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USER ACCEPTANCE OF THE ELECTRONIC HEALTH RECORD SYSTEM AMONG HEALTHCARE WORKERS IN THE TAMALE TEACHING HOSPITAL

ELIJAH BAWA MISHIO

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BY

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THESIS SUBMITTED TO THE DEPARTMENT OF GLOBAL AND INTERNATIONAL HEALTH, SCHOOL OF PUBLIC HEALTH, UNIVERSITY FOR DEVELOPMENT STUDIES IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF MASTER OF PUBLIC HEALTH DEGREE

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DECLARATION

Student

I hereby declare that this thesis is the result of my own original work under the supervision of Dr. Julius Waamsasiko Adong and no part of it has been presented or published elsewhere, either in whole or in part for another academic fulfillment. All related work which served as sources of information have been duly acknowledged by referencing of the authors/researchers.

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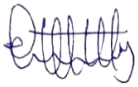
Signature:  Date: **29/01/2025**

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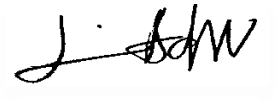
Signature:  Date: **29/01/2025**

Name: **Dr. Julius Waamsasiko Adong**

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ABSTRACT

Electronic Health Records Systems (EHR) have become crucial for improving healthcare globally, particularly in low- and middle-income countries. Despite their advantages over traditional paper records, the acceptance of new information technology remains challenging. Since the implementation of the Lightwave Health Information Management System (LHIMS) EHR in the Tamale Teaching Hospital, Ghana, user acceptance and satisfaction have not been evaluated to gauge staff perceptions of the system. Leveraging the Technology Acceptance Model (TAM), the research aims to assess user acceptance and satisfaction of the LHIMS among healthcare workers in the Tamale Teaching Hospital. A quantitative, analytical cross-sectional approach was used to study 373 health workers. The study applied the Chi-square and logistic regression analyses to identify factors influencing acceptance and satisfaction. The Z-test for proportion was conducted to evaluate differences in staff attitude before and after implementation of the system. The study revealed a high acceptance rate (97%) and satisfaction (77%) with the application. The overall user perception of the intervention was positive. Predictors of user acceptance were being a medical doctor (OR=7.443, p=0.048), perceived usefulness (OR=2.793, p=0.037), behavioral intention to use LHIMS (OR=3.225, p=0.048) and training (OR=2.957, p=0.007). User satisfaction was predicted by perceived ease of use (OR=1.644, p=0.014), perceived usefulness (OR=2.514, p=0.001), training (OR=1.656, p=0.000) and gender (OR=0.411, p= 0.001). Male workers were less likely to be satisfied with the system. The main challenges of the application were inadequate computers and poor internet services, which sometimes caused unnecessary patient delay. The study highlights the potential of the intervention to improve healthcare delivery in the hospital. Management should provide additional computers and ensure continuous internet availability to avoid dissatisfaction among workers.

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I am also thankful to the management and staff of Tamale Teaching Hospital for their cooperation and support during the data collection process. Special thanks to all the healthcare professionals who participated in this study.

Lastly, I extend my appreciation to my colleagues and classmates for their support throughout this academic journey.

DEDICATION

This work is dedicated to God and to my family who have believed in me, inspired me and supported me tremendously in all my educational endeavours.

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ABBREVIATIONS

ATU- Attitude towards LHIMS

BIU- Behavioural Intention to use LHIMS

DHIMS- District Health Information Management System

EHR- Electronic Health Record

EMR- Electronic Medical Record

HIS- Health Information Systems

HMIS- Health Management Information System

ICT- Information and Communications Technology

LHIMS- Lightwave Health Information Management Systems

LMICs- Low- and middle-income countries

MOH- Ministry of Health

NHIA- National Health Insurance Authority

NHIS- National Health Insurance Scheme

PEOU- Perceived Ease of Use

PU- Perceived Usefulness

TAM- Technology Acceptance Model

TTH- Tamale Teaching Hospital

WHO- World Health Organization

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CHAPTER ONE

INTRODUCTION

1.1 Background

Health Information Systems (HIS) are "digital platforms with open data from various sources that are ethically used through effective Information and Communications Technology (ICT) tools to create strategic information for the benefit of public health" (Pan American Health Organization, 2023). Strong HIS generate vital information for decision-making, while weak HIS create a knowledge gap hindering public health improvements (Sirintrapun & Artz, 2015). eHealth or the use of digital technology in healthcare, is a promising solution to address these healthcare challenges. The World Health Organization (WHO) defines eHealth as **"**the cost-effective and secure use of information and communication technologies in support of health and health-related fields including healthcare, health surveillance and health education, knowledge and research" (Sirintrapun & Artz, 2015). eHealth improves access to medical information and services, enhances knowledge and support for users, and aids decision-making (Atinga et al., 2020).

The use of eHealth is rapidly growing in low- and middle-income countries (LMICs) with positive impacts on health economics and outcomes (Atinga et al., 2020). Governments worldwide are investing heavily in eHealth technologies to enhance healthcare services (Yusif & Soar, 2014). In order to combat growing healthcare costs, developed countries like the USA and the UK are spearheading campaigns to encourage the use of Electronic Health Records (EHRs) in hospitals and primary care settings. (Poba Nzaou, 2016).

Sub-Saharan Africa lags behind in the adoption of eHealth technologies (Akanbi et al., 2012). For instance, adoption of electronic records in Nigeria and Ghana has been found to be slow (Boadu

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et al., 2021; Dunn et al., 2011). However, there has been significant progress in the past years. The major factors driving this growth include the increased availability of personal computers and improved internet access, which grew by 2,357.3% between 2000 and 2010 (Akanbi et al., 2012). Nevertheless, only 10% of the population in Sub-Saharan Africa has internet access, with coverage concentrated in urban areas, leaving rural regions, where over 80% of the population lives, underserved (Akanbi et al., 2012). Additionally, major challenges to the adoption of electronic record systems include the high cost of setting up these systems, limited infrastructure, and a shortage of skilled manpower are major challenges. There is however a glimmer of hope since the emergence of Open Source Software which has provided more affordable and adaptable options for many African countries, facilitating broader electronic record systems adoption (Akanbi et al., 2012).

Electronic Health Records (EHRs) are gaining recognition as a crucial type of eHealth technology (Poba Nzaou, 2016). “They are regarded as the cornerstone of current healthcare systems, and their non-adoption could be interpreted as a departure from accepted medical practices” (Poba Nzaou, 2016). An EHR is referred to as “a collective electronic record of the patient's health information, which includes the patient's medical history, medication prescriptions, physical examinations, medical reports, and notes made by healthcare professionals to ensure standardized readable complete orders” (Campanella et al., 2016; Farid, 2019). EHRs offer advantages over paper-based systems, such as reducing waiting times, ensuring safe record-keeping, and facilitating access to patient data during referrals (Attafuah et al., 2022). Through clinical advantages (such as a decrease in medication errors and an improvement in the quality of care), organizational and societal advantages (such as an enhanced ability to conduct research, better population health, and

reduced costs), they have the potential to improve patient and population health outcomes (Poba Nzaou, 2016).

In order to build stronger health systems, the WHO has urged LMICs to implement efficient eHealth initiatives (Ogoe et al., 2018). In response to the WHO's call and with the aim of enhancing healthcare delivery, Ghana's government released an eHealth strategic framework in 2010 (Ogoe et al., 2018). The framework focused on simplifying health information administration, increasing sector capacity for wider eHealth adoption, closing equity gaps, and transitioning to electronic reporting and record-keeping systems. Subsequently, various eHealth technologies were launched, including Sene PDA, Millennium Villages and Mobile Telemedicine, MOTECH, ONETOUCH Medicareline, Vodaphone Healthline Project, and several EHR systems such as IHOST, HAMS, DHIS, DHIMS, HIMS, and Hospital Administration Management Systems (Afarikumah, 2014).

The Lightwave Health Information Management Systems (LHIMS), an EHR introduced by the Ministry of Health (MoH) in 2017, was first tested at the Cape Coast Teaching Hospital. This software had been fully launched and was being used by at least 26 hospitals in Ghana as at 2017 with the aim of achieving nationwide coverage according to the Ministry of Health (Adjei, 2017).

Despite the numerous benefits associated with the use of EHRs, health workers may not share these incentives (Miao et al., 2017). Sustained use of eHealth technologies depends critically on the experiences of end-users, such as healthcare professionals who use it for many facets of routine patient care and management (Miao et al., 2017). Studies show that healthcare workers are more likely to be satisfied with their jobs if they think eHealth technologies are easy to use (Bahadori et al., 2017; Jones et al., 2013). Research has shown that physicians with higher levels of job satisfaction and care commitment were those that used eHealth more effectively (Williams et al., 2019). Additionally, healthcare professionals who are motivated to use e-health are more likely to

remain committed to doing so. In contrast, if they have a negative experience with eHealth, health professionals are more inclined to resist it or stop using it. There is proof that medical professionals who complained about utilizing eHealth also complained about having trouble doing clinical tasks (Al-Mujaini et al., 2011). Health professionals are significant players in the creation, implementation, and usage of eHealth tools like EHRs. In light of this, continuous use of eHealth technology, like EHRs, is associated with how it motivates and elevates job satisfaction among healthcare personnel (Atinga et al., 2020; Menachemi et al., 2010).

Unfortunately, there is a dearth of information regarding how motivated and satisfied healthcare providers are with their jobs when using EHRs. Especially in LMICs, it can be argued that the use of e-health by various healthcare professional cadres has not been thoroughly documented. Compared to other LMICs, relatively little evidence is available regarding the attitudes of Ghanaian healthcare professionals toward the use of eHealth technology, such as EHRs (Atinga et al., 2020; Attafuah et al., 2022; Boadu et al., 2021). Hence, the purpose of this study is to evaluate healthcare professionals' acceptance of electronic health records (LHIMS) at Ghana's Tamale Teaching Hospital (TTH), a tertiary healthcare facility. The study would also seek to assess user satisfaction and motivation to use EHRs among healthcare workers in this health facility. The findings of this research will significantly contribute to the developing body of information on eHealth and direct practice, inquiry, and interventions aimed at boosting eHealth uptake and acceptance in healthcare institutions.

1.2 Problem Statement

Ghana’s Ministry of Health (MoH) is characterized by a multitude of distinct and autonomous management units that operate and produce copious amounts of data stored in isolated compartments (Boadu et al., 2021). This makes it harder to share information across hospitals and

within different departments within the same hospital, which has an impact on how common, chronic, communicable, and lifestyle diseases are managed (Boadu et al., 2021). This lack of effective communication leads to inefficiencies and difficulties in managing diseases.

Underprivileged healthcare institutions in LMICs like Ghana, have long relied on paper-based or manual health record-keeping (Attafuah et al., 2022; Venkatesh et al., 2003). This approach poses numerous challenges, driving the adoption of eHealth tools like EHRs. Large hospitals such as TTH serving as referral facilities for many other facilities face issues with paper-based records due to increasing patient numbers leading to limited storage space, missing records, data losses, high costs, discontinuity of care and delays in accessing information (Boadu et al., 2021). Furthermore, LMICs like Ghana face challenges in managing health data, resulting in gaps in tracking vital statistics and service provision (Boadu et al., 2021). It is thus challenging for governments to pinpoint unmet healthcare needs because of these gaps.

These challenges can however be mitigated through the use of eHealth technologies like EHRs. Ghana's MoH, implemented eHealth policies, including a comprehensive strategy in 2010, with the aim of establishing paperless records and reporting systems such as EHRs in major government hospitals (Afagbedzi et al., 2013). Before this, the District Health Information Management System (DHIMS) served as the main electronic HMIS but had limited clinical use (Abdulai & Adam, 2020). The introduction of an electronic claims system by National Health Insurance Authority (NHIA) prompted the adoption of computerized systems, leading to various privately sourced Electronic Medical Records (EMRs) in public hospitals, lacking standardization and interoperability(Achampong, 2022). To address these challenges, the MoH introduced the LHIMS, a state-of-the-art EHR in 2017 (Adjei, 2017). According to the MoH's programmed based budget

estimates in 2022, LHIMS has now been implemented in all Teaching Hospitals, all regional hospitals and was ongoing at 60 other health facilities nationwide (Based & Estimates, 2023).

The Tamale Teaching Hospital (TTH) has used manual or paper-based records since its establishment in 1974 (K. Issah, Head of ICT, Tamale Teaching Hospital, personal communication, August 2, 2024). Prior to the implementation of LHIMS, the hospital employed the use of an EMR known as Hospital Administration and Management Services (HAMS). This system was however bedeviled with several challenges key among them being user acceptance and lack of interoperability (K. Issah, Head of ICT, Tamale Teaching Hospital, personal communication, August 2, 2024). The implementation of LHIMS which was espoused to solve these issues was thus well received by the management of TTH and was successfully implemented in December, 2020 (K. Issah, Head of ICT, Tamale Teaching Hospital, personal communication, August 2, 2024).

Regardless of the advantages of LHIMS, a system's true value can only be determined by its users' acceptance and application (Boadu et al., 2021). Stated differently, the potential advantages of EHRs can only be fully achieved if they are completely adopted and utilized by medical professionals (Achampong, 2012; Attafuah et al., 2022). One of the most difficult problems in information systems generally is getting users to accept and use new technology (Boadu et al., 2021). User acceptance is considered as an indication of how well a system aligns with the users' characteristics and the tasks it is intended to perform (Ertmer & Ückert, 2005). Therefore, it serves as a reliable overall indicator of the system's success (Ertmer & Ückert, 2005). Furthermore, implementation of some eHealth tools like EHRs have failed due to the discontinuity in evaluation procedures and feedback (Anstey Watkins et al., 2018; Langhan et al., 2015; Mkalira Msiska et al., 2017) The opinions of healthcare professionals regarding the new LHIMS system are essential

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since they are directly involved in its execution.. (Attafuah et al., 2022). Their acceptance and positive perception of the new system is vital for a successful LHIMS implementation (Lee et al., 2022).

Studies on user acceptance, user satisfaction and challenges to EHR usage and implementation are very limited. With the increasing adoption of EHRs in Ghanaian hospitals, evaluating the efficacy of EHR implementation is a challenging yet very necessary task. (Attafuah et al., 2022). Based on a 2019 study, healthcare personnel in two hospitals in Northern Ghana, including TTH, were not well-prepared for the use of electronic health records (EHRs) due to anxieties and concerns about the technology's potential drawbacks (Abdulai & Adam, 2020). Further, research on the impact of this innovation and user acceptance, particularly with regard to healthcare professionals who are the end users of LHIMS, has been sparse since the LHIMS was introduced in TTH. This study thus seeks to assess the user acceptance of LHIMS among healthcare workers in TTH. The study's findings would act as a foundation and a blueprint for lower hospitals such as the district hospitals in the adoption and implementation of LHIMS. Results from a study in TTH would thus have a far reaching impact to many health facilities across the country particularly in the northern parts of Ghana since they have similar issues/challenges confronting them.

1.3 Research Questions

The study would seek to answer the following questions:

1. What is the level of acceptance of LHIMS among healthcare workers in the Tamale Teaching Hospital?
2. What is the level of satisfaction of using LHIMS among healthcare workers in the Tamale Teaching Hospital?

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3. What were the attitudes of users before and after implementation of the LHIMS in the Tamale Teaching Hospital?
4. What factors influence acceptability of LHIMS?
5. What factors influence user satisfaction of the LHIMS?

1.4 Main Objective

The aim of the study was to assess user acceptance and satisfaction of Electronic Health Records (LHIMS) in the Tamale Teaching Hospital among healthcare workers.

1.4.1 Specific Objectives

The specific objectives were to:

1. Determine the level of acceptance of the LHIMS among healthcare workers in the Tamale Teaching Hospital.
2. Determine the level of satisfaction of the LHIMS among healthcare workers in the Tamale Teaching Hospital.
3. Assess the attitude of healthcare workers before and after the implementation of the LHIMS in the Tamale Teaching Hospital.
4. Predict the factors contributing to user acceptance of the LHIMS among healthcare workers in the Tamale Teaching Hospital.
5. Predict the factors contributing to user satisfaction of the LHIMS among healthcare workers in the Tamale Teaching Hospital.

1.4.2 Hypotheses

To evaluate the third objective, the following hypothesis will be tested:

Null Hypothesis (H_0): There is no significant difference in the attitude of healthcare workers before and after the implementation of the LHIMS in TTH.

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Alternative Hypothesis (H_1): There is a significant difference in the attitude of healthcare workers before and after the implementation of the LHIMS in TTH.

The hypothesis aims to evaluate workers' attitudes toward the system after its implementation.

1.5 Significance of the Study

The study's findings will provide valuable insights to stakeholders in the healthcare sector regarding user acceptance, satisfaction, and challenges to using EHRs from the perspectives of healthcare workers. The study would thus clarify the advantages and potential drawbacks of EHR use and make recommendations for how other health facilities might make use of such systems where necessary. The findings of this study would serve as a roadmap for information system designers, hospital administrators, and healthcare professionals interested in using EHRs thereby supporting the creation of specialized systems that cater to the unique requirements of healthcare organizations. Additionally, by evaluating the EHR system from various angles, this study would contribute to the body of existing research on EHR systems and assist Ghana in creating a comprehensive information structure. The findings from this study can therefore be used to develop policies by the Government of Ghana on EHRs and other eHealth technologies. Furthermore, the research would be conducted in partial fulfillment of the researcher's master's degree program in Public Health.

1.6 Chapter Outline

The thesis is organized into six chapters. Chapter one contains the introduction which comprises the background, problem statement, research questions and objectives of the study. The introduction also includes the significance of the study and the organization of the chapters. Chapter two deals with the literature review which includes a history of eHealth in Ghana, challenges of paper-based records, components of EHRs, benefits/challenges of EHRs, factors

influencing user acceptance of EHRs and the theoretical framework for this study. Chapter three focuses on the methodology which covers areas such as the study area, design and population as well as the sample size determination, data collection and analysis. It would also cover issues of ethical considerations. Chapter four describes the study results while chapter five discusses the results. Finally, chapter six contains the concluding remarks of the thesis as well as its recommendations.

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CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This literature review delves into EHRs and their impact on healthcare in Ghana. It covers the history of EHRs in Ghana, drawbacks of paper-based records, EHR benefits, EHR implementation in Ghana, determinants of user acceptance, challenges, and the theoretical framework. A thorough literature search was undertaken which included diverse sources such as academic databases, peer-reviewed journals, books, and reports from organizations like WHO, Ghana's Ministry of Health, and the Ghana Health Service. Additional sources included Google Scholar, PubMed, and Medline. This literature review is aligned with the study's objectives and provides a comprehensive foundation for subsequent analysis in this study.

2.2 Definitions

eHealth

Several definitions have been proffered for eHealth. The WHO defines eHealth as "the cost-effective and secure use of information and communications technologies in support of health and health-related fields, including health-care services, health surveillance, health literature, and health education, knowledge and research" (WHO, n.d.). Expanding its meaning, the phrase encompasses not just a technological advancement but also a novel approach, mindset, and dedication to global, networked thinking in order to leverage ICT to enhance healthcare locally, regionally, and worldwide (Afarikumah, 2014).

Electronic Health Records (EHRs)

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“An electronic health record (EHR) is described as a record of health-related information on an individual that complies with nationally recognized interoperability standards and that can be created, managed, and consulted by authorized clinicians and staff across more than one health care organization" (Poba Nzaou, 2016). “EHRs enable the sharing of patients' medical data, resulting in more efficient workflow between the departments of health institutions and other health institutions with authorized access” (Chao et al., 2013; O’Malley et al., 2010; Shachak et al., 2009).

Electronic Medical Records (EMRs)

“An Electronic Medical Record is an application environment made up of apps for pharmacy, clinical documentation, computerized provider order input, clinical decision support, regulated medical vocabulary and order entry” (Garets & Mike, 2006). “Healthcare professionals utilize this environment to record, monitor, and manage the delivery of healthcare services within a health facility” (Garets & Mike, 2006) An EMR is owned and limited to the care delivering health facility.

The terms EHRs and EMRs are sometimes used interchangeably albeit they mean different things (Garets & Mike, 2006). EMRs are necessary for EHRs to function, and EMRs cannot function to their full capacity without interoperable EHRs. EHRs offers an advantage of interoperability. EHRs can be established if EMRs of various care delivering organizations have advanced to such a level that they can foster a reliable and secure exchange of information among various stakeholders (Garets & Mike, 2006).

2.3 Drawbacks of the Paper-Based Record Systems

Medical records are of utmost importance for both current and future patient care. They contain vital information regarding a patient's healthcare and are integral to the management and planning

of healthcare facilities and services (World Health Organization, 2006). Additionally, they contribute significantly to medical research and the generation of healthcare statistics. Medical professionals are responsible for the creation and maintenance of these records, ensuring that the information can be easily accessed and utilized during the patient's subsequent visits (World Health Organization, 2006). These records also contain data that shows how the patients' conditions have changed over time and aids in analyzing approaches/procedures and their effects (Boadu et al., 2021) The seamless availability of medical records to healthcare personnel when patients return for further treatment is of utmost significance (World Health Organization, 2006). The significance of patient records extends to legal matters as well, where they serve as valuable evidence. They play a crucial role in addressing uncertainties, ensuring clarity, and promoting trust among all parties involved. Patient records ultimately contribute to the protection and well-being of patients, medical professionals, and other stakeholders (Boadu et al., 2021).

Electronic health records systems and paper-based record keeping systems are the two main ways that medical records are kept in healthcare facilities (Acquah-Swanzy, 2015). Although they have been used extensively in the healthcare sector for millennia, paper-based record systems have numerous drawbacks (Acquah-Swanzy, 2015).

Large hospitals encounter challenges when it comes to storing traditional paper records due to limited storage capacity. Consequently, these records may become disorganized and challenging to retrieve, resulting in incomplete and inconsistent information. The retrieval of specific medical records from a stack of files is a time-consuming and an overwhelming task. These records that are improperly classified impede the access and sharing of data, ultimately impacting the provision of appropriate healthcare (Acquah-Swanzy, 2015). Inadequate storage and limited accessibility

further impede retrospective and epidemiological analyses, ultimately undermining research endeavors (Boadu et al., 2021).

The utilization of paper-based record systems presents difficulties when it comes to sharing a patients' medical history, especially for healthcare professionals located in different geographic areas (Acquah-Swanzy, 2015). The presence of illegible handwriting and errors in interpretation often leads to varying interpretations of the same medical records (Acquah-Swanzy, 2015).

Paper-based records lack a guarantee of information backup, leaving them vulnerable to risks such as fire, flood, or theft. “Natural disasters like hurricanes can also destroy or damage these records. Unless duplicates of every paper document are created, the loss of a patient's medical history would be permanent” (Acquah-Swanzy, 2015).

Paper-based medical records pose privacy challenges due to the absence of a robust tracking system, making it hard to monitor who views or accesses the records. Unauthorized individuals can potentially view patient information without detection, posing risks like job loss, embarrassment, discrimination, and insurance difficulties for patients, especially those with sensitive medical histories (Acquah-Swanzy, 2015).

2.4 Benefits of Electronic Health Records (LHIMS)

Electronic Health Records (EHRs) are powerful tools that have brought about transformation in healthcare (Rahman & Reddy, 2015). Compared to paper-based systems, EHRs offer expanded capabilities and benefits. The LHIMS EHR has dashboards that are unparalleled on the continent, integrated management capabilities, and real-time, cutting-edge early warning disease surveillance (Ministry of Health Ghana, 2017). The LHIMS application offers an effective solution by providing accurate and timely data for decision-making, benefiting administrators, management,

providers, and clinicians (Ministry of Health Ghana, 2017). This health information management system according to the MoH addresses crucial needs such as easy access to patient records, seamless record portability, revenue tracking, real-time data availability, and secure environments (Ministry of Health Ghana, 2017). Implementing LHIMS brings advantages like eliminating paper folders and storage costs, improving patient care, reducing waiting times, enhancing revenue accuracy, and facilitating NHIS claims. It also promotes patient safety, streamlines processes, supports clinical research, enables efficient data acquisition, and improves overall hospital operations. The transition to a paperless system has resulted in significant time and cost savings for patients and hospitals, leading to improved efficiency, patient satisfaction, and adherence to treatment protocols.

Electronic Health Records (EHRs) like the LHIMS improve billing accuracy, enhances accurate documentations/evaluations of claims thus reducing financial disputes and potential revenue losses. Their use also saves costs by consolidating patient data, reducing paper usage and storage costs (Rahman & Reddy, 2015; Chao et al., 2013).

“The quality of electronic health records is pivotal in enabling swift access to patient information, promoting effective communication between healthcare providers, ensuring seamless care continuity, and enhancing the overall quality of healthcare” (Ben-Assuli, 2015; Gammal et al., 2021; Pai et al., 2021). Additionally, EHR facilitates the sharing of patients' medical information, leading to improved workflow efficiency across different departments within a health care institution and with other healthcare institutions with authorized access (Chao et al., 2013; Farid, 2019; O’Malley et al., 2010; Shachak et al., 2009).

The adoption of EHR systems in medical practices has led to a reduction in the workload for clinical and administrative staff (Howard et al., 2013). This has been achieved by improving

various aspects of patient management, documentation, and communication. By facilitating easier access to patient records, enabling simultaneous access to charts, and enhancing communication channels, EHRs have effectively alleviated the burdens faced by staff members (Howard et al., 2013).

By enabling simultaneous chart accessibility, the use of an EHR has also lessened the workload on employees. “Staff no longer had to wait for clinicians to finish with a paper chart before finishing their work, which had a significant influence on staff charting” (Howard et al., 2013).

2.5 E-Health in Ghana

In an attempt to mitigate the barriers associated with paper-based record systems, “the government of Ghana through its Ministry of Health has made significant progress in adopting and rolling out various eHealth technologies which have been espoused as revolutionary innovations to improve healthcare worldwide” (Yusif & Soar, 2014). Ghana, for example, developed five e-health policies and strategies in less than ten years, including the “ICT for Accelerated Development (ICT4AD) Policy, Proposals for Ghana eHealth Strategy, Health Sector's ICT Policy and Strategy, eHealth Plan: 2007-2011, and the Ghana E-Health Strategy 2010” (Mensah et al., 2022). Ghana’s MoH and GHS, released an eHealth strategic framework in 2010 (Ministry of Health, 2010). Four primary strategic concepts were presented in the framework: First, to simplify the rules governing the administration of health information and data. The second goal was to increase sector capacity so that eHealth solutions may be used more widely in the healthcare industry. Third, to use eHealth to close equity gaps and widen access within the healthcare industry. Lastly to finally transition to electronic reporting and record-keeping systems (Ministry of Health, 2010; Ogoe et al., 2018)..

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The National eHealth Strategy saw the implementation of various forms of eHealth technologies with varying degrees of success. 22 e-health projects were being implemented in Ghana at various stages, according to a 2014 study (Afarikumah, 2014). “In order to improve the delivery of healthcare, these projects used mobile phones, Personal Digital Assistants (PDAs), websites, and other eHealth or telemedicine applications to facilitate public health activities, data management, e-learning, information management, and communication” (Afarikumah, 2014). Some examples of these projects included the “Sene PDA, Millennium Villages and Mobile Telemedicine, Mobile Technology for Community Health (MOTECH), ONETOUCH Medicareline (ML) Vodaphone Healthline Project, the PAN AFRICA eNETWORK, the Ghana Consultation Network, Mobile Tele dermatology, Moorfields/ Korlebu Eye Centre, the eHealth Initiative, Mahiri Mobile,Infotech Ghana's Health Administration Management System (HAMS), the District Health Information System (DHIS), the District Health Information Management System (DHIMS) and the Health Information Management Systems (HIMS)” (Afarikumah, 2014). “As of 2014, only six out of the ten designated regional hospitals in Ghana as well as additional tertiary and district hospitals had implemented the HAMS software” (Acquah-Swanzy, 2015). “A pilot program for IHOST, a hospital information management system, was also underway in about 47 healthcare facilities across the nation” (Acquah-Swanzy, 2015).

2.6 Implementation of the Lightwave Health Information and Management System (LHIMS) EHR in Ghana

In 2017, Ghana's MoH as part of the national eHealth strategy introduced the Lightwave Health Information and Management System (LHIMS) (Adjei, 2017). This cutting-edge EHR system is expected to be rolled out in all healthcare facilities nationwide. This software had been fully launched and was being used by at least 26 hospitals in Ghana as at 2017 with the aim of achieving

nationwide coverage according to the MoH (Adjei, 2017). According to the MoH's programmed based budget estimates in 2022, LHIMS has now been implemented in all Teaching Hospitals, all regional hospitals and was ongoing at 60 other health facilities nationwide (Based & Estimates, 2023).

The implementation of the LHIMS EHR system in Ghana was thus government-driven, championed through the MoH, with data centers centrally connected to healthcare facilities, allowing access to patient records across facilities (Achampong, 2022). However, challenges arose due to the shift towards paper records, as workers faced difficulties with the EHR system. "The system's implementation did not fully consider the local infrastructure of various facilities, leading to suboptimal results in service quality" (Achampong, 2022). A more thorough survey of network infrastructure would have been beneficial before implementation (Achampong, 2022). This is because the implementation of the EHR system requires improvement in infrastructure, particularly in hardware resources such as computers and network infrastructure (Achampong, 2022). Challenges arose from the availability of computer resources and functional network infrastructure in healthcare institutions (Achampong, 2022). Government support is essential in providing the necessary hardware resources (Achampong, 2022). A robust ICT infrastructure with software interoperability is crucial for the successful implementation of the EHR system (Achampong, 2022). Involving stakeholders in the software development process is vital to meet the demands and expectations of healthcare facilities. Additionally, fast internet and reliable telecommunication coverage can expedite EHR implementation and promote eHealth development (Achampong, 2022). More so, "organizational competency has also been found to have a positive and significant correlation with perceived ease of use among users" (Abdekhoda et al., 2019). Organizational competency pertains to the institutional capacity or efficiency required

for an organization to accomplish its strategic goals and objectives. Consequently, “effective EHR implementation necessitates sufficient technological resources and the allocation of a portion of total revenue by healthcare organizations” (Abdekhoda et al., 2019).

2.7 Level of User Acceptance

User acceptance remains an important indicator of the successful implementation of any technological system. A study in Nigeria found that beyond having a functional technology, successful adoption relies on health workers' acceptance and integration of the system into their routines (Dunn et al., 2011). Several studies demonstrate that the compatibility of the technology with clinical workflows influences whether users accept, reject, or misuse it (Dunn et al., 2011). The success of innovative medical technologies thus depends heavily on the acceptance of medical staff, including doctors, nurses, and other clinicians.

Globally, some studies have reported very high levels of user acceptance of electronic record systems. For instance, in the United Kingdom and Netherlands, 96% and 99% of healthcare workers respectively accepted electronic health records (Essuman et al., 2020). Additionally, in the Philippines, over 97% of healthcare workers accepted the system. However, studies in Africa have revealed lower levels of user acceptance. To illustrate, in the Eastern Region of Ghana, only 59% of health workers accepted the electronic records system (Essuman et al., 2020). Also, 72.2% and 78.1% of healthcare workers in Ethiopia and Nigeria respectively accepted these systems (Kasaye et al., 2023). This is not surprising considering the countless challenges bedeviling countries in Africa compared to their developed counterparts. Major challenges accounting for these differences in the levels of user acceptance between the developed and developing countries include a high cost of implementation, lack of adequate infrastructure, administrative and technical problems among others (Achampong, 2022; Essuman et al., 2020).

Furthermore, in Ghana, the Ministry of Health and Ghana Health Service did not fully engage end-users when the LHIMS EHR was initially rolled out. (Achampong, 2022). This led to a low level of user acceptance leading some institutions to revert to paper records instead of adopting the EHR system. The involvement of end-users (healthcare providers) is very crucial for a successful EHR implementation in order to ensure that the system is tailored to their needs and workflows (Achampong, 2022). This active engagement fosters a sense of ownership and acceptance. Some implementation challenges from existing literature include insufficient training, user resistance, and limited awareness of EHR benefits. Addressing end-users' concerns regarding usefulness and ease of use is vital for a seamless implementation and a broader user acceptance (Achampong, 2022).

The transition from paper health records to EHRs seen in many health facilities in Ghana in the past 5 years prompts a need to assess its workflow impact, staff training, EHR team support, user acceptance and overall satisfaction (Attafuah et al., 2022). The views of healthcare professionals on the challenges and successes of the EHR are vital, as their acceptance plays a crucial role in determining its effectiveness for improving the quality of care (Attafuah et al., 2022).

2.8 Level of User Satisfaction

User satisfaction and motivation to use EHRs is very vital to the successful implementation of EHRs (Boadu et al., 2021). According to studies, “healthcare professionals who believe eHealth systems are simple to use are more likely to be happy with their professions” (Bahadori et al., 2017; Jones et al., 2013). “It has been demonstrated that doctors who used eHealth more effectively reported greater job satisfaction and commitment to care” (Williams et al., 2019). Additionally, healthcare professionals who are motivated to use e-health are more likely to remain committed to doing so. In contrast, if they have a negative experience with eHealth, health professionals are

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more inclined to resist it or stop using it. There is proof that medical professionals who complained about utilizing eHealth also complained about having trouble doing clinical tasks (Al-Mujaini et al., 2011). “In the development, application, and use of eHealth tools like EHRs, health workers are important stakeholders” (Atinga et al., 2020; Menachemi et al., 2010). “As a result, ongoing usage of eHealth technologies, such as EHRs, is related to how it inspires and enhances job satisfaction in healthcare professionals” (Atinga et al., 2020; Menachemi et al., 2010). One study found that “nurses’ satisfaction and intention to use an electronic medical records have a positive influence on system acceptance” (Aldosari et al., 2018). “These findings can serve as valuable guidance for top management and IT support staff to address nurses' concerns and plan accordingly” (Aldosari et al., 2018). “The key to a successful EHR system implementation lies in satisfying the workflow requirements of end-users” (Achampong, 2022). “By re-engineering workflows during the implementation process, greater efficiency, satisfaction, acceptance, and productivity can be achieved” (Achampong, 2022). A new system would thus have a low level of acceptance if it is not re-engineered to match with the workflows of its users. For instance, the EHR implementation at MoH and GHS institutions faced challenges with report generation, which was not integrated into the system. As a result, end-users have to prepare reports manually, leading to potential inaccuracies and increased workload. Integrating EHR into healthcare facilities' workflows may face resistance if it burdens end-users with additional tasks (Achampong, 2022).

Some studies have reported low levels of satisfaction among healthcare workers (Al-Mujaini et al., 2011; Attafuah et al., 2022). A qualitative study in three regions in Ghana (Bono, Greater Accra and Upper East Regions) found that most healthcare workers were not satisfied with the LHIMS system (Attafuah et al., 2022). The factors contributing to the dissatisfaction among the

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workers included inadequate training, difficulties in performing tasks, insufficient logistical support, network issues, and the lack of end-user involvement in the development of EHR systems.

On the contrary, a study in the Cape Coast Teaching Hospital, Ghana reported that 86% of healthcare workers were satisfied with the LHIMS system (Asare et al., 2020). Some reasons cited for this include a reduction in patient waiting and consultation times, as well as enhancements in data capture and retrieval. Also, a study in Malaysia reported that 85% of healthcare workers were satisfied with electronic health record systems. This high levels of user satisfaction is noteworthy since satisfied healthcare workers are more likely to be committed to utilizing the system (Atinga et al., 2020).

2.9 Factors That Influence User Acceptance and Satisfaction of EHRs

Change is a frequent occurrence in everyday life, yet it is often met with doubt and fear (Wilkins, 2009). People tend to stick to familiar routines and avoid the unknown, especially in fields like information technology and medicine, which constantly experience innovations (Wilkins, 2009). Change management involves guiding an organization towards its future state. In the context of health information technology, accepting change becomes crucial as it involves mandatory technology usage for end users (healthcare workers) (Wilkins, 2009).

The acceptance of EHRs by healthcare professionals is crucial to realize the expected benefits (Gagnon et al., 2014). “Understanding the factors that influence EHR acceptance is vital for its successful integration and achieving measurable benefits within the health system and population” (Gagnon et al., 2014). “It is essential to consider factors related to users and their working environment to avoid the pitfalls of previous EHR projects that failed due to poor integration into practices and organizations” (Gagnon et al., 2014).

Existing literature have shown that readiness assessment is one crucial factor for successful EHR adoption (Abdulai & Adam, 2020). It evaluates the preparedness of health institutions and professionals for the new system (Abdulai & Adam, 2020). Electronic Health Records (EHR) installation frequently causes impressions of greater workload because of data entry, delays to workflow, and worries about the switch from paper to digital records (Abdulai & Adam, 2020). To use EHRs efficiently, corporate culture changes are also necessary. "These issues can be addressed by conducting a readiness assessment, which lowers the possibility of financial losses, avoids delays and disappointments for staff and service users, lowers the likelihood of medical errors, and encourages personnel to support implementation plans" (Abdulai & Adam, 2020). Currently, limited research has been conducted on this aspect in Ghana and the West African sub-region (Abdulai & Adam, 2020). Early engagement of end-users and proper training are essential for effective EHR implementation (Abdulai & Adam, 2020). A study done in 2019 on the Health Providers' Readiness for EHR adoption in two hospitals in Northern Ghana (which included TTH) revealed a "low engagement readiness (fears and concerns about the negative impact of EHRs, and willingness for adoption) among healthcare workers in these facilities" (Abdulai & Adam, 2020). This could be attributed partly to a lack of informatics curriculum in health education (Abdulai & Adam, 2020). The study therefore opined that to ensure successful adoption of EHRs, educational programs should include robust informatics training. The study also found out that factors influencing readiness included age, computer expertise, knowledge of EHR, and gender. Younger and more computer-literate providers are more willing to adopt EHRs. Additionally, pre-implementation training is crucial, especially in developing countries with limited computer expertise among health providers (Abdulai & Adam, 2020).

Factors such as perceived ease of use and perceived usefulness have been found by several studies to be strong and significant determinants of healthcare professionals' intention to use and accept EHRs (Boadu et al., 2021). "Perceived Usefulness (PU) is the degree to which a person feels that using a system would improve his or her performance in providing healthcare while perceived ease of use (PEOU) is a measure of how much someone thinks utilizing the system won't need much thought" (Boadu et al., 2021). One study revealed that "perceived ease of use (PEOU) emerged as a robust and significant factor in influencing physicians' intention to use EHRs and also affected their perceived usefulness (PU)" (Gagnon et al., 2014). Another study conducted in Ghana revealed that "most LHIMS users had a positive perception of its usefulness, finding it easy to use with a friendly interface" (Boadu et al., 2021). LHIMS, in the opinion of 76.5 percent of the survey participants, increased healthcare providers' effectiveness (Boadu et al., 2021). While 74 percent of respondents said they believed using LHIMS boosted their productivity at work, 69 percent said they were able to complete jobs more quickly using it, and 86.4 percent said they considered it useful (Boadu et al., 2021). Overall, "76.5% of healthcare professionals perceived LHIMS as a highly useful electronic patients' record management system" (Boadu et al., 2021). Additionally, the study found out that "the majority of healthcare professionals had a favorable attitude towards using LHIMS due to its perceived ease of use, which is known to influence behavioral intention" (Boadu et al., 2021). Over 8 out of 10 respondents said they felt skilled using the interface, and about 83% said it was simple to learn and understand (Boadu et al., 2021). Furthermore, 85% of users said the interface was adaptable for interaction (Boadu et al., 2021). Overall, the perceived ease of use was rated at 84% (Boadu et al., 2021). Similar findings have been replicated by other studies (Attafuah et al., 2022; Gagnon et al., 2014).

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In contrast to the aforementioned studies however, which unequivocally indicate a high level of Perceived Ease of Use (PEOU) regarding Electronic Health Records (EHRs) among the vast majority of their participants, a distinct study focusing on user satisfaction with EHRs revealed a cohort of respondents who did not perceive the utilization of EHRs as straightforward (Attafuah et al., 2022). These respondents articulated challenges related to the accessibility of patient records within the EHR system, noting the need to navigate through a series of interfaces, thereby introducing delays during the consultation process (Attafuah et al., 2022). Their perspective was grounded in the belief that using conventional paper-based folders was a swifter alternative to employing EHRs. Some respondents attributed this preference for manual records to their perceived deficiency in proficient typing skills, which, in their view, rendered them less efficient when compared to the manual note-taking process (Attafuah et al., 2022).

Users' attitude (ATU) and intention determine their usage of new application software (Boadu et al., 2021). “Attitude towards use in the Technology Acceptance Model (TAM) refers to an individuals' evaluation and association of a target system with their job” (Boadu et al., 2021). One study “confirmed a strong and significant relationship between healthcare professionals' attitude towards using LHIMS and their behavioral intention to use it or accept it” (Boadu et al., 2021). This study found that Perceived usefulness (PU) had the greatest impact on their attitude and intention to use LHIMS for patient healthcare delivery at Cape Coast Teaching Hospital in Ghana (Boadu et al., 2021). Thus, if healthcare professionals perceive the LHIMS to be very useful, they would be motivated to get the best out of the system (Boadu et al., 2021). This is similar to another study which also found out that “perceived usefulness was more important than perceived ease of use to determine nurses’ acceptance of EMRs” (Aldosari et al., 2018). The findings indicated that nurses' acceptance of the EMR system is positively influenced by their perceived usefulness and

perceived ease of use (Aldosari et al., 2018)**.**. These factors were identified as crucial predictors of EMR acceptance among nurses. Moreover, "nurse satisfaction and intention were also found to positively impact the acceptance of the system" (Aldosari et al., 2018). "Perceived ease of use (PEOU) also significantly influences attitude; when users perceive a system as easy to use and mentally effortless, they develop a favorable attitude towards it" (Boadu et al., 2021). However, in one study, "PEOU did not have a significant effect on attitude towards LHIMS use, unlike the original TAM hypothesis" (Boadu et al., 2021). The study nonetheless also confirmed that attitude towards using LHIMS significantly affects healthcare professionals' behavioral intention to accept and use LHIMS. The study thus concluded that three main indicators, PU, PEOU, and ATU of the system, all of which are interrelated, can be used to gauge the level of acceptability of LHIMS among health professionals (Boadu et al., 2021)**.**

Other factors have been found to be determinants of the acceptance of EHRs among healthcare professionals either directly or through the major TAM variables.

According to numerous studies, "top management commitment and support are crucial for the creation, application, and adoption of new technologies" (Abdekhoda et al., 2019; Aldosari et al., 2018). Successful EHR implementation requires strong commitment and support from top management, and obstacles like the lack of policy support and uncertain return on investment can hinder the process (Achampong, 2022). Continuous support is essential to achieve the objectives of EHR implementation, and it can be provided by management and policymakers (Achampong, 2022). Technical support is a vital part of the entire implementation process (Achampong, 2022). Failures in some implementations in Ghana were due to inadequate technical support and delayed response times, leading end-users to abandon the system (Achampong, 2022). Both internal and external experts play crucial roles in the successful implementation of the EHR system

(Achampong, 2022). Peer support among end-users also significantly contributes to improved system usage. Facilities with IT support units tend to have smoother implementations, while those lacking such units face challenges like network failures, slow network speeds, and server issues (Achampong, 2022). Support by top management is also a crucial component in the system development life cycle (SDLC), involving post-implementation review, error identification, enhancement, and system performance monitoring (Abdekhoda et al., 2019). Furthermore, results of a study conducted on Determinant Factors of Applying EMRs in Healthcare demonstrates that "management support positively and significantly influences both perceived ease of use (PEOU) and perceived usefulness (PU)" (Abdekhoda et al., 2019). This result aligns with earlier research conducted by Morton (2008), Kowitlawakul (2008), Wu et al. (2008), Gangwar (2015), and Abdekhoda et al. (2015), which also found "a direct and significant connection between management support and the TAM variables (PU and PEOU)". Consequently, successful EHR implementation should be recognized as a crucial change that receives wholehearted support from top managers (Abdekhoda et al., 2019). Additionally, "effective governance, leadership, and organizational culture are crucial factors in the acceptance and successful implementation of an EHR system" (Achampong, 2022). A combination of both bottom-up and top-down approaches provides a solid foundation for a successful EHR implementation (Achampong, 2022). However, because the implementation of LHIMS in Ghana followed a predominantly top-down approach championed by Ghana's MoH without fully involving end-users throughout the implementation process, its success rate suffered (Achampong, 2022). Integrating some bottom-up approaches could have given end-users more autonomy and garnered stronger support for the project's implementation. "Employing these blended approaches would have facilitated the engagement of

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both policymakers and end-users, thereby ensuring successful implementation of the LHIMS EHR system" (Achampong, 2022).

"Compatibility is another factor that contributes to user acceptance of new technology" (Abdekhoda et al., 2019). "Compatibility is defined as the degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters." (Abdekhoda et al., 2019). Compatibility has a direct positive and significant impact on perceived ease of use (PEOU) and perceived usefulness (PU) (Abdekhoda et al., 2019). When implementing an EHR system, it is essential to consider its alignment with the personal characteristics of healthcare staff and its seamless integration into the workflow (Abdekhoda et al., 2019).

"Complexity of the new technology has also been identified by literature to be a key determinant of user acceptance" (Abdekhoda et al., 2019). Existing literature revealed "a negative and significant correlation between complexity and perceived ease of use (PEOU) as well as perceived usefulness (PU)" (Abdekhoda et al., 2019). These results show that the chance of end users implementing the system reduces significantly when the adoption of EHRs is linked to complexity (Abdekhoda et al., 2019). Therefore, to increase user acceptability of new technologies like EHRs, complexity should be kept to a minimum throughout the design of these technologies.

The Technology Acceptance Model (TAM) stands as one of the most influential frameworks for predicting users' perceptions regarding the use of information systems (Gagnon et al., 2014). The TAM also suggests that external factors, including human and social aspects, indirectly shape individuals' attitudes toward technology acceptance by influencing perceived usefulness (PU) and perceived ease of use (PEOU) (Gagnon et al., 2014).

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One study found that "PEOU is augmented by physicians' computer self-efficacy (CSE)" (Aldosari et al., 2018; Gagnon et al., 2014). Physicians who possess a sense of competence in using information technologies face minimal challenges when using EHRs (Gagnon et al., 2014). Computer self-efficacy indirectly influences their behavioral intention to use EHRs, showing a significant overall effect. This study suggests that physicians recognize the significance and necessity of using EHRs in their practice, as it can greatly impact patient care quality. Therefore, "perceived usefulness (PU) might not be as critical as perceived ease of use (PEOU) or the presence of facilitating conditions" (Gagnon et al., 2014). Since most physicians may not be well-versed in new technologies, they prefer user-friendly tools that do not require significant practice changes. "Involving physicians in the EHR design process, particularly through user analysis, proves to be a beneficial strategy to ensure the system's intuitiveness and ease of use for them" (Achampong, 2022). Comprehensive computer training, especially for less computer-savvy end-users, is essential. EHR-specific training is necessary to introduce them effectively to the software. Inadequate training resulted in issues when untrained staff had to use the system (Achampong, 2022). For physicians, EHR implementation brought challenging changes due to logistical issues and workflow alterations (Achampong, 2022). Specifically, providing computer training to physicians would enhance their perception that using EHRs is straightforward. As a result, "physicians are more likely to intend to use EHR when they perceive it as easy to incorporate into their practice" (Gagnon et al., 2014). Training organized by top management boosts motivation, lessens stress and technophobia, and promotes comprehension of new technologies (Abdekhoda et al., 2019). The results of one study indicated that "training and education have a positive and significant effect on PEOU but no significant effect on PU when it comes to the effects of training and education on TAM variables (PEOU and PU)" (Abdekhoda et al., 2019). In a similar vein,

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"training showed no discernible impact on PU" according to Morton (2008) and Abdekhoda et al. (2015). According to other studies, training should be taken into account as a significant factor when new technology is successfully implemented (Achampong, 2022). To boost the acceptance of the computerized technologies like EHRs, full training courses on its use should be made available to healthcare professionals who have not had formal system training (Achampong, 2022; Aldosari et al., 2018). "This would reduce non-compliance and improve EHR system use among healthcare workers who play a significant role in determining the success of EHR implementation" (Achampong, 2022).

"Individual characteristics such as age and prior computer experience were identified as potential factors influencing user acceptance of the planned system" (Yehualashet et al., 2015). In one study, "respondents under 30 years old were found to be 1.89 times more likely to have a positive attitude towards using a new EMR system compared to those above 30 years old" (Yehualashet et al., 2015). This could be attributed to the fact that a significant portion of the participants were under 30 and had a strong familiarity with technology and prior computer experience. As a result, "they were more inclined to embrace and utilize the EMR system for healthcare services compared to older individuals" (Yehualashet et al., 2015).

The literature shows that while there is a growing trend towards computerization in healthcare, some healthcare professionals remain hesitant about using EMRs (Anwar & Shamim, 2011). Their concerns include doubts about the benefits, data privacy, security, and the perceived costs outweighing the benefits (Anwar & Shamim, 2011). To ensure successful implementation and acceptance, it is essential to address these concerns and gather practitioners' views before implementation to meet their requirements effectively (Anwar & Shamim, 2011). This can be achieved through education and training.

2.10 Challenges of Electronic Health Records (LHIMS)

Despite the countless benefits from the use of EHRs like LHIMS, several challenges exist barring the successful implementation of this transformative innovation.

The implementation of clinical information systems, including EHRs, has faced limited success and poses potential risks (Kelay et al., 2013). Poor management of EHRs can hinder a hospital's ability to realize benefits, jeopardize patient safety, and waste resources. Dissatisfaction with EHR systems is widespread, with approximately 20% of hospitals expressing a desire to replace their current system (Poba Nzaou, 2016). This has been due to challenges such as poor usability, deficient functionality, limited interoperability, customization issues, and security vulnerabilities. Patients have concerns about EHRs, particularly regarding privacy issues (Chao et al., 2013). It's important to acknowledge that even successful EHR implementations may not always deliver the expected benefits (Chao et al., 2013). “The potential risks associated with EHRs have received less attention amidst the excitement surrounding their adoption” (Poba Nzaou, 2016).

Physicians may face challenges with EHRs due to its time-consuming nature (Chao et al., 2013). “Health institutes as stakeholders also encounter drawbacks, including the risks of health data loss, illegal information leakage, and high adoption costs” (Farid, 2019). Financial barriers pose significant challenges to the adoption of EHRs (Rahman & Reddy, 2015). “While studies show potential cost savings, the reality is that EHR systems are expensive” (Rahman & Reddy, 2015). Start-up costs involve purchasing hardware, software, and system administration, while ongoing costs include monitoring, upgrades, and maintenance. Physicians and hospital management worry about the time it takes to see a return on investment. Integration with existing systems can also be costly. Surveys indicate that EHR adoption is more prevalent in larger physician practices and hospitals due to the high financial investment involved (Rahman & Reddy, 2015).

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Healthcare workers such as physicians often resist adopting EHRs unless they see tangible benefits such as financial profits, time savings, and improved patient care (Rahman & Reddy, 2015). While research supports these advantages, concrete proof can be challenging to provide. Many physicians recognize the potential for EHRs to enhance patient care, but integrating them into established workflows is a significant change. Technical knowledge and support can be lacking, leading to perceptions of complexity and inadequate training. Customizability and limited system capabilities also pose concerns. Physicians require systems that meet their specific requirements, which can hinder adoption. Increased vendor effort and support may help motivate physicians to embrace EHRs (Rahman & Reddy, 2015).

Privacy and security concerns also pose barriers to EHR adoption, as health records contain sensitive information that can be targeted by attackers (Rahman & Reddy, 2015). The improper disclosure of patient information can lead to legal consequences, and there are doubts about the security of EHR products (Rahman & Reddy, 2015). Legal aspects, such as the need for proper guidance in transitioning to EHRs and increased legal responsibility for physicians, further complicate the adoption and use of EHRs(Rahman & Reddy, 2015). In a study on user satisfaction in Ghana, “a section of respondents voiced apprehensions regarding EHR systems facilitating unhindered access to patient data by healthcare workers who were not directly engaged in patient care, thereby raising concerns about potential breaches of confidentiality” (Attafuah et al., 2022). As an illustration, they highlighted the capability of an EHR system user to be situated in one department while accessing information pertaining to patients in a different ward. This practice, they contended, posed a tangible risk to maintaining confidentiality, thus making the issue of privacy a matter of substantial concern (Attafuah et al., 2022).

Data incompleteness is a common problem in EHRs, with missing data limiting the scope of analysis and the number of factors considered. Reasons for missing data include lack of collection or documentation, inaccurate reporting by professionals, and patients' irregular communication with the healthcare system (Rahman & Reddy, 2015). In a qualitative investigation pertaining to user satisfaction with EHRs conducted in Ghana, a study participant noted that certain physicians exhibit a lower level of computer proficiency and they therefore encounter challenges when attempting to input comprehensive patient information during consultations. (Attafuah et al., 2022). In order to mitigate potential delays within the consultation room, these individuals opt to document concise and abbreviated information, which often lacks comprehensiveness. Consequently, this practice hampers the subsequent review of such information by other healthcare professionals, such as nurses, due to its limited nature (Attafuah et al., 2022). Additionally, "EHR data can also be erroneous due to human errors or faulty equipment, requiring validation techniques for identification and correction" (Rahman & Reddy, 2015). This can be exemplified by errors that have arisen in data entered onto EHRs by some healthcare professionals who sometimes copy and paste patient information from one record to another without undertaking the requisite editing and validation procedures (Attafuah et al., 2022). Uninterpretable data may occur when essential information is missing, making it difficult to interpret results.

There are also barriers that are peculiar to developing countries like Ghana. Underdeveloped countries face barriers related to infrastructure when it comes to establishing a national health information system and promoting Health Information Technology (HIT) (Anwar & Shamim, 2011). These barriers include inadequate infrastructure, high costs of computer hardware and software, limited internet availability, and a lack of skilled workforce and training. Overcoming these barriers is essential for successful implementation of HIT in these countries. A study in

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Ghana revealed that several institutions encountered challenges in the implementation of EHRs due to the absence of essential computer hardware, resulting in disruptions to workflow processes (Attafuah et al., 2022). Notably, participants from various regions in Ghana expressed concerns regarding the insufficient quantity of computers accessible for their professional tasks. This inadequacy consequently engendered operational inefficiencies, as individuals were compelled to await access to a limited pool of available computers. To mitigate the constraints stemming from the shortage of computers, certain individuals resorted to personal laptop usage, while others resorted to manual documentation on paper while awaiting their turn to input data into the computer system. Moreover, select healthcare facilities took the innovative approach of installing the EHR system on nurses' mobile devices, alleviating the strain on the available laptops. This adaptation permitted nurses to review and rectify entries at their convenience. The scarcity of computer resources and these inventive adaptations collectively posed challenges in effectively harnessing the EHR system's potential. Furthermore, study participants underscored that network and electricity-related obstacles emerged as substantial impediments during the processes of data entry and retrieval. Specifically, they cited instances of slow internet connectivity causing delays and system errors, necessitating them to restart the data entry process. Additionally, fluctuations and interruptions in electrical supply posed noteworthy challenges, culminating in data losses and system interruptions, especially during consultations (Attafuah et al., 2022).

“Organizing workshops and training sessions for the establishment and implementation of Health Information Technology (HIT) in underdeveloped countries is challenging due to financial and time constraints” (Anwar & Shamim, 2011). In a particular study, healthcare participants exhibited diverse perspectives concerning their EHR training (Attafuah et al., 2022). Some participants expressed a sense of being adequately trained. Conversely, another segment of participants deemed

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their training as insufficient, frequently necessitating the assistance of IT personnel for matters covered during training sessions (Attafuah et al., 2022). Additionally, significant disparities were evident in the structure of training programs. While specific departmental training, such as that provided to the emergency unit staff, was observed in some cases, a more generalized approach to training was implemented for others (Attafuah et al., 2022).

Efficient, effective, and secure national policies are necessary to address the evolving healthcare needs in accordance with the local environment. These policies should be developed by policymakers and practitioners who can utilize research evidence for their assessment and implementation (Anwar & Shamim, 2011). However, enforcing legislation is challenging in developing countries, and gaining community acceptance for system transformation is even more difficult (Anwar & Shamim, 2011).

2.11 Theoretical Framework

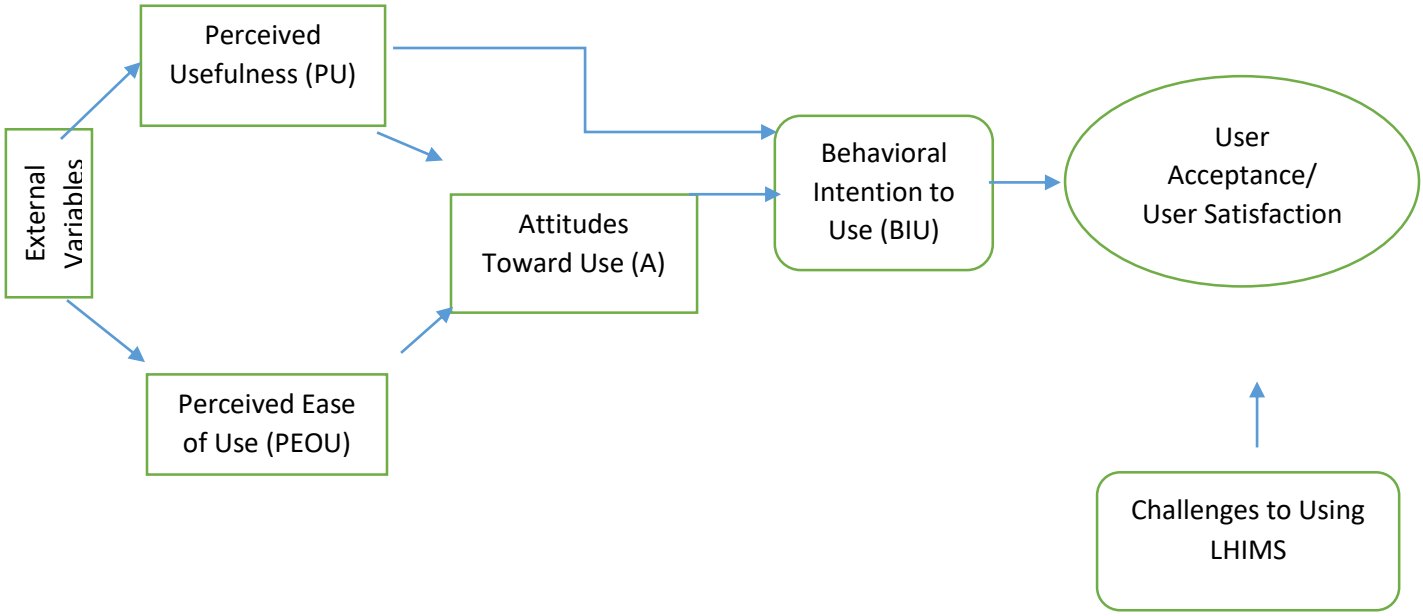
The adoption of technology has been thoroughly studied from both a theoretical and an empirical perspective (Antwi, 2022; Gagnon et al., 2014). This research is grounded in the Technology Acceptance Model (TAM), a widely employed framework for comprehending the adoption and utilization of novel health information technologies by healthcare providers (Antwi, 2022; Gagnon et al., 2014). The Technology Acceptance Model was introduced in 1989 by Fred D. Davis in his study titled "Perceived Usefulness, Perceived Ease of Use, and User Acceptance of IT" (Antwi, 2022; Gagnon et al., 2014). TAM “simulates how users adopt and use technology”. The theory asserts that “when consumers are exposed to new technology, a variety of factors affect their choice of how and when to utilize it” (Poba Nzaou, 2016). The theory's main goal is to describe the variables that affect people's willingness to accept self-service technologies (Antwi, 2022). These variables include “behavioral intents, attitude, perceived system usefulness and perceived system

usability, individual intention" (Poba Nzaou, 2016). Davis argued in favor of using this model to help practitioners and scholars pinpoint the reasons why a particular system is unacceptable (Antwi, 2022). The TAM presents two primary factors influencing users' behavioral intention (BI) or acceptance towards adopting a new technology: "perceived usefulness (PU) and perceived ease of use (PEOU)" (Gagnon et al., 2014).

The Technology Acceptance Model, which is based on the reasoned action theory, seeks to understand behavior by linking the two key predictors: perceived ease of use and usefulness (Antwi, 2022). The idea contends that the intention to use a system, which is a critical component in deciding how often it is actually used, is impacted by users' attitudes about the system and how beneficial they consider it to be (Antwi, 2022). According to the hypothesis, people's performance may be impacted by how convenient a tool is seen to be, as doing so involves less effort and frees up time for other activities (Antwi, 2022).

In his work, Davis starts from the premise that "behavioral intent to use, which he also refers to as acceptance, directly influences actual use of the technology, which is defined as one particular conduct of concern conducted by people with respect to a certain data technology scheme" (Holden & Karsh, 2010). "The definition of behavioral intent is "an individual's motivation or willingness to exert effort to perform the targeted behavior" (Holden & Karsh, 2010). "Behavioral intent/Acceptance is influenced by attitude and perceived usefulness (PU)" (Holden & Karsh, 2010). The definition of attitude is "the assessment of the target conduct by the individual on certain aspects (e.g. good/bad, harmful/beneficial, pleasant/unpleasant) (Holden & Karsh, 2010). The two key TAM variables that have an impact on attitude are perceived utility and perceived ease of use (Holden & Karsh, 2010). Perceived utility is defined as "an individual's perception that using an IT system will improve work efficiency" and perceived ease of use as "an individual's

perception that using an IT system will be effortless" (Holden & Karsh, 2010) Perceived ease of use directly influences perceived usefulness as well. Perceived usefulness, according to Davis et al. (1989), is "the extent to which a person believes that using a particular system would enhance his or her job performance."



Source: Modified Conceptual framework from the Technology Acceptance Model

Perceived Usefulness (PU)

“The degree to which a person feels that using LHIMS would improve his or her performance in providing healthcare is known as PU” (Boadu et al., 2021). For instance, whether the system can assist them in completing their work more quickly (Antwi, 2022).

Perceived Ease of Use (PEOU)

“PEOU is a measure of how much someone thinks utilizing the system won't need much thought” (Boadu et al., 2021). In other words, “PEOU describes the extent to which healthcare professionals

must exert both mental and physical effort to use the EHRs (LHIMS) in their facility after receiving proper training" (Antwi, 2022).

Behavioral Intent to Use/Usage (Acceptance)- BIU

"The acceptance and intention of healthcare workers to use EHRs is influenced by their perceptions of the EHRs' usability, as well as by their comprehension of the transition to the digital age and the idea of using electronic means of maintaining medical information" (Antwi, 2022).

2.12 Relevance of the Technology Acceptance Model to the Study

To represent the emerging LHIMS environment, the TAM provides a robust framework for understanding and analyzing user acceptance and satisfaction with technology by specifying the causal linkages between perceived usefulness (PU), perceived ease of use (PEOU), attitude towards using (ATU), behavioral intention to use (BIU) LHIMS and user acceptance of LHIMS (Antwi, 2022). These concepts explain whether healthcare workers are likely to adopt and use the LHIMS or not. However, while TAM primarily addresses acceptance, it influences satisfaction indirectly. For example, if users perceive the system as useful and easy to use, they are more likely to be satisfied with it. The TAM can therefore guide the study in measuring how these perceptions shape overall satisfaction. Furthermore, the TAM emphasizes the role of attitude as a determinant of behavioral intention to use technology. By examining attitudes before and after LHIMS implementation, the study can gauge how the introduction of the system impacts workers' willingness to engage with it. The TAM theory is therefore pertinent to the study because it clarifies acceptance and satisfaction with the LHIMS and provides a robust framework to assess factors that influence user acceptance and satisfaction with LHIMS among healthcare workers.

2.13 Summary

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Electronic Health Records (EHRs) have assumed a pivotal role in modern healthcare, especially within healthcare systems of low and middle-income nations such as Ghana. They offer a promising solution to the limitations associated with conventional paper-based health record systems and hold the potential to elevate the standard of healthcare delivery in these contexts. Nonetheless, the endorsement and integration of EHRs among critical stakeholders, have been met with substantial challenges, as outlined in this literature review. Notably, their successful implementation has faced challenges related to infrastructure, training, and user acceptance.

Despite a growing body of evidence advocating for the adoption of EHRs in healthcare, their actualization hinges on widespread user acceptance. In Ghana, there exists a dearth of comprehensive data pertaining to the acceptance of EHRs among key stakeholders like healthcare workers and the determinants thereof, particularly in the Northern region. This research endeavor thus assumes paramount importance in bridging this knowledge gap by scrutinizing user acceptance. User acceptance would be assessed using the key technology acceptance model constructs: perceived ease of use, perceived usefulness, attitude and behavioral intentions of healthcare workers towards EHRs.

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CHAPTER THREE

METHODOLOGY

3.1 Introduction

The chapter explains the procedures and methods that would be employed to arrive at the study results. It involves the study area, study design, study population, sample size and sampling technique. It also covers the data collection procedure, data analysis plan and quality control. Ethical issues are also discussed in this chapter.

3.2 Study Area

The Tamale Teaching Hospital, formerly known as the Tamale Regional Hospital, was commissioned on 2nd February 1974 by Lt. Col. I. K. Acheampong, the then Head of State of Ghana (Walana et al., 2016). The Hospital is located in the Eastern part of the Tamale Metropolis and has a total land surface area of 290 acres. Geographically, it is located at latitude 9° 24' 0" north and longitude 0° 50' 0" west (Walana et al., 2016). It is situated in a catchment area with about 4.2 million people living in it. The hospital was built to act as a medical referral facility for the neighboring nations of Togo, Burkina Faso, and Ivory Coast as well as the then-Northern, Upper East, and Upper West Regions, as well as the northern portions of the Brong-Ahafo Region. In 2008, the hospital—which had been serving the area as a Regional Referral Hospital for thirty-four (34) years—was promoted to a Teaching Hospital. In 2009, accreditation was secured for housemanship in all the four major medical disciplines. In 2017, the Hospital acquired accreditation for housemanship in Dentistry (Walana et al., 2016). The Hospital currently has a bed capacity of eight hundred and twelve (812) with several clinical and non-clinical departments (Tamale Teaching Hospital, 2025). The clinical departments in TTH include internal medicine,

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surgery, obstetrics and gynaecology, pediatrics and child welfare, accident and emergency, trauma and orthopedics, pathology, physiotherapy, DEENT (Dental, Eye, Ear, Nose, Throat), radiology, laboratory, public health and pharmacy departments. The various non-clinical departments also include human resource, research, supply chain, procurement, estate, biomedical engineering, ICT, registry, catering, laundry, tailoring, health information, finance, and PPME (Policy, Planning, Monitoring and Evaluation) departments. The Tamale Teaching Hospital was the first hospital in the northern part of Ghana to adopt and implement the LHIMS application in December, 2020 (K. Issah, Head of ICT, Tamale Teaching Hospital, personal communication, August 2, 2024). The study is being conducted in the TTH because there has not been any evaluation of the EHR system to determine its impact on patient care.

3.3 Study Type

This study employed a quantitative approach to assess user acceptance and satisfaction of the LHIMS among healthcare workers in the Tamale Teaching Hospital. A review of the literature indicates that many studies on user acceptance or the impact of EHRs have predominantly used the quantitative approach, focusing on exploring subjective experiences, attitudes and perceptions. While qualitative studies provide valuable insights, they are often limited by their subjective nature, smaller sample sizes, and the potential for researcher bias (Creswell, 2009). Quantitative studies allow for the collection and analysis of numerical data, enabling researchers to test hypotheses, measure relationships between variables, and produce statistically valid results (Creswell, 2009). Employing this methodology ensures that the findings of this study are more objective, generalizable, and precise. This, in turn, serves to validate and support the conclusions of previous qualitative studies by providing empirical evidence derived from larger, more representative samples (Acquah-Swanzy, 2015).

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Moreover, the use of a quantitative approach is consistent with the predominantly quantitative nature of the study's objectives, such as determining levels of acceptance and satisfaction, assessing changes in attitudes, and predicting contributing factors. These objectives require data collection methods such as structured surveys and statistical analysis, which are inherent to quantitative research. Thus, this approach is both methodologically appropriate and critical for achieving the study's goals and contributing to the broader understanding of EHR implementation in healthcare settings.

3.4 Study Design

The study design for this research is a facility-based analytical cross-sectional design, chosen for its suitability in assessing multiple variables at a single point in time. This approach aligns with the study's objective of surveying user acceptance of Electronic Health Records (EHRs), specifically the LHIMS, among healthcare workers within a limited timeframe. Cross-sectional studies are particularly effective for understanding the prevalence of attitudes, perceptions, and behaviors, as well as for identifying associations between key factors and outcomes at a given moment (Setia, 2016).

This is particularly advantageous in a healthcare setting, where operational demands often limit the time available for extended research activities. Furthermore, this design is widely utilized in healthcare research for studying user acceptance and technology adoption, as it enables the exploration of factors influencing acceptance and satisfaction within a defined period (Setia, 2016).

The analytical component of the design enhances the study's depth by enabling the identification of relationships between variables, such as the perceived ease of use and usefulness of LHIMS and

overall user acceptance. Although cross-sectional designs cannot establish causality, they provide valuable insights into correlations that can inform policy decisions and further longitudinal studies (Setia, 2016). This makes the cross-sectional approach a logical and practical choice for assessing EHR adoption in a facility-based context.

3.5 Study Population

The study population consists of all healthcare workers within the Tamale Teaching Hospital who have access to LHIMS software.

3.5.1 Inclusion Criteria

The study included all healthcare workers within TTH who have access to LHIMS software and have been working for at least a year. The duration of work is important as it is assumed that using a new system for that long would enable the individual give a fair assessment of the system.

3.5.2 Exclusion Criteria

The study excluded all temporary staff of TTH for instance those on locum, staff doing their national service and students. Additionally, healthcare workers who were not accessible during the duration of the study such as those on leave were excluded.

3.6 Sample Size Determination

Sample size was calculated using Yamane's formula. Factors considered included a confidence interval of 95%, an acceptable margin of error (e) of 5% or 0.05 and the population of healthcare workers in TTH (N) = 2217 (as at the end of the first quarter of 2023)- Retrieved from the human resource department TTH.

Yamane's formula, $n = \frac{N}{1 + Ne^2}$ where

n = desired sample size, N= population size and e = permitted error (5%, if the confidence level is at 95%) = 0.05.

Computing the sample size using this formula, n= 338.86. However, adjusting for a 10% non-response rate= 33.886, a total of 373 participants would be recruited for the study.

3.7 Sampling Techniques

A stratified probability sampling technique was employed in this study. To ensure that the sample is representative reflecting the various health cadres/professions, stratified sampling was used to determine the number of participants from each health category to be included in the study as outlined in Table 1 below. Subsequently, a list of healthcare workers containing the names, cadres and contact numbers of staff within each department was retrieved from the hospital administration. Participants were then selected randomly using a systematic random sampling technique and contacted to partake in the survey via phone calls, face-to-face or through email.

Table 1: Samples of the various health cadres/professions

Health Cadre	Population	Proportion of Total Population, P	Number To Be Recruited For Study (P X N) Where N=373
Doctors	274	0.1236	46
Nurses/Midwives	1721	0.7763	290
Laboratory Staff	141	0.0636	24
Records	45	0.0203	8

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Radiology	19	0.0086	3
IT Staff	9	0.004	1
Physiotherapy	8	0.0036	1
Total	2217	100	373

Source: Tamale Teaching Hospital Human Resource Department

3.8 Data Collection Tools

The data collection process for this study involved utilizing a well-structured questionnaire, designed to gather information from the study population. The questionnaire items were sourced from established and validated questionnaires in the existing literature, which have undergone rigorous testing in numerous research contexts, rendering them reliable for use in this study. The questions were primarily derived from Davis' Technology Acceptance Model, as outlined in his research on Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology (Davis, 2014). The questionnaire was made up of 4 sections. Section A contained questions on the socio-demographic characteristics of respondents. Section B focused on the main variables of user acceptance which include perceived usefulness (PU), perceived ease of use (PEOU), attitudes towards use (ATU) of LHIMS and behavioral Intentions (BIU) of healthcare workers to use LHIMS. Section C contained questions regarding other factors that contribute to user acceptance of LHIMS. All constructs in Section B and C were measured with a 5-point Likert scale from Strongly disagree to Strongly agree with a neutral point on 3. The various points on the Likert scale were represented as follows: 1=strongly disagree, 2=agree, 3=neither agree/disagree, 4=agree, 5=strongly agree. Section D contained binary questions on the main dependent variables, user acceptance and user satisfaction.

3.9 Pre-Testing

The questionnaires were pre-tested using some healthcare workers in the Tamale Teaching Hospital Polyclinic in order to assess the clarity of the wording of the questionnaire, the feasibility of the designed procedure for data collection, processing, analysis and any potential problems which may arise. The wording of questions which were not clear were edited while typographical errors were also corrected.

3.10 Data Collection Techniques

Data was collected using google forms. After obtaining permission from the institution and individuals willing to partake in the study, the respondents were given access to a link of the questionnaire on google forms. Completed questionnaires from google forms were then aggregated into a Microsoft Excel worksheet. Cleaning of data was done and the data imported into IBM's Statistical Product and Service Solutions (SPSS) Statistics software version 26 for statistical analysis to be done.

3.11 Dependent Variables

The main dependent variable for this study is user acceptance. The secondary dependent variable is user satisfaction. The dependent variables were measured through binary (yes or no) questions, with the purpose of circumventing the introduction of a neutral midpoint, as observed in the Likert scale. This decision stems from empirical evidence indicating that the inclusion of a neutral or "no opinion" option substantially inflates the number of respondents indicating a lack of opinion when they indeed possess one (Edwards L. & Smith C., 2014). Individuals have been found to opt for the neutral midpoint as a means to evade the cognitive effort required to furnish a comprehensive response when providing attitude reports.

3.12 Independent Variables

The independent variables for this study include age, sex, profession/health cadre, years of experience as a healthcare worker, years of experience with EHRs, duration of computer usage in life, history of formal computer training and how frequently EHRs are used. Other variables include the key TAM variables PEOU, PU, ATU and BIU. These would be measured using a 5-point Likert scale.

3.13 Data Analysis

The analysis of data was executed using IBM's SPSS Statistics software version 26. To elucidate the findings, descriptive statistics, encompassing measures such as frequencies, modes, medians and means, were employed. To describe potential associations between categorical variables and the dependent variables, the Chi-square test of independence was. Logistic regressions were further used to determine the relationships between the dependent variables and the independent variables.

Regression Analysis

To analyze factors that affect user acceptance and satisfaction which were measured using a 5-point Likert scale, constructs were combined to form composite variables, facilitating data simplification and enhancing analytical clarity (Muhammad, 2024). Constructs that were used to assess a predictor were combined into a composite variable using the median given the ordinal nature of the Likert responses. The utilization of the median, rather than the mean, as a measure of central tendency was deemed appropriate due to the inherent limitations associated with Likert data, wherein the mean lacks a meaningful interpretation (Sullivan & Artino, 2013; University of St. Andrews, 2023). For example, what is the average of Strongly agree and disagree? Consequently, all six constructs pertaining to perceived ease of use (PEOU) for instance were

integrated into a composite variable denoted as Overall PEOU, while constructs concerning perceived usefulness (PU), among others, underwent a similar treatment as shown in Table 12 (Appendix) These composite variables subsequently served as predictors within logistic regression models.

To mitigate the risk of diluting true associations and thereby yielding large standard errors with imprecise confidence intervals, or conversely, identifying spurious associations, the regression model exclusively incorporated key Technology Acceptance Model variables—namely, PEOU, PU, ATU (before and after), and BIU (Ranganathan et al., 2017). Subsequently, a distinct regression model was executed to examine additional factors that impact user acceptance.

3.14 Data Quality Control

The questions contained in the questionnaire were adapted in close reference with the findings of studies on user acceptance of information and communication technologies like EHRs and the research objectives to provide answers to the research questions in this study. This ensured that the results of this study are both valid and reliable. Additionally, the questionnaire was pre-evaluated with the supervisor of this study and pre-tested on some healthcare workers in the TTH Polyclinic.

3.15 Ethical Considerations

Ethical considerations were carefully addressed in this study to ensure compliance with established research ethics guidelines and the protection of participants' rights and welfare. A research proposal, accompanied by an introductory letter from the School of Public Health at the University for Development Studies and a letter of approval from the Tamale Teaching Hospital, was submitted to the Committee on Human Research, Publications, and Ethics (CHRPE) of the Kwame

Nkrumah University of Science and Technology. The study received ethical clearance under the approval number CHRPE/AP/1004/23.

Upon obtaining ethical approval, informed consent from participants was prioritized. The consent process included both written and verbal explanations of the study's purpose, objectives, and procedures. Participants were provided with comprehensive information regarding the voluntary nature of their participation, the expected duration of the study, and their right to withdraw at any stage without any repercussions.

Confidentiality was emphasized throughout the research process. Participants were assured that all responses would remain anonymous and confidential, with no identifying information being collected or disclosed. Data were stored securely and used solely for the purposes of this study. Furthermore, no questions posed to participants had the potential to reveal their identity, ensuring their privacy and encouraging honest responses.

The study also ensured that participants were not exposed to harm or discomfort during the research process. The researchers maintained transparency by addressing participants' concerns, providing contact details for follow-up questions, and guaranteeing that the findings would be disseminated responsibly to improve healthcare outcomes.

These ethical measures reflect the study's commitment to respecting participants' autonomy, safeguarding their rights, and upholding the integrity of the research process.

CHAPTER FOUR

RESULTS

4.1 Introduction

The chapter presents the results of the analysis of data derived from the survey. The socio-demographic characteristics of respondents were analyzed using descriptive statistics including tables, frequencies and percentages to illustrate the results. Associations between the dependent variables (user acceptance and user satisfaction) and independent variables were explored through chi-square analysis, the logistic regression model and the Z-test for proportions.

4.2 Socio-Demographic Characteristics of Respondents

Overall, 373 health professionals participated in the study (Table 2). Of these, 47% were female while 53% were males. The mean age of respondents was 32 years with a standard deviation of 4 years. About 34% of participants were below 30 years old, 59% were between the ages of 30 and 39 years, while 7% were 40 years or above. Majority of respondents were nurses or midwives (78%), 12% were medical doctors or prescribers while 6% were laboratory staff. Other non-clinical staff included, one physiotherapist, 3 radiology staff, 8 records staff and one ICT staff. More than half (53%) of these health professionals had a bachelor's degree, 12% were holders of a doctoral degree (MBchB), 5% had a Master's Degree, while 26% and 4.0% had a Diploma and Certificate respectively. Over fifty percent of the workers (54%) had practiced healthcare for less than 5 years, 26% had practiced for 5 to 9 years, while 20% had practiced for 10 or more years. Majority of the workers, 63% had used the electronic health records system (LHIMS) for 3 years, 27% had used it for 2 years, while 10% used the system for a year (Table 2).

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Furthermore, 19% of workers reported use of computers and ICT systems for less than 10 years in their lives. 65% reported usage of computers for 10 to 19 years while 16% had used computers for at least 20 years. Majority of workers (59%), further reported having had formal computer training, while 41% had received no formal computer training, but learned on the job. Additionally, 78% used the LHIMS system regularly at work. 20% used it often, while 1% rarely used the system (Table 2).

Table 2- Background Characteristics of Respondents.

Variable	Frequency	Percentage (%)
Age Group		
Less than 30	125	33.5
30 to 39	220	59.0
40 and above	28	7.5
Mean age	31.88 (SD ± 4)	
Gender		
Male	199	53.4
Female	174	46.6
Profession/Health Cadre		
Clinical Staff		
Nurse/Midwife	290	77.7
Medical Doctor	46	12.3
Laboratory Staff	24	6.4
Non-Clinical Staff		
Records Staff	8	2.1
Radiology	3	0.8
ICT Staff	1	0.3
Physiotherapist	1	0.3
Level of Education		
Certificate	15	4.0
Diploma	96	25.7
Bachelor's Degree	197	52.8
MBchB	46	12.3
Master's Degree	19	5.1

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Years In Healthcare Practice		
Less than 5	202	54.2
5 to 9	96	25.7
10 and above	75	20.1
Years of Using LHIMS EHR		
1	37	9.9
2	102	27.4
3	234	62.7
Years of Computer Use in Life		
Less than 10	69	18.5
10 to 19	243	65.1
20 and above	61	16.4
History of Formal Computer Training		
Yes	220	59
No	153	41
Frequency of EHR Usage		
Never	0	0
Rarely	5	1.3
Often	76	20.4
Every time	292	78.3

Source: Field Survey

4.3 Objective 1: Level of User Acceptance

Overall, 97 % of the workers who took part in the survey, accepted the LHIMS as shown in Table 3.

Table 3: Level of user acceptance and satisfaction of the LHIMS at TTH

Indicator Level	Frequency	Percentage
User Acceptance	363	97.3 %
User Satisfaction	286	76.7 %

Source: Field Survey

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4.4 Objective 2: Level of User Satisfaction

User satisfaction was 77% indicating majority of the workers were satisfied with the LHIMS as shown in Table 3.

4.5 Objective 3: Attitude of Users before Implementation of LHIMS EHR

Prior to the establishment of the LHIMS EHR, 46% of health workers showed a favourable attitude towards using EHR systems, though 31% did not. The rest were neutral (23%). About 61% believed it was a good idea to use LHIMS for healthcare delivery while 22% disagreed. Majority (69 %) anticipated using EHRs in the future before its implementation albeit, 19% did not. Another 56% expected its usage to be enjoyable while 69% believed it would support healthcare professionals in providing better care though 19% disagreed. Additionally, 40% of workers expressed dissatisfaction with paper-based record systems while 29% did not. However, 31% were indifferent to the question on whether they were satisfied with using paper-based records. Furthermore, 68% believed that all healthcare professionals should learn to use the EHRs effectively albeit 16% disagreed. Overall, 66% of workers had a positive attitude towards the implementation of an EHR system in the hospital.

TABLE 4: Attitudes before implementation of LHIMS.

Attitude before the implementation of LHIMS	Disagree (%)	Neutral (%)	Agree (%)
I had a generally favourable attitude towards using electronic health record systems before its implementation.	113 (31.4)	85 (22.8)	171 (45.8)
I believed it was a good idea to use LHIMS for healthcare delivery before its implementation.	83 (22.2)	64 (17.2)	226 (60.6)
I expected to use an electronic health record system in the future	70 (18.8)	47 (12.6)	256 (68.6)

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I expected using LHIMS would be enjoyable/satisfying prior to its implementation	83 (22.2)	83 (22.3)	207 (55.5)
I believed electronic health records would support healthcare professionals in providing better care	70 (18.8)	46 (12.3)	257 (68.9)
I was not satisfied with using paper-based patient records	109 (29.2)	115 (30.8)	149 (39.9)
I believed all healthcare professionals should learn to use the EHRs effectively prior to its implementation	58 (15.5)	63 (16.9)	252 (67.6)
Overall, my attitude about EHR usage was positive prior to its implementation in TTH.	74 (19.8)	55 (14.7)	244 (65.5)

Source: Field Survey

4.5.1 Attitudes after Implementation of LHIMS

After the implementation of the LHIMS, 66% showed a favourable attitude towards using the LHIMS while 15% did not. About 77% endorsed the LHIMS EHR as a good idea after its implementation while 11% disagreed respectively. Also, 79% expected the use of the system to continue in the future. Another 68% reported they enjoyed using the system while 14% did not. Additionally, 76% believe the LHIMS system would support healthcare professionals in providing better care while 11% disagreed. After the implementation of the LHIMS, only 28% remained indifferent when asked if they were satisfied with paper-based records, however, 47% expressed dissatisfaction with paper-based records while 24% did not. A significant majority encompassing 82% of workers believed all healthcare professions should learn to use the LHIMS effectively though 10% disagreed. Overall, 78% of workers reported a positive attitude towards the LHIMS after its implementation.

TABLE 5: Attitudes after implementation of LHIMS

Attitude after the implementation of LHIMS	Disagree (%)	Neutral (%)	Agree (%)

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I have a generally favourable attitude towards using LHIMS system	56 (15.0)	72 (19.3)	245 (65.7)
I believe it is a good idea to use LHIMS for healthcare delivery	41 (11.0)	44 (11.8)	288 (77.2)
I expect my use of LHIMS to continue in the future	32 (8.6)	48 (12.9)	293 (78.5)
Overall, I enjoyed using the LHIMS	53 (14.2)	67 (18.0)	253 (67.8)
I believed electronic health records would support healthcare professionals in providing better care	40 (10.7)	50 (13.4)	283 (75.9)
I am not satisfied with using paper-based patient records	91 (24.4)	106 (28.4)	176 (47.2)
I believe all healthcare professionals should learn to use the EHRs effectively	37 (9.9)	32 (8.6)	304 (81.5)
Overall, my attitude about LHIMS usage is positive	36 (9.6)	48 (12.9)	289 (77.5)

Source: Field Survey

To assess whether the differences in healthcare workers' attitudes before and after the implementation of the LHIMS were statistically significant, a Z-Test for Proportions was conducted, based on the hypothesis that "there was no significant difference in the attitude of staff before and after implementation of the LHIMS." This analysis focused exclusively on respondents who expressed agreement with each attitude-related item before and after the system's implementation. The results showed significant differences with respect to the items; favorable attitude for LHIMS, LHIMS being a good idea, expecting LHIMS use in the future, satisfaction with LHIMS, all staff encouraged to use LHIMS, and overall positive attitude

Table 6: Z-Tests for Proportions of attitudes before and after the implementation of LHIMS

Factor (Agree)	Pre-implementation %	Post-implementation %	P-value

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Favorable attitude for LHIMS	171 (45.8)	245 (65.7)	0.001
LHIMS use is a good idea	226 (60.6)	288 (77.2)	0.001
Expect to use LHIMS in the future	256 (68.6)	293 (78.5)	0.008
Expect LHIMS use to be satisfying	207 (55.5)	253 (67.8)	0.007
Believed LHIMS would ensure better care	257 (68.9)	283 (75.9)	0.069
Never satisfied with paper-based patient records	149 (39.9)	176 (47.2)	0.186
Believed all staff should learn to use LHIMS	252 (67.6)	305 (81.5)	0.002
Overall my attitude about LHIMS is positive	244 (65.5)	289 (77.5)	0.002

Source: Field Survey

4.6 Objectives 4 and 5: Factors Contributing to User Acceptance and User Satisfaction of EHRs

The results as show in Table 12 (Appendix 1) outlines the factors contributing to user acceptance of the LHIMS. Overall, majority of respondents exhibited positive inclinations towards the focal variables (perceived ease of use, perceived usefulness, behavioural intention to use LHIMS, training, personal identity and challenges to using LHIMS), as evidenced by the prevalence of higher ratings on the Likert scale as seen in Table 12 (Appendix 1).

Perceived Ease of Use (PEOU) of the LHIMS among workers in Tamale Teaching Hospital

Perceived ease of use was measured using six constructs as shown in Table 12 (Appendix 1). About 64% of health workers agreed that it was easy to learn how to use the LHIMS while 20% disagreed. Majority of workers (57%) reported that they found it easy to get LHIMS to do what

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they wanted it to do. Additionally, 63% agreed that it was easy to use LHIMS though 20% disagreed. Also, 65% believed that their interaction with the LHIMS was clear and understandable while an additional 59% reported they found LHIMS flexible to interact with and easy to navigate. Another 62% of workers agreed it was easy to become skillful at using the LHIMS system though 19% disagreed.

Perceived Usefulness (PU) of the LHIMS among workers in Tamale Teaching Hospital

To gauge the perceived usefulness (PU) of the LHIMS, six statements were used as shown in Table 12 (Appendix 1). 49% of workers accepted that using LHIMS in their job enabled them to accomplish tasks more quickly. Furthermore, 53% accepted that using LHIMS made it easier to do their jobs while 51% and 53% further accepted that using LHIMS improved their job performance and effectiveness on the job respectively. Although 15% of workers did not find LHIMS useful in their work, a significant number of workers (69%) found the LHIMS useful in their job. More so, 52% of workers reported that using the LHIMS enhanced productivity in their job.

Behavioural Intention to Use the LHIMS among workers in Tamale Teaching Hospital

In analyzing respondents 'behavioural intention' to use the LHIMS, five factors were considered. As shown in Table 12 (Appendix 1), 80% had the intention to use LHIMS for their work, another 80% of workers indicated they did not mind spending some time to learn how to use the system for their work while an additional 82% intended to use the LHIMS as often as possible. Furthermore, 80% planned to use the LHIMS in the future while 81% admitted they would encourage the use of the LHIMS among their colleagues.

Training and Education on LHIMS among workers in Tamale Teaching Hospital

Training and education of respondents regarding the LHIMS, was assessed with five factors. As shown in Table 12 (Appendix 1), 49% of health workers received the training needed to be able to understand and use the LHIMS, though 29% had not received optimal training. About 53% of workers admitted the training they received made the LHIMS more useful to them, though 24% did not. Additionally, 50% reported that the training made it easier for them to use the LHIMS though only 36% admitted that their organization provided complete training in using the LHIMS. An additional 45% reported that IT staff provided an adequate support to LHIMS albeit 30% disagreed.

Personal identities of workers in Tamale Teaching Hospital

About 69% of workers reported being comfortable with information and communication technology while 14% disagreed. Additionally, 80% of workers identified as persons who embrace change. Majority of workers (71%), did not want the LHIMS to change the manner in which they interact with patients while 65% did not want the LHIMS to change their daily work routine.

Challenges to using LHIMS among workers in Tamale Teaching Hospital

Respondents were also assessed to determine their perceptions on some of the challenges confronting usage of the LHIMS in their facility. Overall, 47% of workers accepted that high cost of implementation was one challenge in the implementation of the LHIMS though 19% disagreed, while 34% of workers remained neutral. Additionally, 49% admitted that resistance to change was a key challenge while 26% disagreed. Another 75% reported the lack of essential logistics like computers and laptops as a major challenge while a further 63% and 74% admitted that lack of adequate training or support and technical difficulties or malfunctions respectively were major challenges to the use of the LHIMS, while 57% of workers accepted having difficulty in navigating

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the LHIMS interface, 55% reported the time-consuming data entry process as a major challenge and a further 53% confirmed concerns over data security and privacy. Furthermore, 79% admitted frequent power outages and lack of a dedicated power supply was a major challenge. Additionally, 70% confirmed poor internet or network connectivity as a major challenge.

4.6.1 Association between Background Characteristics and User acceptance/User Satisfaction

A chi-square analysis was conducted (Table 7) to identify associations between background characteristics and user acceptance/satisfaction. However, for some variables, the expected cell counts were less than 5 in more than 20% of the cells. Therefore, the chi-square test was adjusted using Fisher's exact test to analyze the data accurately. The analysis showed a statistically significant relationship between profession of health workers (grade) and user acceptance of LHIMS ($x^2 = 6.775$, $p = 0.041$). There was also a statistically significant relationship between age ($x^2=5.985$, $p = 0.049$), gender ($x^2=7.849$, $p=0.005$), frequency of LHIMS usage and user satisfaction ($x^2 = 8.990$, $p =0.007$).

Table 7: Association between Background Characteristics and Dependent Variables-User Acceptance & User Satisfaction

	USER ACCEPTANCE		USER SATISFACTION	
VARIABLE	**Chi-square**	**P-Value**	**Chi-square**	**P-Value**
Age Groups	5.594	0.058	5.985	0.049
Gender	0.183	0.669	7.849	0.005
Professional Grades	6.775	0.041	2.257	0.520
Level of Education	2.500	0.550	5.755	0.212
Years in Healthcare Practice	2.770	0.287	1.874	0.404
Years of LHIMS Usage	1.825	0.358	3.054	0.216
Years of Computer Use	4.290	0.085	1.098	0.594

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History of formal computer training	1.530	0.216	0.332	0.565
Frequency of LHIMS Usage	4.492	0.158	8.990	0.007

Source: Field Survey

Logistic Regression of Background Characteristics and User Acceptance

The logistic regression model was conducted to determine associations between background characteristics and user acceptance of LHIMS (Table 8). Age, profession, years of computer use, frequency of LHIMS usage and history of formal computer training were assessed. These variables were selected due to their relatively low p-values from the chi-square analysis with each p-value falling below an arbitrary cut-off of 0.25.

There was a significant association for workers with at least 20 years of computer use compared to those with less than 10 years (OR = 6.307, 95 % CI, 1.17-33.89, p = 0.032), indicating higher odds of user acceptance. Furthermore, the analysis revealed a significant association between a medical doctor and user acceptance compared to non-clinical staff (OR = 7.443, 95% CI, 1.019-54.378, p = 0.048). Thus medical doctors were more likely to accept the LHIMS than non-clinical staff However, age, frequency of LHIMs use and formal training in ICT did not attain statistical significance with user acceptance.

Table 8: Multivariable logistic regression of background characteristics against user acceptance

Variable	OR	95% CI	P-value
Age Group (years)			
Less than 30	Ref		
30 to 39	2.072	0.243-17.683	0.506

40 and above	2.470	0.439-13.909	0.305
Profession			
Non-Clinical Staff (Records, Radiology, ICT, Physiotherapist)	Ref		
Nurse/Midwife	4.116	0.097-174.864	0.459
Medical Doctor	7.443	1.019-54.378	0.048
Laboratory Staff	3.134	0.338-29.054	0.315
Years of Computer Use			
Less than 10	Ref		
10 to 19	2.913	0.419-20.263	0.280
20 and above	6.307	1.174-33.897	0.032
Frequency of LHIMS Usage			
Every time	Ref		
Often	15.118	0.443-516.142	0.132
Rarely	14.740	0.439-495.180	0.133
History of Formal Training			
No	Ref		
Yes	0.361	0.084-1.544	0.170

Ref- Reference Category OR-Odds Ratio C.I- Confidence Interval

Logistic Regression of Background Characteristics against User Satisfaction

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The Logistic regression model was run for user satisfaction against age groups, gender, level of education, years of LHIMS usage and frequency of LHIMS usage. An arbitrary cut-off p-value of 0.25 was used to include variables based on results from the Chi-square analysis seen in Table 7.

The results reveals that gender significantly associated with user satisfaction, with males being less likely to report satisfaction compared to females (OR=0.411, 95% C.I, 0.243-0.696, p= 0.001) Other variables, including age groups, level of education, years of LHIMS usage, and frequency of LHIMS usage, did not show statistically significant associations with user satisfaction.

Table 9: Multivariable Logistic regression of background characteristics against User Satisfaction

Variables	OR	95% CI	P-value
Age Groups			
Less than 30	Ref		
30 to 39	1.975	0.732-5.328	0.179
40 and above	2.117	0.849-5.278	0.107
Gender			
Female	Ref		
Male	0.411	0.243-0.696	0.001
Level of Education			
Certificate	Ref		
Diploma	3.941	0.706-21.999	0.118
Bachelor's Degree	2.337	0.935-5.839	0.069
Master's Degree	1.219	0.561-2.649	0.616
MBchB	1.325	0.356-4.933	0.675

Years of LHIMS Usage			
1 year	Ref		
2 years	0.776	0.342-1.764	0.546
3 years	1.404	0.750-2.626	0.288
Frequency of LHIMS Usage			
Every time	Ref		
Often	3.678	0.480-28.191	0.210
Rarely	1.615	0.205-12.698	0.649

Ref- Reference Category OR-Odds Ratio C.I- Confidence Interval

4.6.2 Predictors of User Acceptance with TAM Model Constructs

The logistic regression model was employed to examine the relationship between key variables from the technology acceptance model, along with other predictors of user acceptance.

The individual constructs used to assess each predictor were initially combined into composite variables using the median response given the ordinal nature of the data. This was necessary to simplify the data and enhance analytical clarity. Consequently, all six constructs pertaining to perceived ease of use (PEOU) for instance, were integrated into a composite variable denoted as Overall PEOU, while constructs concerning perceived usefulness (PU), among others, underwent a similar treatment as depicted in the Table 13 (Appendix 2). These composite variables subsequently served as predictors within logistic regression models.

The findings, presented in Table 10 indicate that Perceived Usefulness (OR=2.793, 95 % CI, 1.063-7.335, p = 0.037**)** and Behavioral Intention to Use the LHIMS (OR=3.225, 95% CI, 1.012-

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10.463, p=0.048) were statistically significant predictors of user acceptance, with the electronic health record system.

Furthermore, the model revealed that training (OR=2.957, 95% CI 1.345-6.500, p=0.007)) and personal identity (OR= 2.998, 95% CI, 1.341-6.704, p=0.007) were statistically significant predictors of user acceptance. Conversely, the model found no statistically significant relationship between user acceptance and perceived ease of use, attitudes before and after implementation of the LHIMS, and challenges to using to LHIMS.

TABLE 10: Predictors of User Acceptance using TAM Model variables

VARIABLE	ODDS RATIO (OR)	95% C.I	P-VALUE
Overall PEOU	0.796	0.285-2.221	0.663
Overall PU	2.793	1.063-7.335	**0.037**
Overall Attitudes Before	1.264	0.420-3.803	0.677
Overall Attitudes After	0.585	0.126-2.719	0.494
Overall BIU	3.255	1.012-10.463	**0.048**
Overall Training	2.957	1.345-6.500	**0.007**
Overall Personal Identity	2.998	1.341-6.704	**0.007**
Overall Challenges	0.669	0.343-1.306	0.239

PEOU-Perceived Ease of Use PU- Perceived Usefulness BIU- Behavioural Intention to Use LHIMS
TAM- Technology Acceptance Model C.I- Confidence Interval OR- Odds Ratio

4.6.3 Predictors of User Satisfaction using Technology Acceptance Model variables

The logistic regression model was also used to investigate the relationship between user satisfaction and key variables from the technology acceptance model (TAM), as well as other predictors of user acceptance. The analysis revealed that the key TAM variables—Perceived Ease of Use (OR=1.644, 95% CI, 1.106-2.445, p=0.014), Perceived Usefulness (OR=2.514, 95% CI,

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1.828-3.456, p=0.001) and attitudes before the implementation of LHIMS (OR=0.501, 95% CI, 0.328-0.766, p=0.001), were statistically significant predictors of user satisfaction.

Additionally, training (OR=1.656, 95% CI, 1.326-2.067 p=0.000), was found to have a statistically significant relationship with user satisfaction, increasing the odds of user satisfaction among healthcare workers.

The model did not find statistically significant relationships between user satisfaction and attitudes after the implementation of LHIMS, Behavioral Intention to Use LHIMS, Personal Identity, and Challenges to using the LHIMS.

TABLE 11: Predictors of User Satisfaction Using Model Constructs

VARIABLE	ODDS RATIO (OR)	95% C.I	P-VALUE
Overall PEOU	1.644	1.106-2.445	**0.014**
Overall PU	2.514	1.828-3.456	**0.001**
Overall Attitudes Before	0.501	0.328-0.766	0.001
Overall Attitudes After	0.679	0.362-1.271	0.226
Overall BIU	1.574	0.994-2.494	0.053
Overall Training	1.656	1.326-2.067	**0.001**
Overall Personal Identity	1.256	0.921-1.713	0.150
Overall Challenges	0.820	0.622-1.083	0.162

PEOU-Perceived Ease of Use PU- Perceived Usefulness BIU- Behavioural Intention to Use LHIMS TAM- Technology Acceptance Model C.I- Confidence Interval OR- Odds Ratio

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CHAPTER FIVE

DISCUSSION

The study set out to assess the user acceptance and satisfaction of the Electronic Health Records System (LHIMS) among Healthcare Workers in the Tamale Teaching Hospital (TTH). The key results of the study were; high acceptance of the LHIMS (97%), coupled with a high level of satisfaction (77%) of the LHIMS among health professionals in the TTH. The results further indicate there was an improvement in the attitudes of healthcare professionals towards the LHIMS after implementation, compared to pre-implementation attitudes. Significant predictors of user acceptance included perceived usefulness, behavioral intention to use LHIMS, training, personal identity, having at least 20 years' experience with computers and being a medical doctor. Additionally, gender, perceived usefulness, perceived ease of use, and pre-implementation attitudes were significant predictors of user satisfaction. The major challenges associated with the LHIMS system were inadequate number of computers, technical difficulties, frequent power outages, lack of a dedicated power supply, poor internet connectivity, and inadequate training and support.

The results of this study indicate an overwhelming acceptance of the LHIMS system among the health workers, with 97% expressing overall approval of the system. Though differences in design, the finding is similar to results in another study where over 97% of healthcare workers in urban, rural and remote sites across the Philippines accepted EHRs (De Mesa et al., 2024). The results is also comparable to studies in the United Kingdom and Netherlands where 96% and 99% of health workers respectively accepted electronic record systems (Essuman et al., 2020).

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However, the acceptance rate is higher than results of other studies in Africa including the Eastern Region of Ghana where only 59% of health workers accepted the electronic records system (Essuman et al., 2020), Ethiopia (72.2%) and Nigeria (78.1%) (Kasaye et al., 2023). The reasons provided by Essuman et al. included a high cost of implementation, administrative and technical problems and privacy problems.

Such a substantial acceptance rate may suggest that the majority of health workers recognize the benefits and improvements brought about by the LHIMS as espoused by EHR advocates (Gagnon et al., 2014). Specifically, in TTH, health workers found the LHIMS useful and had strong positive intentions to use the system. This significantly boosted the acceptance rate.

Overall, the high acceptance of the LHIMS system among health workers in TTH is a promising indicator of its successful implementation and the positive impact it has on healthcare quality and delivery (Zhou et al., 2019). This acceptance is likely to lead to sustained use and optimization of the LHIMS in TTH, ultimately contributing to improved healthcare outcomes.

User satisfaction with the LHIMS system stood at 77%, indicating that a significant majority of the health workers were satisfied with the system. This result is comparable to other studies where 85% of health workers were satisfied with the electronic records systems in Malaysia (Azmi et al., 2022). Similarly, a study in the Cape Coast Teaching Hospital, Ghana reported that 86% of healthcare workers were satisfied with the LHIMS system (Asare et al., 2020). Some reasons cited for this include a reduction in patient waiting and consultation times, as well as enhancements in data capture and retrieval.

Contrary to these findings however, some studies have reported low levels of satisfaction among users (Al-Mujaini et al., 2011; Attafuah et al., 2022). A qualitative study in three regions in Ghana

(Bono, Greater Accra and Upper East Regions) found that most healthcare workers were not satisfied with the LHIMS system (Attafuah et al., 2022). The factors contributing to the dissatisfaction among the workers included inadequate training, difficulties in performing tasks, insufficient logistical support, network issues, and the lack of end-user involvement in the development of EHR systems. Although the level of user satisfaction in TTH is high, the health workers in this study who were not satisfied with the LHIMS may share similar concerns.

The high satisfaction rate at TTH can be attributed to the ease of use, perceived usefulness, and overall positive attitude of health workers toward the LHIMS system. This is noteworthy, as satisfied healthcare workers are more likely to be committed to utilizing the system, as indicated by findings from another study (Atinga et al., 2020). This in turn contributes to the system's sustained use and the realization of its associated benefits.

The study examined user attitudes before and after implementing the LHIMS system at TTH. Initially, only 46% of healthcare workers had a favourable attitude towards the system, which increased to 66% post-implementation. This is lower compared to another study where 82% of healthcare professionals generally had a favorable view of LHIMS, attributed to a high perceived ease of use (84%) and usefulness (77%) (Boadu et al., 2021). This suggests that TTH workers may not find LHIMS as user-friendly or beneficial as their counterparts in the Cape Coast Teaching Hospital, Ghana.

Post-implementation, overall positive attitudes towards LHIMS improved, with 78% of health workers showing a favorable view compared to 66% pre-implementation. This finding is higher than the 56% favourable rating in another study (Yehualashet et al., 2015). It is however similar to the 83% reported in the Cape Coast Teaching Hospital (Boadu et al., 2021). Additionally, 77% of workers in TTH endorsed LHIMS as a good initiative, 79% anticipated future use, 68% enjoyed

using the system while 82% believed all staff should learn to use the LHIMS. These factors likely contributed to broad acceptance of the system in TTH.

A hypothesis test was conducted to evaluate any significant differences in staff perceptions before and after the implementation of the LHIMS. The Z-test was significant in the overall outlook, including several items as shown in Table 6. The test results show that overall, the LHIMS implementation has made a positive impact on staff attitude, leading to the high acceptance and satisfaction levels. The increase in positive attitudes which was confirmed to be significant by the Z-test of proportions suggests growing acceptance due to greater familiarity with the system.

Based on the results, healthcare workers with at least 20 years of computer experience were significantly more likely to accept the LHIMS system compared to those with less than 10 years of experience (OR = 6.307, 95% CI, 1.17-33.89, p = 0.032). A similar, study found that the length of computer use significantly impacts user acceptance among nurses (Aldosari et al., 2018). The implication of the finding is that the large number of staff with 10 to 19 years of experience in computer use (Table 2) would be beneficial in future to the application.

Medical doctors are significantly more likely to accept EHRs compared to non-clinical staff **(**OR = 7.443, 95% CI, 1.019-54.378, p = 0.048). This finding is noteworthy because physicians have traditionally been slow to adopt EHRs (Gagnon et al., 2014). A major barrier for physicians has been a lack of familiarity with the technology and concerns about its complexity (Pavlovic et al., 2021). Many doctors often fear that new systems will be too complicated or disrupt their workflows, causing stress and anxiety (Pavlovic et al., 2021).

Physicians have also expressed concerns about the time-consuming nature of data entry. For example, one prescriber noted that before the implementation of EHRs, they could see at least

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three patients in thirty minutes, but with EHRs, they could only see one patient in the same time frame (Attafuah et al., 2022).

Despite these challenges, the study's findings suggest that physicians in TTH recognize the benefits of EHRs for healthcare and are becoming more comfortable with using them. This indicates that there is a strong foundation of acceptance among physicians that management can build on.

The results showed that male workers had significantly lower satisfaction with the LHIMS system compared to females **(**OR=0.411, 95% CI of 0.243-0.696, p-value= 0.001). This finding is inconsistent given the belief that men tend to have more positive attitudes towards technology and are more likely to adopt IT tools (Abdulai & Adam, 2020). Another study indicated that being female positively influenced the likelihood of adopting eHealth technologies, although it did not provide reasons for this gender-based disparity (Kesse-Tachi et al., 2019). In contrast, a study from Bangladesh found that males were more likely to be satisfied with eHealth tools, attributing this to cultural and social norms that limit women's mobility in a male-dominated society (Hossain et al., 2019).

Considering the male population in TTH (53%), there could be dire implications for the system if morale among the male staff is not improved.

User acceptance is greatly influenced by key Technology Acceptance Model (TAM) variables (Antwi, 2022; Gagnon et al., 2014; Venkatesh et al., 2003). Perceived Usefulness emerged as a statistically significant predictor of user acceptance (OR=2.793, 95 % CI, 1.063-7.335, p = 0.037). Thus, the odds of accepting the LHIMS was higher if health workers perceived the system as useful. The findings of this study align with previous research, indicating that perceived usefulness is a key determinant of health workers' acceptance of EHRs (Aldosari et al., 2018; Boadu et al.,

2021). Workers who viewed the LHIMS system as useful were more inclined to accept and utilize it effectively. This contrasts with findings from another study which suggested that perceived ease of use might be more critical for physicians who already understand the importance of EHRs (Gagnon et al., 2014).

The findings of this study implies that health workers in TTH have found the records system to be useful for their work which has contributed significantly to their acceptance of the LHIMS. This is important for management, because the system will enhance staff work and will translate into improvement in the quality of medical care in TTH.

Additionally, Behavioral Intention to Use the LHIMS was a statistically significant predictor of user acceptance (OR=3.225, 95% CI, 1.012-10.463, p=0.048). This means that health workers who had a strong intention to use the LHIMS were more likely to accept it. Thus, the behavioral intention to use (BIU) the LHIMS system increased the odds of acceptance. The findings of this study align with previous research, indicating that behavioral intention is a key determinant of health workers' acceptance of electronic record systems (Aldosari et al., 2018; Boadu et al., 2021).

At TTH, approximately 80% of the workforce demonstrated a strong inclination to utilize the LHIMS in their work, commit time to mastering the system, advocate for its adoption among peers, and expressed intentions to use LHIMS regularly, with plans to continue its use in the long term. These factors contributed to a generally positive behavioural intention to use LHIMS and a readiness to integrate LHIMS into their professional routines.

The study also identified training as a significant predictor of user acceptance of the LHIMS system among healthcare workers at TTH (OR=2.957, 95% CI 1.345-6.500, p=0.007). This suggests that adequate training significantly enhances the likelihood of system acceptance. The

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importance of training is emphasized as it improves healthcare professionals' perceptions of ease of use, reduces stress and technophobia, and increases motivation to use the system, thereby fostering widespread acceptance (Abdekhoda et al., 2019; Achampong, 2022; Gagnon et al., 2014). Training has been found to positively and significantly increase the perceived ease of use of health workers thereby improving user acceptance of eHealth technologies (Abdekhoda et al., 2019; Yehualashet et al., 2015). These findings underscore the essential role training plays in enhancing user acceptance.

The study further identified personal identity as a significant predictor of user acceptance of the LHIMS system among healthcare workers at TTH (OR=2.998, 95% CI 1.341-6.704, p=0.007). This implied that personal identity related to comfort with using technology and openness to change significantly boosted the odds of user acceptance in TTH. Hence, healthcare workers who are comfortable with ICT and those who readily embrace change are more likely to accept the LHIMS system. Resistance to change has been a major challenge to the acceptance and adoption of EHRs among healthcare workers (Cho et al., 2021).

With 69% of TTH workers reporting comfort with ICT and 80% identifying as being open to change, there is a strong foundational readiness for engaging with digital systems like LHIMS in TTH. However, there is still a need for targeted support and motivation by hospital management to address resistance from the minority who do not readily embrace change.

Contrary to the Technology Acceptance Model which suggests that Perceived Ease of Use can also affect user acceptance of new technology, this study did not find any statistically significant relationship between Perceived Ease of Use and user acceptance (Antwi, 2022; Gagnon et al., 2014; Venkatesh et al., 2003). The study's findings is thus in sharp contrast to a study where PEOU emerged as strong predictor of physician's intention to use an EHR system (Gagnon et al., 2014).

More so, in contrast to the findings of this study, PEOU was found to be a crucial predictor of electronic medical records systems acceptance among nurses in a distinct study (Aldosari et al., 2018).

Nonetheless, attitudes toward the LHIMS and challenges to using the LHIMS system didn't emerge as significant predictors of user acceptance. This implies that factors like how easy it is to use, attitudes toward LHIMS and challenges encountered while using the LHIMS system may not matter as much in determining user acceptance in TTH.

Regarding user satisfaction, Perceived Ease of Use (PEOU) emerged as a statistically significant predictor of user satisfaction (OR=1.644, 95% CI, 1.106-2.445, p=0.014). This implies that workers who perceived LHIMS as easy to use were more satisfied with the system. This aligns with results of a study where PEOU was also found to increase the odds of user satisfaction (Atinga et al., 2020). In this study, the major reasons were that health workers found learning to use the LHIMS as easy (64%), and believed that their interaction with the LHIMS was clear and understandable (65%). Comparatively, these results are similar although lower than a study conducted in the Cape Coast Teaching Hospital, Ghana which showed that 83% of respondents agreed that learning to use the LHIMS was easy while another 83% agreed the LHIMS user interface was clear and understandable (Boadu et al., 2021).

The results of the study have significant implications for both management and staff. For staff, a user-friendly system reduces the cognitive and operational challenges, making it easier to perform clinical tasks efficiently and accurately, which leads to higher job satisfaction and a stronger commitment to patient care (Atinga et al., 2020).

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For management, ensuring that the system is easy to use is crucial, as it directly impacts user satisfaction and the quality of data entry. However, the fact that a minority of health workers do not find the system easy to use is concerning, as it could lead to incomplete or inaccurate data, ultimately affecting the quality of healthcare delivery.

Additionally, the study found that perceived usefulness had a significant impact on user satisfaction, with those who found the system useful being more likely to express satisfaction (OR=2.514, 95% CI, 1.828-3.456, p=0.001). This aligns with results of existing studies (Berhe et al., 2017; Dubale et al., 2023; Jaber et al., 2021). This finding implies that health workers in TTH appreciate the usefulness of the LHIMS and this has significantly improved their satisfaction with the system. Therefore, the LHIMS would remain an integral part of the healthcare process. This underscores the importance of designing systems that meet practical needs and enhance work efficiency (Attafuah et al., 2022).

Furthermore, the findings highlighted the importance of training in shaping user satisfaction. Health workers who received adequate training were more likely to report satisfaction (OR=1.656, 95% CI, 1.326-2.067 p=0.000). This is consistent with results of another study where training on EHRs significantly improved user satisfaction (Musa, 2023). However, in another study in Ghana, inadequate training and lack of target training programs led to dissatisfaction with the LHIMS (Attafuah et al., 2022). This implies that, though training deficiencies were reported by health workers in TTH the training they received significantly boosted their satisfaction with the system.

The model however did not identify statistically significant relationships between user satisfaction and attitudes post-implementation, Behavioral Intention to Use LHIMS, Personal Identity, or Challenges. This suggests these factors may not have significant impacts on satisfaction levels in TTH.

CHAPTER SIX

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction

The present study aimed to evaluate user acceptance and user satisfaction of the Electronic Health Records (EHR) system, specifically the LHIMS, among healthcare workers at the Tamale Teaching Hospital. This evaluation was anchored on the Technology Acceptance Model (TAM) and supplemented by additional factors identified through a comprehensive literature review. The primary objectives were to determine the levels of acceptance and satisfaction, assess user attitudes before and after the system's implementation, and identify factors contributing to user acceptance and user satisfaction. This chapter provides a summary of the key findings, limitations, offers recommendations for future research, and highlights the study's contribution to the field.

6.2 Summary of Key Findings

The study revealed a high level of user acceptance (97%) and user satisfaction of the LHIMS among healthcare workers in the Tamale Teaching Hospital, suggesting that majority of the workers recognize the benefits of the application in their duties.

The overall user attitude toward the system after implementation was positive, indicating that the application has made positive impact on staff, leading to the greater acceptance and satisfaction. The implementation of the LHIMS led to a significant enhancement in workers' attitudes, resulting in a more favorable perception of the system, increased recognition of its future utility, improved satisfaction, and a generally more positive outlook towards it.

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Health workers with at least 20 years' experience of computer use were found to have a higher probability of accepting the LHIMS application. Therefore, over 50 percent of staff with 10 to 19 years of computer experience would benefit the system in future.

Another significant finding was that medical doctors were more acceptable to the LHIMS than the other staff. This finding has positive implications for the success of the system because, doctors traditionally have been slow to incorporate electronic records systems in their duties.

Regarding the Technology Acceptance Model, perceptions on how useful the system is, and behavioral intention to use LHIMS were predictors of acceptance to use the LHIMS. This implies that workers in TTH appreciate the usefulness of the LHIMS system and have strong positive intentions to use the LHIMS. These factors significantly increased the odds of user acceptance among health workers in TTH.

Additionally, training and openness to change (personal identity) significantly boosted their acceptance of the system. This suggests that adequate training significantly enhances the likelihood of system acceptance.

User satisfaction was significantly predicted by staff perceptions on how useful the system is, how easy it is to use the system, training and gender. How useful the system is and how easy it is to use significantly increased the odds of user satisfaction.

Male workers were found to have significantly less satisfaction with the LHIMS compared to the female workers. With a male population of over 50 percent, there could be serious implications for the future of the system if the male workers are not motivated.

The major challenges associated with using the LHIMS system were inadequate computers, technical difficulties, frequent power outages, lack of a dedicated power supply, poor internet connectivity and inadequate training and support.

6.3 Conclusions

Overall, the study demonstrates that the LHIMS system has been successfully accepted and integrated by healthcare workers at the Tamale Teaching Hospital, with high levels of satisfaction reported. The positive attitudes towards the system, both before and after implementation, highlight the readiness of healthcare professionals to embrace digital record-keeping. Despite some challenges, the overall acceptance and satisfaction with the LHIMS system underscore its potential to enhance healthcare delivery. However, the presence of notable challenges and a significant minority of dissenting opinions indicates areas for improvement. Addressing these issues would be crucial for optimizing the system's functionality and effectiveness. The LHIMS can significantly enhance healthcare delivery and efficiency, ultimately contributing to better patient outcomes in the Tamale Teaching Hospital and similar settings.

6.4 Recommendations

The following recommendations are based on the findings of the study:

To sustain the acceptance and satisfaction levels and ensure a positive staff attitude, the management of TTH should prioritize comprehensive training programs that enhance the knowledge, attitudes, skills and familiarity of the system among healthcare workers. Training programs should include annual refresher trainings, on-the-job training and orientation for new staff and basic computer training for those with inadequate computer skills

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Additionally, tailored mentorship programs should be offered to support those less comfortable with technology. Training should be adapted to different user levels, and should cover all aspects of the system's functionality, addressing any knowledge gaps among users.

Management of TTH should set up a technical support team to ensure that staff have access to prompt technical support for troubleshooting issues all year round. A responsive helpdesk can reduce frustration, encourage continued use of the system and ensure staff gain adequate experience in computer use. Additionally, management should recognize and reward staff who show significant improvement or proficiency in computer use. This can motivate others to engage more actively with the training programs.

To motivate doctors to fully accept the technology, management should implement targeted incentives such as recognition for efficient use, opportunities for professional development, and involvement in decision-making regarding technology use. For the rest of the staff, focus on providing comprehensive training, continuous support, and fostering a positive work culture where their feedback is valued and acted upon is crucial. Together, these strategies will promote widespread acceptance and integration of the technology across all levels of staff.

Given that males were less satisfied with the system, management should engage them in structured feedback processes, emphasize the system's practical benefits, and offer tailored training programs. They should also foster a positive environment through peer support networks and open dialogue. To sustain satisfaction among female health workers in TTH, management should also provide personalized training, maintain an ongoing feedback loop, and create supportive communities for sharing experiences. Highlighting success stories and offering leadership opportunities in technology adoption will further empower female users.

Furthermore, management of TTH should work to positively influence user attitudes by demonstrating the clear benefits of the system in improving workflow and patient care. This can be achieved through success stories, regular updates on system improvements, and transparent communication about how the system enhances clinical practice. This would boost the perceived usefulness of the system and attitudes of workers towards the LHIMS.

Hospital management should invest in adequate high-performance, durable computers with scalable specifications and integrated security features to ensure data protection and regulatory compliance. Furthermore, the provision of handheld devices, such as tablets, for medical staff during ward rounds is advised to enhance mobility, facilitate real-time access to patient records, improve operational efficiency, and ensure accurate documentation at the point of care.

The management of TTH should also invest in upgrading the hospital's network infrastructure to ensure reliable and high-speed internet access. This may include enhancing bandwidth capacity, installing redundant network systems to prevent downtime, and implementing enterprise-grade Wi-Fi solutions with strong coverage across all areas of the hospital. Additionally, the hospital should consider offline-capable EHR software that allows staff to continue accessing and updating patient records even during connectivity issues, with automatic synchronization when the internet is restored. Regular network performance assessments and a dedicated IT support team are also essential to promptly address any connectivity problems that arise.

Furthermore, the hospital management should invest in a dedicated and reliable power supply. This should include installing uninterruptible power supply (UPS) systems for critical hardware, such as servers and network infrastructure, to prevent data loss and system downtime during power interruptions. Additionally, the hospital should consider investing in backup generators capable of providing sufficient power during extended outages, ensuring continuous operation of the EHR

system. Regular maintenance and testing of these power systems are crucial to ensure their reliability in emergencies.

The government of Ghana through the Ministry of Health can support Tamale Teaching Hospital by funding training programs, invest in upgraded network infrastructure, logistics, stable power solutions like backup generators, and offline-capable EHR systems to ensure seamless operations. Further, they should establish a dedicated technical support team to handle system maintenance and troubleshooting. Additionally, they should organize recognition and incentive programs for proficient staff to boost motivation and engagement, ensuring sustained acceptance and satisfaction with the system.

6.5 Limitations

The research was confined to a single healthcare institution, which may limit the generalizability of the findings across other health facilities including primary and secondary health centers which are also implementing the LHIMS. Additionally, the study did not explore the long-term impact of the LHIMS on patient outcomes or healthcare efficiency.

6.6 Future Research

Expanding the study to include multiple healthcare institutions would enhance generalizability. Investigating the impact of EHR systems on patient outcomes and healthcare efficiency would provide a more comprehensive understanding of their benefits. Additionally, future studies should explore strategies to address identified challenges, such as enhancing training programs, improving system usability, and ensuring robust technical support and infrastructure.

6.7 Contribution

This study makes significant contributions to the field of healthcare informatics. It provides empirical evidence of high user acceptance and satisfaction with the LHIMS system among healthcare workers in a resource-constrained healthcare setting. By identifying key predictors of acceptance and satisfaction, the study offers valuable insights for healthcare administrators and policymakers aiming to implement or improve EHR systems. The findings regarding challenges and barriers to EHR adoption can inform targeted interventions to enhance system usability and integration. Overall, this study contributes to the growing body of knowledge on the successful implementation and adoption of EHR systems in healthcare settings particularly in developing countries, offering a contextual understanding that can inform future initiatives.

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APPENDIX 1

Table 12: Factors Contributing to User Acceptance and User Satisfaction of EHRs

Variable	Disagree (%)	Neutral (%)	Agree (%)
Perceived Ease of Use			
It is easy to learn how to use LHIMS	75 (20.1)	59 (15.8)	239 (64.1)
I find it easy to get LHIMS to do what I want it to do	94 (25.2)	67 (18.0)	212 (56.8)
It is easy to use LHIMS	75 (20.1)	63 (16.9)	235 (63.0)
I believe that my interaction with LHIMS is clear and understandable.	84 (22.5)	45 (12.1)	244 (65.4)
I find LHIMS flexible to interact with and easy to navigate	80 (21.4)	73 (19.6)	220 (59.0)
It is easy for me to become skillful at using LHIMS system.	69 (18.5)	72 (19.3)	232 (62.2)
Perceived Usefulness	**Disagree (%)**	**Neutral (%)**	**Agree (%)**
Using LHIMS in my job enables me to accomplish tasks more quickly.	114 (30.6)	77 (20.6)	182 (48.8)
Using LHIMS in my job makes it easier to do my job.	101 (27.1)	73 (19.6)	199 (53.3)
Using LHIMS in my job improves my job performance.	102 (27.3)	80 (21.4)	191 (51.3)
Using LHIMS enhances my effectiveness on the job.	102 (27.3)	74 (19.8)	197 (52.8)
I find LHIMS useful in my job	57 (15.3)	58 (15.5)	258 (69.2)

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Using LHIMS in my job increases my productivity	87 (23.3)	92 (24.7)	194 (52.0)
Behavioural Intention to Use LHIMS	**Disagree (%)**	**Neutral (%)**	**Agree (%)**
I am willing to use LHIMS for my work.	33 (8.8)	41 (11.0)	299 (80.2)
I do not mind spending some time to learn how to use this system for my work.	30 (8.0)	46 (12.3)	297 (79.7)
I intend to use the LHIMS as often as possible	36 (9.7)	30 (8.0)	307 (82.3)
I plan to use the LHIMS in the future	34 (9.1)	39 (10.5)	300 (80.4)
I will encourage the use of LHIMS among my colleagues	34 (9.1)	36 (9.7)	303 (81.2)
Training and Education	**Disagree (%)**	**Neutral (%)**	**Agree (%)**
I received the training that I need to be able to understand and use the LHIMS.”	109 (29.2)	82 (22.0)	182 (48.8)
The LHIMS training made it more useful to me.	91 (24.4)	86 (23.1)	196 (52.5)
The LHIMS training made it easier for me to use this technology	96 (25.7)	89 (23.9)	188 (50.4)
My organization provided me complete training in using LHIMS	145 (38.8)	95 (25.5)	133 (35.7)
IT staff provided an adequate support to LHIMS	112 (30.0)	92 (24.7)	169 (45.3)
Personal Identity	**Disagree (%)**	**Neutral (%)**	**Agree (%)**

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I am comfortable with information and communication technology	54 (14.4)	62 (16.6)	257 (68.9)
I consider myself a person that embraces change	37 (9.9)	38 (10.2)	298 (79.9)
I do not want that the LHIMS to change the manner that I interact with patients	46 (12.3)	64 (17.2)	263 (70.5)
I do not want the LHIMS EHR to change my daily work	69 (18.5)	62 (16.6)	242 (64.9)
Challenges	**Disagree (%)**	**Neutral (%)**	**Agree (%)**
High cost of implementation	72 (19.3)	127 (34.0)	174 (46.6)
Resistance to change from staff	96 (25.7)	95 (25.5)	182 (48.8)
Lack of computers and other logistics	52 (13.9)	41 (11.0)	280 (75.1)
Lack of training and support	74 (19.8)	66 (17.7)	233 (62.5)
Technical difficulties or malfunctions	63 (16.9)	34 (9.1)	276 (74.0)
Difficulty in navigating the LHIMS interface	92 (24.7)	67 (18.0)	214 (57.3)
Time-consuming data entry	112 (30.0)	56 (15.0)	205 (55.0)
Concerns over data security and privacy	114 (30.6)	62 (16.6)	197 (52.8)
Frequent power outages and lack of a dedicated power supply	49 (13.1)	28 (7.5)	296 (79.4)
Poor internet or network connectivity	58 (15.6)	53 (14.2)	262 (70.2)

Source: Field Survey

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APPENDIX 2

Table 13: Creation of Composite Variables

Variables	Number of items	Cronbach's Alpha	Composite variable	Median	Range
PEOU	6	0.940	Overall PEOU	Agree	Agree
PU	6	0.950	Overall PU	Agree	Agree
Attitudes before implementation of LHIMS	8	0.923	Overall Attitudes Before	Agree	Agree
Attitudes after implementation of LHIMS	8	0.943	Overall Attitudes After	Agree	Agree
Behavioural Intention to Use LHIMS	5	0.964	Overall BIU	Agree	Agree
Training	5	0.928	Overall Training	Neutral	Agree
Personal Identity	4	0.858	Overall Personal Identity	Agree	Agree
Challenges	10	0.908	Overall Challenges	Agree	Agree

Source: Field Survey

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APPENDIX 3

PARTICIPANT INFORMATION LEAFLET AND CONSENT FORM

Title of Research:

User Acceptance of the Electronic Health Record System among Healthcare Workers in the Tamale Teaching Hospital.

This study is being conducted by Dr. Elijah Bawa Mishio, a final year student of the University for Development Studies, Tamale. This study is mainly for academic purposes and in partial fulfilment for the award of Master of Public Health degree by the School of Public Health, University for Development Studies, Tamale. The study would be a cross-sectional study aimed at assessing the level of acceptance of the novel, state of the art Electronic Health Records (EHR) System known as the Lightwave Health Information and Management System (LHIMS) and factors that affect user acceptance from the perspectives of healthcare workers in the Tamale Teaching Hospital. A total of 373 healthcare workers in the Tamale Teaching Hospital would be recruited to participate in this study. Participants would be chosen through a randomized sampling method and will be required to fill out either a paper-based or digital questionnaire, based on their individual convenience and preference. There are no potential health risks in this study. However, there may be a brief disruption in work activities to complete questionnaire. To minimize this, the specific dates and times for data collection will be coordinated with your hospital administration to minimize disruption to daily operations. The study's findings will provide valuable insights to stakeholders in the healthcare sector regarding user acceptance, satisfaction, and challenges to using EHRs from the perspectives of healthcare workers. This would serve as a roadmap for information system designers, hospital administrators, and healthcare professionals interested in using EHRs thereby supporting the creation of specialized systems that cater to the unique requirements of healthcare organizations.

Data provided by you would be highly confidential and no questions would reveal the identity of any participant. Data collected cannot be linked to you to anyway. Your decision to partake in this study should be out of your own free will. If you choose not to participate in this study, this would not affect your treatment in this hospital in any way. You may also choose to withdraw from the research at any time without having to explain yourself. Additionally, you may also choose not to answer any question you find uncomfortable or private. There will be no consequence, loss of benefit or care to you if you choose to withdraw from the study.

If you have any question concerning this study, please do not hesitate to contact Dr. Elijah Bawa Mishio on 0543415606 or 0206048768. Further, if you have any concern about the conduct of this study, your welfare or your rights as a research participant, you may contact:

The Office of the Chairman

Committee on Human Research and Publication Ethics

Kumasi

Tel: 03220 63248 or 020 5453785

APPENDIX 4

CONSENT FORM

Statement of person obtaining informed consent:

I have fully explained this research to _____ and have given sufficient information about the study, including that on procedures, risks and benefits, to enable the prospective participant make an informed decision to or not to participate.

DATE: _____ NAME: _____

Statement of person giving consent:

I have read the information on this study/research and I have also talked it over with the interviewer to my satisfaction.

I understand that my participation is voluntary (not compulsory).

I know enough about the purpose, methods, risks and benefits of the research study to decide that I want to take part in it.

I understand that I may freely stop being part of this study at any time without having to explain myself.

I have received a copy of this information leaflet and consent form to keep for myself.

NAME:_____

DATE: _____ SIGNATURE/THUMB PRINT: _____

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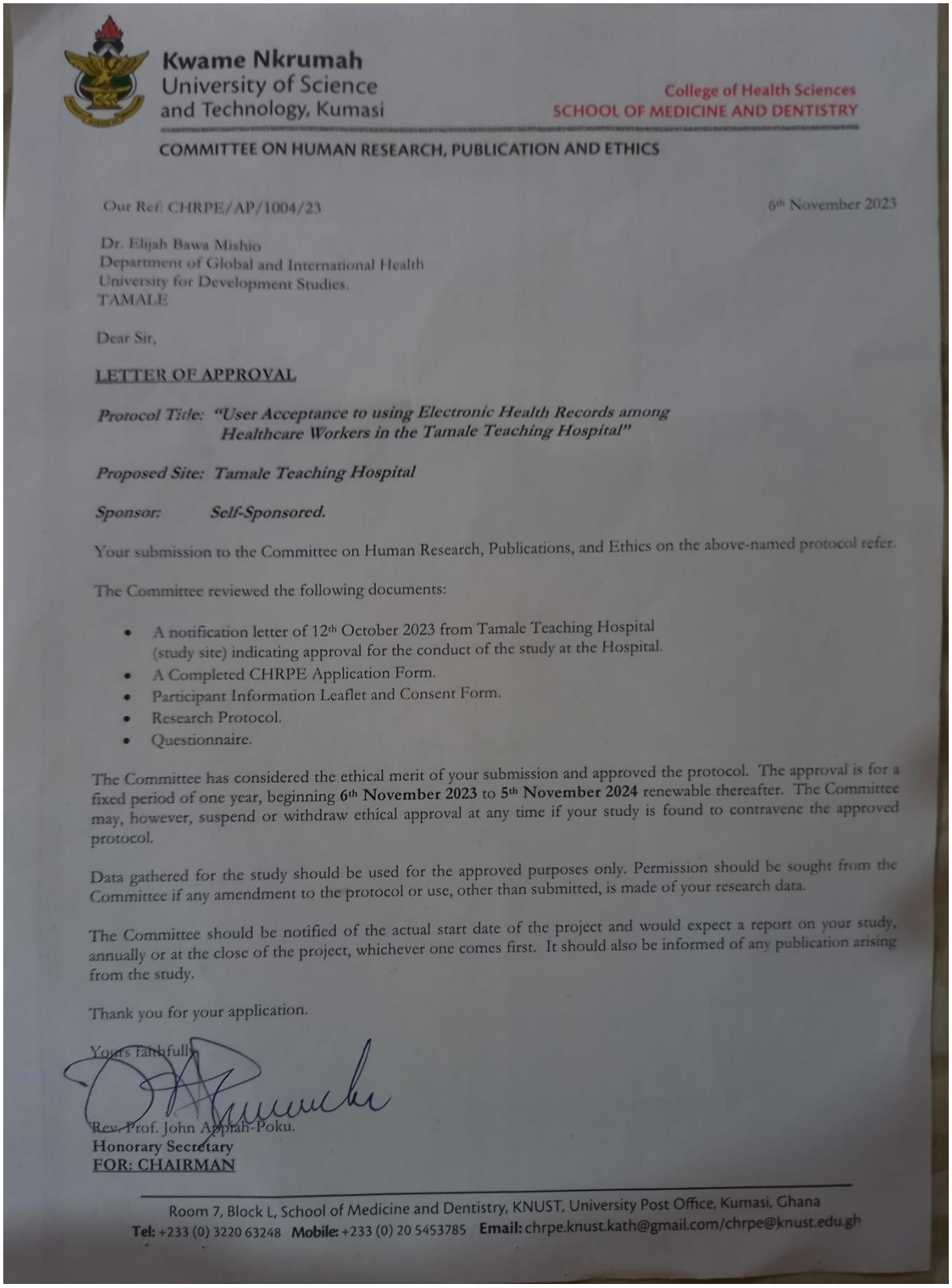
APPENDIX 5

ETHICAL CLEARANCE



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University of Science
and Technology, Kumasi

College of Health Sciences
SCHOOL OF MEDICINE AND DENTISTRY

COMMITTEE ON HUMAN RESEARCH, PUBLICATION AND ETHICS

Our Ref: CHRPE/AP/1004/23

6th November 2023

Dr. Elijah Bawa Mishio
Department of Global and International Health
University for Development Studies.
TAMALE

Dear Sir,

LETTER OF APPROVAL

Protocol Title: *"User Acceptance to using Electronic Health Records among Healthcare Workers in the Tamale Teaching Hospital"*

Proposed Site: *Tamale Teaching Hospital*

Sponsor: *Self-Sponsored.*

Your submission to the Committee on Human Research, Publications, and Ethics on the above-named protocol refer.

The Committee reviewed the following documents:

- A notification letter of 12th October 2023 from Tamale Teaching Hospital (study site) indicating approval for the conduct of the study at the Hospital.
- A Completed CHRPE Application Form.
- Participant Information Leaflet and Consent Form.
- Research Protocol.
- Questionnaire.

The Committee has considered the ethical merit of your submission and approved the protocol. The approval is for a fixed period of one year, beginning **6th November 2023** to **5th November 2024** renewable thereafter. The Committee may, however, suspend or withdraw ethical approval at any time if your study is found to contravene the approved protocol.

Data gathered for the study should be used for the approved purposes only. Permission should be sought from the Committee if any amendment to the protocol or use, other than submitted, is made of your research data.

The Committee should be notified of the actual start date of the project and would expect a report on your study, annually or at the close of the project, whichever one comes first. It should also be informed of any publication arising from the study.

Thank you for your application.

Yours faithfully,

Rev. Prof. John Appiah-Poku.
Honorary Secretary
FOR: CHAIRMAN

Room 7, Block L, School of Medicine and Dentistry, KNUST, University Post Office, Kumasi, Ghana
Tel: +233 (0) 3220 63248 **Mobile:** +233 (0) 20 5453785 **Email:** chrpe.knust.kath@gmail.com/chrpe@knust.edu.gh

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APPENDIX 6

QUESTIONNAIRE

SECTION A: SOCIODEMOGRAPHIC CHARACTREISTICS OF RESPONDENTS

1. Age_____
2. Gender: Male [ ] Female [ ]
3. Profession/Health Cadre

   Medical Doctor [ ] Physician Assistant/Nurse Practitioner [ ] Nurse/Midwife [ ]

   Anesthetist [ ] Laboratory Scientist/Technician [ ] Radiology [ ] Physiotherapy [ ]

   Pharmacist [ ] Non-Clinical Staff [ ]
4. Level of Education

   MBchB [ ] Certificate [ ] Diploma [ ] Bachelor's Degree [ ] Master's Degree [ ]

   PHD [ ] Other Doctoral Degree [ ] Please specify _____
5. How long have you worked in healthcare practice _____
6. How many years have you used EHRs (LHIMS) _____
7. For how many years have you used computers in life? _____
8. Have you had any formal computer training? Yes [ ] No [ ]
9. How often do you use LHIMS in your work. Never [ ] Rarely [ ] Often [ ] Every time [ ]

NB: The sections below consist of a series of statements under each sub-heading. Please indicate how much you agree or disagree with these statements using the 5-point Likert scale.

1=strongly disagree (SD), 2=disagree (D), 3=neither agree/disagree (N), 4=agree (A), 5=strongly agree (SA)

QUESTION	SD	D	N	A	SA
SECTION B: TECHNOLOGY ACCEPTANCE MODEL					
PERCEIVED EASE OF USE					
10. It is easy to learn how to use LHIMS					
11. I find it easy to get LHIMS to do what I want it to do					
12. It is easy to use LHIMS					
13. I believe that my interaction with LHIMS is clear and understandable.					

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14. I find LHIMS flexible to interact with and easy to navigate					
15. It is easy for me to become skillful at using LHIMS system.					
PERCEIVED USEFULNESS	**SD**	**D**	**N**	**A**	**SA**
16. Using LHIMS in my job enables me to accomplish tasks more quickly.					
17. Using LHIMS in my job makes it easier to do my job.					
18. Using LHIMS in my job improves my job performance.					
19. Using LHIMS enhances my effectiveness on the job.					
20. I find LHIMS useful in my job					
21. Using LHIMS in my job increases my productivity					
ATTITUDE BEFORE THE IMPLEMENTATION OF LHIMS	**SD**	**D**	**N**	**A**	**SA**
22. I had a generally favourable attitude towards using electronic health record systems before its implementation.					
23. I believed it was a good idea to use LHIMS for healthcare delivery before its implementation.					
24. I expected to use an electronic health record system in the future					
25. I expected using LHIMS would be enjoyable/satisfying prior to its implementation					
26. I believed electronic health records would support healthcare professionals in providing better care					
27. I was not satisfied with using paper-based patient records					
28. I believed all healthcare professionals should learn to use the EHRs effectively prior to its implementation					
29. Overall, my attitude about EHR usage was positive prior to its implementation in TTH.					
ATTITUDE AFTER THE IMPLEMENTATION OF LHIMS	**SD**	**D**	**N**	**A**	**SA**
30. I have a generally favourable attitude towards using LHIMS system					
31. I believe it is a good idea to use LHIMS for healthcare delivery					
32. I expect my use of LHIMS to continue in the future					
33. Overall, I enjoyed using the LHIMS					
34. I believed electronic health records would support healthcare professionals in providing better care					
35. I am not satisfied with using paper-based patient records					
36. I believe all healthcare professionals should learn to use the EHRs effectively					
37. Overall, my attitude about LHIMS usage is positive					
BEHAVIOURAL INTENTION TO USE LHIMS	**SD**	**D**	**N**	**A**	**SA**

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38. I am willing to use LHIMS for my work.					
39. I do not mind spending some time to learn how to use this system for my work.					
40. I intend to use the LHIMS as often as possible					
41. I plan to use the LHIMS in the future					
42. I will encourage the use of LHIMS among my colleagues					
SECTION C: OTHER FACTORS INFLUENCING USER ACCEPTANCE					
Training and Education	**SD**	**D**	**N**	**A**	**SA**
43. I received the training that I need to be able to understand and use the LHIMS."					
44. The LHIMS training made it more useful to me.					
45. The LHIMS training made it easier for me to use this technology					
46. My organization provided me complete training in using LHIMS					
47. IT staff provided an adequate support to LHIMS					
Personal identity					
48. I am comfortable with information and communication technology					
49. I consider myself a person that embraces change					
50. I do not want that the LHIMS to change the manner that I interact with patients					
51. I do not want the LHIMS EHR to change my daily work					
CHALLENGES OF LHIMS					
What do you think are the biggest challenges your practice has faced following the implementation of LHIMS? Indicate how much you agree or disagree using the 5-point Likert scale:	**SD**	**D**	**N**	**A**	**SA**
52. High cost of implementation					
53. Resistance to change from staff					
54. Lack of computers and other logistics					
55. Lack of training and support					
56. Technical difficulties or malfunctions					
57. Difficulty in navigating the LHIMS interface					
58. Time-consuming data entry					
59. Concerns over data security and privacy					
60. Frequent power outages and lack of a dedicated power supply					
61. Poor internet or network connectivity					

SECTION D: USER ACCEPTANCE

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USER ACCEPTANCE

62. Overall, do you accept the LHIMS EHR?

Yes [ ] 2. No

USER SATISFACTION

63. Overall, are you satisfied with the use of the LHIMS EHR in your job?

Yes [ ] 2. No [ ]

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APPENDIX 7

PLAIGIARISM REPORT

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Elijah Bawa Mishio

USER ACCEPTANCE OF THE ELECTRONIC HEALTH RECORD SYSTEM AMONG HEALTHCARE WORKERS IN THE TAMALE TE...

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