DETERMINANTS OF UTILIZATION OF ELECTRONIC HEALTH RECORDS AMONG PUBLIC HEALTH FACILITIES IN MACHAKOS COUNTY, KENYA

JULIUS MWANIKI NDUNG'U

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DECLARATION AND APPROVAL

Student Declaration

This is my own work, and it hasn't been submitted for a degree or any other honor at any other university.

Name: Julius Mwaniki Ndung'u

Reg. No. MPH/2022/30677

Signature:  Date: 13/6/2025

Approval

This thesis/project is being submitted for examination with our approval as University supervisors

Name: Dr. Violet Maritim

Institutional Affiliation: School of Public Health, Department of Community Health and Biostatistics, Mount Kenya University- KENYA

Signature:  Date: 15/6/2025

Name: (Sr.) Dr. Margaret Wandera

Institutional Affiliation: School of Health and Biomedical Science, Department of Health Systems Management and Public Health, Technical University of Kenya-KENYA

Signature:  Date: 15/6/2025

DEDICATION

This work is dedicated to health records professionals as it will go a long way in breaking the barriers in the industry.

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ABSTRACT

The ideal electronic health system should improve patient care, reduce patient turnaround times, and allow users to leverage secondary data to enhance health care delivery and outcomes. Information technologies are starting to be accepted in the healthcare industry as instruments for enhancing accountability, efficiency, and service delivery. Several factors: the capacity building, insufficient technical support besides insufficient leadership in the healthcare sector have hindered the adoption of EHR systems. The broad objective of the study was to identify the determinants of the adoption of electronic health records in Machakos County public health facilities. The specific objectives included identifying the organizational, management, health worker, and health facility factors that affect the uptake of electronic health records in particular public health facilities. The study unit was the health facility focusing on health providers who handle data and service provision, including hospital management officers (facility in-charges, medical officers of health, and clinicians), ICT officers, and healthcare workers. The study employed a cross-sectional analytical design with a focus on the healthcare staff at the designated public health facilities. The sampling procedure used was purposive sampling and stratified random sampling technique and a total of 411 respondents were reached in the 8 health facilities selected for this study. During the study, 8 key informants were interviewed using an interview guide to obtain qualitative data. SPSS, was used to analyse the data. Chi-square test was utilized. Statistical significance tests considered a p-value of less than 0.05 to be significant. NVIVO was used for the analysis of qualitative data. The 253 (61.6%) of the participants had computers in most of the clinics/departments, with the facility has adequate hardware and software set up (p=0.041) being significant.Skills to operate the electronic health records system (p=0.035) and the health care workers having positive perception on the systems use (p=0.050) were significant. On organizational factors such as the finances needed to procure and implement an EMR system was significant (p=0.023), and the sufficiency mechanisms to build capacity for a new EMR system (p=0.041) were statistically significant. The results indicated that 291 (70.8%) of the health facilities had a core management team and there was significant association between the system being guided by an appropriate strategic framework (p=0.039), and the systems being implemented supported by all department heads (p=0.047). The study's concluded that health workers related factors such as ICT literacy, health facility factors like reliable hardware and software infrastructure, organizational factors resource availability, capacity building and technical expertise, and managerial factors such as strong commitment from leadership are key factors to ensure a successful implementation of an electronic health records system. The study recommends that it is key to provide infrastructure both hardware and software, capacity building of healthcare workers on their ICT skills and familiarize them with EMR systems. Hospital management should be actively involved in EMR planning and implementation. Establish mechanisms to regularly monitor and evaluate EMR usage, identify system gaps, and act on feedback from users to improve system performance and usability.

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ABBREVIATIONS AND ACRONYMS

DHS	Demographic Health Survey
EMR	Electronic Medical Record
HIS	Health Information System
HMIS	Hospital Management Information System
ICT	Information Communication Technology
ISS	Information System Strategies
KHIS	Kenya Health Information System
MIS	Management Information System
SDGs	Sustainable Development Goals
SPSS	Statistical Package for Social Sciences
TTF	Task Technology Fit
WHO	World Health Organization

DEFINITION OF KEY TERMS

E-health	The utilization of the Internet and technologies, in the healthcare industry to enhance the quality, efficiency, and accessibility of clinical and business operations for patients, healthcare providers, and organizations.
Electronic Health Records (EHR)	Paper charts for patients are digitally transformed to give real-time, patient-centered records secure and accessible to authorized users.
Health Facility factors	Refers to the elements within health care institution influencing electronic health records implementation success components such as equipment availability, workflow design, physical facilities (buildings) technology items (computers) that make sharing of information easy.
Health Information System (HIS)	Systems designed to collect, process, store, and disseminate health-related information to improve healthcare delivery.
Health leadership	The aspect of getting to guide and put in structures favorable for running systems both bottom up and up bottom approaches is referred to as leadership.
Health Management Information System (HMIS)	Collection, storage, and dissemination of data relevant to the functioning of a health care system or any of its components, aiding in decision-making and health system performance

	monitoring.
Health Sector Strategic Plan Indicators	Metrics used to monitor and evaluate the performance of health systems and guide strategic planning in the health sector.
Health workforce	This includes the healthcare workers that support offering of health services in the health facilities like the nurses, doctors, pharmacists among others.
Information System	This refers to a system which provides information that is critical to help in decision making for organizations at all the levels.
Patient Safety	The avoidance of mistakes and unfavorable patient outcomes related to healthcare.
Service delivery	When providing foe and ensuring that the healthcare services are readily available and accessible to all the people when they need them.
System	It refers to set items that work together as a formation of the larger interconnecting network so as to achieve a common goal.
Utilization of health records	This refers to the systematic use and application of patient health information contained in medical records for various purposes beyond direct patient care. This encompasses how

health records are accessed, analyzed, and leveraged to achieve multiple objectives in healthcare and related fields.

CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

Clinical errors are reduced, healthcare professionals are assisted, care efficiency is increased, and even patient care quality is improved by modern information technology, all of which offer significant opportunities for healthcare delivery (Magutu, et al., 2021). One of the six fundamental components needed to strengthen the health system, according to USAID, is the health management information system. Any systematic attempt to gather, store, and distribute data pertinent to the functioning of a health care system is known as a health information system (HIS). The roles of the health system are data assembly, gathering, examination, fusion, communication and use. It also supplies the framework for decision making (WHO, 2023). Therefore, there could be a large number of health applications running within any one health system. The Ministry of Health, Partners, and stakeholders use the integrated reporting systems to regularly gather pertinent and useful information to monitor Health Sector Strategic Plan (HSSP) Indicators, which enables monitoring, and evaluation of the health care delivery. (MOH, 2022). (Yeates and Wakefield, 2021). Healthcare institutions have been forced to implement provider payment methods and systems, which are linked to HMIS, since the beginning of electronic money transfers. This was done to increase financial accountability and expedite facility-level payment operations (Kimama, 2022). Additionally, the use of digital tools and apps is permeating every aspect of our life, providing chances like electronic health (e-health) to address societal issues. To improve patient outcomes by use of e-health to improve, efficiency, effectiveness, and accessibility of health (Rodrigues, 2021).

A lack of qualified healthcare personnel makes it difficult for Kenya's health system to meet the country's growing healthcare demands and cost, according to the Ministry of Health. Acknowledging significance of optimal health for bolstering human capital development, nation’s endeavours to furnish top-notch healthcare to every inhabitant, hoping to empower them to lead prosperous and socially engaged lifestyles (MOH, 2022). If managers believe they are not part of the process, they may obstruct the information system's successful implementation. The procurement procedure for hardware and software is a laborious one that involves inviting bidders to participate and selecting the supplier with the highest bid (Kimama, 2022).

Kenya’s Ministry of Health has established a comprehensive policy framework for Electronic Health Records (EHR) driven by the 2023 Digital Health Act and earlier standards dating from 2010. The Act formally recognizes EHRs as an essential mode of healthcare delivery alongside telemedicine and m-health, mandates that licensed providers employ interoperable systems that ensure data safety, reliability, patient access, and informed consent, and empowers the Cabinet Secretary to develop corresponding standards and reporting protocols. Complementing this legislative foundation, the 2010 “Standards and Guidelines for Electronic Medical Record Systems in Kenya,” issued by the Ministry of Health’s Health Information Systems division, stipulates that all EHR systems must be reviewed and approved by HIS, adhere to national data ownership rules, and maintain stringent confidentiality and accountability for health workers (MOH, 2023).

1.2 Statement of the Problem

In Machakos County, Kenya healthcare system faces challenges due to limited uptake of electronic health records (EHR). Despite the benefits associated with EHR, including improved outcomes, reduced turnaround times, and enhanced decision support through secondary data, their implementation has been sluggish (Winter, *et al.,* 2022). Public hospitals in Machakos County still rely heavily on manual data reporting and entry, leading to inefficiencies and errors in patient care and data management. In private facilities, especially in Nairobi and Nakuru, EMR adoption is driven by factors like data security, infrastructure access, and staff digital competence (Muinga *et al.,* 2020). These facilities benefit from better training and infrastructure, resulting in improved diagnostic accuracy, efficiency, and patient satisfaction. However, in public settings (as seen in Mombasa County), staff attitudes and ICT literacy strongly influence EHR usage, with perceived usefulness having a weaker impact; notably, Internet connectivity significantly moderates uptake (Mwang'ombe, 2021).

Several factors contribute to this issue. The absence of comprehensive policies, lack of awareness, and insufficient leadership in the healthcare sector have hindered the adoption of EHR systems (Muinga, *et al.,* 2020). A 2024 cross-sectional survey of 411 healthcare workers in Machakos County revealed that younger knowledgeable members adopt EHR systems. However, challenges persist: inadequate training, resistance and insufficient technical support hinders full adoption in public facilities. A pilot of the Afya EHMS (OpenMRS-based) in Machakos saw initial uptake in the county hospital and five primary care facilities, but three primary facilities eventually discontinued use due to unreliable ongoing support (Ndungu, *et al.,* 2024). As a result, Machakos County struggles with inadequate health information management, which is a

critical component of effective healthcare delivery according to World Health Organization (WHO) standards.

While some progress has been made, particularly in clinics managing HIV patients through the Kenya Electronic Medical Records System, other clinics within the health facilities do not benefit from such systems. Consequently, routine health data reporting remains manual, with summary tools being submitted to sub-counties for entry into the Kenya Health Information System (KHIS). The reporting rate for key performance indicators in 2023 was only 87% of the expected 100%, reflecting the inefficiency and gaps in the current system (KHIS, 2023). Therefore, to address the challenges and enhance service delivery this study aims to examine the determinants of utilization of electronic health records in selected public health facilities in Machakos County.

1.3 Objectives of the Study

1.3.1 Broad Objective

To establish factors influencing the utilization of electronic health records (EHR) among public health facilities in Machakos County, Kenya.

1.3.2 Specific Objectives

i. To determine the influence of health facility factors on utilization of electronic health records in Machakos County, Kenya.
ii. To determine health workers-related factors associated with the utilization of electronic health records in Machakos County, Kenya.

iii. To determine the organizational factors associated with the utilization of electronic health records in Machakos County, Kenya.

iv. To establish management factors influencing the utilization of electronic health records in Machakos County, Kenya.

1.4 Research Questions

i. What are the health facility factors influencing utilization of electronic health records in Machakos County, Kenya?

ii. What are the health workers-related factors influencing utilization of electronic health records in Machakos County, Kenya?

iii. What are the organizational factors influencing utilization of electronic health records in Machakos County, Kenya?

iv. What are the managerial factors influencing utilization of electronic health records in Machakos County, Kenya?

1.5 Hypothesis

i. **H_0:** There is no association between health facility, health workers-related, organizational and managerial factors and the utilization of electronic health records in Machakos County.

ii. **H_1:** There is an association between health facility, health workers-related, organizational and managerial factors and the utilization of electronic health records in Machakos County.

1.6 Justification of the study

The adoption is essential to addressing problems associated with hardcopy, such as decreasing timeliness, accuracy, and completeness of reporting (Oleribe, et al., 2021). Having a stable infrastructure and capacity of the health workforce is key in delivering the information management system within a health facility. Data on determinants of implementation of electronic health records is a crucial ingredient for public health efforts aimed at addressing quality and reliability of the reports. This study will be critical in contributing towards the SDG number three which is on health and well-being, the achievement of the universal agenda is also critical.

1.7 Significance of the Study

Insights on factors driving adoption, with a focus on e-health systems in Machakos County's public facilities. The data gathered plays a role in shaping the policy guidelines and intervention programming that will increase the adoption of e-health solutions. The findings will be key in policy development and resource allocation by the Government bodies like the Ministry of Health and County Health Departments to inform policy updates, prioritize digital health investment, and allocate resources effectively. For instance, if a study reveals low EHR adoption in rural facilities due to poor infrastructure, policymakers can prioritize investments in internet connectivity, power supply, and training programs. Healthcare facility managers, and donor organizations can use insights to improve EHR system design, usability, and integration with existing workflows. Findings highlighting user resistance or inadequate training can guide the development of tailored capacity-building programs and user-friendly interfaces that enhance

acceptance and sustained use of EHR systems. The data will serve as the foundation for planning, advocacy, and the implementation of improved procedures by Machakos County and the government of Kenya (MOH) as well as for referencing, and future research.

1.8 Scope of the Study

Objectives were to identify organizational, managerial, health worker-related, and health facility elements and the usage of e-health in public health institutions, specifically in Machakos County. The research questions, which were derived from the goals, helped to construct the study hypothesis. A cross-sectional study design with both qualitative and quantitative methods used to collect data. The study population: hospital management officers (facility in-charges, and medical officers of health, clinicians), ICT officers, and healthcare workers handling data and service provision (health records officers, nurses, and doctors/clinicians). Stratified random sampling for study participants. Questionnaires and key informant interview guides were used for data collection.

1.9 Study Limitations

The study centered on respondents from public health facilities in Machakos. The self-reporting limitation in this study was overcome through validating the study questionnaire during the pre-test which involved a smaller population to make it simple, short and clear with a simple language that was personalized to the study population

1.10 Delimitations

The delimitation of the study included the data collection tools that had to go a pretest to ensure sound questions that were easily understood, and information collected from the study participants. The sample also include non-response rate, taking into consideration all the sample characteristics of the study population such as availability not to impact the study

1.11 Assumptions of the Study

Researcher made assumptions: the respondents were honest in their remarks on use of electronic health records at specific public health facilities; respondents understood questions asked to them; and the instrument employed produced reliable replies.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

The chapter presentation primarily centered on theoretical, empirical literature, as well as the information gaps this study sought to address, the conceptual framework's focus was essential to this chapter.

2.2 e-Health Records Overview

In the last several years, reports by WHO indicated that the recent advances in electronic health management systems have advanced and the uptake is high in private facilities as compared to public facilities (WHO, 2022). For quality outcomes to be experienced, the systems have to have high levels of professionalism at entity level by the service providers. The healthcare professionals, therefore, need to consistently collect, collate and analyze the health data so as to identify the performance, the trends and inform major decisions within the healthcare set-up (Hayajneh *et al.,* 2021). These systems have revolutionized how health data is managed, stored, and utilized, leading to improved healthcare delivery in settings where they are effectively implemented. However, the potential for achieving high-quality outcomes through these systems hinges on the professionalism and competence of healthcare providers at the entity level. This professionalism is crucial because it ensures that the systems are not merely technological tools but are integral to the healthcare process.

Healthcare workers need to regularly participate in the painstaking gathering, assembling, and analysis of health data in order for these systems to fully benefit society. This practice is not just

a procedural necessity but a strategic one that enables the identification of performance metrics, detection of trends, and the provision of data-driven insights. These understandings are critical for making well-informed decisions that can enhance the overall effectiveness of healthcare delivery, optimize resource allocation, and improve patient outcomes. The consistent and accurate use of these electronic health management systems can transform how healthcare organizations operate, making them responsive to the population they serve (Hayajneh *et al*., 2021).

The combination of human resource, technical and information processors within an information system makes it easy to complete the system. The automation of healthcare systems to routinely manage the reporting of the various health indicators and manage patients is key in this process (Tan, 2020). An e-health system in a health facility is key as it contains the individual patient records registered with unique identifiers, it further contains the patient history and keeps track of the patient folders across the various clinics within the facility and also has the flexibility to allow for scheduling and manage patient bookings (Kimama, 2022).

The basic inpatient module is designed to manage the admissions, patient transfer, including the discharge processes and all the required forms and information has to be filled. Billing is done at every stage before accessing a service to allow for ease accountability of services given or received and consolidation becomes easier and real-time information is generated upon request. Both cash and insurance methods are provided to manage patients' approvals, deduct payments and other exclusions as need be. Pharmacy is also another critical aspect of the process as it handles the prescription aspect, dispensing and dosage of the various classification and indexes

of drugs. Other aspects supported include radiology for scheduling, requisition, reporting examining and information management (Hayajneh *et al.,* 2021).

The fragmentation of the existing literature on e-health deployment across several specialist areas is one issue. It could be challenging for managers, policymakers, or clinicians to find and use the right body of evidence given the abundance of reviews on the use of various e-health technologies that are available (Mair *et al.,* 2022). EHR will enable large data transfer and storage and utilization hinges on technological, institutional, and health worker-related factors.

2.3 Objective Based Literature Review

Globally, Electronic Health Records (EHRs) is driven by needs: improve healthcare efficiency, reduce medical errors, and enhance data-driven clinical decision-making. In good economies: United States, United Kingdom, and Australia, empirical evidence shows that EHRs contribute significantly to better patient outcomes, continuity of care, and cost reductions. Kruse et al., (2022), in systematic review, reported that EHRs have improved clinical workflows, reduced duplicate testing, and improved patient satisfaction. They also found that EHR systems facilitate communication among healthcare professionals and improve the timeliness of interventions, especially in emergency settings.

Despite these benefits, global adoption faces substantial challenges, particularly in terms of system interoperability, data security, and user acceptance. Studies have noted that EHRs sometimes create additional work for clinicians due to complex interfaces or system incompatibility across institutions (Adler-Milstein & Jha, 2023). Moreover, concerns around data privacy and cybersecurity breaches remain significant barriers. These challenges necessitate

ongoing training, substantial investment, and policy support to ensure sustainable implementation. Overall, while the empirical literature underscores the transformative potential of EHRs globally, the success of implementation heavily depends on infrastructure readiness, regulatory support, and human resource capacity

In Sub-Saharan Africa, the implementation of EMRs is gradually increasing, largely driven by the urgent need to monitor chronic conditions like HIV/AIDS and tuberculosis. Empirical studies reveal that EMRs have enhanced the quality of health service delivery in high-burden settings. For instance, Were et al., (2021), in a study conducted in Uganda, found that EMRs significantly improved record accuracy and timely clinical decision-making, especially in HIV treatment centers. EMRs helped health workers retrieve patient histories more efficiently, leading to better adherence monitoring and continuity of care.

However, the region continues to face unique challenges that hinder EMR optimization. Infrastructural constraints such as unreliable electricity, poor internet connectivity, and lack of trained personnel are frequently cited in empirical evaluations (Tierney et al., 2022). Moreover, many EMR systems implemented in the region are donor-funded and often not integrated into national health systems, raising concerns about sustainability. Limited stakeholder involvement and low clinician buy-in also affect long-term success. Despite these limitations, evidence from pilot studies and national programs suggests that when appropriately supported, EMRs improve healthcare delivery.

Kenya has made significant progress in EMR implementation, primarily through support from global health initiatives such as PEPFAR, USAID, and CDC. The Ministry of Health introduced

national systems like KenyaEMR and IQCare, which have been deployed in hundreds of health facilities. Muthee et al., (2023) found that the adoption of EMRs in HIV clinics significantly improved patient follow-up, enabled automatic generation of routine reports, and reduced data entry errors. Their retrospective study in Kenyan public health facilities highlighted the practical benefits of EMRs in clinical documentation, care coordination, and adherence monitoring.

However, challenges remain, including data duplication, insufficient system upgrades, and poor infrastructure in rural areas. The literature also reports gaps in healthcare worker training and user support, which have led to underutilization of EMRs despite their availability. A study by Were et al., (2021) showed that while clinicians acknowledge the benefits of EMRs, a lack of adequate technical support undermines their effectiveness. Nevertheless, Kenya has developed a national eHealth strategy that supports the integration of EMRs into broader health information systems, indicating a commitment to long-term sustainability and scalability.

At the county level, Machakos has made strides in digitizing health records, especially in public hospitals and select health centers. Wanyee et al., (2022), in a county-specific case study, found that EMR use in Machakos improved patient flow, reduced reliance on paper files, and allowed faster generation of monthly reports. Healthcare workers reported better tracking of patient appointments and reduced loss to follow-up. The study also indicated that EMR systems enhanced accountability through improved audit trails and data access controls.

Technology infrastructure hardware, software, network and other related equipment are needed to determine a successful utilization and adoption of eHealth. This however has not been taken

up in most of the public health facilities in developing countries, in which Kenya is one of them, because of the numerous technological adoption challenges (Juma et al., 2022).

2.3.1 Health Information Related to Health Facility Factors

Health Infrastructure: The availability of the healthcare infrastructure namely computers, software and internet connection in countries like Netherlands, Denmark and Finland has always been growing and this is linked with the financial support that is provided by the governments (Swanzy, 2019). This includes hospitals, clinics, medical laboratories, diagnostic centers, health information systems, and the necessary equipment and technology required to provide care. Additionally, health infrastructure encompasses the availability of a skilled healthcare workforce, such as doctors, nurses, technicians, and administrative personnel, as well as systems for water, sanitation, and power that support health facilities. In comparison with many developing countries, studies indicate inadequate infrastructure for adoption of health information infrastructure. This, posed a great challenge in adopting this technology. The lack of basic hardware like computers, internet appliances, low network coverage across many parts of the countries, lack of printers and general redundancy (Sood *et al.,* 2021; Laerum *et al.,* 2019; Staren, 2018). Availability of health infrastructure varies widely between regions, reflecting disparities in economic development, government investment, and policy priorities. In high-income countries, health infrastructure is generally more advanced, with widespread access to modern medical facilities, cutting-edge technology, and well-trained healthcare professionals. These countries often have robust health information systems, efficient supply chains, and

comprehensive insurance coverage, ensuring that most citizens can access necessary healthcare services.

Health infrastructure is a major problem in developing nations, there may be restricted access to clinics, hospitals, and necessary medical supplies in many areas. Particularly impacted are isolated and rural locations, where there are few, ill-equipped, or understaffed medical institutions. This disparity leads to higher rates of mortality.

Internet connection: According to a cross-sectional study done in African nations, is internet access. The findings were indicative that to access health care that is of quality, access to information is critical, getting to have effective communication among the team members and the relevant health stakeholders, so are the patients to access their information (Tang, 2021). Internet connectivity is a critical enabler of quality healthcare in the modern world, yet a cross-sectional study conducted across several African countries revealed major challenges hindering the full realization of quality healthcare is inadequate internet connectivity. This challenge has far-reaching implications for healthcare delivery, as access to information, effective communication among healthcare providers, and patient engagement are all critically dependent on robust internet infrastructure. In the digital age, access to real time, accurate information is a cornerstone of quality healthcare. Healthcare professionals rely on the internet to access the latest medical research, treatment guidelines, and continuing education resources, which are crucial for making informed decisions that can significantly impact patient outcomes (Muinga *et al.,* 2020). For example, a doctor in a rural clinic may need to consult online databases for the most recent treatment protocols for a specific condition or to access telemedicine platforms that connect them

with specialists in urban centers. Without reliable internet access, healthcare providers are often forced to rely on outdated information, which can compromise the quality of care provided to patients.

Effective communication among healthcare team members is also vital for coordinated and efficient care delivery. In modern healthcare systems, communication is often facilitated through digital platforms that allow for real-time sharing of patient information, lab results, and treatment plans. These platforms enable multidisciplinary teams, often spread across different locations, to collaborate seamlessly. However, the study highlighted that in many parts of Africa, poor internet connectivity hinders this critical aspect of healthcare (Odekunle *et al.,* 2019). Disruptions in communication lead to delays in diagnosis, treatment and increase risk of medical errors, impacting negatively on patient outcomes. Internet connectivity plays a role in patient engagement and empowerment. Rise of patient-centered care models brought increasing emphasis on involving patients in their own healthcare decisions. Patients must often have access to their medical data, educational resources, and lines of communication with their healthcare professionals in order to participate in this process (Oleribe *et al.,* 2020). Online patient portals, for example, give patients access to their test results, book appointments, and interact with their doctors. In regions with poor internet connectivity, patients may struggle to access these resources, limiting their ability to actively participate in their care (Muinga *et al.,* 2020). This can lead to poorer health outcomes and lower satisfaction with the healthcare system.

Poor internet connectivity in many African for reliable internet access is often nonexistent or severely underdeveloped (Orodho & Kombo, 2002). This digital divide exacerbates existing

health disparities, as those in underserved areas are less likely to benefit from advancements in digital health technologies. Governments and private sector players are often reluctant to invest in building internet infrastructure in these areas due to the high costs and perceived low return on investment. Even in regions where internet infrastructure is available, the high cost of connectivity remains a significant barrier. Many healthcare facilities in public sector, operate on limited budgets to run high costs associated with reliable, high-speed internet access (Pejovic *et al.,* 2019). Additionally, individual healthcare providers and patients may also find it challenging to bear the cost of internet services, further limiting the adoption of digital health tools (Quatab *et al.,* 2019). The high cost of connectivity needs to be addressed to ensure health innovations reach all segments of the population.

The study discovered that patients' and healthcare professionals' lack of technical proficiency prevent the efficient use of digital health solutions. Training and education are essential to ensure healthcare providers can fully leverage online platforms and patients can navigate these systems to access information and services. Without addressing the issue of digital literacy, investments in internet connectivity may not yield the desired improvements in healthcare delivery (Ramzan, 2020). Having dependable internet access helps medical practitioners make better clinical decisions by giving them fast access to a wealth of medical information. Through online databases, journals, and peer-reviewed articles, doctors can stay updated on the latest medical advancements, treatment guidelines, and emerging health threats. This continuous learning process is vital for maintaining the quality of care, particularly in rapidly evolving fields such as oncology, infectious diseases, and cardiology (Rodrigues, 2021). For example, in order for healthcare professionals to make well-informed judgements on patient management and

treatment procedures during the COVID-19 epidemic, they needed access to real-time data and study findings.

Due to its heavy reliance on internet connectivity, telemedicine has emerged as a crucial instrument for increasing access to healthcare in underprivileged areas. Telemedicine reduces the need for travel and overcomes geographic obstacles by facilitating remote consultations, which closes the gap between medical professionals and patients in rural areas (Rohit, 2020). However, the study indicated that in regions with poor internet connectivity, the potential of telemedicine remains largely untapped. Enhancing internet infrastructure in these areas could significantly improve access to specialist care, follow-up consultations, and chronic disease management, leading to better health outcomes (Winter *et al.*, 2019). Data management, including electronic health records (EHRs), is another area where internet connectivity is crucial. EHRs improve the accuracy and efficiency of patient data management, reduce paperwork, and enable seamless sharing of information across different healthcare providers. This integrated approach to data management is essential for coordinating care, avoiding duplication of tests, and ensuring continuity of care. However, without reliable internet access, the implementation and use of EHRs can be challenging, leading to fragmented patient records and reduced quality of care (Tang, 2021).

Public-private partnerships (PPPs) play a critical role in expanding internet infrastructure, particularly in rural and underserved areas (Tan, 2020). By pooling resources and expertise, these partnerships can help overcome the financial and logistical challenges associated with building and maintaining internet connectivity. Governments can create favorable regulatory

environments and provide incentives to encourage private sector. This includes not only the physical infrastructure, such as fiber-optic cables and mobile networks, but also the supporting infrastructure, such as reliable power supplies and data centers. International aid and development organizations can play a crucial role in funding these initiatives, particularly in low-income countries where government resources are limited (Staren, 2018). Moreover, innovative solutions, such as satellite internet and community-based networks, can provide alternative means of connectivity in hard-to-reach areas.

Training healthcare workers in the use of data management systems, and telemedicine platforms is essential for effective implementation (Odekunle et al., 2019). Additionally, educating patients on how to access and use online health resources can empower them. Governments, educational institutions, non-governmental organizations (NGOs) can collaborate to develop and deliver these training programs. Finally, strong policy and regulatory frameworks are needed to support the expansion of internet connectivity in healthcare. Governments should prioritize digital health in their national health strategies and create policies that facilitate the deployment of internet infrastructure. This includes removing barriers to investment, ensuring affordable access to internet services, and promoting the use of digital tools (Staren, 2018). Additionally, policies that protect patient privacy and data security are essential to building trust in digital health initiatives. The levels of internet access globally is not evenly distributed and there are low levels of penetration and this applies to the seemingly little or low levels of basic connectivity in the developing countries (Pejovic *et al.*, 2019).

Power supply: Health institutions in most impoverished nations should ideally not have access to main power sources; if they do, the electricity is typically erratic and unpredictable, and power surges automatically cause errors that safeguard electronic equipment. In many developing countries, the challenges associated with reliable power supply in healthcare facilities are significant and multifaceted. Often, health facilities in these regions lack access to a consistent and stable source of electricity, which is crucial for the effective functioning of medical equipment and the overall operation of healthcare services. When power is available, it is frequently characterized by instability and unreliability, with frequent outages and power surges that can occur without warning. These surges can be particularly damaging to electronic medical equipment, which is highly sensitive to fluctuations in power. Such equipment, including diagnostic machines, ventilators, and electronic health record systems, is vital for providing accurate diagnoses, effective treatments, and maintaining patient records. Erratic power supply risk of malfunctioning of essential medical devices potentially compromising patient safety. Power surges lead to the degradation of expensive and essential devices, causing them to fail or become less accurate over time, forcing healthcare providers to work with unreliable tools, impede their ability to deliver timely and effective care.In emergency situations, the inability to depend on a stable power source can have dire consequences, leading to delays in critical interventions and, in extreme cases, the loss of lives. The situation is further exacerbated by the fact that many of these facilities do not have access to alternative power sources, such as generators or solar power systems, or if they do, these alternatives are often insufficient to meet the demands of a fully operational health facility. Addressing this issue requires not only investments in strengthening the power infrastructure but also implementing protective measures

for medical equipment, such as surge protectors and uninterruptible power supply (UPS) systems, to ensure that healthcare providers can deliver safe and reliable care even in the face of power instability. For instance, as compared to the neighboring countries, Kenya has a good and stable form of electricity supply as the major source of power is the hydroelectricity and fossil fuel and at times generators that use diesel are still in place (Blantz, 2021). The challenge is that generators cannot operate for long hours as they are mainly prone to mechanical failure and abruption. The challenge that still exists is the potential to provide uninterrupted supply of power which consequently affects the provision of good information technology services (Achampong, 2020).

2.3.2 Health Workers Related Factors

Knowledge and Skills in ICT: In the developing countries, it is noted that majority of the healthcare workers do have limited knowledge on the basic modules on ICT that are deemed to effectively operate an electronic health record system. This therefore, greatly influences the acceptability or rejection of the systems by the end user (Ajami and Tadi, 2019). On the other hand, it has been indicated that the developers many at time when they develop systems without the end-user inputs, it ends up being complicated. This has an implication in that it requires advance level of skill set to be able to operate and maneuver through the system (Alverson *et al.*, 2021). In Kenya, it is noted that there is insufficient levels of knowledge and skills needed to use the computer technology and this has thus slowed down the uptake of the electronic medical records system. This therefore has a ripple effect on the quality of data collected since manual systems take precedence (Kanyua, 2019).

Perception on the Systems Use: The wide incorporation and acceptance of the system among the users is dependent on the promotion, capacity building and skillset given to the electronic medical records system. The ease to manipulate and navigate through the system, determines the perception that the user will have. The perceived ease and usefulness are the two key features that mostly are focused on in any system as this has the direct impact on the end user (Johnson *et al.,* 2021). When adopting new systems and technologies, the extent of use is dependent on how best the system will improve the efficiency, performance and quality of work for the users. The system performance therefore, is highly pegged on the acceptability and its efficiency in improving systems (Davis, 2018).

User Satisfaction: Employees who have jobs based on the past experience, able to manage the expectations currently at work and any future expectations are best placed to explain the satisfaction levels (Kidd, 2021). The loyalty of staff members, the advantages of utilizing the new system, working hours and benefits received, working environment, and the reputation of the medical facility in relation to the calibre of care provided to these patients are some of the primary factors taken into account for employee satisfaction. For maximum utilization of a new system, users must understand benefits gotten daily realized from the improved, streamlined work practices (Antoncic, 2019).

2.3.3 Organizational Factors

The internal factors within a health facility do influence the practices by the health workers on how they are receptive to technology. The organizations that have strong leadership and features do have high chances of better introducing and receiving the technology unlike the latter. This is

also influenced by the capacity of human resource and other existing infrastructure and financial capability (Yarbrough and Smith, 2017).

Financial Resources: Regarding the expense of integrating new technologies into the healthcare system, poorer nations certainly have difficulties. The cost of deployment was identified as one of the study's constraints when it came to the adoption of EMR systems in Nigeria (Aknbi *et al.,* 2022). Research undertaken in Sub-Saharan Africa has demonstrated a correlation between the limited acceptance of EMR systems and the implementation costs related with setting up the hardware, software, and capacity development infrastructure (Alverson *et al.,* 2021; Odekunle *et al.,* 2019). In Kenya, the cost associated with putting up the infrastructure for EMR is the health facilities is deemed high and only limited to those who can afford the cost of setting up (Kinyua, 2019). It is believed obstacle to the adoption of EMR is a lack of funding, an inadequate budget, and financial help (Ramzan, 2020; Quatab *et al.,* 2019).

Capacity Building: Once a new system is introduced in an organization or health facility, there has to be some form of training for the end users. The training of clinical staff, records officers among other point of service and back-end users has recorded high level of usage of the EMR systems across the developed and developing countries (Sahay & Walsham, 2020). A study conducted on the awareness creation on systems states that, training of workers does increase the awareness and functionality levels and thus usage of the technology introduced among the end users, and this also enhances the expected benefits (Khan *et al.,* 2021).

Technical Expertise: The limitations of experienced staff available within the healthcare workspace poses challenges in many of the developing countries in adopting electronic medical

records. The number of health staff who at minimal have basic IT skills is wanting and for the few who have the knowledge in most cases they are not involved in the mainstream of the EMR related designing and implementation (Achampong, 2020). The expense and sustainability of ICT staff is costly and many of the healthcare facilities do not have information technology experts. The few that have, they overwork them due to the numerous responsibilities and thus minimal time is spent in implementing the new technology. It is therefore critical that health facilities have full time, IT experts dedicated and reliable for all EMR related issues otherwise the problems faced currently will continue to persist (Zakaria *et al.*, 2020).

User Involvement: To involve end users in the project from start to finish, electronic medical record adoption and deployment are essential. While designing the usability and usefulness of the EHR, it is crucial to remember that the potential users of the system, the healthcare professionals, are taken into account to effectively meet their requirements and expectations. Otherwise, the adoption of a new system, such as an EHR, may be hampered by user resistance, problems with trust, and a continuous preference for the outdated system, which may seem to them to be fairly simple to use in terms of managing patient information (Sahay & Walsham, 2020).

Harmonized Legal Standards: Privacy breach is a potential barrier to the adoption of EHR, which is a concern due to the nature of the information shared among healthcare practitioners. Hospital administration's privacy policies, and the code of conduct for healthcare workers, ensure the confidentiality and security of patient information by preventing access by non-users. Numerous studies indicate that health professionals consider this information to be of utmost

importance and would be reluctant to enter it into an electronic system because of possible legal repercussions (Boonstra and Broekhuis, 2021). If the information were to be entered, there is also the possibility of security issues because system users are likely to be aware of it. The policymakers participating in the creation of this system also do not impose strict regulations to guarantee the security and also confidentiality of patient information (Menachemi and Collum, 2019).

2.3.4 Managerial Factors

Senior Management Roles: The information system needs to provide awareness of all aspects of information management and a way to handle different kinds of issues. In certain cases, senior management may not understand the objective or have confidence in Information System Strategies' (ISS) ability to accomplish. It is recommendended the executives validate the time and resources required to build the ISS while also considering their involvement in implementing the plan (Achampong, 2020). The requirement to harmonize the company plan with information systems strategy is one of the issues managements faces today, achieved by determining IS gap and organization's current state and its desired future. (Barreau, 2019).

Management Support: Inadequate coordination and work sharing, changes that replace senior management, insufficient roles in implementation, and a lack support from top management for the development and implementation of the electronic medical record system are a few instances of management challenges that might occur. Many actions must be brought into harmony through the coordinating process in order to achieve desired results (Hatch, 2020). As a result, tasks can run concurrently without getting in the way or disrupting one another. The fundamental

idea is that every component of the electronic medical record system is interrelated. Although coordination should be ubiquitous, it does involve intentional effort, therefore it should fall within each manager's purview. Effective coordination fosters cooperation, gives clear instructions, and maximizes utilization of resources which helps businesses meet their objectives (Akrani, 2021).

Workplace Communication: Poor workplace communication, on the other hand, results in a negative feedback cycle. Poor workplace communication is a significant issue that can lead to a negative feedback cycle, adversely affecting organizational performance, employee morale, and overall productivity. When communication within a workplace is ineffective, it sets off a chain reaction of problems that perpetuate and intensify over time. At the core of this issue is the breakdown in the flow of information between team members, departments, and management. Miscommunications, misunderstandings, or the absence of clear communication can lead to confusion about tasks, roles, and expectations. This confusion often results in mistakes, missed deadlines, and subpar performance, which not only hinders the progress of individual projects but can also have a cascading effect on the organization as a whole.

As these errors and inefficiencies accumulate, frustration begins to build among employees. Workers who are unclear about their responsibilities or who receive mixed messages from supervisors may feel demotivated or disengaged. This lack of clarity can foster an environment of blame and defensiveness, where employees are more focused on protecting themselves from criticism rather than collaborating effectively with their colleagues. In such environments, open and honest communication becomes even more difficult, as employees may fear reprisal or may

have lost confidence in the effectiveness of their communication channels. This further exacerbates the problem, as essential information may be withheld, distorted, or misinterpreted, leading to a continuous cycle of poor communication and declining performance.

The negative feedback cycle of poor workplace communication extends beyond the immediate work environment and can have long-term implications for the organization. As communication breakdowns persist, employee dissatisfaction can lead to increased turnover rates. For organizations, high turnover is expensive not just in terms of hiring and training costs but also in terms of institutional knowledge and continuity lost. Moreover, as experienced employees leave, the remaining staff may become overwhelmed by increased workloads, further straining communication and collaboration. New hires may struggle to integrate into the team if they are not properly informed or if they enter an environment where poor communication is the norm.

Additionally, poor communication can erode trust between employees and management. When leaders fail to communicate effectively, whether by not providing adequate feedback, not listening to employee concerns, or failing to articulate a clear vision, it can lead to a disconnect between management and staff. Employees may feel undervalued or ignored, which can decrease their commitment to the organization and reduce their willingness to go above and beyond in their roles.

Ppoor communication can impact external relationships with clients, partners, and other stakeholders. Miscommunications or delays in communication can lead to misunderstandings, unmet expectations, and damaged reputations. For businesses that rely on strong customer

relationships, the repercussions can be particularly severe, potentially leading to the loss of clients and a tarnished brand image.

Regular feedback mechanisms should be in place to address any communication issues before they escalate. Leadership plays a critical role in setting the tone for effective communication; by modeling good communication practices and encouraging an environment where employees feel safe to express their ideas and concerns, leaders can help break the negative feedback cycle. Additionally, using modern communication tools and platforms can enhance the clarity and efficiency of information exchange within the organization. The project team's morale suffers when they are unclear about what is expected of them to implement EHR systems, which makes communication much more challenging. Creating a more pleasant business culture helps improve poor workplace communication. To address reasons for poor workplace communication is by having regular meetings, managers and employees works together (Hatch, 2020).

2.4 Theoretical Framework

2.4.1 Structuration Theory

Foundation of structural theory, a sociological idea that gives insights into human behaviour, is the "duality of structure," a synthesis of agency effects and structure. Structuralism acknowledges interplay of power, standards and values, meaning and assumes a dynamic relationship between various aspects of society, as opposed to explaining human behaviour result of an individual's expression of will (agency) or as a result of strong, stable societal structures (political, religious, or educational institutions). The sociologist Anthony Giddens came up with the concept (Giddens, A. (1984).

In the same way that structure affects a person's autonomy, Giddens claims that agency is employed to uphold and modify structures. The structure is what happens when an actor and a structure cross path. According to Giddens, structure is made up of the guidelines and instruments that a social system requires, where "system" refers to the connections between its constituents. He further explains that structuration is an ongoing process that impacts social systems. Thus, structuration theory resolves the tension between macro-micro and structural agency viewpoints in an attempt to understand human social behaviour. Examining how the actor and the structure interact will help achieve this. Both the structure and the agency theories fall short of providing a comprehensive explanation for social behaviour, according to structural theory (Giddens, A. (1984).

Rather, it recognizes that social institutions set standards that individuals must adhere to in order to ensure that these structures are maintained. Social institutions are inherently unstable due to their social construction, which is not dependent on human behaviour. Alternatively, actors who practice reflexivity affect social systems by functioning beyond the constraints set by such structures.

The social system's norms, resources, and other characteristics are used by the human agents in an HMIS to carry out their everyday tasks. The resources and rules that regulate HMIS user behaviour are updated on a regular basis by human agents. Kouroubali (2012) argues that the efficient deployment of HMIS requires a dual approach involving the actors and the structure, whereby the actors execute changes to the structure while going about their daily lives.

2.4.2 Task-Technology Misfit Theory

Any health organization has a significant difficulty with task and information management. This is because workers are obliged to utilize a system rather than information practices to complete activities relevant to their jobs. The performance of organizations is hampered by these gaps between tasks and accessible technology. Several studies have looked at issues that arise when workers attempt to complete their task using systems that have functions that are poorly matched to the demands of the job, (Boardman & Sasse, 2019; Dabbish & Kraut, 2016; Bondarenko *et al.*, 2010).

Goodhue and Thompson (1995) developed a hypothesis to look at how a system can cause an employee to perform worse if the technology was poorly fitted to the requirements of the employee's particular work. According to the Task-Technology Fit (TTF) principle, when information technology's capabilities align with the tasks a user must do, it is more likely to improve performance and be employed. Goodhue and Thompson (1995) developed a task-technology fit measure that takes into account factors: production timeliness, quality, location, authorization, compatibility, usability/training, system reliability, and user interaction. Two to ten questions are used to examine each element, and answers are graded on a seven-point scale from strongly disagree to strongly agree. When combined with utilisation, the TTF metric was found by Goodhue and Thompson (1995) predictor of user reports of increased effectiveness and competence that might be connected usage of relevant system.When health system can't meet the reporting needs Task Technology mismatch arises which is done by analyzing job requirements during system development.

2.5 Conceptual Framework

The figure below served as a representation of the study's conceptual framework. The graphic illustrated how the representation, which unambiguously depicted the link between independent and dependent variables under study, works.

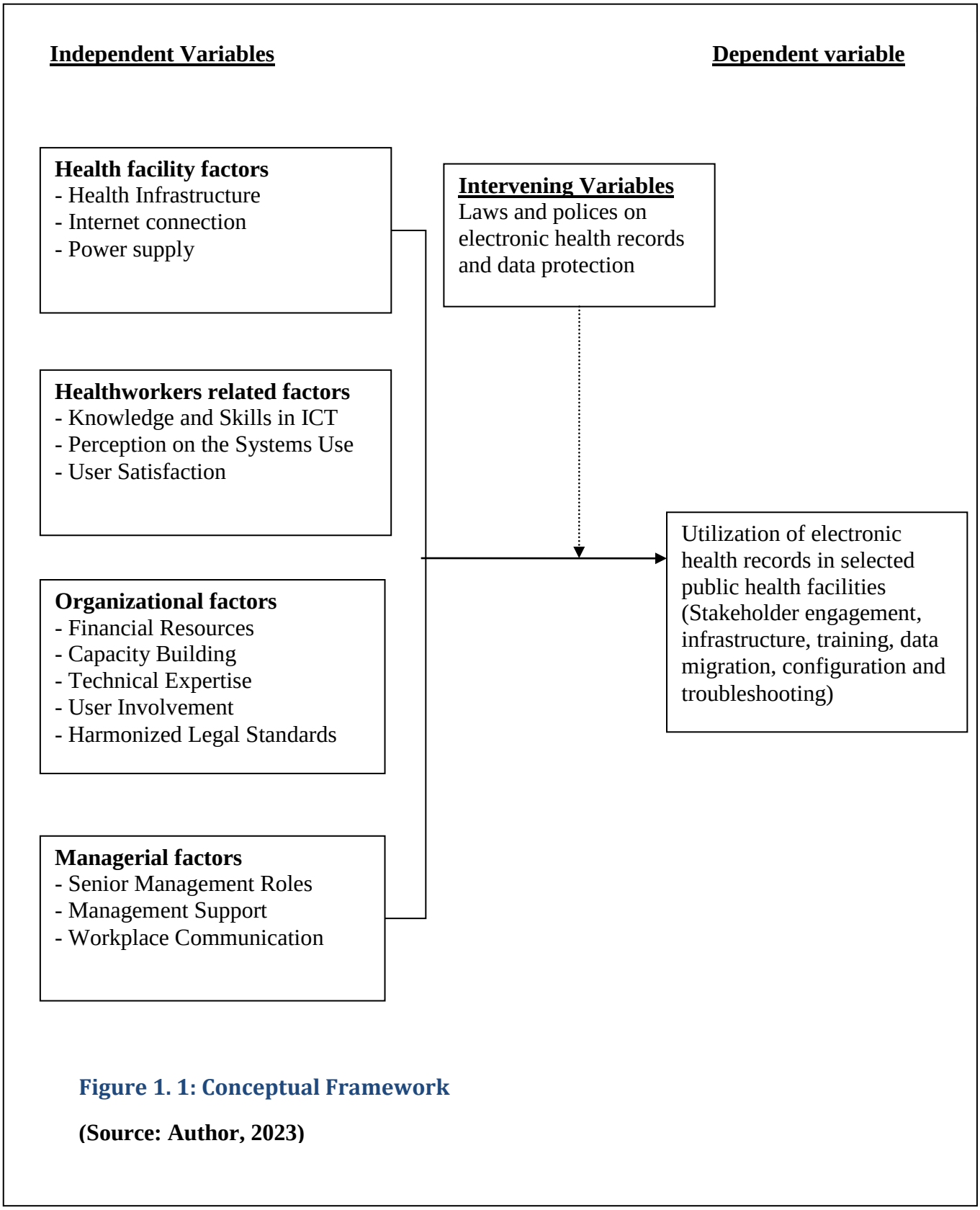

Figure 1. 1: Conceptual Framework

(Source: Author, 2023)

2.6 Recap of the Literature

In light of the rapid advancements in technology, public health institutions, like private health facilities, must participate in this field and fully realize the potential and advantages that come with the usage of electronic health records. Research conducted in Kenya on factors influencing adoption of electronic health records in certain public health institutions (Juma et al., 2022; Kimama, 2022; Kanyua, 2019). In this era of technology, different information systems have been developed to help ease the effectiveness, quality and reduce paperwork within the healthcare space. Many variables do impact the notable low adoption rate of these electronic medical record systems, particularly in public health institutions, as the research has noted. The knowledge gap in Kenya, alongside the increasing need for adopting such systems therefore, necessitates this study so as to fill the gap, as well as come up with recommendations and strategies that will go a long way in reversing the situation.

The study done by Sood *et al.,* 2021, indicates lack of basic hardware like the computers, and internet appliances as inhibitors to adopting electronic systems, this study will focus on the connection of electricity and internet and maintenance of the machinery. Alverson *et al.,* 2021 in their study, they identified poor knowledge and skills as a barrier and in this study, the focus will be on the quality of training, the retaining of knowledge and skill as well as perception of the systems and user satisfaction levels. Aknbi *et al.,* 2022 highlighted that financial resources are key in setting up the electronic systems, further to this, the study will look into the unexplored areas of financing, technical expertise, managerial roles and involvement as well as sustainability of the electronic records.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

Methodology is in this chapter, contents covered: target audience, research design, sample size and sampling methods, data collection tools (validity, reliability tests, pilot testing, etc.), data collection techniques, data analysis strategies, ethical considerations, and operational definitions of variables.

3.2 Research Design

Both qualitative and quantitative data collection techniques, with a cross-sectional analytical design are used because it is essential for testing hypotheses, cost- and time-effective.

3.3 Location of the Study

The study was conducted in Machakos County. There are 47 counties in Kenya, including this one. It is a component of the former Eastern Province and is situated in the country's eastern part. Machakos Town is the largest town and the county's capital. A large portion of the county's economy comes from agriculture, and attempts have been made to enhance healthcare and education. The people are served by a number of hospitals, colleges, and educational institutions.

3.4 Research Variables

3.4.1 Independent variables

Independent variables included health facility factors, health workers related factors, organizational factors and managerial factors.

3.4.2 Dependent variables

Utilization of electronic health records among public health facilities was the dependent variable.

3.4.3 Intervening variables

The intervening variables were the laws and policies on electronic health records and data protection.

3.5 Target Population

Health professionals employed by Machakos County's public health facilities were the study's target group. To obtain first-hand experience, the focus was further focused on health workers who often deal with electronic health records. The study population from which a research sample was drawn and from whom the findings were examined Okombo & Orodho (2002). The researcher focused on, hospital management officers (facility in-charges, and medical officers of health, clinicians), ICT officers, and healthcare workers handling data and service provision (health records officers, nurses and doctors/clinicians). The hospital medical superintendents in each facility were interviewed as informants.

Table 3.1: Sampling Frame

Group	Health facility staff
Machakos level 5	685
Kangundo level 4	485
Katani dispensary	80
Mitaboni health Centre	120
Endei dispensary	78
Kyeleni health center	153
Kavumbi dispensary	87

Matuu district hospital	370
Total	**2056**

Source (KHIS, 2023)

3.5.1 Inclusion Criteria

Hospital management officers (facility in charge, medical superintendent, ICT officers, and healthcare professionals (doctor, nurse, technician) who work in the chosen public health facilities and consented.

3.5.2 Exclusion Criteria

The study excluded health workers volunteering and not employed by the county government. The newly recruited less than 3 months in employment were excluded from the study as they were not well acquainted with the operations of the hospitals.

3.6 Sampling Procedures

The selection of health facilities for the study was purposive based on their levels (level 1-5). The levels formed the study strata. The selection of health workers to participate in the study was purposive, based on availability at the time.

3.7 Sample Size Determination

The Fisher's formula was used to calculate the sample size for a proportion since the target population size was known. The formula was given by:

$$n = \frac{(Z^2pq)}{d^2}$$

Whereby: **n** = the desired sample size

Z = 1.96 (standard deviation at the specific required level of confidence, which corresponds to a confidence level of approximately 95%)

p = 0.5 (proportion estimated is unknown)

d = 0.05 (level of statistical significance)

q = 1 - p = 1 - 0.5 = 0.5

Therefore: $= \frac{(1.96^2 \times 0.5 \times 0.5)}{0.05^2} = 384.16$

=384 respondents

A 10% (or around 39) allowance was applied to the sample size in order to account for non-response, making 424 respondents total. The study respondents were proportionally distributed across eight healthcare facilities at a rate of 20.62% to maintain consistency and fairness in the sampling process across all health facility groups. This percentage corresponds to the proportion of each health facility group relative to the total study population.

Table 3.2: Study Population and Sample Size Distribution

Group	Health facility staff	Percentage	Sample size
Machakos level 5	685	20.62	141
Kangundo level 4	485	20.62	100
Katani dispensary	80	20.62	17
Mitaboni health Centre	120	20.62	25
Endei dispensary	78	20.62	16
Kyeleni health center	153	20.62	31
Kavumbi dispensary	87	20.62	18
Matuu district hospital	370	20.62	76

Total	**2056**	**424**

The researcher also interviewed 8 key informants comprising the facility in charges/medical superintendent or their assistants in the event of absence.

3.8 Construction of Research Instruments

a) Primary research instrument was a formulated semi-structured questionnaire, employed to gather comprehensive data from participants and to capture a wide range of insights and detailed responses. The format allowed for flexibility, enabling participants to provide in-depth information ensuring key areas of interest were covered.

b) To assist us in getting information from the institution in charge, a key informant interview guide reflecting the primary goals of the research was created. One on One in-depth interviews were held.

3.9 Testing for Validity and Reliability

3.9.1 Pre-test

Guarantee questionnaire's validity and reliability which involved administering the questionnaire to a tenth of the study population in Matuu district hospital. This process aimed to identify any ambiguities, misunderstandings, or other issues that could affect the respondents' ability to provide accurate and meaningful answers. Participants were invited to offer input on the pre-test regarding the questionnaire's general form, topic relevancy, and question clarity. This feedback was invaluable in pinpointing questions that were potentially confusing or misinterpreted. Based on the participants' responses and comments, necessary revisions were made to the questionnaire

to enhance its clarity and comprehensibility. To further assess reliability, the consistency of the respondents' answers was evaluated. This involved checking for similar responses to related questions and ensuring that the questionnaire yielded consistent results when administered under similar conditions. Any discrepancies or inconsistencies found were addressed by refining the questions to ensure they accurately captured the intended information.

3.9.2 Validity

Face validity, which determined the genuine measure of the idea being examined by an expert examination of the questionnaire's items, were used to establish the validity of the survey. The readability, clarity, and comprehensiveness of the surveys were evaluated using content validity. However, while face validity provides a basic level of assurance that the survey looks right, it is not sufficient on its own to establish the overall validity of the survey. To further strengthen the validity, content validity is also employed. Content validity goes beyond the surface appearance and delves deeper into evaluating the survey's content. It involves a thorough examination of the questionnaire's items to assess whether they fully cover the domain of the concept being measured. This process typically involves experts in the field to systematically review the survey to address all aspects of the concepts. For example, in a survey measuring employee engagement, content validity would involve ensuring that the questions cover all relevant areas such as motivation, organizational commitment, communication, and workplace culture, rather than focusing on just one or two aspects.

Content validity assesses the readability, clarity, and comprehensiveness of the survey items making it easier to interpret by ensuring that the language used is acceptable for the intended

audience. Clarity ensures questions are unambiguous and straightforward, reducing the likelihood of misinterpretation.

3.9.3 Reliability

Test-retest procedure was repeatedly used, to ascertain dependability, the same group in Machakos County received the questionnaire twice. This was measured using the Cronbach alpha coefficient. Calculations were made in the two tests, established the average and thus determine reliability using the Cronbach, (2009). If the alpha coefficient in this study was 0.7, then this was considered reliable for use in data collection.

3.10 Measurement of Variables

In this study, variables were measured using questionnaire and Likert-scale items. The dependent variable, EHR implementation, was assessed based on the extent of system use across clinical, administrative, and reporting functions. Independent variables included health facility-related factors, health worker-related factors, and organizational and managerial factors. Each construct was measured using multiple items rated on a 5-point Likert scale ranging from "strongly disagree" to "strongly agree," and composite scores were generated for analysis. Validity through expert review, reliability using Cronbach’s alpha as indicated in the section above.

3.11 Data Collection Procedure

3.11.1 Study Instruments

Questionnaire was the main data collection instrument for quantitative data and the key informant guide for the qualitative information.

3.11.2 Data Collection

Semi-structured questionnaires were used to facilitate interviews with research participants, and in less than a month, data was gathered. Three research assistants with diplomas in health-related fields participated in the activity. They received training on the study's purpose and overview, methodology, and techniques for managing and ensuring the quality of data. Key informant interviews were done by the principal investigator.

3.12 Data Analysis Techniques and Procedures

Collected cleaning before data analysis for correctness and completeness in accordance with the goals. To offer description, the descriptive statistics was generated, standard deviation and mean were applied to each variable. The Chi-square test was used to show how nominal and ordinal variables relate to one another. For statistical significance testing, a p-value of less than 0.05 was significant.

Analyses, Statistical Package for Social Sciences version 27 was utilized. Raw interview scripts were created by transcribing data from KIIs. The analysis involved making a codebook, using NVIVO v12 software to code and categorize the data into themes using a deductive method.

Results were presented in a unique way to show the descriptive analysis and the associations that show the significance levels. The analysis plan per objective is as below table 3.3.

Table 3.3: Analysis Plan

Variable	Type of Variable	Measurement Tool	Level of Measurement	Statistical Analysis
EHR utilization	Dependent	Likert-scale	Ordinal	Descriptive stats, Chi-square test
Health Facility Factors	Independent	Likert-scale	Ordinal/Categorical	Descriptive stats, Chi-square test
Health workers-related	Independent	Likert-scale	Ordinal/Categorical	Descriptive stats, Chi-square test
Organizational Factors	Independent	Likert-scale	Ordinal	Descriptive stats, Chi-square test
Managerial Factors	Independent	Likert-scale	Ordinal	Descriptive stats, Chi-square test

3.13 Ethical Considerations

Ethics Review Committee, Mount Kenya University approved the study, National Council for Science, Technology, and Innovations issued a further permit. The study was carried out with permission granted by the Machakos County Department of Health and consent from hospital administration. Besides, ethical standards that prioritized the welfare, autonomy, and dignity of all participants was reinforced in the study. Participants were asked for their informed permission after being told of the study's goal and expected benefits. The respondents' identities were kept private with minimize of any potential harm or discomfort to participants.

CHAPTER FOUR: RESEARCH FINDINGS AND DISCUSSION

4.0 Introduction

Present study findings aligned with study objectives using tables, figures, and charts. Both qualitative and quantitative results are presented. Analysis done using SPSS version 27, MS Excel version 2019, and Nvivo is utilized. 424 study participants, study reached 411 participants for quantitative interviews, a response rate of 96.9% as shown in figure 4.1. Werner in his findings in 2004, response rate surpassing 80%, is considered reliable valid results. Qualitative interviews, all the 8 facilities in charges/medical superintendent targeted were interviewed.

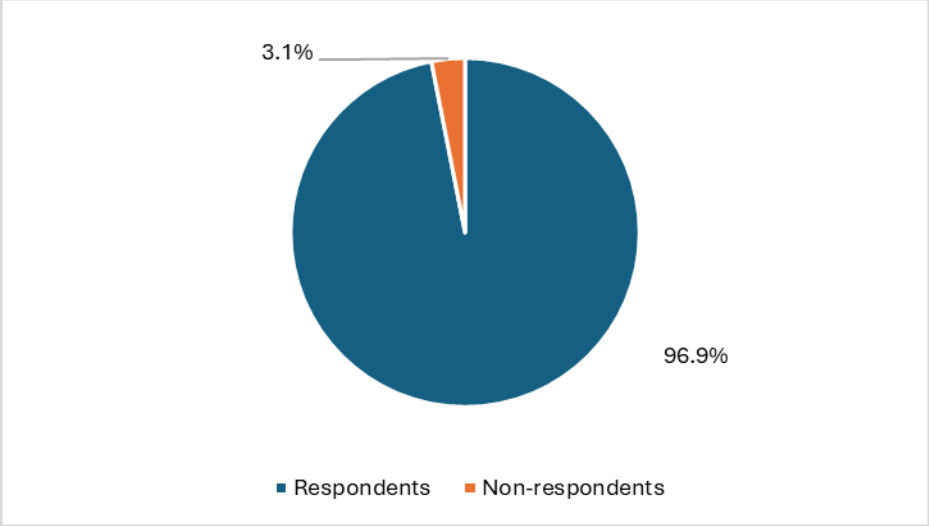

Figure 4.1 Response rate of the study respondents

4.1 Respondents' Socio Demographic Characteristics

Study findings indicated majority 280 (68.1%) were female, while 131 (31.9%), were male, Participants age was majorly presented by 20-29 years 154 (37.5%), 119 (28.9%) aged between 30-39 years, 93 (22.6%) aged 40-49 years and 50 and above were 41 (10.0%).

All participants had attained education at 12 (2.9%), 156 (38.0%), 204 (49.6%) and 39 (9.5%) for certificate, diploma, bachelors, and post-graduate education level respectively. On the years of experience, those with less than 1 year were 41 (10.0%), 1-5 years were 182 (44.3%), 6-10 years of experience were 81 (19.7%) and those with over 10 years of experience were 107 (26.0%). As shown in table 4. 297 (72.3%) respondents reported an EMR system in their health facilities

Table 4. 1: Respondents' socio demographic characteristics

Variable	**Category**	**Frequency (n)**	**Percent (%)**
Sex	Male	131	31.9
	Female	280	68.1
	Total	411	100
Age	Below 20 years	4	1.0
	20-29 years	154	37.5
	30-39 years	119	28.9
	40-49 years	93	22.6
	50 and above years	41	10.0
	Total	411	100
Highest Level of Education	Certificate	12	2.9
	Diploma	156	38.0
	Bachelors	204	49.6
	Post-graduate	39	9.5
	Total	411	100
Years of experience	Less than 1 year	41	10.0
	1-5 years	182	44.3
	6-10 years	81	19.7
	Over 10 years	107	26.0
	Total	411	100
If the facility has any form of EMR system	Yes	297	72.3
	No	114	27.7
	Total	411	100

4.1.1 Association between socio-demographics and utilization of EHR

Age cohort of below 20 and 21-29 years were significantly associated with electronic health records utilization with p values of (χ^2=6.12, p=0.001) and (χ^2=12.45, p=0.025). The level of education for bachelor's and postgraduate was significantly associated with the implementation of electronic health records with p values of (χ^2=18.4, p=0.002) and (χ^2=4.08, p=0.027) respectively. No association between years of work experience and implementation of electronic health records with p value of (χ^2=6.51, p=0.659).

The study findings are in line with the two key informant interview guides who indicated that '*A health care workers who has undergone higher level of training such as bachelor's and post graduate, better understand the need for EMRs and especially the young generation is prone to adopting this quickly but it is not commensurate to years of experience'*. These are illustrated in table 4.2.

Table 4.2: Association between socio-demographics and utilization of EHR

Predictors	Health facility have any form of electronic medical records system		χ^2	Degree of freedom (df)	P value (p<0.05)
	No	Yes			
Age				4	
Below 20 years	0 (0.0)	4 (45.0)	6.12	1	0.001
20-29 years	5 (3.2)	149 (96.8)	12.45	1	0.025
30-39 years	23 (19.3)	96 (80.7)	4.17	1	0.053
40-49 years	51 (54.8)	42 (45.2)	1.01	1	0.835
50 and above years	35 (85.4)	6 (14.6)	6.33		
Highest level of education				3	0.064
Certificate	11 (91.7)	1 (8.3)	8.52		
Diploma	95 (60.9)	7 (39.1)	5.21	1	0.267
Bachelors	2 (1.0)	202 (99.0)	18.4	1	0.002
Post-graduate	6 (15.4)	33 (84.6)	4.08	1	0.027
Years of experience				3	0.659
Less than 1 year	29 (70.7)	12 (29.3)	6.51		
1-5 years	37 (20.3)	145 (79.7)	4.71	1	0.835
6-10 years	15 (18.5)	66 (81.5)	3.32	1	0.406
Over 10 years	33 (30.8)	74 (69.2)	0.79	1	0.582

4.2 Utilization of EMR in public health facilities

4.2.1 Health facility with a computer in most clinics/departments

In this study 253 (61.6%) of the participants as shown in figure 4.2, indicated that the facilities they worked in had computers in most of the clinics/departments, while 133 (32.3%) did not have them and 25 (6.1%) did not know.

The consensus from key informants was summarized, '*The main systems we have are the HIV EMR, inpatient software and Kenya Health Information System for reporting especially in the level 5 and two of the level 4 health facilities. The facilities are at least equipped with*

infrastructure such as computer, software, and power for sustaining an electronic health records system'.

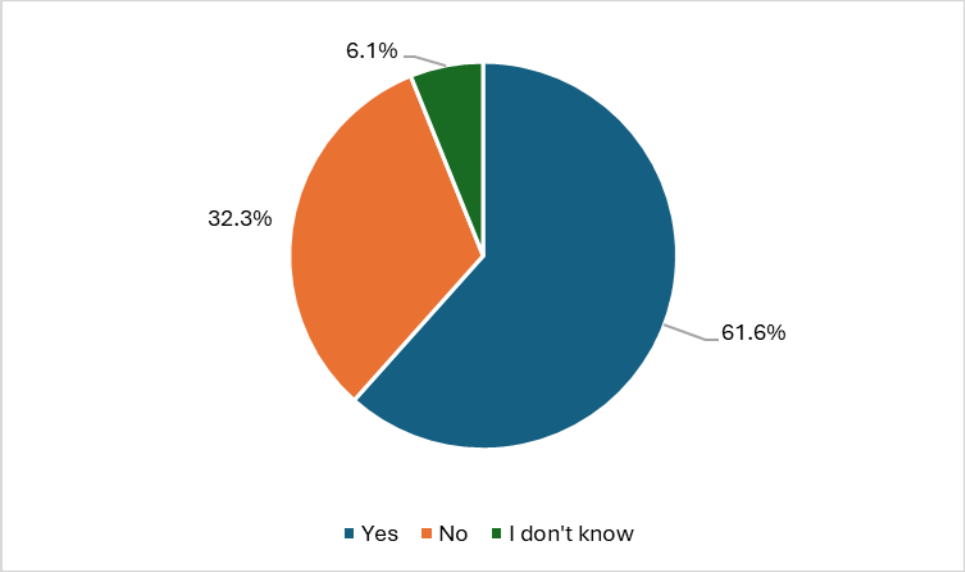

Figure 4.2 Health facility with a computer in most clinics/departments

4.2.2 Utilization of EMR in health facilities

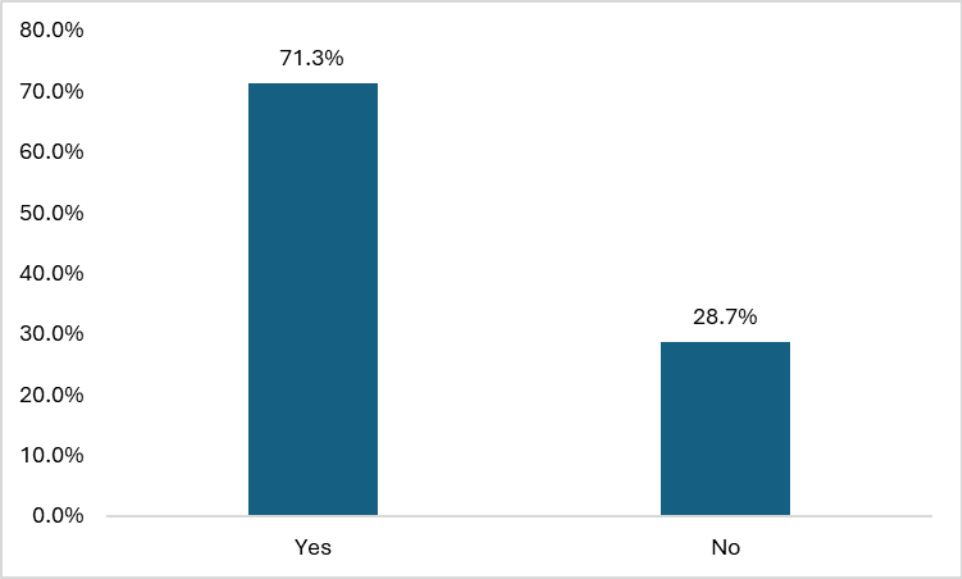

Figure 4.3 Health facility utilizing EMR

The findings indicated 253 respondents, 71.3% were using EMR, 28.7% were not using the EMR as per the figure 4.3 above.

4.3 Objective 1: Health facility factors

An interval scale is what the five-point Likert scale is known as. It denotes no extent at all between 1 and 1.8. 1.81 to 2.60 denotes a modest degree. It indicates neutrality from 2.61 to 3.40, big extent from 3.41 to 4.20, and very large extent from 4.21 to 5.

Mean of 2.381, majority of the respondents were to a small extent with ICT infrastructure being reliable. A Mean of 4.463, indicating to a small extent facilities had adequate hardware and software set-up.

A mean of 3.881, a large extent indicated they had a connection to power grid, while a mean of 1.063 was to no extent connected to internet. The mean of 2.791 indicated a neutral user interface of the electronic health records systems is user friendly and with a mean of 1.135, to no extent make sure staff activities match the features of the electronic health records system, as shown in table 4.3.

Table 4.3: Analysis of the Likert Scale for health facility factors

Statement	Very large extent	Large extent	Neutral	Small extent	No extent at all	Mean	Std Deviation
The ICT infrastructure is reliable and supports the efficient operation of the system.	9.2%	17.3%	15.3%	38.0%	20.2%	2.381	1.013
The facility has adequate hardware and software set up	29.2%	21.2%	12.4%	32.8%	4.4%	4.463	1.307
The facility is connected to a power grid	41.1%	51.6%	3.6%	3.6%	0.0%	3.881	1.729
The facility has a connection of internet	1.9%	5.1%	2.2%	9.0%	81.8%	1.063	0.995
The user interface of the electronic health records system is user-	26.5%	21.2%	29.2%	18.7%	4.4%	2.791	2.194

friendly and intuitive.							
To make sure staff activities match the features of the electronic health records system, system testing is continuously conducted.	0.0%	3.4%	5.6%	12.4%	78.6%	1.135	0.894

4.3.1 Association between health facility factors and implementation of EHR

The study results indicate there was significant association between ICT infrastructure being reliable to support the efficient operation of the system (χ^2=9.71, p=0.039), the facility has adequate hardware and software set up (χ^2=4.17, p=0.041) and the facility is connected to a power grid (χ^2=4.23, p=0.040). On the other hand, the facility connection to internet (χ^2=2.73, p=0.098) and the user interface of the electronic health records system is user-friendly and intuitive (χ^2=3.28, p=0.070) were not significantly associated, this is shown in table 4.4.

Insights shared with informant aligned the findings; '*The health facilities in Machakos not most of them are connected to power and the available computers are not well maintained thus affecting the implementation or running of the electronic records systems'*.

Table 4.4: Association between health facility factors and implementation of EHR

Predictors	**Health facility have any form of electronic medical records system**		**χ^2**	**Degree of freedom (df)**	**P value (p<0.05)**
	No	**Yes**			
Health facility factors				**5**	
The ICT infrastructure is reliable and supports the efficient operation of the system	302 (73.5)	109 (26.5)	9.71	1	0.039
The facility has adequate hardware and software set up	204 (49.6)	207 (50.4)	4.17	1	0.041
The facility is connected to a power grid	396	15 (3.6)	4.23	1	0.040

The facility has a connection of internet	(96.4) 382 (92.9)	29 (7.1)	2.73	1	0.098
The user interface of the electronic health records system is user-friendly and intuitive.	215 (52.3)	196 (47.7)	3.28	1	0.070
To make sure staff activities match the features of the electronic health records system, system testing is continuously conducted.	397 (96.6)	14 (3.4)	4.12		

4.4 Objective 2: Health workers related factors

4.4.1 Basic knowledge on how to run and operate a computer

The study found out 373 (90.8%) had basic knowledge while 38(9.2%) did not have as shown in figure 4.4.

Guide insights supported the findings that: "*With the current world of technology, majority of the health workers know how to use and operate computers, which is one of the basic requirements".*

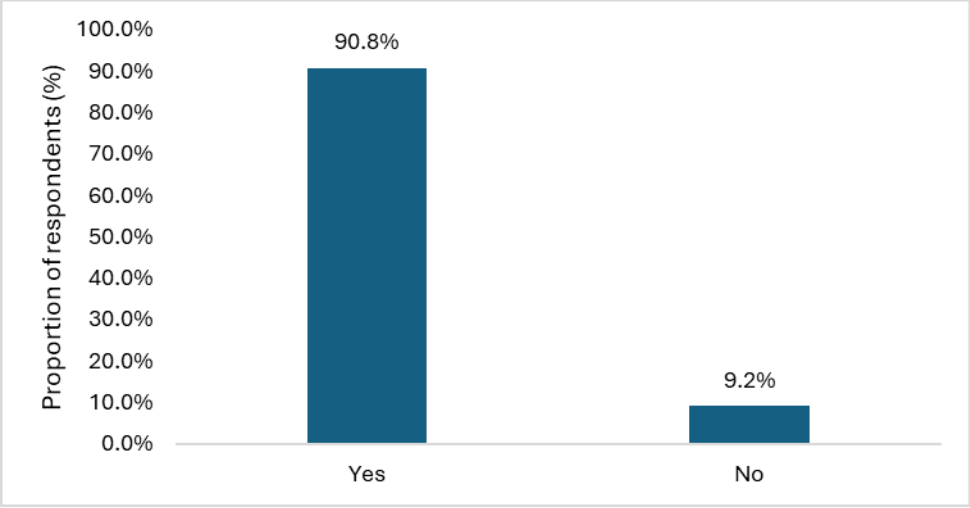

Figure 4.4 Basic knowledge on how to run and operate a computer

4.4.2 Analysis of the Likert Scale for health workers related factors

An interval scale is what the five-point Likert scale is known as. It denotes no extent at all between 1 and 1.8. 1.81 to 2.60 denotes a modest degree. It indicates neutrality from 2.61 to 3.40, big extent from 3.41 to 4.20, and very large extent from 4.21 to 5.

A small extent a mean score of (mean=1.881) health care workers have positive perception on the system use, neutral with a mean score of (mean=1.307 and 3.381) related to ability to operate the electronic health system. A large extent of agreement mean score of (mean=3.905 and 3.909) healthcare providers attitude and faster data retrieval. A mean of 4.463 to a very large extent have sufficient ICT knowledge as indicated in table 4.5.

Table 4.5: Analysis of the Likert Scale for health workers related factors

Statement	Very large extent	Large extent	Neutral	Small extent	No extent at all	Mean	Std Deviation
The healthcare professionals possess sufficient ICT knowledge and skills.	66.2%	24.6%	1.7%	5.1%	2.4%	4.463	2.048
The ability to operate the electronic health records system is strong among users.	9.2%	14.8%	35.8%	26.5%	13.6%	2.606	1.307
The health care workers have positive perception on the systems use	9.2%	19.2%	25.3%	29.4%	16.8%	1.881	1.729
Healthcare professionals' attitudes on the changes brought forth by the electronic health records system is favourable.	19.7%	27.3%	18.7%	23.4%	10.9%	3.905	2.894
The healthcare workers have expressed a positive user satisfaction on the EMR system	10.9%	19.7%	28.5%	25.8%	15.1%	3.381	2.194
The electronic health records system has enhanced faster retrieval of data for the healthcare workers	21.7%	31.4%	18.0%	19.7%	9.2%	3.909	2.948

4.4.3 Association between health workers related factors and utilization of EHR

To determine the relationship between parameters linked to health workers and use of electronic health records. The findings showed a strong correlation between healthcare professionals with adequate ICT knowledge and abilities (χ^2=19.05, p=0.012), the ability to operate the electronic health records system (χ^2=7.52, p=0.035) health care workers positive perception on the systems use (χ^2=3.84, p=0.050) with the implementation of electronic health records. Healthcare professionals' attitudes being unfavorable (χ^2=2.23, p=0.136) was not statistically significant.

The findings are in concurrent with informant interview guide that; '*It is critical for health care workers to possess ICT skills and as the skills will enable them to navigate the system well and be able to actualize its operation and further recommend changes to be made'*. These are illustrated in table 4.6.

Table 4. 6: Association between health workers-related factors and utilization of EHR

Predictors	**Health facility have any form of electronic medical records system**		**χ2**	**Degree of freedom (df)**	**P value (p<0.05)**
	No	**Yes**			
Health workers related factors				**5**	
The healthcare professionals possess sufficient ICT knowledge and skills.	38 (9.2)	373 (90.8)	19.05	1	0.012
The ability to operate the electronic health records system is strong among users.	312 (75.9)	99 (24.1)	7.52	1	0.035
The health care workers have positive perception on the systems use	294 (71.5)	117 (28.5)	3.84	1	0.050
Healthcare professionals' attitudes on the changes brought forth by	218 (53.0)	193 (47.0)	2.23	1	0.136

the electronic health records system are unfavorable.					
The healthcare workers have expressed a positive user satisfaction on the EMR system	285 (69.3)	126 (30.7)	2.86	1	0.091
The electronic health records system has enhanced faster retrieval of data for the healthcare workers	193 (47.0)	218 (53.0)	5.27		

4.5 Objective 3: Organizational Factors

4.5.1 Structures and legal processes for utilizing an EMR system

Respondents 101 (24.6%) agreed to structures and legal processes being in place, 284 (69.1%) indicated no and 26 (6.3%) did not know as shown in figure 4.5.

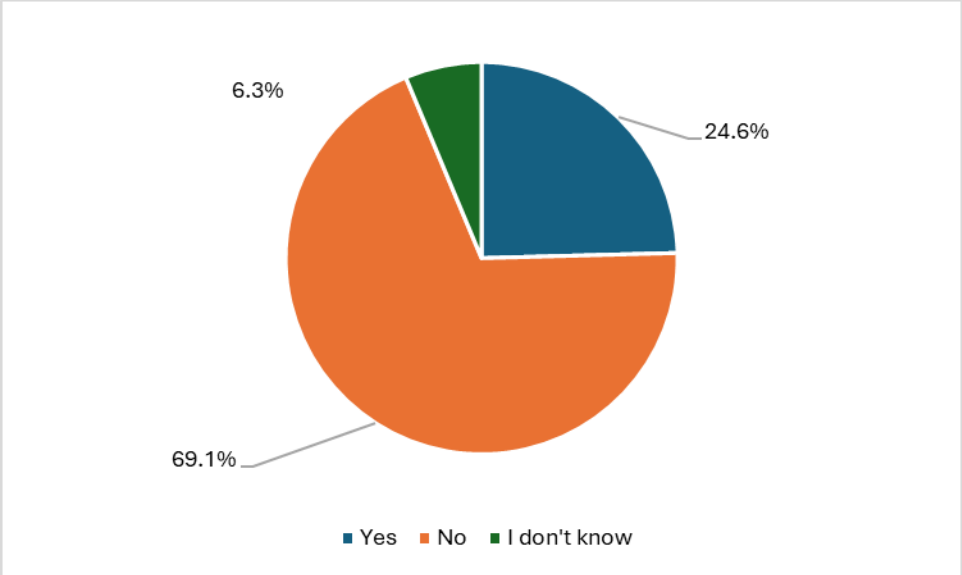

Figure 4.5 Structures and legal processes for utilizing an EMR system

4.5.2 Analysis of the Likert Scale for organizational factors.

An interval scale is what the five-point Likert scale is known as. It denotes no extent at all between 1 and 1.8. 1.81 to 2.60 denotes a modest degree. It indicates neutrality from 2.61 to 3.40, big extent from 3.41 to 4.20, and very large extent from 4.21 to 5.

Statement on sufficient financial resources needed for procurement had a mean of 4.303 and the interoperability and compatibility problems mean on 4.501. To a small extent, mean of 3.465 the facilities have sufficient mechanisms to build capacity for a new EMR system. Neutral respondent on the existence of technical expertise to run an EMR system (mean=2.064),

electronic health records system implementation policy (mean=3.905). Promoting institutional quality and data accountability, mean of 3.871 as shown in table 4.7.

Table 4.7: Analysis of the Likert Scale for organizational factors

Statement	Very large extent	Large extent	Neutral	Small extent	No extent at all	Mean	Std Deviation
There are sufficient financial resources needed for procurement and implementing an EMR system	0.0%	1.0%	2.7%	35.3%	61.1%	4.303	2.174
The facility has sufficient mechanisms to build capacity for a new EMR system	1.5%	13.6%	21.4%	47.9%	15.6%	3.465	2.407
There exists technical expertise to run an EMR system	4.4%	8.0%	43.6%	35.5%	8.5%	2.064	1.095
The electronic health records system is being implemented in accordance with an institutional policy.	11.2%	16.3%	51.8%	11.9%	8.8%	3.905	2.315
The electronic health records system has promoted institutional quality and data accountability	24.1%	51.3%	13.6%	8.3%	2.7%	3.871	2.302
Interoperability and compatibility problems arise during system operations and are promptly fixed	1.0%	3.2%	8.8%	21.2%	65.9%	4.501	2.419

4.5.4 Association between organizational factors and utilization of EHR

Analysis revealed a strong correlation, the availability funds required for its acquisition (χ^2=12.71, p=0.023), sufficiency mechanisms to build capacity (χ^2=6.38, p=0.041), existence of technical expertise (χ^2=3.84, p=0.050). No significant association on institutional policy (χ^2=3.07, p=0.079) and implementation.

The findings agreed with interview guide; '*Availability of financial resources, human capacity and the expertise at the health facilities is critical and key to see the successful implementation of*

the medical records system. These investments need to be put in when a system is to be installed and used'. These are illustrated in table 4.8.

Table 4.8: Association between organizational factors and utilization of EHR

Predictors	Health facility have any form of electronic medical records system		χ^2	Degree of freedom (df)	P value (p<0.05)
	No	Yes			
Organizational factors				**5**	
There are sufficient financial resources needed for procurement and implementing an EMR system	407 (99.0)	4 (1.0)	12.71	1	0.023
The facility has sufficient mechanisms to build capacity for a new EMR system	349 (84.9)	62 (15.1)	6.38	1	0.041
There exists technical expertise to run an EMR system	360 (87.6)	51 (12.4)	3.84	1	0.050
The electronic health records system is being implemented in accordance with an institutional policy.	298 (72.5)	113 (27.5)	3.07	1	0.079
The electronic health records system has promoted institutional quality and data accountability	101 (24.6)	310 (75.4)	5.93	1	0.015
Interoperability and compatibility problems arise during system operations and are promptly fixed	394 (95.9)	17 (4.1)	4.81		

4.6 Objective 4: Managerial Factors

4.6.1 The facility has a core management team.

The study found 291 (70.8%) of the health facilities had a core management team, 77 (18.7%) did not and 43 (10.5%) unsure as shown in figure 4.6.

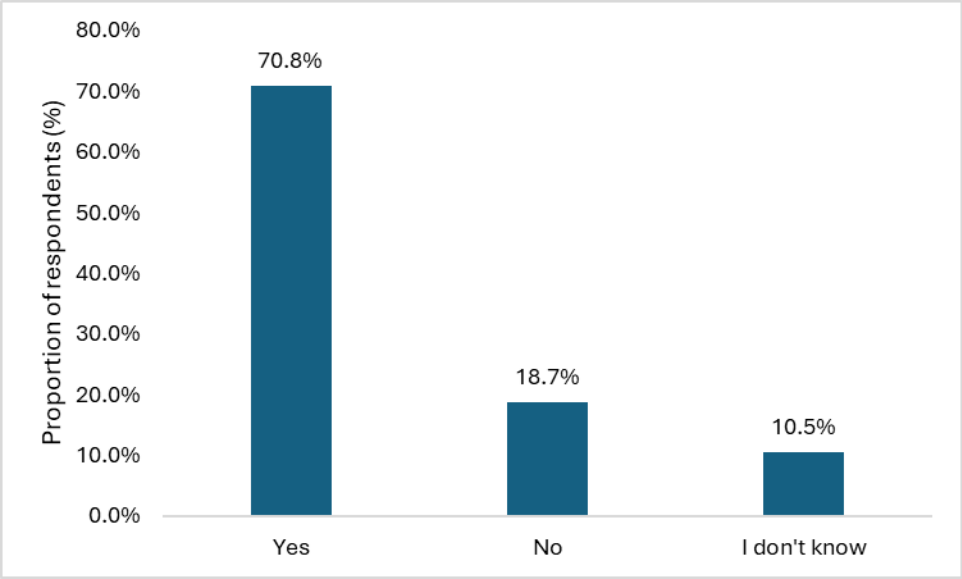

Figure 4.6 The facility has a core management team

4.6.2 Analysis of the Likert Scale for organizational factors

Five-point Likert scale used in the study denotes no extent at all between 1 and 1.8. 1.81 to 2.60 denotes a modest degree. Neutrality from 2.61 to 3.40, big extent from 3.41 to 4.20, and very large extent from 4.21 to 5 it means very large extent that the electronic health records systems are guided by an appropriate strategic framework (mean=4.303), that the system is implementation is supported by all department heads (mean=3.465) and the department heads are informed about all system functions (mean=3.905). Work on system monitoring is effectively (mean=2.064), neutrality on efficient procedure, department heads in continual communication with a mean of 3.465 as shown in table 4.9.

Table 4.9: Analysis of the Likert Scale for organizational factors

Statement	Very large extent	Large extent	Neutral	Small extent	No extent at all	Mean	Std Deviation

The electronic health records systems are guided by an appropriate strategic framework.	22.4%	51.3%	14.6%	9.0%	2.7%	4.303	2.174
The electronic health records system's implementation is supported by all department heads.	12.4%	43.1%	20.2%	16.8%	7.5%	3.465	2.407
The departmental in-charges efficiently divide up the work of keeping an eye on system functioning.	7.8%	18.5%	23.6%	36.3%	13.9%	2.064	1.095
Department heads are informed about all system functions and actively participate in them.	6.6%	33.8%	26.3%	18.7%	14.6%	3.905	2.315
To guarantee an efficient procedure, department heads and employees are in continual communication.	7.5%	18.5%	45.5%	13.6%	14.8%	3.871	2.302

4.6.4 Association between managerial factors and utilization of EHR

Analysis revealed a strong correlation between the system's direction and suitability of the strategic framework (χ^2=9.64, p=0.039), department heads support (χ^2=3.94, p=0.047). No significant association between work delegation (χ^2=3.29, p=0.069) and the department heads involvement (χ^2=1.23, p=0.268).

The findings agreed with informant interview guide; '*In all instances, a system that has been installed for use, has to have a guiding framework and under one department for ease of monitoring and it does not need so many managers for managing it. A system administrator is sufficient'*. These are illustrated in table 4.10.

Table 4.10: Association between managerial factors and utilization of EHR

Predictors	**Health facility have any form of electronic medical records system**	**χ^2**	**Degree of freedom (df)**	**P value (p<0.05)**

	No	Yes			
Managerial factors				**4**	
The electronic health records system's are guided by an appropriate strategic framework.	108 (26.3)	303 (73.7)	9.64	1	0.039
The electronic health records system's implementation is supported by all department heads.	183 (44.5)	228 (55.5)	3.94	1	0.047
The departmental in-charges efficiently divide up the work of keeping an eye on system functioning.	303 (73.7)	108 (26.3)	3.29	1	0.069
Department heads are informed about all system functions and actively participate in them.	245 (59.6)	166 (40.4)	1.23	1	0.268
To guarantee an efficient procedure, department heads and employees are in continual communication.	304 74.0)	107 (26.0)	4.51		

4.7 Hypothesis Testing of the Structural Variables

The electronic health records system was examined in relation to many aspects using structural equation modelling (SEM), acceptable due to the independent and dependent variables structural in character. Connections of the ideas or the unobservable variables, as well as the latent components directly or indirectly impacting changes in the values of other latent factors in the suggested model, are defined by SEM. The estimated model's goodness of fit is displayed in the table below.

Table 4.11: Goodness of Fit of the Model

Fit Statistic	Value	Description
Likelihood ratio		
chi2_ms (409)	630.503	Model versus Saturated
p > chi2	0.000	
chi2_bs (348)	1460.588	Baseline vs. Saturated
p > chi2	0.000	

Population error		
RMSEA	0.149	Root Mean Squared Error of Approximation
90% CI, Lower Bound	0.137	
Upper bound	0.161	
P-close	0.000	Probability; RMSEA <= 0.05
Size of Residuals		
SRMR	0.230	Standardized Root Mean Squared Residual
CD	0.997	Coefficient of Determination

The goodness of fit of the model indicates the overall influence of the predictor variable on the dependent variable. The results demonstrate that the estimated goodness of fit of the model was sufficient. Based on the model's goodness of fit, it was concluded that all four structural components matched the data well after modelling them, as table 4.11 illustrates. This was due to the likelihood ratio test's overall p value of 0.000, which indicated that the factors had a combined importance in explaining the adoption of the electronic health records system, the dependent variable. Other model fitness criteria, including the Root Mean Squared Approximation Error, also supported this

Table 4.12: Structural Equation Model

Structural Equation Model

Number of observations = 411

Estimation method = ml (maximum likelihood)

Log likelihood = -5665.2936

Structural Implementation	Coefficients.	OIM Std. Err	t	P>t	(95% Conf. Interval)	
Health facility factors	0.1964	0.1306	1.50	0.133	-0.0595	0.4523
Health workers related factors	0.4534**	0.1766	2.57	0.010	0.1082	0.7996
Organizational factors	0.6566**	0.1892	3.47	0.001	0.2857	1.027
Management factors	0.0045	0.1032	0.04	0.965	0.1977	0.2068

** Significant at 5% level

Specifically, the study found that, when all other factors were held constant, health facility factors had an effect on electronic health records system deployment by 0.1964. The impact was negligible, though. This is as a result of the p value of 0.133 being significant at the 0.05 level or higher. When all other parameters were held constant, health workers related factors had a significant impact on electronic health records system implementation at the 0.05 level by 0.4534. Less than 0.05, or 0.001, was the p value. However, even holding other parameters constant, organizational issues also had an impact on electronic health records system deployment, by 0.6566. At the 0.05 threshold, the impact was likewise determined to be statistically significant. This is as a result of the p value of 0.001 being below the 0.05 threshold. Finally, while keeping other parameters equal, management factors had an insignificantly small impact on electronic health records system implementation (0.0045).

4.8 Discussion

The results are discussed and put into context with the reviewed literature. It focuses on the main study objectives, what was unique, the similarities and differences and the impact of the findings.

4.8.1 Health facility factors and utilization of electronic health records

Findings indicated 61.6% of the participants reported computers in most of the clinics and departments. Significant association between the reliability of ICT to support the efficient operation of the system. Key informants' confirmed, '*The main systems we have are the HIV EMR, inpatient software and Kenya Health Information System for reporting especially in the level 5 and two of the level 4 health facilities. The facilities are at least equipped with infrastructure such as computer, software, and power for sustaining an electronic health records*

system'. This aligns with Sood *et al*., (2021), who highlighted challenges such as of inadequate hardware, low network coverage and general redundancy.

A critical factor in the operation of computers is a stable power supply. Key informant confirmed; '*The health facilities in Machakos not most of them are connected to power and the available computers are not well maintained thus affecting the implementation or running of the electronic records systems'*. The findings indicated that while facilities were connected to a power grid, interruptions to power supply, affects the provision of reliable information technology services (Achampong, 2020), suggesting reliability is crucial for the effective implementation of EHR systems.

The study also examined the facilities' internet connectivity and the user interface of the EHR system had no statistical significance with the utilization of electronic health records. Consistent with findings from Tang (2021), who noted that internet connectivity remains a major challenge in many African countries. The study emphasized that access to quality healthcare relies heavily on effective communication among team members, health stakeholders, and patients, which is facilitated by robust information systems.

Contrastingly, a study by Jones *et al*., (2022) found that facilities with consistent internet connectivity and user-friendly EHR interfaces experienced higher adoption rates and more efficient healthcare delivery. This suggests that while connectivity may not be significantly associated in some contexts, its presence can enhance the overall functionality and user experience of EHR systems.

The implications are clear: health facility factors significantly impact the success of electronic health records systems. Outdated technology infrastructure, lack of dedicated IT support, and

unstable power supply can hinder user adoption and system functionality, ultimately limiting the potential of EHRs to improve healthcare delivery within the facilities (WHO, 2023). Addressing infrastructural and logistical challenges is key to successful implementation and utilization of EHR systems.

4.8.2 Health Workers related factors and utilization of EHR

The study found significant association between healthcare professionals, ICT skills and successful utilization of EHR systems as echoed by key informants indicating '*prudent for health care workers to possess ICT skills and as the skills will enable them to navigate the system well and be able to actualize its operation and further recommend changes to be made'*. However, a contrasting study conducted in Kenya by Kanyua (2019) indicated that there are insufficient levels of knowledge and skills needed to use computer technology, which has slowed down the adoption. This inadequacy in skills results in a reliance on manual systems, negatively affecting the quality of data collected.

Additionally, the findings showed that healthcare workers had a positive perception of the EHR systems. This aligns with Kanyua (2019), who stated that widespread acceptance and incorporation of EHR systems among users depend on promotion, capacity building, and the skillset provided for the electronic medical records system. The ease of manipulating and navigating the system significantly influences user perception. Johnson *et al*. (2021) emphasized that perceived, usefulness, user acceptance of any system, directly impacts the end user's experience.

Contrastingly, a study by Ahmed *et al*. (2022) found that despite sufficient ICT training, healthcare professionals reluctant to embrace, lack of motivation hindered the successful utilization of EHR systems..

Furthermore, a study by Otieno *et al*. (2020) concluded leadership support and continuous professional development are crucial in overcoming resistance and enhancing the adoption of EHR systems. Their findings suggested that healthcare facilities with strong leadership and ongoing training programs experienced higher levels of EHR adoption and improved data quality.

These findings imply that successful implementation of EHR systems in a health facility hinges on health workers related factors such as computer literacy, perceived system usefulness, and staff motivation. Inadequate training, a confusing interface, or a lack of leadership support can lead to resistance, data quality issues, and ultimately hinder the system's effectiveness in improving patient care. Addressing health workers related factors training programs, user-friendly system interfaces, and strong leadership support is essential utilization of EHR systems.

4.8.3 Organizational factors and utilization of EHR

The study found a significant association between organizational factors like sufficiency of financial resources and utilization of EHR system as highlighted by key informants; '*Availability of financial resources, human capacity and the expertise at the health facilities is critical and key to see the successful implementation of the medical records system. These investments need to be put in when a system is to be installed and used'*. This finding aligns with a study conducted in Sub-Saharan Africa,on low adoption of EHR systems linked to the high costs associated with setting up the necessary infrastructure, including hardware, software, and capacity building

(Alverson *et al.,* 2021). Similarly, a study by Kinyua (2019) in Kenya highlighted that the costs involved in establishing the infrastructure for EHR systems are prohibitive for many health facilities, limiting adoption to those that can afford these expenses.

Capacity building mechanisms for a new EHR system were also found to be significant for implementation as indicated by Khan *et al*. (2021), who indicated training healthcare workers increases awareness, functionality levels, and usage of the introduced technology, enhancinhg the expected benefits of EHR systems by ensuring that end users are competent and confident in using the new systems.

Additionally, the existence of technical expertise to run an EHR system was significantly associated with its implementation. Achampong (2020) reported similar findings in developing countries, where the number of health staff with basic IT skills is often insufficient, those with the necessary knowledge are frequently not involved in the design and implementation leading to suboptimal outcomes.

Contrastingly, a study by Nkansah *et al*. (2022) found that in facilities with robust financial backing, clear workflows, and sufficient resources for training and support, EHR implementation was more successful, and staff resistance was minimized. These facilities experienced fewer data quality issues and improved operational efficiency.

The implications of these findings are clear: organizational factors are important, Without strong financial resources, clear workflows, adequate training, and support, and user involvement, staff may resist using the system, leading to data quality issues and hindering the EHR's ability to optimize patient care, improve operational efficiency, and achieve the organization's overall

health goals (WHO, 2021). Therefore, addressing these organizational factors is essential for the effective adoption and utilization of EHR systems.

4.8.4 Managerial factors and utilization of EHR

The study found that health facilities with a core management team showed a significant association between managerial factors and the implementation of electronic health records (EHR). Specifically, it was found that having a strategic framework and support from department heads significantly influenced the success of EHR implementation, Which are in line with interview guide; '*In all instances, a system that has been installed for use, has to have a guiding framework and under one department for ease of monitoring and it does not need so many managers for managing it. A system administrator is sufficient'*. This aligns with findings by Akrani (2021), which emphasized that effective coordination involves intentional effort from each manager, enhancing teamwork, providing clear instructions, and optimizing resource use to achieve organizational goals and improve productivity.

Contrasting studies offer additional insights. For instance, Lewis *et al*. (2022) found that facilities with a well-defined strategic framework and proactive departmental involvement experienced fewer challenges in EHR implementation. In contrast, facilities lacking these managerial supports struggled with system adoption and operational efficiency.

The study also indicated no significant association between departmental in-charges efficiently dividing the work of monitoring system functioning and department heads being informed about all system functions and actively participating in them. This aligns with Hatch (2020), who highlighted poor communication creates a negative feedback cycle, lowers and hinders HER utilization.

However, contrasting studies by Smith and Roberts (2021) showed that facilities with strong departmental coordination and active participation of department heads saw better EHR implementation outcomes. This suggests that while general support from management is crucial, specific actions such as clear task division and comprehensive system understanding by all department heads are equally important.

The implications of these findings are clear: managerial factors are needed in an EHR system. Poor planning, inadequate communication, and lack of ongoing support from senior management can lead to user resistance, data quality issues, and system underutilization. Conversely, effective managers can ensure successful adoption by allocating resources for training, fostering a culture of data accuracy, and addressing staff concerns. This, in turn, enables the EHR system to optimize workflows, improve patient care, and contribute to the facility's overall success (WHO, 2021).

CHAPTER FIVE: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Summary

Summary as well as, study conclusions is well outlined, and the recommendations are stated clearly in this section.

The study concluded utilization of EHR in Machakos County is influenced by health facility infrastructure, health worker-related factors, organizational support, and managerial involvement. Chi-square analysis revealed significant associations between EHR implementation and factors such as availability of reliable ICT infrastructure, adequate technical capacity, user satisfaction, financial support, and strategic leadership. Despite the potential benefits of EHRs in improving healthcare delivery, challenges such as limited training, inconsistent technical support, and resource constraints were identified as major barriers to full adoption, underscoring the need for targeted policy interventions, capacity-building initiatives, and stronger managerial commitment to enhance EHR adoption and utilization across public health facilities.

The findings indicated that infrastructure, power supply, and system functionality significantly impact EHR implementation. As revealed by the study a stable power supply and well-maintained ICT infrastructure are important for the successful adoption of digital health. Health worker-related factors, ICT knowledge, perceived usefulness, and motivation, influences EHR adoption. Facilities with staff with know-how on ICT and clear system benefits experienced higher rates of successful implementation.

EHR utilization is supported by funding, leadership commitment, clear communication, investment in training, and continuous technical support, facilities with structured training and

strong leadership showed better adoption. Strategic framework and departmental support enhances the success of HER utilization.

5.2 Conclusions

The health facility: health infrastructure, power supply, system functionality affect electronic systems utilization. Effective implementation also depends on staff skills on ICT, perceived system usefulness, and staff motivation and satisfaction. Lacking this causes resistance, data quality issues, and ultimately failure of system use.

Organizational factors: Insufficiency in financial resources, technical expertise, and adequate resources for training and support, and user involvement, can lead to poor system adoption and failure in optimizing patient care through the system. The managerial factors: Effective leadership, clear communication regarding EHR benefits, and investment in training and technical support essential for staff buy-in, ensuring the EHR becomes a valuable tool for improved patient care, informed decision-making, and overall efficiency within the facility.

In conclusion, the study supports the rejection of the null hypothesis, indicating that health facility, health worker-related, organizational, and managerial factors are significantly associated with the implementation of EMRs in Machakos County. The findings underscore the importance of a holistic approach that includes capacity building, infrastructure investment, leadership involvement, and policy formulation. Strengthening these areas will likely enhance EMR utilization and improve health service delivery outcomes in Kenyan public health facilities.

5.3 Recommendations

5.3.1 Recommendation for Policy from the study

1. Health facilities should invest in reliable ICT infrastructure, including stable power supply, internet connectivity, and modern hardware/software systems. This is critical for system efficiency and user confidence.

2. Implement regular, targeted training programs for healthcare workers to enhance their ICT skills and familiarize them with EMR systems. Capacity building should also include refresher courses and on-the-job training.

3. Hospital management and departmental heads should be actively involved in EMR planning and implementation. Their leadership is crucial in building trust, addressing resistance, and ensuring compliance. Additionally, provide dedicated support staff to address technical issues and troubleshoot problems.
4. Establish mechanisms to regularly monitor and evaluate EMR usage, identify system gaps, and act on feedback from users to improve system performance and usability.

5.3.2 Recommendation for Further Research

1. It is critical to have a comparative study done in another county located in an urban area focusing on the same aspect, to allow for better and robust programming.

2. Due to Kenya's decentralized government structure, comparable research comparing various sectors and even counties are also necessary.

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APPENDICES

APPENDIX I: CONSENT FORM

STUDY TITLE: Examine the determinants of implementation of electronic health records in selected public health facilities in Machakos County.

Researchers' Statement: Greetings, Sir or Madam I'm Julius M. Ndung'u, and I attend Mount Kenya University for my master's degree. My research aims is to investigate the factors that influence the adoption of electronic health records in specific public health facilities located in Machakos County. I kindly ask that you take part in the research. This form contains all the information you require to make an informed decision about whether or not to participate in the study.

Voluntarism

You have the right to refuse participation in this study. Please remember the participation in this study is voluntarily. You may ask questions related to the study at any time.

You may refuse to respond to any questions and you may stop an interview at any time. You may also stop being in the study at any time without any consequences to the services you receive here or any other organization now or in the future.

Benefits

If you participate in this study, you will help provide valuable information on the effective use of electronic health records in public health facilities.

Reward

There are no rewards or any payment to you if you participate. But a stipend for water and lunch will be reimbursed at 500/-

Confidentiality

The interviews and examinations will be conducted in a private setting within the selected healthcare facility. Your name will not be recorded on the questionnaire. The questionnaires will be kept in a locked cabinet for safe keeping at Mount Kenya University. Everything will be kept private and only shared with the study team.

Participants Declaration and Consent:

I give my permission to take part in this research. I've been made aware of the nature of the study and given an explanation of any possible dangers. I am aware of the study's objectives and my rights as a participant. I've had an opportunity to ask questions, and I've been told that I can contact the researcher if I have any more questions about the study or my rights as a subject. I am aware that I have the option to discontinue the study at any moment. I willingly consent to take part in the research. I've also received assurances that the information I share and my personal information will be kept private.

Participant’s signature……. Date……

Research assistant’s signature …… Date……

APPENDIX II: QUESTIONNAIRE

Instructions

Please provide responses to the following questions.

Section I: Demographic Characteristics

1. What is your age?
    1. Below 20 ()
    2. 20-29 ( )
    3. 30-39 ( )
    4. 40-49 ( )
    5. 50 and above ( )

2. What is your gender?
    1. Male ( )
    2. Female ( )

3. What is your highest level of education?
    1. Certificate ( )
    2. Diploma ( )
    3. Bachelors ( )
    4. Post graduate ( )

4. Years you have worked in this facility?
    1. Less than 1 year ( )
    2. 1-5 years ( )
    3. 6-10 years ( )
    4. Over 10 years ( )

5. Does the health facility have any form of electronic medical records system?
    1. Yes ( )

2. No ( )

Section II: Health Facility Factors

6. Does the health facility have a computer in most of the clinics/departments?
   1. Yes ( )
   2. No ( )
   3. I don't know ( )

7. The statements below are a relation to the health facility factors within the health facility. You can indicate the extent of agree.
(*1-Very large extent, 2-Large extent, 3-Neutral extent, 4-Small extent, 5-No extent at all*).

Statement	1	2	3	4	5
The ICT infrastructure is reliable and supports the efficient operation of the system.					
The facility has adequate hardware and software set up					
The facility is connected to a power grid					
The facility has a connection of internet					
The user interface of the electronic health records system is user-friendly and intuitive.					
To make sure staff activities match the features of the electronic health records system, system testing is continuously conducted.					

Section III: Health workers related factors

8. Do you have basic knowledge on how to run and operate a computer?
   1. Yes ( )
   2. No ( )

9. The statements below are a relation to the health workers related factors within the health facility that relate to EMR system in a facility. You can indicate the extent of agree.
(*1-Very large extent, 2-Large extent, 3-Neutral extent, 4-Small extent, 5-No extent at all*).

Statement	1	2	3	4	5

The healthcare professionals possess sufficient ICT knowledge and skills.					
The ability to operate the electronic health records system is strong among users.					
The health care workers have positive perception on the systems use					
Healthcare professionals' attitudes on the changes brought forth by the electronic health records system are unfavorable.					
The healthcare workers have expressed a positive user satisfaction on the EMR system					
The electronic health records system has enhanced faster retrieval of data for the healthcare workers					

Section III: Organizational Factors

10. Does the facility have the structures and legal processes needed for implementing an EMR system?

1. Yes ( )
2. No ( )
3. I don't know ( )

11. The statements below are a relation to the organizational factors within the health facility that relate to EMR system in a facility. You can indicate the extent of agree.

(*1-Very large extent, 2-Large extent, 3-Neutral extent, 4-Small extent, 5-No extent at all*).

Statement	1	2	3	4	5
There are adequate financial resources available to support the procurement and implementation of an Electronic Medical Records (EMR) system in your facility.					
The facility has sufficient mechanisms to build capacity for a new EMR system					
There exists technical expertise to run an EMR system					
The electronic health records system is being implemented in accordance with an institutional					

policy.					
The electronic health records system has promoted institutional quality and data accountability					
Interoperability and compatibility problems arise during system operations and are promptly fixed					

Section IV: Managerial Factors

12. Does the facility have a core management team?
    1. Yes ( )
    2. No ( )
    3. I don't know ( )

13. The statements below are a relation to the managerial factors within the health facility that relate to EMR system in a facility. You can indicate the extent of agree.

(*1-Very large extent, 2-Large extent, 3-Neutral extent, 4-Small extent, 5-No extent at all*).

Statement	1	2	3	4	5
The electronic health records system's electronic health records are guided by an appropriate strategic framework.					
The electronic health records system's implementation is supported by all department heads.					
The departmental in-charges efficiently divide up the work of keeping an eye on system functioning.					
Department heads are informed about all system functions and actively participate in them.					
To guarantee an efficient procedure, department heads and employees are in continual communication.					

APPENDIX III: KEY INFORMANT INTERVIEW GUIDE

Position……. Date……

In your own view and experience:

1. Is the facility equipped with infrastructure (hardware and software, power, internet) for sustaining an electronic health records system?
2. Doe health workers within this health facility have the knowledge and skills in ICT?
3. Has the facility invested on capacity building of the staff for electronic health records systems?
4. Are users involved in the determination of an electronic health records system to be selected?
5. Does the facility have the legal policies needed to setup an electronic health records system?
6. Are there clear roles and responsibilities of senior and junior staff in regards to an electronic health records system?
7. Are there clear communication line when it comes to electronic health records system implementation?

APPENDIX IV: ETHICAL CLEARANCE CERTIFICATE

Mount Kenya University

REF: **MKU/ISERC/3611**
TO: **JULIUS M. NDUNG'U**

Date: 12 April 2024

REG: **MPH/2022/30677**

Dear Sir/Madam,

RE: DETERMINANTS OF IMPLEMENTATION OF ELECTRONIC HEALTH RECORDS IN SELECTED PUBLIC HEALTH FACILITIES IN MACHAKOS COUNTY, KENYA

This is to inform you that **Mount Kenya University** has reviewed and approved your above research proposal. Your application approval number is **2655**. The approval period is **12/04/2024 - 11/04/2025.**

This approval is subject to compliance with the following requirements;

i. Only approved documents including informed consents, study instruments, MTA will be used
ii. All changes including amendments, deviations and violations are submitted for review and approval by **Mount Kenya University**
iii. Death and life-threatening problems and serious adverse events or unexpected adverse events whether related or unrelated to the study must be reported to **Mount Kenya University** within 72 hours of notification
iv. Any changes, anticipated or otherwise that may increase the risks or affect the safety or welfare of study participants and others or affect the integrity of the research must be reported to **Mount Kenya University** within 72 hours
v. Clearance for export of biological specimens must be obtained from relevant institutions
vi. Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. Attach a comprehensive progress report to support the renewal
vii. Submission of an executive summary report within 90 days upon completion of the study to **Mount Kenya University**

Prior to commencing your study, you will be expected to obtain a research license from National Commission for Science, Technology and Innovation (NACOSTI) https://research-portal.nacosti.go.ke and also obtain other clearances needed.

Yours sincerely,

The Chairman
Mount Kenya University
Ethics Review Committee
P. O. Box 342 - 0100, Thika

Dr. Alfred Owino, PhD
Chairman, Mount Kenya University ISERC

APPENDIX V: LETTER OF INTRODUCTION

Mount Kenya University

DIRECTORATE OF GRADUATE STUDIES

MPH/2022/30677

15th April, 2024

National Commission for Science Technology & Innovation (NACOSTI)
Off Waiyaki, Upper Kabete
P.O Box 30623- 00100
NAIROBI, KENYA

Dear Sir/Madam,

RE: JULIUS M. NDUNG'U– REGISTRATION NO. MPH/2022/30677

The purpose of this letter is to introduce the above named student who is pursuing **Master of Public Health** in the department of **Community Health, Epidemiology and Biostatistics in the school of Public Health.**

The title of the research is **"Determinants of Implementation of Electronic Health Records in Selected Public Health Facilities in Machakos County, Kenya."** It has been cleared by the University's Ethics Review Committee (Certificate attached) and now has to proceed to the field to collect data between **April, 2024 and June, 2024.**

Any assistance accorded to the student will be highly appreciated.

Thank you.

Mount Kenya University
P. O. Box 342 - 01000. THIKA
Office of the Director,
Graduate Studies

Dr. Samuel M. Kaenga, Ph.D.
Director, Graduate Studies
Enc.

APPENDIX VI: NACOSTI APPROVAL

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY & INNOVATION

Ref No: 980870

Date of Issue: 30/April/2024

RESEARCH LICENSE

This is to Certify that Mr.. JULIUS MWANIKI NDUNG'U of Mount Kenya University, has been licensed to conduct research as per the provision of the Science, Technology and Innovation Act, 2013 (Rev.2014) in Machakos on the topic: DETERMINANTS OF IMPLEMENTATION OF ELETRONIC HEALTH RECORDS IN SELECTED PUBLIC HEALTH FACILITIES IN MACHAKOS COUNTY KENYA for the period ending : 30/April/2025.

License No: NACOSTI/P/24/34983

980870

Applicant Identification Number

Director General
NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY & INNOVATION

Verification QR Code

NOTE: This is a computer generated License. To verify the authenticity of this document, Scan the QR Code using QR scanner application.

See overleaf for conditions

APPENDIX VII: MACHAKOS COUNTY APPROVAL

OFFICE OF THE PRESIDENT
MINISTRY OF INTERIOR AND NATIONAL ADMINISTRATION
STATE DEPARTMENT FOR INTERNAL SECURITY AND NATIONAL ADMINISTRATION

Telephone: 21009 and 21983 – 90100
Email Address: cc.machakos@interior.go.ke
Fax No. 044-21999
When replying please quote:

OFFICE OF THE COUNTY COMMISSIONER
P.O. Box 1 – 90100
MACHAKOS

REF: CC/ST/ ADM 5/9 VOL. V/73

6th May, 2024

All Deputy County Commissioners
MACHAKOS COUNTY

RE: RESEARCH AUTHORIZATION – JULIUS MWANIKI NDUNG'U

The National Commission for Science, Technology and Innovation has authorized the above mentioned Student of Mounty Kenya University to carry out a research on ***"Determinants of Implementation of Electronic Health Records in Selected Public Health Facilities"*** *in* Machakos County for the period ending **30th April, 2025**.

Please be notified and accord him the necessary assistance.

COUNTY COMMISSIONER
06 MAY 2024
MACHAKOS

SAMANTHA KEGEHI
FOR: COUNTY COMMISSIONER
MACHAKOS COUNTY

APPENDIX VIII: MACHAKOS DEPARTMENT OF HEALTH APPROVAL

REPUBLIC OF KENYA
COUNTY GOVERNMENT OF MACHAKOS
DEPARTMENT OF HEALTH

Telephone: +254-44-20246
Fax: 254-44-20655
Email: dms.machakos@outlook.com

Machakos Highway
P.O. Box 2574-90100
Machakos, Kenya

Ref No. MKS/DMS/RESEARCH APPROVALS/2024/15 **23th May 2024**

Dear Julius Ndung'u,

RE: LETTER OF AUTHORIZATION FOR CONDUCTING PROPOSED RESEARCH

The Department of Health Services, Machakos County, is keen to collaborate in your study titled, **"Determinants of implementation of Electronic Health Records in selected Public Health Facilities in Machakos County, Kenya."**

Note is taken of the letter of Ethical Clearance from Mount Kenya University ISERC, REF: **MKU/ISERC/3611,** for the approval period **12th April 2024 to 12th April 2025** as well as the Research License from the National Commission for Science, Technology & Innovation number **NACOSTI/P/24/34983** for the period ending **30th April 2025**.

You are hereby authorized to proceed with your research in Machakos County and urged to share the findings with the Department of Health; Machakos County, through the Email: research.dhes@gmail.com

Sincerely,

DIRECTOR
23 MAY 2024

Dr. Sharon Mweni
County Research Coordinator
Deputy Director Medical Services
Machakos County

CC:
County Executive Committee Member – Health
Chief Officer – Medical Services & Public Health
All Directors
County Research Committee

APPENDIX IX: TURNITIN REPORT

DETERMINANTS OF UTILIZATION OF ELECTRONIC HEALTH RECORDS AMONG PUBLIC HEALTH FACILITIES IN MACHAKOS COUNTY, KENYA

by Julius Mwaniki Ndung'u

Submission date: 23-Jun-2025 04:07PM (UTC+0300)
Submission ID: 2704671750
File name: JULIUS_MWANIKI_NDUNGU_THESIS_23_JUNE_2025.pdf (1.71M)
Word count: 20791
Character count: 127858

DETERMINANTS OF UTILIZATION OF ELECTRONIC HEALTH RECORDS AMONG PUBLIC HEALTH FACILITIES IN MACHAKOS COUNTY, KENYA

ORIGINALITY REPORT

20%	19%	5%	9%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

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4	Submitted to Mount Kenya University Student Paper	1%
5	www.iprjb.org Internet Source	1%
6	Submitted to Kenyatta University Student Paper	<1%
7	www.coursehero.com Internet Source	<1%
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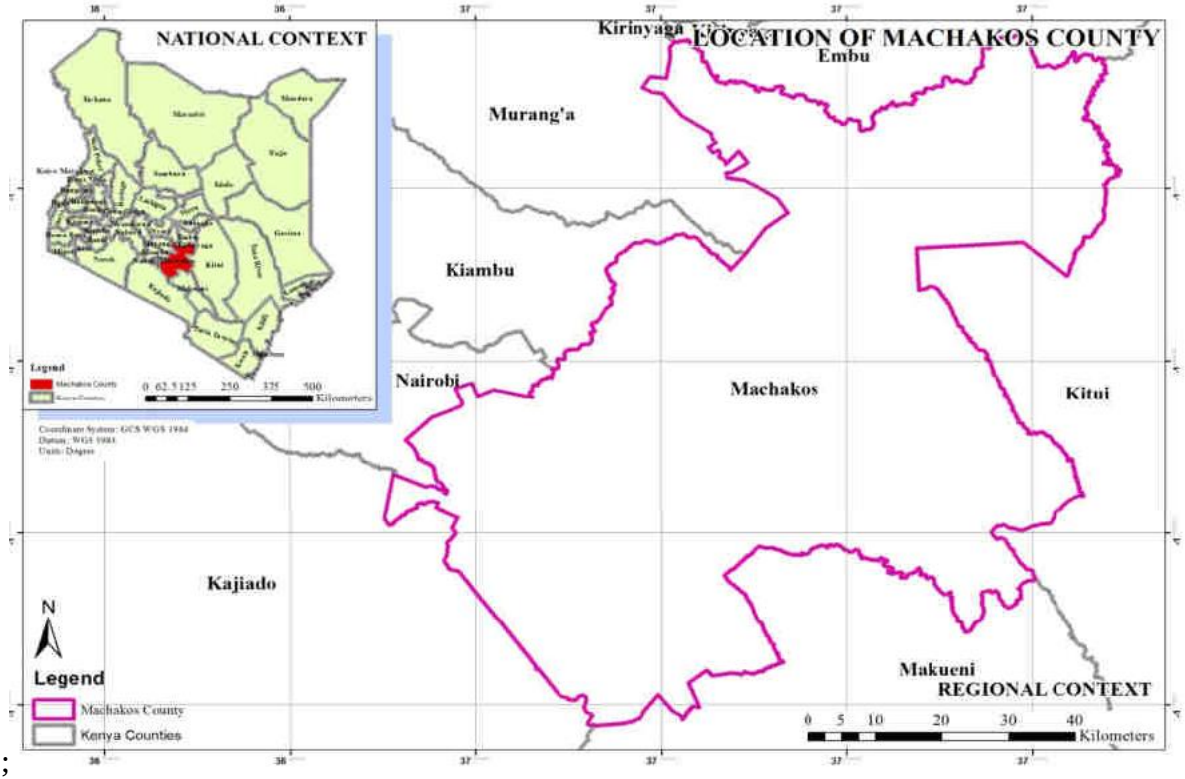
10	ir.jkuat.ac.ke Internet Source	<1%
11	etd.aau.edu.et Internet Source	<1%

APPENDIX X: MAP OF THE MACHAKOS COUNTY



;

Source: Machakos County Spatial Database