas 6.2% did not take sides with a mean of 4.2 and an SD of 1.2. With an average of 3.8 and SD of 1.3, 26.2% of the responses were in concurrence that flow of patients is faster and more convenient. Furthermore, 41.5% were in strong concurrence while 6.2% did not take sides. Finally, 46.2% of the responses were in strong agreement that the finance department has reported smooth accountability. However, 32.3% were in agreement while 7.7% were neutral with a mean of 4.0 and an SD of 1.3. The results are displayed in Table 4.11.

Table 4.11: Descriptive Results for Performance of Hospitals

	SD	D	N	A	SA		
	%	%	%	%	%	M	S Dev
The performance has been increasing since the incorporation of the system	1.5%	7.7%	15.4%	29.2%	46.2%	4.1	1.0
Our patients have reported increased levels of satisfaction	4.6%	6.2%	12.3%	23.1%	53.8%	4.2	1.1
The system has eliminated a lot of manual works	0.0%	13.8%	10.8%	33.8%	41.5%	4.0	1.0
Stakeholders have expressed satisfaction with quality of care	3.1%	4.6%	12.3%	18.5%	61.5%	4.3	1.1
It is fast, accurate and timely in comparison to previous states	6.2%	6.2%	12.3%	23.1%	52.3%	4.1	1.2
The financial performance has increased drastically	3.1%	7.7%	10.8%	20.0%	58.5%	4.2	1.1
The system translates to the operational efficiency of the organization	9.2%	9.2%	9.2%	27.7%	44.6%	3.9	1.3
There is better performance with the automated appointment scheduling	4.6%	7.7%	6.2%	21.5%	60.0%	4.2	1.2
Flow of patients is faster and more convenient	6.2%	20.0%	6.2%	26.2%	41.5%	3.8	1.3
The finance department has reported smooth accountability	9.2%	4.6%	7.7%	32.3%	46.2%	4.0	1.3

4.5 Diagnostic Tests

Before estimating a model, it is paramount to ascertain the suitability of data for such model estimation. Thus, diagnostic tests were carried out before model estimation. The tests conducted include the tests for autocorrelation, multicollinearity tests as well as the normality tests.

4.5.1 Tests for Multicollinearity

Multicollinearity tests are executed to establish the degree of correlation amid the independent attributes in the study. In cases where there is high correlation between two independent elements, one

of the factors is omitted in the study. Due to multicollinearity issues, the confidence intervals and the

Standard errors are elevated which may lead to unstable estimates of the coefficients for individual

predictors (William *et al.* 2013). The study adopted Variance Inflation Factor method to carry out

multicollinearity tests. As a decision rule, VIF values greater than 10 would imply the presence of

multicollinearity in the data set. However, VIF values less than 10 implied the lack of multicollinearity

in the data set (Field, 2009). The results clearly reflect that all Variance Inflation Factor (VIF) values

for the study variables are below 10 (1.535<10), 1.429<10 and 1.248<10).

Table 4.12: Multicollinearity Test Results

	Collinearity Statistics	
	Tolerance	**VIF**
(Constant)		
Human Resource Management Information System	0.651	1.535
Patients Integrated System	0.700	1.429
Integrated Security System	0.801	1.248

a Dependent Variable: Performance of Hospitals

b Predictors: (Constant), Integrated Security System, Patients' Integrated System, Human Resource
Management Information System

4.5.2 Test for Autocorrelation

The tests for autocorrelation is usually carried out to establish the correlation of error terms among the

variables. In carrying out these tests, the Durbin Watson method was utilized by the study. As a

decision making rule, Durbin Watson value of 2 implies the absence of correlation of error terms.

Watson value > 2 implies the presence of negative autocorrelation while Watson value < 2 implies the

presence of positive autocorrelation. From the results, the Watson value of 2.009 implied that there

was no serial autocorrelation among the error terms. Thus, the data is fit to carry out regression

analysis.

Table 4.13: Autocorrelation Test Results

Model	Durbin-Watson
1	2.009

a a Dependent Variable: Performance of Hospitals

b Predictors: (Constant), Integrated Security System, Patients' Integrated System, Human Resource Management Information System

4.5.3 Normality Tests

Before carrying out regression examination, it is necessary to assess on the distribution of data. The assumption of normality (ut ~ N (0, σ2)) is therefore necessary (Brooks, 2008). The study applied the Skewness and Kurtosis in testing for the normality in the data set. As a rule of thumb, the values of P>0.05 this suggests that the data follows a normal distribution, leading to the rejection of the null hypothesis. Therefore, the study fails to reject the alternative hypothesis. It's important to highlight from the results that the estimated p-values for the study variables are greater than 0.05, namely, 0.211 > 0.05, 0.077 > 0.05, and 0.124 > 0.0. This is reflection that the data set in investigation is normally distributed and the therefore, zero hypothesis that the data is not normally distributed is declined and the study fails to reject the alternative hypothesis.

Table 4.14: Normality Test Results

	Obs	Pr(Skewness)	Pr(Kurtosis) adj	Prob>chi 2
Human Resource Management Information System	65	0.034	0.615	0.211
Patients Integrated System	65	0.763	0.116	0.077
Integrated Security System	65	0.120	0.291	0.124

4.6 Inferential Analysis

Inferential analysis in this study involved correlation and regression analysis and involves ascertaining the existence of relationships among the variables in investigation. The main attributes were human resource management information system, patients' integrated system and integrated security system, which were the independent variables and the performance of hospitals, was the dependent variable.

4.6.1 Correlation

Pearson correlation analysis carried out to ascertain the strength and direction of relationships amid the factors under investigation. From the outcomes, the correlation between human resource management information system and performance of hospitals was positive and statistically significant (0.543, $0.000 < 0.05$). Furthermore, outcomes of correlation between patients' integrated system and performance of hospitals was also positive and significant (0.529, $0.000 < 0.05$). Security integrated system further indicated a significant positive correlation with performance of hospitals (0.562, $0.00 < 0.05$). Thus, it can be concluded that the identified study elements are significant in providing explanations for the performance of the level 4 and level 5 hospitals in Nairobi County. The correlation outcomes are outlined in Table 4.15.

Table 4.15: Correlation Results

		Performance of Hospitals	Human Resource Management Information System	Patients Integrated System	Integrated Security System
Performance of Hospitals	Pearson Correlation	1			
	Sig. (2-tailed)				
	N	65			
Human Resource Management Information System	Pearson Correlation	.543**	1		
	Sig. (2-tailed)	0.000			
	N	65	65		
Patients Integrated System	Pearson Correlation	.529**	.532**	1	
	Sig. (2-tailed)	0.000	0.000		
	N	65	65	65	
Integrated Security System	Pearson Correlation	.562**	.423**	.343**	1
	Sig. (2-tailed)	0.000	0.000	0.005	
	N	65	65	65	65

** Correlation is significant at the 0.01 level (2-tailed).

4.6.2 Regression Analysis

A regression analysis was conducted to determine the linear link amid the variables of the study, which included human resource management information system, patients' integrated system and integrated security system on performance of hospitals. From the outcomes of regression analysis the model estimated explains 48.2% of the total changes in performance of hospitals as evidenced by the value

of R Square in the model of 0.482. This means that the variables human resource management information system, patients' integrated system and integrated security system are significant in providing explanations on performance of hospitals. The model summary results are tabulated below.

Table 4.16: Model Summary

R	R Square	Adjusted R Square	Std. Error of the Estimate
.694a	0.482	0.457	0.30951

a Predictors: (Constant), Integrated Security System, Patients' Integrated System, Human Resource Management Information System

4.6.3 Analysis of Variance

The model estimated was significant statistically. This is indicated by the estimated p-value of 0.000, which is less than 0.05. Furthermore, these results can be confirmed by the estimated value of F (18.92) which is far greater than the F critical value (F 3, 61) in the F tables. Thus, the identified study variables are significant in giving explanations on performance of hospitals. The ANOVA outcomes are outlined in Table 4.17.

Table 4.17: ANOVA Results

	Sum of Squares	df	Mean Square	F	Sig.
Regression	5.438	3	1.813	18.922	.000b
Residual	5.844	61	0.096		
Total	11.282	64			

a Dependent Variable: Performance of Hospitals

b Predictors: (Constant), Integrated Security System, Patients' Integrated System, Human Resource Management Information System

4.5.4 Regression Coefficients

Based on the regression coefficient outcomes, the estimated model's constant exhibited a positive value on table 4.18. The coefficient of human resource management information system was positive (0.194) and statistically significant (0.038<0.05). Improving human resource management information system by unit results in a significant 0.194 units improvement in the performance of the level 4 and level 5 hospitals under review in the study. Thus, human resource management information system is a significant determinant of the performance of the level 4 and level 5 hospitals in Nairobi County. The coefficient of patients' integrated system was positive (0.219) and statistically significant (0.015<0.05). Improving patients' integrated system by unit results in a significant 0.219 units improvement in the performance of the level 4 and level 5 hospitals under review in the study. Thus, patients' integrated system is A noteworthy factor influencing the performance of the level 4 and level 5 hospitals in Nairobi County. The coefficient of security integrated system was positive (0.295) and statistically significant (0.001<0.05). Improving security integrated system by unit results in a significant 0.295 units improvement in the performance of the level 4 and level 5 hospitals under review in the study. Thus, security integrated system is a noteworthy factor influencing the performance. of the level 4 and level 5 hospitals in Nairobi County.

Table 4.18: Regression Coefficients

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	1.258	0.32		3.925	0.000
Human Resource Management Information System	0.194	0.091	0.243	2.126	0.038
Patients' Integrated System	0.219	0.088	0.274	2.492	0.015
Integrated Security System	0.295	0.083	0.365	3.545	0.001

a Dependent Variable: Performance of Hospitals

4.6 Discussions of the Findings

From the results of the regression coefficients, the coefficient of human resource management information system was positive (0.194) and significant (0.038<0.05) implying that improving human resource management information system by a unit leads to a significant improvement in the performance of hospitals. The human resource Integrated system is critical in safeguarding the confidential information about the employees. It assists in management of clocking and time out.

Kisame (2016) indicated that biometric systems are important for business operation. The automation blueprints adoption of electronic employee's systems. The system helps in efficient attendance management of employees, payroll preparation and standardization. Moreover, the system provides efficient and effective techniques for the operation of the hospital. The activities, undertakings, leaves and bonus are handled through automated systems. Ononiwu and Okorafor, (2012) concluded that effective systems increase productivity among the employees and offer guidance on the working hours. The actions provide a framework for efficient business operation.

The coefficient of patients' integrated system was positive (0.219) and significant (0.015<0.05) implying that improving patients' integrated system by a unit leads to a significant improvement in the performance of hospitals. The patients' integrated system plays an important part in from patients' registration to the discharge. The system is designed to answer questions raised by the patients and relay them to the doctors for more actions. The automated excel can enhance the management of massive data. Currently, there are powerful tools to improve the patients' outcomes. Automation upgrades the accuracy of the results, improves speed and reduces room for medical errors. Kassan (2021) opined that delivery of quality service relies on the quality systems to address the predicaments facing the patients. The automation of healthcare enhances better therapeutic options.

The outcomes align with the findings of Porter and Thomas (2013) who concluded on the strong correlation amid the patients' satisfaction and quality of hospitality products. The outcome also concluded that numerous health facilities have embarked on changing the environmental serenity to reflect hotels. Moreover, conducive and private rooms with self-service enhance the performance of the hospital. Delnoij et al. (2010) further indicated that managers valued operational efficiency and productivity. Nonetheless, the patients made the decision on which hospital to obtain service based on the prices. However, manually operated hospitals were more procedural and costly than automated ones.

The coefficient of integrated security system was positive (0.295) and significant (0.001<0.05) implying that improving integrated security system by a unit leads to a significant improvement in the performance of hospitals. The security integrated system, known as integrated security or security system is critical for the safety of both employees and the patients. The security systems entail the promotion of safety of information and ensuring adherence to well-stipulated policies that promote the hospital operation. The system protects the employees and patients' confidential information from the cyber-attacks (Bartholomeusz, 2023). Moreover, the majority of the hospital has additional security information of perimeter walls, doors and barriers. Likewise, the integrated system prevents virtual and intrusion motivated in degrading the credibility of security, confidentiality, accountability, integrity and availability of the data. The presence of biometrics systems, CCTV and Sensor among other security measures. Moreover, the system detects intruders and relays warning information for responses.

The outcomes are in agreement with the findings of Njonde and Kimanzi (2014) who indicated that IFMIS played an immense part in finance, reporting, budgets, control mechanisms, monitoring and balance-checks. The assessment concluded that the use of IFMIs support standardization, ease the

process, elimination predicaments and enhanced the performance. Twathe (2020) argued that automation was an integral plan for excellence performance, execution of changes, enhancement of medical information, and improvement of service deliveries. Kisame (2016) opined that the computerizing biometric systems enhanced the efficiency and effectiveness. Kassan (2021) recommended for the technological absorption to eliminate risk in the hospital.

CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATION

5.1 Introduction

The part is a presentation of the main outcomes from the data analysis. The assessment then outlines the conclusions the study makes based on the summarized results of the study and finally the basis of the recommendations and the conclusions of investigation, which are done in accordance with the objectives of the study. The general objective of this study was to examine the impact of the level of automation on the performance of hospitals in Nairobi County. The study also sought to evaluate the challenges experienced in automation of hospitals in Nairobi County

5.2 Summary of the Findings

The independent variable of the study, level of automation, was measured by HRMIS, patients' integrated system and integrated security system, which were assessed on their influence on the performance of hospitals. From the study findings, the correlation results indicated that the correlation between human resource management information system and performance of hospitals was positive and statistically significant (0.543, 0.000<0.05). The regression outcomes pointed out that the coefficient of human resource management information system was positive (0.194) and statistically significant (0.038<0.05). Thus, human resource management information system is a significant determinant of the performance of the level 4 and level 5 hospitals in Nairobi County. On the effect of patients' integrated system on the performance of hospitals in Nairobi County, the correlation results indicated that the correlation between patients' integrated system and performance of hospitals was positive and statistically significant (0.529, 0.000<0.05). The regression outcomes pointed out that the coefficient of patients' integrated system was positive (0.219) and statistically significant

(0.015<0.05). Thus, patients' integrated system is a significant determinant of the performance of the level 4 and level 5 hospitals in Nairobi County.

Analysis of third independent variable sub construct, namely the integrated security system on the performance of hospitals in Nairobi City County showed that the correlation results indicated that correlation between integrated security system and performance of hospitals was positive and statistically significant (0.562, 0.000<0.05). The regression outcomes further pointed out that the coefficient of integrated security system was positive (0.295) and statistically significant (0.001<0.05). Hence, integrated security system is a significant determinant of the performance of the level 4 and level 5 hospitals in Nairobi County.

The last objective of the study was to evaluate the challenges experienced in the automation of hospitals in Nairobi City County. Among the key highlights outlined by respondents were on data security and patient privacy issues since patient data must be kept private and secure. The respondents reported that there is usually resistance from staff and doctors, as was noted that office staff may fear their jobs are in jeopardy when administrative tasks are automated. Another challenge noted was mistrust whereby patients, as well as some healthcare providers, may not trust an automated treatment plan.

5.3 Conclusions

The study concludes that there is a positive and significant association amid the Human Resource Management Information System and the performance of hospitals in Nairobi County. Thus, human resource management information system is a significant determinant of the performance of the level 4 and level 5 hospitals in Nairobi County. The human resource Integrated system is critical in safeguarding the confidential information about the employees. It assists in management of clocking

and time out. The system helps in efficient attendance management of employees, payroll preparation and standardization. Moreover, the system provides efficient and effective techniques for the operation of the hospital. The activities, undertakings, leaves and bonus are handled through automated systems. Effective systems increase productivity among the employees and offer guidance on the working hours. The actions provide a framework for efficient business operation.

Further, the patients' integrated system has a favorable and noteworthy association with the operational effectiveness of hospitals in Nairobi County. Thus, patients' integrated system is a significant determinant of the performance of the level 4 and level 5 hospitals in Nairobi County. The patients' integrated system plays an important part in from patients' registration to the discharge. The system is designed to answer questions raised by the patients and relay them to the doctors for more actions. The automated excel can enhance the management of massive data. Automation upgrades the accuracy of the results, improves speed and reduces room for medical errors. Delivery of quality service relies on the quality systems to address the predicaments facing the patients. The automation of healthcare enhances better therapeutic options.

The study finally concludes that integrated security system has a positive and significant relationship with the performance of hospitals in Nairobi County. Thus, integrated security system is a significant determinant of the performance of the level 4 and level 5 hospitals in Nairobi County. The security-integrated system, known as integrated security or security system is critical for the safety of both employees and the patients. The security systems entail the promotion of safety of information and ensuring adherence to well-stipulated policies that promote the hospital operation. The system protects the employees and patients' confidential information from the cyber-attacks. Moreover, the majority of the hospital has additional security information of perimeter walls, doors and barriers. Likewise, the integrated system prevents virtual and intrusion motivated in degrading the credibility of security,

confidentiality, accountability, integrity and availability of the data. The presence of biometrics systems, CCTV and Sensor among other security measures. Moreover, the system detects intruders and relays warning information for responses.

5.4 Recommendations

The study suggests that it is advisable for level 4 and level 5 hospitals in Nairobi County to fully embrace the Human Resource Management Information System. This would beneficial as it would be critical in addressing some of the human resource management challenges including but not limited to identifying ghost workers. Furthermore, the system is essential in monitoring the performance of the employees and hence good in identifying the employee excesses and deficits, which in the long run positively, influences the performance of the hospitals.

Moreover, it postulates that the level 4 and level 5 hospitals in Nairobi County ought to fully adopt the patients' integrated system. The system would be beneficial to the hospital in several ways. With the system, the hospital would be able to monitor the progress of the patients keenly as well as efficiently keeping the patients' records, which can easily be retrieved during the next visits of the patients. The system would further make the handling of the patients efficiently right from easing the registration and discharge processes and even the billing procedures.

Lastly, it posits that the level 4 and level 5 hospitals in Nairobi County ought to fully adopt the integrated security system. The security of the patients and the hospital is paramount in the wake emerging dynamic security threats. In a hospital setup, the hospital instruments and apparatus are extremely sensitive and may be used to commit crimes. Thus, the system would be critical in monitoring the use of such instruments. The system would further be essential in cubing the increasing

cases of child theft. The system would help the hospitals in avoiding and control of such cases in an efficient and effective manner.

5.5 Limitations of the Study

Though the overall objective of this study was to examine the impact of the level of automation on the performance of hospitals in Nairobi City County, specifically level four and five hospitals, the study had several challenges that would highlight areas of deliberation for future readings. To increase generalizability of the research findings, other levels of hospitals should be studied, under the same variables, which this study could not be undertaken due to time and financial constraints. This academic study is undertaken within a given duration, and thus limited into the time that a researcher can take.

Another limitation is that among the shortcomings of using descriptive cross-sectional research design is that it is done at single point in time. A similar research could be conducted for a longer period. For instance, a longitudinal study which is a form of correlational research that entails examining variables over an extended duration. The choice to utilize questionnaires as the principal method for data collection implies a methodical and organized approach to information gathering. However, there are limitations since respondents most give only information requested on the questionnaire. Other modes of data collection could be considered for a similar study, for instance interviews.

5.6 Suggestions for Further Studies

From the study findings, the researcher strongly advocates for a comparable future study that will use longitudinal research design which might offer different and /or superior results since automation in addition to innovations is changing rapidly, and report on the performance of the hospitals situated in Nairobi City County. While the present study provided valuable insights into the effect of level of automation on the performance of hospitals in Nairobi City County, several case studies can be undertaken and results compared for further recommendations in the field of study. Finally, a study using similar

independent and dependent variables can be undertaken in a different industry, using a case study, sampling

or census, to compare how the study variables define relationships in different industries.

REFERENCES

A, Shehu V. & Dika. (2011). Using real time computer vision algorithms in automatic attendance management systems. Proceedings of the ITI 2010 32nd Int. Conf. on Information Technology Interfaces, June 21-24, 2010.

Abanti, C. (2010). *Acceptability Survey of Biometric-Based Authentication System. Anthology of Abstracts of the 3rd International Conference on ICT for Africa, International Center for IT and Development.* Yaounde: Baton Rouge LA.

Acemoglu, D., & Robinson, J. (2022). Non-Modernization: Power–Culture Trajectories and the Dynamics of Political Institutions. *Annual Review of Political Science*, 25, 323-339.

Acikgoz, F., Elwalda, A., & De Oliveira, M. J. (2023). Curiosity on Cutting-Edge Technology via Theory of Planned Behavior and Diffusion of Innovation Theory. *International Journal of Information Management Data Insights*, 3(1), 100152.

Acuity Market Intelligence. (February, 2018). Biometrics: high value workforce management. The critical role of biometric time and attendance to workforce management solutions. White Paper.

Adewole K., Adbulsalam S., Babatunde R., Shittu T. & Olotede M. (2014). Development of finger biometric attendance system for non-academic staff in a tertiary institution . *Computer Engineering and Intelligent Systems Review*.

Adila M. (2012). application of biometrics in healthcare facilities in Kenya. *Unpublished MBA Project*.

Akinduyite C.O, Adetunmbi A.O, Olabode O.O. & Ibidunmoye E.O. (2013). Fingerprint based attendance management system. *Journal of Computer Sciences and Applications*, 100-105.

Aldhyani, T. H., & Alkahtani, H. (2023). Cyber Security for Detecting Distributed Denial of Service Attacks in Agriculture 4.0. *Deep Learning Model. Mathematics*, 11(1), 233.

Allen, D. (2001). *Getting things done: The art of stress-free productivity.* New York: Viking ISBN 978-0-670-88906-8.

Amlung, J., Huth, H., Cullen, T., & Sequist, T. (2020). Modernizing health information technology: lessons from healthcare delivery systems. *JAMIA open*, 3(3), 369-377.

Appaw-Agbola, E. T. (2020). Implementing Yield Management in Hotels: An Empirical Study on Small and Medium Hotels in Ghana. 130-132.

Armbrust, M., Fox, A., Griffith, R., Joseph, A. D., Katz, R., Konwinski, A., &Zaharia, M. (2010). A view of cloud computing. Communications of the ACM. *Journal Of applied economics and business*, 50-58.

Bakken, S., & Baker, C. (2023). Measurement and automation of workflows for improved clinician interaction: upgrading EHRs for 21st century healthcare value. *Journal of the American Medical Informatics Association*, 30(1), 1-2.

Barney, J. (1991). Firms resources and sustained competitive advantage. *Journal of Management*, 99-120.

Bartholomeusz, S. (2023). Cyber threats in healthcare. Governance Directions. *Governance Directions*, 75(3), 867-870.

Battesse, W. T. (2005). Sustainability: a new and complex challenge for crisis managers. *International Journal of Sustainable Strategic Management*, 4-16.

Bethapudi, A. (2013). A view of cloud computing. Communications of the ACM. *Journal Of applied economics and business*, 50-58.

Bigdeli, M. J. (2013). Health policy and systems research in access to medicines: A prioritized agenda for low- and middle-income countries. 11-37.

Burns, L. R., Nembhard, I. M., & Shortell, S. M. (2022). Integrating network theory into the study of integrated healthcare. *Social Science & Medicine*, 296, 114664.

Butterworth-Heinemann, B. (2013). Close Circuit Television on university campuses: unexamined implications for the expectation of privacy and academic freedom. *International Journal for law and public administration.*

Cavtat, C. S. (2013). *Theory building in applied disciplines.* San Francisco: Koehler Publishers.

Charles. (2022). Effect of globalization on primary healthcare services in Nasarawa State, Nigeria. *Journal of Agripreneurship and Sustainable Development*, 5(1), 190-201.

Coats, T. S. (2007). Crisis management: a strategic and tactical leadership imperative for organizational sustainability. *International Journal of Sustainable Strategic Management*, International Journal of Sustainable Strategic Management, 60-73.

Cooper, D. R., & Schindler, P. S. (2014). *Business Research Methods. (12th Ed.).* McGraw: Hill Companies.

Crook, T. K. (2008). strategic resources and performance. A Meta – Analysis. *Strategic Management Journal*, 1141- 1154.

Cupido. (2011). The implementation of a time and attendance system at Stellenbosch Municipality – a change management perspective masters project in public administration. *University of Stellenbosch.*

D, S. (2013). Biometrics – implemented into the healthcare industry increases the security for the doctors, nurses, and patients.

Davenport, T. H. (2013). *Process innovation: reengineering work through information technology.* Harvard Business Press.

De Sausmarez, N. (2008). Challenges to Kenyan tourism since 2008: crisis management from the Kenyan tour operator perspective. *Current Issues in Tourism*, 792-809.

Delnoij, D. M. J., Rademakers, J. J. D. J. M., & Groenewegen, P. P. (2010). The Dutch Consumer Quality Index: an example of stakeholder involvement in indicator development. *BMC Health Services Research*, 10(88), pp.1-12.

Duygan, M., Fischer, M., & Ingold, K. (2023). Assessing the readiness of municipalities for digital process innovation. *Technology in Society*, 72, 102179.

Eisenhardt, R. (1989). A framework linking intangible resources and capabilities to sustainable competitive advantage. *Strategic Management Journal*, 607- 618.

Fátima Levandovski, P., Dias da Silva Lima, M. A., & Marques Acosta, A. (2015). Patient satisfaction with nursing care in an emergency service. *Investigación y educación en enfermería*, 33(3), 473-481.

Galbreath, J. (2005). Which resources matter for firm success? An exploratory study of resource-based view. Technovation. 979-987.

Grandon, E. E. (2004). Electronic commerce adoption: An empirical study of small and medium US businesses. *Information & Management*, 197-216.

Hans, Ossebaard, Lisette Van Gemert-Pijnene . (2016). EHealth and quality in health care: implementation time. *International Journal for Quality in Health Care*, Volume 28, Issue 3, Pages 415–419.

Harikrishnan, D., Sunilkumar, N., Joseph, S., & Nair, K. K. (2023). A novel verification framework to analyse security attacks in a fingerprint authentication system. *International Journal of Internet Technology and Secured Transactions*, 13(1), 64-84.

Hidayat, M., & Mukminin. (2022). The Diffusion of Innovations Model: Applications to Education Policymaking and Critique. Edukasi. *Jurnal Pendidikan dan Pengajaran*, 9(2), 100-107.

Hitt O. D., I. V. (2013). *Enabled Organizational Agility and Sustainable Competitive Advantage*. Working Paper Series.

Homeland Security News Wire. (2011). Homeland Security News Wire, (2011, June 10). Malaysia's Biometric Failure. Retrieved June 5, 2012 from http://www.homelandsecuritynewswire.com/malaysias-biometric-failure.

Hsieh, L. F. (2010). A performance evaluation model for international tourist hotels in Taiwan-An application of the relational network DEA. *International Journal of Hospitality Management*, 14-24.

Iacovou, C. L. (1995). Electronic data interchange and small organizations. *Adoption and impact of technology*, 465–485.

Jamal, A. A., Majid, A. A. M., Konev, A., Kosachenko, T., & Shelupanov, A. (2023). A review on security analysis of cyber physical systems using Machine learning. Materials Today: Proceedings. 80, 2302-2306.

Kassan. (2021). Use of Integrated Security Management System.

Kenya, G. o. (2014). Ministry of health Kenya healthy policy 2014 – 2030 towards attaining the higher standards of health.

Kilincer, I. F., Ertam, F., Sengur, A., Tan, R. S., & Acharya. (2023). Automated detection of cybersecurity attacks in healthcare systems with recursive feature elimination and multilayer perceptron optimization. Biocybernetics and Biomedical Engine. *Biocybernetics and Biomedical Engineering*, 43(1), 30-41.

Kim, Y. G. (2019). Empirical verification of a conceptual model of local food consumption at a tourist destination. *International Journal of Hospitality Management*, 484-489.

Kim, Y. G., Eves, A., & Scarles, C. (2013). An Empirical verification of a conceptual model of local food consumption at a tourist destination. *International Journal of Hospitality Management*, 33, 484-489.

Kisame. (2016). Effects of Computerized Biometric Employees Clocking System.

Kothari, A. (2015). An exploratory analysis of the nature of informal knowledge underlying theories of planned action used for public health-oriented knowledge translation. *BMC research notes*.

Kothari, C. (1990). *Research methodology: Methods and techniques.* New Delhi: New Age International publishers limited.

Kreugle, H. (2007). CCTV Surveillance, 2nd Edition. *International Journal for law and public administration*.

Kungu M. (2014). Contraceptives use Dynamics in Kenya 2003-2014. *Doctorate of Philospohy in Population Studies, University of Nairobi*.

Kungu P.W. (2010). Implementation of ISO 9001: 2008 quality management system at Total Kenya Limited . *Unpublished master's thesis, University of Nairobi, Kenya*.

Lan, Y., Chandrasekaran, A., Goradia, D., & Walker, D. (2022). Collaboration structures in integrated healthcare delivery systems: an exploratory study of accountable care organizations. *Manufacturing & Service Operations Management*, 24(3), 1796-1820.

Lee, D. (2017). Healthqua: a multi-item scale for assessing healthcare service quality. *Service Business*, 11, 491-516.

Lv K . (2014). Does ecological civilization construction enhance official promotion? Evidence from national key ecological function zones. *J Shanghai Univ Financ Econ*, 16(2):67–74.

Martinho, R., Rijo, R., & Nunes, A. (2015). Complexity analysis of a business process automation: case study on a healthcare organization. *Procedia computer science*, 64, 1226-1231.

Mashar, M., Chawla, S., Chen, F., Lubwama, B., Patel, K., Kelshiker, M. A., ... & Peters, N. S. (2023). Artificial Intelligence Algorithms in Health Care: Is the Current Food and Drug Administration Regulation Sufficient? *JMIR AI*, 2(1), e42940.

Matheson, C. (2015). Will Universal Health Coverage (UHC) lead to the freedom to lead flourishing and healthy lives?Comment on "Inequities in the freedom to lead a flourishing and healthy life: issues for healthy public policy. *International Journal of Health Policy Management*, 4(1), 49–51.

Midiwo. (2015). Influence of Human Resource Information Systems on The Public Universities in Kenya. *Unpublished Thesis; Doctor of Philosophy in Human Resource Management, Jomo Kenyatta University*.

Mugenda, O. M., & Mugenda, A. G. (2013). *Research Methods: Quantitative and Qualitative Approaches.* Nairobi: Acts Press.

Muheidat, L. T. (2020). Privacy and Security: Challenges and Solutions. Applied Sciences.

Mulumba, M. (2012). Biometric authentication systems and service delivery in the healthcare sector in Kenya.

Musyoka, S. T. (2016). Factors affecting provision of quality service in the public health sector: A case of Nyahururu district hospital, Kenya. *International Journal Of Management And Economics Invention*.

Muthee, N. M., Mang'ana, R. (2021). Influence of system automation on service delivery at the Ministry Of Public Service And Gender in Nairobi- Kenya. *International Academic Journal of Human Resource and Business Administration*, 3(10), 153-166.

Mwaniki. (2017). Effect of strategy on performance of firms in the Medical Insurance Industry in Kenya. *Unpublished MBA Project, University of Nairobi*.

Mwarangu, M. (2018). Adoption of Information Management Systems And Performance Of Orthodox Tea Project In Kenya Tea Development Agency. *Journal of clinical monitoring and computing*, 25(2), 129-135.

Nandi, S., Sarkis, J., Hervani, A., & Helms, M. (2021). Do blockchain and circular economy practices improve post COVID-19 supply chains? A resource-based and resource dependence perspective. *Industrial Management & Data Systems*, 121(2), 333-363.

Njonde, J. N. & Kimanzi, K. (2014). Effect of integrated financial management information system on performance of public sector: A case of Nairobi County Government. *International Journal of Social Sciences and Entrepreneurship*, 1 (12), 913-936.

Odero, C. (2022). Human Resource Information System and Performance of Staff: a Case of the Teachers Service Commission, Samburu County, Kenya. *Doctoral dissertation, University of Nairobi*.

Oloyede, J. (n.d.). Addressing sustainability: a strategy development framework. *International Journal of Sustainable Strategic Management*, 303-319.

Omachonu, V. a. (2010). Innovation in Healthcare Delivery. *The Public Sector Innovation Journal, vol. 15*.

Omobayo, A. (2015). Optimization of bimodal biometrics system for access control authentication in Kenya, School of Computing, College of Science, Engineering and technology. *University of South Africa*.

Omobogo, R. (2015). *Contemporary Strategy Analysis.* Oxford: Blackwell: 4th ed.

Omolloh, J., Were, S., & Muchelule, Y. (2023). Time management and performance of county referral hospitals in kenya; the moderating role of stakeholder participation. *International Journal of Management and Business Research*, 5(1), 444-457.

Ononiwu G. C.& Okorafor, G. N. (2012). Radio frequency identification-based attendance system with automatic door unit. *Academic Research International*.

Oso, W. Y. (2011). *A general guide to writing research proposals and reports.* Nairobi: Jomo Kenyatta Foundation.

Owino, Senaji, Eng and Ntara . (2017). Effect of innovation in revenue collection processes on organizational performance of Nairobi City County. *International Academic Journal of Human Resource and Business Administration*, 2(3), 361-380.

Panigrahi, R. R., Jena, D., & Mishra, P. C. (2022). Inventory automation practices and productivity: a study on steel manufacturing firms. *International Journal of Applied Systemic Studies*, 9(3), 195-213.

Pato, J. N. and Millett. L. I. (2011). *Biometric Recognition: Challenges and Opportunities.*

Porter, M. (2013). The strategy that will fix healthcare. Retrieved March 18th, 2014 from http://hbr.org/2013/10/the-strategy-that-will-fix-health-care/ar/1.

Poster, C. (2013). Hospitality Management Theory. Retrieved from www.smallbusiness.chron.com/managementtheories-practices-hospitality industry-41708.html.

Ramdani, B. C. (2013). SMEs' adoption of enterprise applications: A technology-organization-environment model. *Journal of Small Business and Enterprise Developmen*, 735-753.

Resnik. (2023). Disclosing and managing non-financial conflicts of interest in scientific publications. *Research Ethics*, 17470161221148387.

Rixom, J. M., Jackson, M., & Rixom, B. A. (2023). Mandating diversity on the board of directors: Do investors feel that gender quotas result in tokenism or added value for firms? *Journal of Business Ethics*, 182(3), 679-697.

Rodgers. (1962). *Diffusion of Innovations.* Wiesbaden: Springer.

Rostow.W. (1960). *The stages of economic growth: a non-communist manifesto.* Cambridge: Cambridge University Pres.

Rumelt, D. (2002). Towards a strategic theory of the firm alternative theories of the firm. *Elgar Reference Collection international library of critical writings in Economics*, 286-300.

Russel, M. R. (2011). Research challenges in sustainable strategic management: change and sustainability. *International Journal of Sustainable Strategic Management*, 2-15.

Sabinet. (2019). Preregistration nursing students' perceived confidence in learning about patient safety in selected Kenyan universities. *African Journal*.

Salancik, G. R., & Pfeffer, J. (1978). Effects of ownership and performance on executive tenure in U.S. Corporations. *Academy of Management Journal*, 23: 653-664.

Salter, M. B., Mutlu, C. E., & Frowd, P. M. (2023). *Research methods in critical security studies.* New York: Taylor & Francis.

Saunders, M., Lewis, P., & Thornhill, A. (2016). *Research methods for business students*. Seventh edition. FT Prentice Hall: Finance Times, Pearson Education.

Singh, Chakkaravarthy, M., & Das. (2023). Study of Malaysian Cloud Industry and Conjoint Analysis of Healthcare and Education Cloud Service Utiliztion. In Transactions on Computational Science XXXIX (pp. 44-70). *In Transactions on Computational Science XXXIX Berlin, Heidelberg: Springer Berlin*, pp. 44-70.

Singleton, R. A. (2011). *Approaches to Social Research.* Oxford University Press.

Swift, J. (2010). *Where did time fly: Practical unconventional tips to save and optimize time.* Amazon USA ISBN 13: 978- 1452855325: CreateSpace Independent Publishing Platform.

Tetteh, E. (2012). Automation System Procedure of the Ghana Revenue Authority on the Effectiveness of Revenue Collection: A Case Study of Customs Division.

Thomas and Michael. (2013). Strategy that will fix Health Care.

Thota, M. K., Shajin, F. H., & Rajesh. (2020). Survey on software defect prediction techniques. *International Journal of Applied Science and Engineering*, 17(4), 331-344.

Toner, K. (2012). Transforming the Air Traffic Management System--Why Is It So Hard? *Planning and Development; Washington DC*.

Too S. (2021). Electronic Service Practices and Customer Satisfaction at Kenyatta National Hospital.

Tornatzky, L. G. (1990). *The process of technology innovation.* Lexington: Lexington, MA.

Twathe. (2020). Effects of Strategic Change Management on the performance of Coast General Hospital.

Wang, L., Wang, Z., Ma, Q., Fang, G., & Yang, J. (2019). The development and reform of public health in China from 1949 to 2019. *Globalization and health*, 15(1), 1-21.

Wang, Y. C. (2007). Towards a theoretical model of technology adoption in hospitality organizations. *International Journal of Hospitality Management*, 560–573.

Wani, T. A., & Ali, S. W. (2015). Innovation diffusion theory. *Journal of general management research*, 3(2), 101-118.

Woodward, G., Combs, J. G, Galbreath, J. & Scholes, K. (2012). *Exploring Corporate Strategy.* New Delhi: Prentice Hall of India.

Yazdany, J., Trupin, L., Tonner, C., Dudley, R. A., Zell, J., Panopalis, P.,& Yelin, E. (2012). Quality of care in systemic lupus erythematosus: application of quality measures to understand gaps in care. *Journal of general internal medicine*, 27, 1326-1333.

Younjoo, C., Hwajin, J., Anseop, C., & Minki, S. (2019). *Design of a connected security lighting system for pedestrian safety in smart cities.*

Yusuf, M. (2013). The Impact of Management Information System (MIS) on the Performance of Business Organizations in Nigeria. *Diss.University of Abuja*.

Zhang, M. A. (2001). The role of intangible assets in sustaining competitive advantage among the pharmaceutical manufacturer. *Operational Performance Journal*, 607-618.

Zhang, R. (2010). Security models and requirements for healthcare application clouds. *IEEE 3rd International Conference on Cloud Computing*.

APPENDICES

Appendix I: Questionnaire

Dear Respondent,

Kindly read this questionnaire and help to answer the questions that are outlined to help in the study. Your reply will be safeguarded with utmost integrity, ethics and confidentiality it deserves. The responses are useful solely in academic learning. The questionnaire concerns the level of automation and performance of level 4 and 5 hospitals in Nairobi, Kenya. The questionnaire has four sections, namely A, B, C and D.

Section A: Demographic Data: Kindly tick where appropriate

1. Kindly indicate your gender:
   a) Female   [ ]

   b) Male   [ ]

2. Kindly indicate your department
   ……………………………………………………………..
3. Please tick the highest level of education achieved:
   a) Diploma level   [ ]
   b) Undergraduate level   [ ]

   c) Post graduate Level   [ ]

   d) Others specify   ……………………………………………………...

4. How many years have you been in the current position in this organization?

a) 0-5   [ ]

b) 5-10   [ ]

c) 10-15   [ ] and   d) Above 15   [ ]

5. Which is the current level of your hospital?

a) level 4 [ ]

b) Level 5 [ ]

6. Kindly indicate the number of years since your hospital was upgraded to current level
a) 0-5   [ ]

b) 5 -10   [ ]

c) 10 – 15   [ ]

d) Above 15   [ ]

SECTION B: LEVEL OF AUTOMATION
1. Indicate the types of automation that your hospital has implemented

Type of Automation	Yes	No
Human resource management information system		
Patients' integrated system		
Integrated security system		
Others (specify)		

2. Kindly give the number of years that have elapsed since the implementation of the Automation:

      a) 0 - 5 years   [ ]
      b) 5 – 10 years   [ ]
      c) 10 – 15 years   [ ]
      d) Above 15 years [ ]

3. Using the following scale, please show the level of your agreement to the following statements on **HRMIS**:

Use a scale of: 1= Strongly Disagree; 2= Disagree; 3= Neutral; 4= Agree, 5= Strongly Agree.

No.	HUMAN RESOURCE MANAGEMENT INFORMATION SYSTEM	1	2	3	4	5
i.	Automation has been incorporated in the hospital.					
ii.	The automation assists in clocking in and clocking out by the employees.					
iii.	The automation is useful in preparation of payroll for the employees					
iv.	The automation enhances increase the standardization in the daily undertaking					
v.	It has enhanced evaluation and monitoring of the employees					

4. Kindly indicate your level of agreement to the following statements on **Patients Integrated System** using the following scale: *1= Strongly Disagree; 2= Disagree; 3= Neutral; 4= Agree and 5= Strongly Agree*.

No.	PATIENTS' INTEGRATED SYSTEM	1	2	3	4	5
i.	The patients are registered in the system when they get to the hospital					

	ii.	The data can be seen by other users in the respective departments without carrying manual files					
	iii.	The identification, admissions and discharge is done through biometric system					
	iv.	The patients' repeat visits do not require them to carry the previous results					
	v.	The system has eased the queuing, doctor's time and increase the number of patients seen					

5.Kindly rate following **Integrated Security System** highlights in your hospitals.

Use a scale of: 1= Strongly Disagree; 2 =Disagree; 3=Neutral; 4=Agree and 5= Strongly Agree.

No	INTEGRATED SECURITY SYSTEM	1	2	3	4	5
i.	Security system has eliminated fraud and mismanagement					
ii.	Security system has enhanced surveillance and reduced violence					
iii.	CCTV cameras have been placed in strategic position to monitor activities					
iv.	There are electronic alarms that sense danger and alert the management and security personnel					
v.	The entry and exit point have electronic check-points					

6. Kindly rate the level of the performance of your hospital since the Level of Automation was updated.

Use a scale of: 1= Strongly Disagree; 2= Disagree; 3= Neutral; 4= Agree and 5= Strongly Agree.

NO	PERFORMANCE OF HOSPITALS	1	2	3	4	5
i.	The performance has been increasing since the incorporation of the system					

ii.	Our patients have reported increased levels of satisfaction					
iii.	The system has eliminated a lot of manual works					
iv.	Stakeholders have expressed satisfaction with quality of care					
v.	It is fast, accurate and timely in comparison to previous states					
vi.	The financial performance has increased drastically					
vii.	The system translates to the operational efficiency of the organization					
viii.	There is better performance with the automated appointment scheduling					
ix.	Flow of patients is faster and more convenient					
x.	The finance department has reported smooth accountability					

SECTION C

5. In your view, expound on other aspects of performance of level 4 and 5 hospitals in Nairobi County
………………………………………………………………………........................
....
....……
…………………………………………………………………………………………
…………
………………………………………………………………

6. In your opinion, what are the challenges experienced in the automation of level 4 and 5 hospitals in Nairobi City County
...........……………………………………………..…………………………………
…………………………………………………………………………………………
…………………………………………………………………………………………
…………………………………………………………………………………………

7. Kindly give any other information that might help in this study
…………………………………………………………………………………………
…………………………………………………………………………………………
…………………………………………………………………………………………
………………

THANK YOU FOR YOUR PARTICIPATION

Appendix II: List of Level Four and Five Hospitals in Nairobi County

S/no.	Name of Hospital
1	AAR Health Services
2	Aga Khan University Hospital
3	Avenue Hospital
4	Coptic Hospital
5	Gertrude's Children's Hospital
6	Guru Nanak Ramgarhia Sikh Hospital
7	Karen Hospital
8	Mama Lucy Kibaki Hospital
9	Mater Hospital
10	Mbagathi County Hospital
11	Metropolitan Hospital
12	MP Shah Hospital
13	Mutuini Hospital
14	Nairobi Hospital
15	Nairobi West Hospital
16	Nairobi Women Hospital
17	Pumwani Maternity Hospital
18	St. Francis Hospital, Kasarani

Source: NAIROBI CITY COUNTY RECORDS, 2023

Appendix III: Introductory Letter

UNIVERSITY OF NAIROBI

FACULTY OF BUSINESS AND MANAGEMENT SCIENCES

OFFICE OF THE DEAN

Telegrams: "Varsity",	P.O. Box 30197-00100, G.P.O.
Telephone: 020 491 0000	Nairobi, Kenya
VOIP: 9007/9008	Email: *fob-graduatestudents@uonbi.ac.ke*
Mobile: 254-724-200311	Website: *business.uonbi.ac.ke*

Our Ref**. D61/9815/2018**   **October 30**, **2023**

National Commission for Science, Technology and Innovation

NACOSTI Headquarters

Upper Kabete, Off Waiyaki Way

P. O. Box 30623- 00100

NAIROBI

RE: INTRODUCTION LETTER: WAMBUGU BEATRICE WANJIKU

The above named is a registered Masters in Business Administration candidate at the University of Nairobi, Faculty of Business and Management Sciences. She is conducting research on *"LEVEL OF AUTOMATION AND PERFORMANCE OF HOSPITALS IN NAIROBI COUNTY".*

The purpose of this letter is to kindly request you to assist and facilitate the student with necessary data which forms an integral part of the Project.

The information and data required is needed for academic purposes only and will be treated in **Strict-Confidence**.

Your co-operation will be highly appreciated.

PROF. JAMES NJIHIA

DEAN, FACULTY OF BUSINESS AND MANAGEMENT SCIENCES

JN/pgr